** FLUORIDATION **

RESOURCE GUIDE

FOR SPEAKERS

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TABLE OF CONTENTS

Introduction 5

Executive Summary (from: *Synopsis of Fundamentals of Relation of Fluorides and Fluoridation to Human Health*) 6

Tooth Decay; Fluorides on This Earth; Definition of Water Fluoridation; Benefits of Water Fluoridation; Fluorides in Water; Fluorides in Food; Metabolism of Fluorides in the Human Body; Safety of Fluoridation; Alternatives to Water Fluoridation

Dental Needs and Fluoridation in Michigan 9

Dental Needs; Fluoridation in Michigan; Attempts for Statewide Fluoridation in Michigan; Act 346 of 1978 Michigan Legislature; Rulings of Michigan Supreme Court

Benefits

Benefits of Water Fluoridation in Four Michigan Cities, Graph and Tables; Addendum to Discussion; Ten Years of Water Fluoridation in the city of Flint and in Three Other Fluoridated Cities in Michigan (Table) 12

Fluoridation Saves Teeth, Dollars and Dental Manpower 20

Abstracts: California Report; Newburgh-Kingston Report; Florida Study; Cleveland Report; Philadelphia Survey; Philadelphia Story; Idaho Study; Sheboygan, WI Study; Prince George Report; Trenton Program; Mayor's Remarks About Trenton; Milwaukee Report; Examples of Lower Costs; Examples of Estimated Saving in Various States and Ontario, Canada; New Zealand Report; Effective Malocclusion

Cost-Benefits - Newbrun and Gish from 1978 Workshop at the University of Michigan 30

Editorial - The Real Tooth Toughener - Paw Paw Courier Leader 31

Adult Dental Health Benefits from Fluoridation Documented in New American and British Reports (HEW Bulletin) 32

Abstracts: Keene's Studies of Naval Recruits (2); British Studies (3); Russell and Elvolve Study in Colorado; Aurora - Rockford, Ill. Study; 15 year Study in Grand Rapids; Fluorides and Mineral Metabolism; N.R.C. Recommended Dietary Allowances

Health and Safety

Essentiality of Fluorine (HEW Bulletin). 39

Food and Nutrition Board of National Research Council Reaffirms its Recommendation of Fluoridation and Reaffirms its Consideration of Essentiality of Fluoride 42

Recommended Dietary Allowances, National Academy of Sciences. 44

Total Fluoride Intake (HEW Bulletin). 52

Report on Fluoride Intake in Michigan 54

Introduction: Changes in Dietary Fluoride, Estimate of Changes in Fluoride Intake Based on Dental Examinations; Based on Urinary Fluoride Excretions; Effect of Increased Fluorides on Health; Summary, Overall Summary

Methodologic Problems in Evaluating the Carcinogenic Risk of Environmental Agents. Article by M. A. Strassburg and Sander Greenland from J. of Environ. Health 41:214-217 Jan. - Feb., 1979 81

Cancer Mortality Trends not Attributable to Fluoridation 85

Statement of Fluoridated Drinking Water and Cancer 86

Fluoride-Cancer Relationship 88

Memorandum: Evaluation of Statistical Presentation From the National Health Federation. 89

Fluoride and Cancer: No Link and a Non-Issue. Article by Dr. Peter Cooper of the John Curtin School of Medicine, Australia 91

Michigan Health Director Bites Right Back on Opposition Claims, Fluoridation Reporter November-December 1963 93

Misrepresentation of Statistics on Heart Deaths in Antigo, Wisconsin 94

Memorandum from Research Analyst, Wisconsin Department of Health and Social Services

Comparison of morality rates in fluoridated and non-fluoridated communities 100

No Evidence of Allergy to Fluorides in Optimally Fluoridated Water -- American Academy of Allergy; A Statement on the Question of Allergy to Fluoride as Used in the Fluoridation of Community Water Supplies 101

Mayo Clinic Doctors Restate Endorsement of Fluoridation and Refute Misinterpretations of Kidney Disease Personnel 104

British Physicians Confirm Safety and Effectiveness and Urge Fluoridation 106

Personal Health - Jane E. Brody, N.Y. Times, 2-13-80 107

Environment

Environmental Protection Agency Supports Fluoridation 109

Misinterpretation of "Safe Drinking Water Act" 110

Relationship of Air Pollution to Community Water Fluoridation 112

Opposition

Consumer Reports: "No 'Scientific Controversy' Over the Safety of Fluoridation" 113

The Health Robbers. Article by Dr. Stephen Barrett and Gilda Knight 121

The Unhealthy Alliance; NHF's Leaders; How NHF is Organized; NHF's Philosophy; The Scope of NHF Activity; NHF's Fight Against Fluoridation; The Unique Alliance; The Poisonmongers; Fluoridation's Credentials; Opposition to Fluoridation; Neutralizing Politicians; How poisonmongers Work; Let the People Decide; The Devout Anti; NHF's Cancer Scare; Don't be Misled

Congressional Record - National Health Federation: The Questionable Vitamin Lobby, Memorandum on the National Health Federation to Acting Commissioner of Food and Drugs 130

Court Cases: Aitkenhead vs. Borough of West View; Yiamouyiannis vs. Schneiderman; Yiamouyiannis vs. Consumer Reports; Ford vs. City of New York; City of Brainerd vs. State of Minnesota 136

Letters of Appeal From the Safe Water Foundation; Other National Opposition 139

Endorsements

Letter from Christian Science Church 146

State and National Organizations Endorsing Fluoridation 147

Addendum

Michigan Department of Public Health Policy Statement on Fluoridation of Community Water Supplies . . . . . A

Synopsis of Fundamentals of Relation of Fluorides and Fluoridation to Human Health A-9

World Health Organization - Fluoridation and Dental Health (May 1969) B-1

Introduction; 1. Dental Caries as a World Health Problem; 2. Fluoride and Dental Caries; 3. Effect of Water Fluoridation; 3.1 Dental Health; 3.2 General Health; 4. Engineering and Economic Considerations; 5. Other Methods of Supplying Fluorides; 6. Position of Professional Organizations; 7. WHO Activities Related to Water Fluoridation; Annex I. Reported Water Fluoridation Programmes; Annex II. Examples of Dental Effects of Water Fluoridation as Reported in Several Communities; Annex III. Excerpts from Reports of WHO Expert Communities, Study Group and Seminars and from Resolutions by WHO Regional Committees; Annex IV. International Dental Federation

Why Does the Michigan Department of Public Health Promote Water Fluoridation? C-1

Studies of Fluoridation's Effectiveness - A Bibliography of American and Foreign Studies D-1

Suggested Outline for Speakers - Nature's Way to Prevent Tooth Decay; Summary Hints for Speakers E-1

INTRODUCTION

This manual has been compiled to provide the speaker with at least a partial scientific background and facts about the multiple facets of fluoridation.

Its intent is to show that no controversy about this public health measure exists among creditable scientific and public health organizations. Rather, subjective allegations by persons, who, for some reason wish to block the utilization of this measure in the prevention of disease create in the public's mind the illusion of conflict and uncertainty about this preventive method.

The appearance before a lay audience does not require a thorough scientific dissertation but merely a clear and honest presentation of the obvious facts about the subject of fluoridation. The speaker is encouraged to interpret the complexity of scientific language and conclusions into simple statements that can be understood by the lay audience without scientific expertise or training.

The speaker also is advised not only to become familiar with the entire content of this document but also to utilize the Table of Contents in exploration of any detail concerning an aspect of fluoridation.

Some sections of the manual contain references for further study by the interested individual. For example, the Synopsis of Fundamentals of Relation of Fluorides and Fluoridation to Human Health and the WHO Report refer to many studies listed in each bibliography.

The speaker is encouraged to utilize the supplement, Answers to Questions Concerning Fluoridation and Fluoride as an aide for a presentation on fluoridation.

Acknowledgment:

Appreciation is expressed to Mrs. Jan Bradfield, Secretary for the Dental Division, Michigan Department of Public Health, for her effort and ideas in the development of this resource guide.

EXECUTIVE SUMMARY *

Tooth Decay

Tooth decay is recognized as a widespread chronic disease in man that destroys body tissues and produces pain, discomfort, fever and infection which can spread into other tissues such as the lymph glands and tonsils. Death can occur from this disease because of complications with valvular disease of the heart, especially bacterial endocarditis. Tooth decay may result in absence from school or work and increasing costs of treatment of this disease may strain a family or a community budget.

Fluorides on this Earth

Fluorides are not a recent discovery by man in a laboratory but have been present on this earth probably since its creation. Fluorides are present as inorganic compounds in rocks and soil throughout the earth's surface. Some organic fluorides occur naturally but do not have any relation to fluoridation because of their insolubility. Fluorides are present in minute amounts in nearly every food and water supply. Unfortunately these very small amounts in foods are too low for the prevention of tooth decay. Some water supplies become naturally fluoridated as the original water seeps through the rocks and soils and absorbs fluorides during this route. These waters retain sufficient amounts of the fluoride ion for the prevention of tooth decay. Natural fluorides have been present in the water supply of millions of people for generations and fluoridation only adds an identical fluoride ion to the same level in community water supplies as the concentration in the protective naturally fluoridated waters.

Definition of Water Fluoridation

Water fluoridation is the controlled adjustment of a water supply of a temperate climate to an optimum concentration of about one part of the fluoride ion in a million parts of water or 1/10,000 of one percent of fluorides in water.

Fluoridation does not affect the taste, the odor or the color of water. Hardness of the water has no relation to benefits of fluoridation. Fluoridation does not affect the use of water for any domestic or industrial purpose.

Benefits of Water Fluoridation

Children drinking water with a significant amount of fluorides since birth have upwards to two-thirds less tooth decay than children with water with insufficient fluorides. The optimum concentration of fluorides in water in temperate zones is about 0.7 - 1.2 parts per million for these dental benefits. Some other benefits to general health are indicated through fluoridation such as better condition of the bones of the elderly population. Financial savings in dental treatment can be attained through the lesser amount of tooth decay in children of fluoridated communities.

History of Fluorides and Fluoridation

The early history of the relationship of fluorine and dental decay began in the last quarter of the 19th century. Lower amounts of tooth decay were observed along with discolored teeth (mottled enamel) in some regions of the U.S.A.

*From: *Synopsis of Fundamentals of Relation of Fluorides and Fluoridation to Human Health.* Michigan Department of Public Health, 1979.

One investigator thought that the mottled enamel appeared to be caused by something in the drinking water which, in 1931, was discovered by a new laboratory analysis to be an excessive amount of fluorides in the water. At this time it was noted that trace amounts of fluoride in water might inhibit dental decay with no noticeable staining or pitting. A series of studies in naturally fluoridated communities were carried out by the U.S. Public Health Service in 1938, and a direct relationship was established between the proportion of fluorides in drinking water and the amount of tooth decay among children who drank the water since birth. Some children in South Dakota, Wisconsin and Colorado had stained teeth from too much fluoride, but this entire population also had less tooth decay than groups of children in the same states with very little fluoride in their drinking water.

These studies in the natural fluoride areas of the U.S.A. were confirmed by scientists in similar areas of other countries. It was concluded that one part per million of fluoride in water does not produce any observable mottling of teeth or any undesirable hazard to the general health of humans but does produce less tooth decay.

The next step was to see if the same benefits could be attained by increasing the concentration of fluoride-deficient water of a community water supply to a level of one part fluoride per million parts of water. In 1945, controlled studies of fluoridation began at Grand Rapids, Michigan, Newburgh, New York, and in Brantford, Ontario. The results of these studies after more than 10 years showed a uniform and constant reduction of dental decay and demonstrated that fluoridated domestic waters exert the same reduction of tooth decay as observed in naturally fluoridated areas. Fluoridation is merely the transference of a natural phenomenon to a disease control measure of widespread usefulness to man.

In 1979, there are more than 6.7 million people drinking fluoridated water in 440 Michigan communities; in addition, 105 million American people and a total of 130 million people in England, Russia, Canada, Netherlands, Chile, German Democratic Republic and other countries of this world drink fluoridated water.

Fluorides in Water

Some water supplies have too little natural fluoride, some too much, and others just the right amount. Too little fluoride in water will not reduce tooth decay, but too much fluoride (much more than two parts per million) even in a temperate climate may cause pitting and staining of the teeth in some individuals. The amount of available fluorides is dependent on the solubility of the different inorganic compounds. At the optimum concentration (about 0.7 - 1.2 parts per million in temperate climates) upwards to two-thirds of tooth decay can be prevented.

Fluorides in Food

Although fluorides are present in almost all foodstuffs in some trace amounts, food does not contain enough fluoride to prevent tooth decay in children. The intake of fluoride from food was not a primary consideration in studies in naturally fluoridated regions of the U.S.A.; the essential determination was the inverse relation of the concentration of fluorides in drinking water to the amount of tooth decay in a population. A recent review by the Michigan Department of Public Health confirmed an insignificant impact through food processing with fluoridated water. In

nonfluoridated areas fluoride tablets or drops have to be used because of insufficiency of fluoride in foods for dental benefits.

Metabolism of Fluorides in the Human Body

Fluorides are rapidly excreted by the body. The amount excreted depends on the intake of fluorides and the absorption by the body--in children, proportionally more fluoride is retained by the body during tooth and bone development. As the skeletal system matures and tooth development and bone growth ceases, a higher percentage of the intake of fluorides is excreted. Only enough fluorides are used by the body of an adult to satisfy the ionic exchange between the bones and blood. The excretion of fluoride is very rapid as one-third of an oral dose can be excreted in three hours and, in 24 hours, 60 percent of the oral dose of fluorides is eliminated from the body.

Safety of Fluoridation

Reputable scientific organizations throughout the world support water fluoridation and recommend one part per million of fluorides in the water supply in areas of temperate climates as safe, beneficial and economical and not productive of any undesirable systemic effect in man. No significant abnormal systemic or functional effects, except for some mottling of teeth, have occurred in Americans who have used waters containing as high as eight parts per million fluorides for as long as 37 years. At one part per million no noticeable mottling occurs but marked protection against tooth decay does occur.

Detailed studies of the relation of general health to fluoridation throughout the world by scientists of many disciplines and countries have not demonstrated any effect of fluoridation on mortality rates or illness. Fluoridation has had no effect upon the prevalence and incidence of cancer, arthritis, allergies, heart disease, birth defects and diseases of bones, skin, eyes, endocrine glands, kidneys, liver, nerves, blood, lungs or digestive system. However, physicians may recommend limiting fluoride intake for patients having kidney disease so severe that they cannot excrete fluoride.

Acute poisoning by fluorides does occur when there is accidental ingestion of excessive amounts of the raw chemical. Chronic poisoning also has occurred in cases of long term chronic industrial exposure to very high levels. Several reports described skeletal changes in the tropic zones of India resembling those of the chronically exposed industrial workers. No confirmation has been presented that the amount of skeletal accumulation after ingestion of waters at about one part per million or even higher in the temperate climate of the U.S.A. has been harmful. Chronic fluorosis is not found generally in temperate climate of the U.S.A.

Alternatives to Water Fluoridation

Other methods of reducing tooth decay either by fluorides or by some other agent or agents have been suggested as alternatives to water fluoridation. On a community basis no other method has been proven to be as effective, safe, economical or practical as water fluoridation in the reduction of tooth decay.

DENTAL NEEDS AND FLUORIDATION IN MICHIGAN

DENTAL NEEDS:

During the middle of the decade of 1940, a dental survey was made of 7,373 school children in five communities of Michigan. At this period of time, only nonfluoridated areas were available for any determination of the prevalence of tooth decay.

The data revealed:

> The school children had an individual average of 5.5 primary teeth and nearly seven permanent teeth which showed evidence of attack by tooth decay. Forth-eight percent of these permanent teeth needed fillings and nearly ten percent of these permanent teeth were extracted or missing.
>
> The eight year old in the study had an average of five primary teeth and nearly two and one-half permanent teeth already afflicted by tooth decay.
>
> The twelve year old had accumulated nearly seven decayed permanent teeth and the sixteen year old had eleven permanent teeth decayed.

More recent dental surveys in Flint, Sturgis and the Upper Peninsula of Michigan (nonfluoridated at the time of survey) revealed the same prevalence of dental decay.

FLUORIDATION IN MICHIGAN

January 28, 1945 proved to be a historic occasion in dental health when Grand Rapids, Michigan was the first city of the world to add fluoride to its fluoride-deficient water supply to the recommended level of one part per million. After some data were available in 1951, fluoridation was approved by the Michigan Department of Public Health, U.S. Public Health Service and the American Dental Association. Continuing research in Grand Rapids up through 15 years of fluoridation showed the same dental benefits that were shown in areas with natural fluoridation. Studies in Midland and Wyandotte confirmed these results as did later investigations in Flint, Jackson, Battle Creek and Kalamazoo. The Flint Study was conducted in 1976.

Newburgh, New York and Brantford, Ontario began water fluoridation shortly after Grand Rapids and later reports indicated that tooth decay was diminished in about the same amount among children of these two cities as in children of Grand Rapids.

Muskegon was to be the control city for ten years of the Grand Rapids study. When the dental benefits to children of Grand Rapids began to appear, Muskegon chose to fluoridate its water system in 1951.

Midland, Michigan did not wait for the results in Grand Rapids but decided to fluoridate its water supply in 1946. Ludington and Algonac followed this example in 1949.

In 1950, there were already seven communities serving nearly a quarter-million people in Michigan. In the following year of 1951, the population on fluoridated water was over 800,000 in 32 communities. The 1950's and later years were marked by intensive opposition to fluoridation but despite the opposition, in 1960 1.1 million people of Michigan in 77 communities had access to fluoridated water. Today in Michigan about 6.7 million people in 440 communities are drinking fluoridated water.

The eastern portion of Michigan has included many communities with significant amounts of fluorides present naturally in the water system. Cheboygan, for example, has had the optimal concentration of one part per million naturally during all these years.

ATTEMPTS FOR STATEWIDE FLUORIDATION IN MICHIGAN

Dr. Albert E. Heustis in the early 1960's, when he was Director of the Michigan Department of Public Health, attempted to obtain approval of a regulation to attain universal water fluoridation in Michigan. The regulation would require fluoridation of all water supplies of 1,000 or more people. Dr. Heustis relied essentially on a 1913 statute delegating supervisory powers to the director of the state health department over public water systems to ensure a "pure and wholesome" water supply. To support his stand, he wrote that tooth decay can be defined as a public health problem because it is a widespread disease (that it could scarcely be more widespread if it were a communicable disease), because there is knowledge to deal with the problem and because this knowledge is not being applied fully to the detriment of hundreds of thousands of children. The contention was that fluoridation was the proper safeguarding of public health and the regulation was related to the provision of pure and wholesome water.

The more than 20 years of effort on the part of the state health department, the Michigan State Dental Association and allied professional associations to obtain water fluoridation was described as a long, drawn-out and costly endeavor--costly in terms of money and efforts to promote water fluoridation, costly in terms of the expense of conducting referenda (in some communities two, and even three times) and most importantly, costly in terms of a generation of children who have been permitted to grow up in many parts of the state without the proven benefits of fluoridated water.

The effort was nullified when the Joint Committee on Administrative Rules of the Michigan Legislature voted unanimously to suspend the regulation. The action to suspend the rule came at a time when a great deal of criticism was being directed at a number of state agencies by members of the Legislature over the issuance of rules and regulations which lawmakers felt represented an intrusion into their own sphere of responsibility.

The issue appeared to be a question of drawing fine lines between the extent of implied authority granted to agencies by statute, and the lawmaking prerogative of elected representatives of the people and the Joint Rules Committee took aim at the most controverted one at hand--the fluoridation regulation.

The committee explicitly stated that the question was not over the scientific merits of fluoridation, mentioning that, "Some of our members feel that the balance of scientific evidence supports the health benefits and safety of fluoridated water." However, noting that Dr. Heustis relied essentially on a 1913 statute delegating supervisory powers to the director of the state's health department over public water systems to ensure a "pure and wholesome" water supply, the committee members were unanimous in questioning whether or not the rule promulgated by Dr. Heustis was "of a type which is within the intent of the enactment passed in 1913."

In raising this question, the committee took exception to Attorney General Frank Kelly's opinion which supported Dr. Heustis. The attorney general advised Dr. Heustis that the proposed rule was within the authority delegated to him as director of the state's health department.

ACT 346 OF 1968 MICHIGAN LEGISLATURE

As a result of this action, Act 346 of the Michigan Legislature was enacted in 1968. This legislation, approved by the Governor on July 19, 1968, provided in Section 2 that every county, city, township or village or combination thereof supplying water to the public shall fluoridate within five years after effective date of the Act, unless fluoridation is rejected by ordinance or by referendum. Act 346 was not enforceable since Section 1 prohibited any state agency to order fluoridation of any public water supply.

ACT 368 OF 1978 MICHIGAN LEGISLATURE

Act 368 of the 1978 Michigan Legislature provided the same conditions for fluoridation with a single modification. Act 368 read that fluorides may be added to the water supply instead of that fluorides shall be added, and deleted any period of compliance.

RULINGS OF MICHIGAN SUPREME COURT

In 1965, the Michigan Supreme Court upheld the power of the city of Detroit to fluoridate its water supplies on the basis that each city charter shall provide "for the public health." The Court also ruled in the same case that the power of the state to adopt and enforce regulations to protect and improve public health involved fluoridation in the prevention of tooth decay although it was not a communicable disease.

(Portions of this section were extracted from: Miller, C.L., Statewide fluoridation order suspended. Mich. S. Dent. A.J. 50:11-3, Jan. 1968. At the time of the writing, the author was Administrative Assistant of the Dental Division of the Michigan Department of Public Health. Presently, C.L. Miller, D.O. is a physician in private practice in the city of Jackson, Michigan and is an ardent supporter of water fluoridation.)

BENEFITS OF WATER FLUORIDATION IN FOUR MICHIGAN CITIES

The city of Flint began fluoridating its water supply in 1966. The cities of Jackson, Battle Creek and Kalamazoo started water fluoridation in 1951.

During the course of a federal grant project in the schools of these four cities, the Dental Division of the Michigan Department of Public Health was gathering data on the condition of the teeth of children in these areas. These data first were tabulated for rates of incidence to satisfy the purposes of the project. After these counts were finished, data on prevalence of carious lesions were tabulated to check the benefits of water fluoridation among children of these four cities.

Since Flint started fluoridation in 1966, children examined in that city during that year would not show any benefits and they may be considered as resident of a nonfluoridated community up to that time. These children in the Flint 1966 group did not have any benefits of any form of fluorides.

In 1970, dental examinations were made on another group of Flint children. These children had been exposed to fluoridated water for 4-4½ years at the time of examination since the examinations were made during January through June of 1970.

Children of Jackson, Battle Creek and Kalamazoo were examined during the school year of 1968-69 and water fluoridation was in force for 18 years in the thre cities. Data will be presented only on continuous residents since birth. As far a it could be determined, the children did not have any benefits from other forms of fluorides except through water fluoridation.

Examinations were made by a dentist with a mouth mirror and explorer under good lighting.

RESULTS:

10-12 Year Age Group - After 4-4½ years of fluoridation, the Flint 1970 group in each age group of 10, 11, and 12 years, shows a range of 19-30 percent less carious lesions than the Flint 1966 group, (Tables II and III). When the age group of 10-12 years are combined, the reduction in decayed, missing and filled permanent teeth is about 21 percent and in decayed, missing and filled permanent tooth surfac it is nearly 23 percent.

The children of Jackson, Battle Creek and Kalamazoo are enjoying the maximum benefits of water fluoridation in reduction of carious lesions of 52 percent of DMF teeth to nearly 67 percent of DMF surfaces among the three ages. The combined age group of 10-12 years shows a range of 53 percent reduction in DMF teeth for the Kalamazoo group to 64 percent reduction in DMF surfaces for the children of Jackson and Battle Creek.

The percent of children with no decayed, missing or filled permanent teeth in the Flint 1966 group, ages 10-11 years, was 12.4 while the children of the three fluoridated cities had children in a similar condition of above 40 percent. The Flint 1970 group had a better percentage than the Flint 1966 children of 22 percent.

The modest benefits for the Flint 1970 group and the maximum benefits for each group of Jackson, Battle Creek and Kalamazoo are illustrated in Figures I and II.

Missing Teeth - The rate for missing teeth among the Flint 1966 group of ages, 10-12 years, was .22 per child. The Flint 1970 group had a lower rate per child of .15 missing teeth per child while the groups of children, ages 10-12 years, of Jackson, Battle Creek and Kalamazoo had a much lower rate of missing teeth per child of .04. Thus, it can be stated that children of a nonfluoridated area in this age group will have five and one half times more missing permanent teeth as will children of similar ages residing in a fluoridated area. The decline in the Flint 1970 group shows impressively the benefits of water fluoridation although only four and a half years in effect.

13 Year Olds - Some children of the age of 13 years were examined in Jackson, Battle Creek and Kalamazoo. These children were continuous residents since birth in the three cities. In 1966, a group of children of the same age were examined in Flint. In 1970, not enough children in Flint of this age were examined for a valid comparison. The Jackson, Battle Creek and Kalamazoo group had a mean number of decayed, missing and filled permanent teeth per child of 2.01 whereas the Flint 1966 13 year olds had a mean rate of 5.29. This difference is 62 percent.

In decayed, missing and filled permanent tooth surfaces per child, the fluoridated group had a rate of 2.16 and the Flint 1966 group had 9.15 such surfaces per child. This difference amounts to 67 percent less such surfaces for the fluoridated group.

For missing teeth per child, the 13 year old children of Jackson, Battle Creek and Kalamazoo showed a similar rate of .04 as did the children, ages 10-12 years, of these cities.

In the Flint 1966 group, these children with no benefit of fluoridated water had .44 missing teeth per child or eleven times as much as the fluoridated group. The 13 year olds of the fluoridated had 41 percent who have had no decay in permanent teeth whereas the Flint 1966 group had only 11 percent.

DISCUSSION:

The dental benefits of water fluoridation to children of Jackson, Battle Creek and Kalamazoo is no surprise for the data herein only confirm the overwhelming evidence showed in other studies including the study in Grand Rapids, which began fluoridation in 1945 and was the first city in the world to do so.

After four and one half years of fluoridation, children of Flint are beginning to show some benefits which should reach the lower amount of tooth decay among children of the three fluoridated cities when water fluoridation has been in effect in Flint for a significant period of years as it has been in Jackson, Battle Creek and Kalamazoo. It is regrettable that the fluoridated water was not made available to the Flint children sooner.

The percent of children who have not experienced decay in any permanent teeth leads to an interesting speculation. A child born in a fluoridated area has a chance of slightly one in two of having no tooth decay in permanent teeth upon reaching the ages of 10-12 years. In contrast a child in a nonfluoridated area has a chance of one in eight of being in such condition when he is of these ages.

Studies have shown that nearly all permanent teeth in children are lost due to tooth decay. The loss of a permanent tooth involves either a costly replacement of the missing tooth or it could lead to the more expensive consequences of gingiva disease and malocclusion.

The children of Jackson, Battle Creek and Kalamazoo will soon enter the life of adulthood. It can be assumed that the benefits of fluoridated water will continue as they develop into adults as a study of adults, ages through 44 years in Colorado Springs, which is a naturally fluoridated area showed the 60 percent reduction in dental cavities.

SUMMARY:

Children, ages 10-13 years, of Jackson, Battle Creek and Kalamazoo show the maximum dental benefits of drinking fluoridated water since birth when compared to a group of Flint children who have not had the benefits of any fluorides. Children in Flint are showing some benefits after four and one half years of water fluoridation.

TABLE I

NUMBER OF CHILDREN IN EACH AGE GROUP					
AGE	FLINT 1966	FLINT 1970	JACKSON	BATTLE CREEK	KALAMAZOO
10	106	181	161	55	192
11	173	303	134	99	169
12	133	248	130	93	109
TOTAL	412	732	425	247	470

TABLE II

PREVALENCE OF DECAYED, MISSING AND FILLED PERMANENT TEETH BY AGE AND BY CITY

AGE (Yrs.)	FLINT 1966	FLINT 1970		JACKSON		BATTLE CREEK		KALAMAZOO	
	DMFT	DMFT	% DIFF[1]	DMFT	% DIFF[1]	DMFT	% DIFF[1]	DMFT	% DIFF[1]
10	2.76	2.23	19.2	1.33	51.8	1.27	54.0	1.30	52.9
11	3.36	2.63	21.7	1.45	56.8	1.32	60.7	1.61	52.1
12	4.12	3.20	22.3	1.53	62.9	1.91	53.6	1.90	53.9
Adjusted Rates[2] Ages 10-12	3.45	2.71	21.4	1.45	58.0	1.50	56.5	1.62	53.0

TABLE III

PREVALENCE OF DECAYED, MISSING AND FILLED PERMANENT TOOTH SURFACES BY AGE AND BY CITY

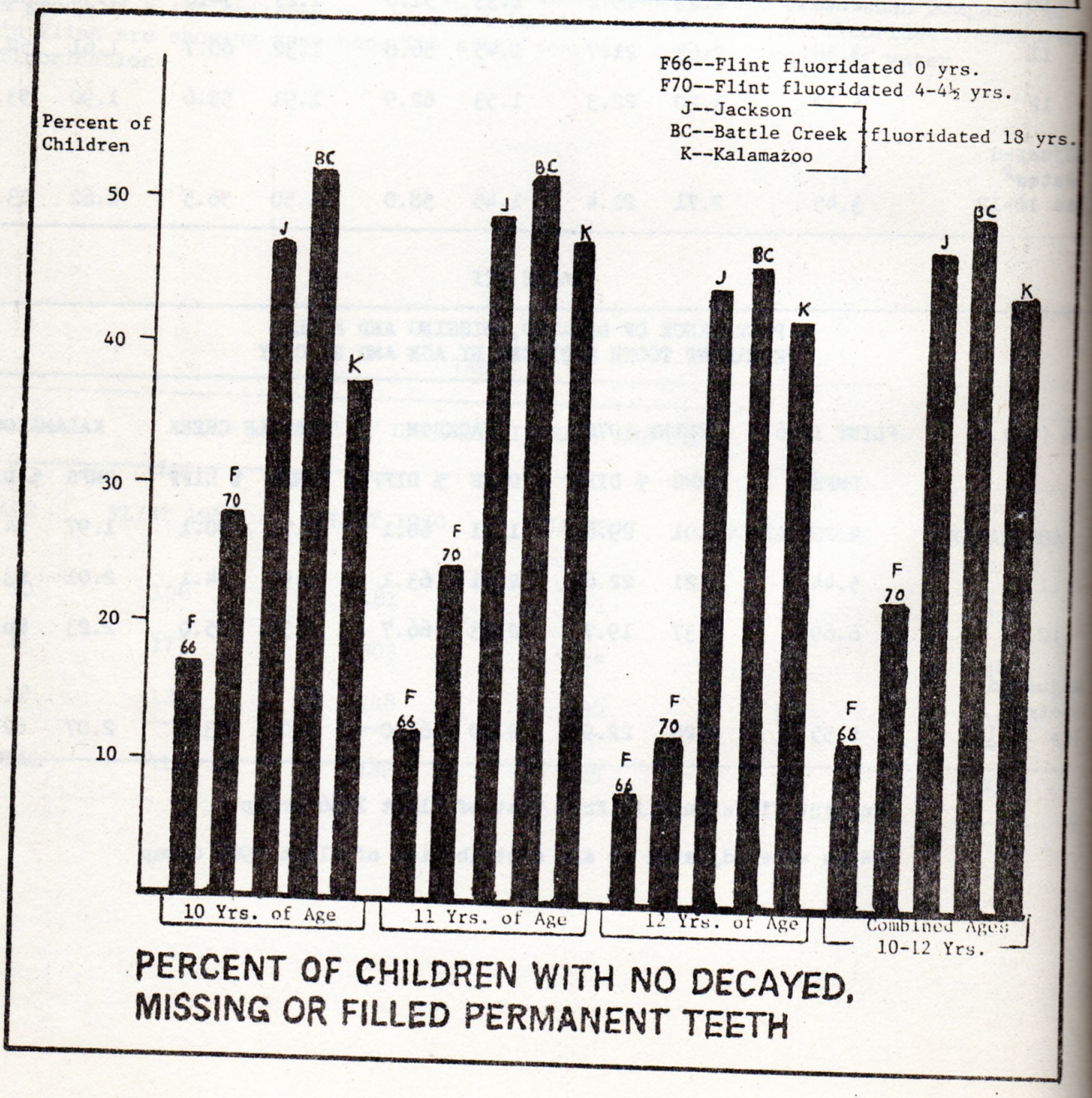
AGE (Yrs.)	FLINT 1966	FLINT 1970		JACKSON		BATTLE CREEK		KALAMAZOO	
	DMFS	DMFS	% DIFF[1]	DMFS	% DIFF[1]	DMFS	% DIFF[1]	DMFS	% DIFF[1]
10	4.29	3.01	29.8	1.71	60.1	1.71	60.1	1.97	54.1
11	5.44	4.21	22.6	2.01	63.1	1.95	64.1	2.01	63.1
12	6.69	5.37	19.7	2.23	66.7	2.34	65.0	2.23	66.7
Adjusted Rates[2] Ages 10-12	5.55	4.28	22.9	2.00	64.0	2.01	63.8	2.07	62.7

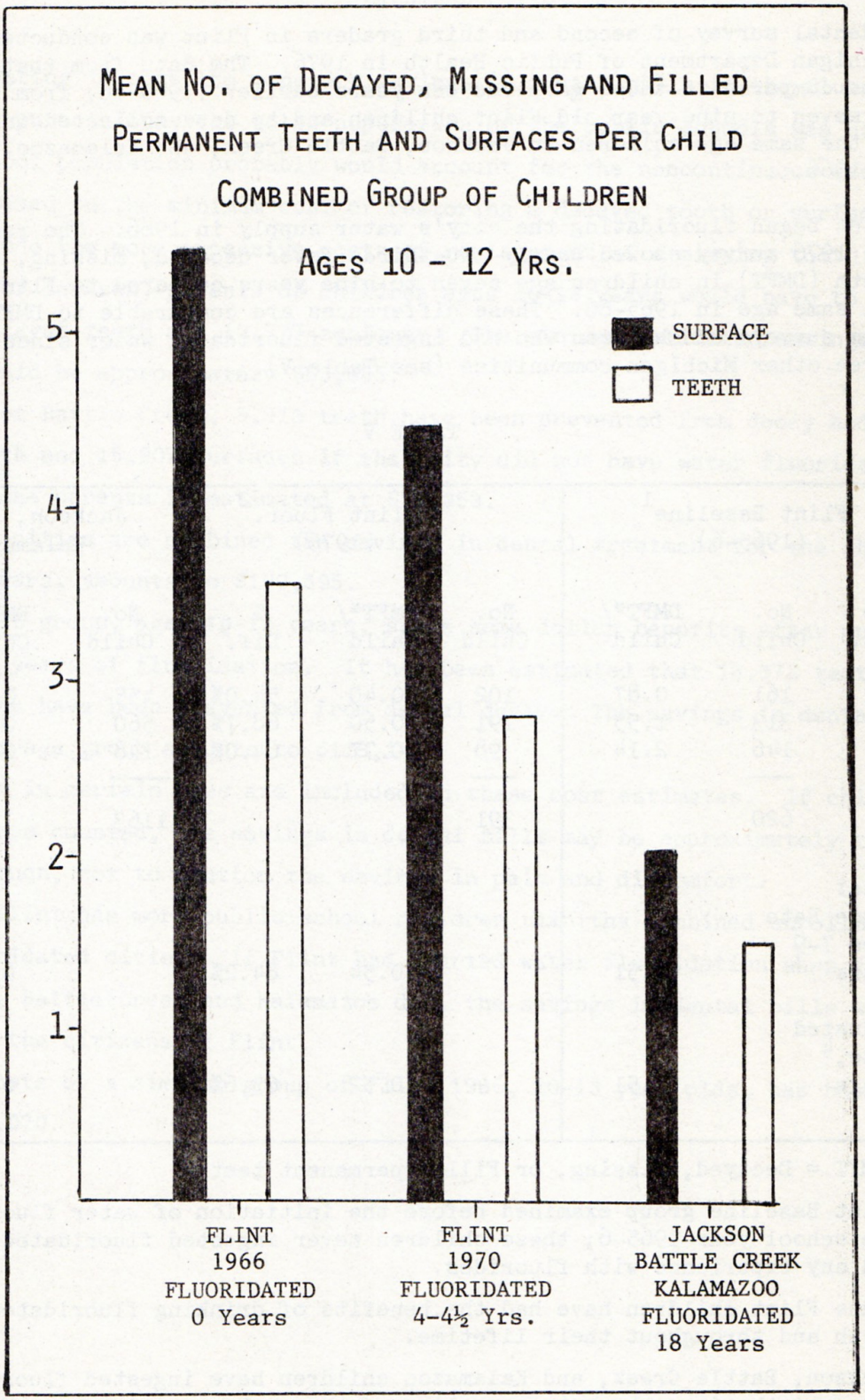
[1]Percent difference is from that of Flint 1966 Group

[2]Rates were adjusted to age distribution of Flint 1966 Group

TABLE IV

PERCENT OF CHILDREN CARIES FREE BY AGE AND BY CITY				
	AGE 10 Yrs.	AGE 11 Yrs.	AGE 12 Yrs.	COMBINED 10-12 Yrs.
FLINT 1966	17.9	12.1	8.3	12.4
FLINT 1970	28.2	24.1	15.7	22.3
JACKSON	47.2	48.5	43.9	46.6
BATTLE CREEK	52.7	51.5	46.2	49.8
KALAMAZOO	46.9	37.9	42.2	42.3




MEAN NO. OF DECAYED, MISSING AND FILLED
PERMANENT TEETH AND SURFACES PER CHILD
COMBINED GROUP OF CHILDREN
AGES 10 - 12 YRS.
SURFACE
TEETH
5
4
3
2
1
FLINT
1966
FLUORIDATED
0 Years
FLINT
1970
FLUORIDATED
4-4½ Yrs.
JACKSON
BATTLE CREEK
KALAMAZOO
FLUORIDATED
18 Years

Results of Water Fluoridation in Flint, Jackson, Battle, Creek, and Kalamazoo

A dental survey of second and third graders in Flint was conducted by the Michigan Department of Public Health in 1976. The data from that survey were compared to those gathered ten years earlier (1965-66) from a survey of seven to nine year old Flint children and to data collected in surveys of the same age children in Jackson, Battle Creek, and Kalamazoo, Michigan in 1966.

Flint began fluoridating the city's water supply in 1966. The results of the 1976 survey showed nearly two-thirds fewer decayed, missing, and filled teeth (DMFT) in children age seven to nine years compared to Flint children the same age in 1965-66. These differences are comparable to DMFT ratios from surveys of children who had ingested fluoridated water since birth in three other Michigan communities (see Table V).

TABLE V

	Flint Baseline[1] (1965-6)		Flint Fluor.[2] (1976)			Jackson, Battle Creek, Kalamazoo (1966)		
Age Yrs.	No. Child	DMFT*/ Child	No. Child	DMFT*/ Child	% Dif.[5]	No. Child	DMFT*/ Child	% Dif.[5]
7	161	0.87	102	0.40	54.0%	455	0.39	55.2%
8	313	1.55	191	0.50	68.7%	560	0.59	62.0%
9	146	2.14	98	0.77	64.0%	148	0.71	66.8%
	620		391			1163		
Total Crude Rate Ages 7-9 years		1.51		0.54	64.2%		0.53	64.9%
Adjusted Rate,[4] years		1.51		0.52	65.6%		0.57	62.5%

*DMFT = Decayed, Missing, or Filled permanent teeth

[1]Flint Baseline group examined before the initiation of water fluoridation during the school year 1965-6; these children never ingested fluoridated water nor have had any experience with fluorides.

[2]These Flint children have had the benefits of drinking fluoridated water since birth and throughout their lifetime.

[3]Jackson, Battle Creek, and Kalamazoo children have ingested fluoridated water since birth since the water supplies of these three cities have been fluoridated since 1951.

[4]Total rates were adjusted to the age distribution of Flint 1965-6 Baseline group.

[5]Differences as compared to the Flint Baseline (1965-6) group.

ADDENDUM TO DISCUSSION - Benefits of Water Fluoridation in Four Michigan Cities

It is interesting to note the monetary savings in dental bills in the fluoridated cities. For this purpose only the total population of the public schools was used. The parochial school population probably would account for the noncontinuous residents. The estimate is based on the minimum cost of restoring a decayed tooth or surface and does not include the more expensive costs of replacement of a missing tooth.

In the city of Jackson, parents of children ages 10-13 years would have to pay for 5,859 more decayed teeth and 12,777 surfaces. The minimum estimated savings for this age group would be approximately $63,885.

In the city of Battle Creek, 5,310 teeth have been prevented from decay and 9,835 decayed teeth and 15,907 surfaces if that city did not have water fluoridation. The savings to these parents is estimated at $79,353.

If the three cities are combined the savings in dental treatment for the children, ages 10-13 years, amounts to $192,595.

The Flint 1970 group, ages 10-12 years, shows some dollar benefits after only four and one-half years of fluoridation. It has been estimated that 13,372 teeth and 23,629 surfaces have been prevented from dental decay. The savings in dental treatment for this age group amounts to $118,145.

Just children in certain ages are included in these cost estimates. If children of all ages were counted, the savings in dental bills may be approximately three to four times as much, not to mention the savings in pain and discomfort.

The city of Flint has more public school children than the combined enrollment of the three fluoridated cities. If Flint had started water fluoridation when the cities of Jackson, Battle Creek and Kalamazoo did, the savings in dental bills would be tremendous for the citizens of Flint.

The dental costs of a similar group of Flint 1966, 10-13 year olds, has been estimated as $314,070.

FLUORIDATION SAVES TEETH, DOLLARS, AND DENTAL MANPOWER

Twenty-five years of experience have conclusively demonstrated that adjusted fluoridation of public water supplies prevents up to two-thirds of tooth decay in children. Where fluoridation has been in effect, dentists have more time to provide more care for more people, and the cost-per-patient of dental health care programs for children is dramatically reduced. The following information provides examples of the effectiveness of fluoridation in saving teeth, saving dollars, and saving dental manpower.

Cross, Charles O. (President, Southwest Administrators, Los Angeles, California): "The economics of fluoridation," Journal of the Southern California Dental Association 36:499-500, December 1968. (Excerpts from the article by a labor leader closely associated with the dental care programs of the Teamsters Union).

> Our experience in the dental care field commenced in 1962. Presently, we have five different dental programs in effect. Our experience on these programs has varied due to the composition of each covered group. However, without any doubt, the overall cost of care has increased considerably since 1962. . . Three of the dental programs I administer are underwritten by the California Dental Service. They have supplied us with some statistics relevant to children from birth to age nineteen. Their study covers twelve of the major population centers in the State of California and includes two areas whose water supply is presently fluoridated. These are: San Francisco and Solano. The survey breakdown claims into three groups: those under $15; those between $15 and $50; and those exceeding $50. To cite two very pertinent examples, Los Angeles and San Francisco: In Los Angeles the number of claims under $15 was 15.3%; in San Francisco, 28.2%. In Los Agneles the number of claims between $15 and $50 is 44.1%; in San Francisco, 64.8%. Of paramount significance is the percentage of claims which exceeded $50. In Los Angeles this figure is 40.6%; in San Francisco, 7%. I am inclined to doubt that these figures reflect anything as coincidental as a change in climate. They are specific and cannot be ignored.
>
> Fluoridation will bring about not only general improvement in overall dental health, but very definite dollar savings. . . I must say that in my view the economics of fluoridation make it essential that all those interested in dental care, and particularly unions and corporations, place themselves in the vanguard of any effort to fluoridate.

Ast, David B., et al:- "Time and cost factors to provide regular, periodic dental care for children in a fluoridated and nonfluoridated area: final report," Journal of the American Dental Association 80:770-776, April 1970.

> Dental health studies continue to provide unequivocal confirmation that drinking optimally fluoridated water during childhood markedly reduces the hazards of both initial tooth decay and the progression of decay. Among 387 five and six year old children examined in Newburgh, New York (fluoridated), 41% were completely decay-free, whereas among 379 similarly aged children in Kingston (nonfluoridated), only

17% were completely free of decay. These children subsequently received complete initial dental care and annual incremental care for six years. At initial examination and each succeeding year, children in the nonfluoridated area required more compound fillings and more extractions than did their counterparts in the fluoridated area. Costs in the nonfluoridated area were more than twice as high, and chair time per patient was about one and one-half times that needed in the fluoridated area. The benefits from both fluoridated water and regular periodic dental care starting early in life make it quite clear that this kind of program is essential (1) to reduce the hazard of tooth loss and the potential results, (2) for economic reasons, and (3) to conserve the limited professional manpower time available so that more patients needing attention can get it.

Frank, John E., Law, Frank E., Spitz, Grace S., and Galagan, Donald J.: "School dental care in a community with controlled fluoridation," Public Health Reports 79:113-124, February 1964. (Dental Abstracts, May 1964) (Excerpts)

In a city with controlled fluoridation and a system of regular dental care for the school population, the number of dentist man-hours per child is about one-third the number required in a city without fluoridation. In the city with fluoridation the dentist can treat many more children than in cities without fluoridation.

Gainsville, Fla., began controlling the fluoride level of its drinking water at 0.8 ppm in 1949. This study began in January, 1954, and ended in 1959, and was designed to provide complete dental care (except orthodontics) for the approximately 5,000 children in grades one through six. Each school was visited four times during the study. . . .

The increasing effectiveness of fluoridation during the course of the study is illustrated by the increase in proportion of eight-year-old white children whose permanent teeth were caries-free. 22 per cent in the first series, 27 per cent in the second, 36 per cent in the third and 43 per cent in the fourth. In this interval the DMF rate decreased 42 per cent . . . .

Treatment time per child averaged 45 minutes in the first two series and 30 minutes in the final two series. In the first series a dentist was able to care for 1,270 children in 12 months. By the third series more than 2,000 children per year were treated by each dentist, an increase of nearly 60 per cent.

Treatment time in Gainesville was less than had been observed in the earlier school dental care studies in Richmond, Ind., and Woonsocket, R. I. In Richmond and Woonsocket (then nonfluoridated) about three dental hours were required per child in the first treatment series, four times that in Gainesville.

Healy, Thomas F.: "Study of the effects of fluoride on teeth of children in Cleveland public schools," Cleveland Public Schools, Cleveland, Ohio, November 1963. (Excerpts)

This is the report on the dental examinations of some 80,000 kindergarten children over a period of eight years in the Cleveland Public Schools. Naturally, it has to do with the primary teeth. Fortunately for our study, we have the detailed yearly dental examination of each school year as our pre-fluoride base line examination. We could have selected any other year, but this was the year before the fluorides were added to the water. They were added in July, 1956.

We used three criteria as means of comparison. First, the number (in percentage) of children entering the kindergarten with Physiologically Perfect (P.P.) sets of teeth. . . .The second criteria of comparison is the DEF - decayed plus extracted plus filled. By coincidence, DEF is the abbreviation for defects and that is exactly what DEF means--teeth that have defects, as contrasted to physiologically perfect teeth. The third criteria of comparison is tooth loss. This is based on the number of teeth that had been extracted before the child entered kindergarten.

	Physiologically Perfect	DEF	Tooth Loss
1955-56	27.9%	3.4	.29
1962-63	59.3%	1.3	.07
Improvement	112.0% (Twice as many)	61.7% (Reduced 2/3)	75.8% (Reduced 3/4)

Bronstein, Edward: "A survey of caries experience among the pre-school children of Philadelphia," Journal of Public Health Dentistry 29:24-26 Winter 1969 (Excerpts)

Epidemiological studies of dental caries experience among preschool children are scarce in the literature. Since these data are needed in planning and budgeting programs of dental care for preschoolers in such programs as "Get Set" and "Head Start," the Division of Dental Health of the Philadelphia Department of Health decided to collect current data on def (decayed, extracted, filled) for preschool children in the City . . . .Among the three-year-olds, about 85 percent were free of carious lesions. The percentage with no caries experience dropped for four and five-year olds, but the total still was 72 per cent. The implication, then, is that less than one-third of these children would need any operative treatment. (Only) one child out of the 682 three and four-year olds examined had a tooth indicated for extraction. It was an anterior tooth injured in an accident. The number of teeth indicated for extraction in the total population of patients is about one percent. In a similar study in 1957, this rate was 23 per cent. . . . A decrease of over 70 percent in caries experience of three year olds, 60 percent in four-year-olds, and 50 percent in five-year olds occurred in the 10 years. . . . Philadelphia has benefited from fluoridated drinking water since 1954, hence, most of these children have gained the optimum benefits from fluoridation. Some of these children, however, were born in nonfluoridated areas and subsequently moved to Philadelphia.

The survey has demonstrated once again that fluoridation has a considerable effect on the primary dentition . . .the volume of expected lesions could be expected to be from two to three times as great in a pre-school population not benefiting from fluoridation as one benefiting from fluoridation as one benefiting from fluoridated drinking water.

Soricelli, David A.: "Fluoridation - the Philadelphia Story," Archives of Environmental Health 8:752, May 1964. (Excerpts)

The act was simple, the cost and maintenance are insignificant and the results so tremendously rewarding in the overt improvement in oral health, not to mention the inestimable potential savings of millions of dollars each year on dental bills as a result of decreased needs, that it is difficult to conceive that there still exists any community which has not yet taken advantage of this procedure. . . .The actual and potential savings realized from fluoridation are impressive. In Philadelphia last year, it is estimated that fluoridation reduced the number of decayed permanent teeth by about 360,000 representing a potential financial saving in dental care of about $2,000,000 to residents for 1960 alone. This amount will increase to near maximum figure by 1972 so that the financial as well as the health aspects are worthy of note.

Young, Wesley O.: "Fluorides and dental caries in Idaho: IV. Cost of providing care for children in fluoride and fluoride-deficient areas," Newsletter, Idaho State Dental Association, January 1957. (Excerpts)

Generally, complete treatment for the primary teeth would have cost about twice as much in Coeur d'Alene (nonfluoridated) as in Nampa (naturally fluoridated). . .The contrast is. . .striking for the eight-year-olds in the two cities. At this age, the cost of providing complete care for the primary teeth in Coeur d'Alene would have been more than $30, of which only $13 represented care that had been received. Complete treatment of the primary teeth in Nampa would have come to less than $13 -- $5.27 worth of treatment that had been received and an additional $7.12 worth of care that was needed.

The same cost differential existed in the cost of providing care for the permanent teeth.....At age 13, the average Coeur d'Alene child had received $41.33 worth of care but needed $24.21 more. The average cost of providing care for the 13-year-olds in Nampa was only $10.47, and all except $3.19 of this total represented treatment already received.

This analysis of treatment costs in two Idaho cities re-emphasizes the tremendous impact of fluorides on dental decay experience. In addition to the benefits of improved oral health, however, fluoridation programs more than repay their cost by reducing the amount of money the community must expend on dental care.

Schreiber, M.F.: "Sheboygan led fluoridation 'war' on tooth decay," Fluoridation News (Wisconsin Department of Health) 3:5-6, April 1966 (article first published in Sheboygan Press, February 25, 1966. (Excerpts)

> Throughout the past two decades, clinical tests have provided uncontestable evidence that tooth decay among residents born here after water was fluoridated has been reduced by more than 60 per cent. The State Board of Health reported that before fluoridation here, average dental care costs were $172.32 per child from birth through age 14. Now the average cost has been lowered to $46.39, representing a saving of $124.93 -- a return of $55.77 for each $1 invested in the fluoridation program. In the 20 years of water fluoridation in Sheboygan, combined costs for the fluoride compound and equipment maintenance has amounted to $140,527,000 or $7,026.53 annually . . . The vast savings in dollars, plus incalculable savings in human misery . . . has cost the individual an average of 14 3/4 cents per year.

Hann, H. J. (Study Director). "The dental benefits of water fluoridation; 1968 Prince George report," Prince George and District Dental Society and the Northern Interior Health Unit, Prince George, British Columbia, October 1968. (Summary)

> In Prince George, British Columbia, the 1968 findings of the Dental Caries Study showed a continuing reduction in dental decay experience in children twelve years after the introduction of water fluoridation in that community. The over-all reduction in decayed, missing, and filled (DMF) teeth in children of all ages through 14 during the first 12 years of fluoridation was 61.1 percent. In the six-to-eight-year age group, the percentage of decay-free deciduous teeth increased from 48.1 percent in 1956 to 71.5 percent in 1968. In 1956, the average child in this group had 2.5 decayed, missing, and filled (DMF) teeth; in 1968, only 0.8, or less than one. An impressive improvement was demonstrated in the 12- to 14-year-age group. In 1956, the permanent tooth loss for each 100 children was 102.0; in 1968, the loss figure was found to be only 13.9, a decrease of 86 percent. The economics value of fluoridation is therefore considerable.

"Trenton Fluoridation Program," Journal of the New Jersey State Dental Society 41:5, January 1970. (Dental Abstracts, p. 406-7, July 1970.) (Excerpts)

> "The long fight, through public hearings and two referendums, before Trenton introduced fluoride into its communal water supply, was well worth the effort," the city's mayor, Carmen Armenti, commented as he reviewed the latest statistics on caries among Trenton's young people. "The experts told us fluoridation would have drastic long-range effects on dental health in this community, but no one was prepared for the exceptional results after only five years of fluoridation."
>
> A comparison of results of studies of children in 1963 and 1969 shows dramatic results: 170% improvement in the number of children without any caries, 230% improvement in the number of fillings per child, and 216% improvement in the number of extractions per child.

"How can any community refuse to allow its young people the benefits of fluoridation after comparing these recent data?" asked Mayor Armenti. "Anyone who cares for children must be concerned."

In 1963 the Mercer County Dental Society examined the teeth of children in three public and two parochial schools in various parts of Trenton. The results were appalling, especially in depressed areas where almost 100% of the children examined were in dire need of dental attention. In 1965, after a difficult campaign, the water supply of Trenton was fluoridated. In the summer of 1965, 3.5 fillings per child were inserted; one of every three children required extractions, and 32% required no dental work. In 1969, the fifth year of fluoridation, 56.3% of the children needed no dental attention, and 1.5 fillings per child were inserted. The number of extractions was lowered to one in every 6.5 children.

"Milwaukee: Results of Twelve Years of Fluoridation," Fluoridation News, Wisconsin Division of Health, 6, Fall 1969. (Excerpts)

Comparing the decay incidence found in 1965 examinations of school children with baseline statistics reported in 1950, three years before fluoridation started, the rate of decayed, missing, and filled teeth declined 53 percent in the permanent teeth of fourteen year olds to 67 percent in the permanent teeth of six year olds. In all age groups the final reduction in dental decay experience in the permanent dentition was well over half. The deciduous or "baby" teeth of the five, six, and seven year olds showed a comparable decay experience decline of from 35 to 40 percent from 1950 to 1965.

Perhaps even more remarkable was the increase in the percentage of children with no decay at all present reported in the study. There were, for example, eight times as many thirteen year old children free of dental decay in 1965 as in 1950.

The cost for the great improvement in dental health was remarkably low. The total twelve-year cost including equipment and fluoride was $476,521 or an average of five cents per person per year.

EXAMPLES OF LOWER DENTAL CARE COSTS PER CHILD IN TAX-SUPPORTED PROGRAMS (HEAD START, ETC.) IN FLUORIDATED AREAS.

FLUORIDATED	NONFLUORIDATED
ARIZONA	
$41.61 (Tucson, part)	$62.97 (Tucson)
CALIFORNIA	
$26.35 (San Francisco)	$70.01 (Berkeley)
$27.77 (Vallejo)	$66.76 (San Mateo)
MISSOURI	
$26.60 (St. Louis)	$41.55 (Kansas City)
	$63.37 (Springfield)

EXAMPLES OF LOWER DENTAL CARE COSTS PER CHILD IN TAX-SUPPORTED PROGRAMS (HEAD START, ETC.) IN FLUORIDATED AREAS (cont.)

FLUORIDATED	NONFLUORIDATED
OHIO	
$27.62 (Portsmouth City)	$75.29 (Mad River Township)
$24.32 (Portsmouth Minford School)	$86.88 (Scioto County Northwest School)
$22.09 (Lake County)	$78.84 (Perry County) (New Lexington)
$21.45 (Northwestern Ohio, five communities)	$60.50 (Hocking County) (Logan)

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Brewster, L. L.: "Tucson Headstart dental care project," American Journal of Public Health 58:881-891, May 1968

California Dental Service Corporation: "The relationship of fluoridation and Operation Head Start expenditures," California Dental Service Newsletter, San Francisco, California, June 1967.

Hagan, J. H. (President, MDSC): "Annual report to the membership of the Missouri Dental Service Corporation, 1970," Missouri Dental Service Corporation, Crystal City, Missouri.

Ohio Dental Association (Council on Legislation): "Tax savings from fluoridation in Ohio Head Start and other anti-poverty dental programs," Ohio Dental Association, 40 S. Third Street, Columbus, Ohio, April 1969. (Original distribution by Ohio Citizens' Committee for Fluoridation)

EXAMPLES OF ESTIMATED SAVINGS IN COSTS OF CHILDREN'S DENTAL CARE RESULTING FROM FLUORIDATION

MICHIGAN

In Battle Creek, Kalamazoo, and Jackson, fluoridated since 1951, children showed a 52 to 76 percent reduction in decayed and missing teeth. As a result, the parents of children ten to twelve years old in these three communities saved more than $118,000 through the reduced costs of dental care. Fluoridation represents a significant net profit to each family who lives there.

Source: Michigan Department of Public Health, 1971

MASSACHUSETTS

More than 1,000 7 to 13 year old children from nonfluoridated communities in eastern Massachusetts received dental care for three years at a Boston clinic. The cost of the care that these children received was calculated and compared with the cost of caring for children of like ages in some fluoridated communities. The comparison indicated that, had these communities been fluoridated, care costs would have been $13 less per child per year.

Source: Forsyth Dental Center, Boston, 1971

ONTARIO, CANADA

A series of dental health surveys among five-year-old children in North York, a Toronto suburb, revealed the important effect of fluoridation on the costs of care of primary teeth. Calculated costs for 5-year-olds born 20 months before fluoridation began totaled about $63 per child, while for 5-year-olds born after fluoridation began, the total cost was only about $34 per child, a difference of 46 percent. These costs included examination and X-rays, which were done whether or not treatment was needed.

Source: University of Ontario, 1971

NEW YORK

The Bureau of Dental Health made some comparisons between the estimated cost of dental care in a fluoridated and a nonfluoridated community, assuming populations of 100,000 each, with about 35,000 people under 21. About a fourth of these young people would be eligible for dental care under Medicaid in New York State. Without fluoridation, treatment costs would total about $137,000; in the fluoridated community, the cost would be less than half, about $63,000. Even with the annual cost of fluoridation added, the local community Medicaid fund savings would be $16,000 a year. Another $48,000 in State and Federal Medicaid funds would be saved. The total savings to families paying their own children's dental bills would be far greater.

Source: New York State Health Department, 1968

OHIO

The improvement in children's dental health and parents' savings in dental bills after ten years of fluoridation in Toledo were documented recently. Savings of at least $29 per child per year for second and third grade children were attributed to fluoridation. In 1955, children in these grades averaged nearly seven teeth decayed, missing, or filled, compared with slightly more than three among their 1965 counterparts. The total savings in dental costs for these children was estimated to be $481,000.

Source: Toledo Health Department, Toledo, Ohio, 1968

Denby, G. C., and Hollis, J.J.: "The effects of fluoridation on a dental public health programme," New Zealand Dental Journal 62:32-36, January 1966. (Summary)

> In 1965, dental officers of the New Zealand Department of Health made a survey of the effectiveness of ten years of fluoridation in Hastings. The survey showed that:
>
> (1) The cost of dental treatment, i.e. for fillings and extractions per "Completion" in Hastings children has been reduced from 8.57 dollars to 4.27 dollars. Total treatment costs have been reduced from 11.45 dollars to 7.48 dollars. The latter figure includes a charge for examination and X-rays, this charge being a standard one that is independent of the treatment needs of the individual.

(2) The number of fillings required in the deciduous teeth of Hastings children has been reduced from 5 to 3 per completion; and the number of fillings required in 12-year-olds (who were selected as an example) has been reduced from 5 to 1.2 fillings per completion.

(3) The usual number of children whom Hastings nurses were able to treat prior to fluiridation was about 475 per nurse. This number has been increased to about 700 children per nurse and in the case of experienced operators 800 to 900 children are being handled.

The reduction in the need for School Dental Nurses has a twofold benefit for New Zealand in that there is a saving in the cost of the Programme, and a saving in labor in a country with a labor shortage . . . Further, the dental practitioners have more time to devote to the population over 16.

Salzmann, J. A.: "Effects of fluoride on prevalence of malocclusion," Journal of the American College of Dentists 35:82-91, January 1968. (Dental Abstracts, p. 406-7, July 1968) (Excerpts)

Hill, Blayney, and Wolf in 1959 reported 20% less malocclusion among 6- to 8-year-old children, and 17% less among 12- to 14-year-old children, drinking fluoridated water, compared with pre-fluoridation findings in Evanston. In 14-year-old children who had been drinking fluoridated water, compared with pre-fluoridation findings in Evanston. In 14-year-old children who had been drkinking fluoridated water all their lives, they found a much higher rate of normal occlusion and considerably lower rate of malocclusion than in children on nonfluoridated water.

After about ten years of fluoride experience in Newburgh, N. Y., Ast and co-workers (1962) found that the use of fluoridated water by children during their dental development period reduced the loss of permanent first molars to the vanishing point. . . .

The Kingston children (with nonfluoridated water) showed consistently higher percentages of malocclusion than did the Newburgh children. The percentage of children with normal occlusion was almost twice as high in Newburgh compared to those in Kingston. A follow-up study by Ast and others (1965) concluded that "The benefits which accrue from public water fluoridation programs may be measured not only in terms of significant protection against dental caries but also with respect to a reduced hazard of malocclusion, especially severe malocclusion which may be regarded as physically handicapping."

Mitchell, George E.: "The false economy of dental neglect," Chapter II in "Economic benefits from public health services: Objectives, methods, and examples of measurement," U. S. Public Health Service Publication No. 1178, Superintendent of Documents, Washington, D. C., Aptil 1964. (Excerpts)

. . . .dental neglect is a major, costly health problem. . . It is quite evident that only a fraction of the Nation's dental ills can be treated adequately. Unless available preventive measures are applied, expenditures will continue to go upward and the problem will

increase in magnitude and severity each year. . . .It is not easy to come up with a specific dollars and cents evaluation of the gain to the nation's economy from dental public health activities - or to state it conversely, the loss in the economy due to dental neglect . . .The public spends over 2.4 billion dollars per year - about $12 per person - to maintain a standard of dental health of which no one can really be proud. I estimate that to treat the existing backlog of dental needs would cost the nation 15 billion dollars in the first year alone, or nearly $80 for each person in the United States . . .Fluoridation of community water supplies is one health measure which has proved effective in preventing 60 to 70 percent of new tooth decay. . . We can estimate fairly accurately the dollars and cents value of fluoridation on the basis of potential costs of treating cavities which could be prevented by this measure. On this basis, the delay in adopting fluoridation was estimated in 1960 to be costing more than $452 million a year. If all communities throughout the Nation adopted water fluoridation, the dollar saving in dental treatment made unnecessary by the measure would be about $700 million annually. This figure is the potential return on an annual national investment in fluoridation of only about $12 million - amounting to a return of $58 for each dollar invested.

Division of Dental Health
Preventive Practices Branch

Cost Benefit Estimates - Newbrun and Gish from 1978 U. of M. Workshop

The previous cost-saving ratio of 1:36 was computed with dental treatment and fluoridation costs that prevailed in 1974. These figures were based on permanent teeth only and did not include the costs for examinations, radiographs, or topical applications of fluoride. Since that time, this country has undergone an unprecedented spiraling inflation rate which has accelerated the manpower-labor costs much more rapidly than the mechanical and chemical costs for fluoridation.

In the published proceedings of a workshop at the University of Michigan entitled, "The Relative Efficiency of Methods of Caries Prevention in Dental Public Health," the topic of cost-benefit of various caries prevention techniques was addressed by Dr. Ernest Newbrun and Dr. Charles Gish.

In his presentation, "Cost-Effectiveness and Practicality Features in Systemic Use of Fluorides," Dr. Newbrun established a cost-benefit ratio of 1:50. This ratio was based on the cost of dental services at the time of his presentation and is specifically related to the use of fluoridation of public water supplies as a means to reduce dental caries.

A second presentation, based on community experience in Indiana, was presented by Dr. Gish. Although there were minor variations in assigned costs, the overall benefits remained consistent and the fact that the benefits accrue without professional manpower was again emphasized. The salient point of Dr. Gish's data was that for every $100,000 spent we can prevent one-half million cavities through fluoridation, or we can treat 10,000 cavities through professional services at a cost of $10 per cavity.

During the subsequent discussion, the workshop participants supported the ratio of 1:50 but questioned the presentors on their conservative estimates. Some of the factors that were either underestimated or omitted in determining the cost-benefits of fluoridation were:

(a) Calculations based on 50 percent rather than 60 percent reduction.

(b) Reduction in prevalence was not considered, e.g., 6-fold increase in caries-free children.

(c) Smaller lesions resulting in less complex cavity preparation, fewer replacements, etc.

(d) No compensation for prophylactic restoratives.

(e) The lack of a fluoride-free control group, i.e., other systemic and topical regimens.

EDITORIAL FROM COURIER LEADER

PAW PAW, MICHIGAN, AUGUST 1971

THE REAL TOOTH TOUGHENER

We have gone through all the arguments before several years ago when we first proposed fluoridation of the water supply in Paw Paw.

The battle boiled hot and heavy for a time, but nothing ever came of it.

We have no desire to start the controversy all over again, but we do feel that residents of the four communities this newspaper now serves should be aware of a recent study in four Michigan cities to illustrate how we are depriving ourselves of a major health protection.

The results of the study in Flint, Jackson, Battle Creek and Kalamazoo make the fluoride toothpaste commercials pale in comparison.

In Flint, which only began fluoridating its water in 1966, the study showed children in 1970 had 30 percent fewer cavities and 22 percent fewer missing permanent teeth.

Kalamazoo, Battle Creek and Jackson, which began water fluoridation 20 years ago, displayed much more dramatic results in the study. Children in those cities showed a tremendous 52 to 67 percent reduction in decayed, missing and filled permanent teeth.

Even more conclusive, more than 40 percent of the children in those cities had NO decayed, missing or filled teeth at all.

Now, if we don't care about our children's teeth, then let's put it on a strictly monetary level.

Dr. Louis F. Szwejda of the Michigan Department of Public Health, who did the recent study, puts it this way:

"For Jackson," he says, "without fluoridation parents would have had to pay for nearly 7,000 more decayed teeth in the 10 to 12 age bracket and just under 13,000 surfaces--at a minimum estimated cost of about $64,000.

"In Battle Creek, over 5,300 teeth have been protected from decay, and almost 10,000 surfaces--amounting to a minimum saving of slightly under $50,000.

"Water fluoridation in Kalamazoo has meant a saving to parents of more than $79,000 in dental expense, from the extra protection of over 8,500 teeth and almost 16,000 surfaces."

And in Flint, after only 4½ years, "the study shows parents have saved more than $118,000 in reduced dental bills so far, for the age 10 through 12 year old childre

As we said at the outset, we have no stomach for starting the fluoridation battle all over again, but if we can continue to ignore the above statistics, then the holes in our heads are not all in our teeth.

U.S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE

Public Health Service

National Institutes of Health

Refer: PPB-35
February 1972

ADULT DENTAL HEALTH BENEFITS FROM FLUORIDATION DOCUMENTED IN NEW AMERICAN AND BRITISH REPORTS

Attached are abstracts and excerpts from five recent reports on adult benefits from fluorides. These are an addendum to the annotated bibliography distributed with CPB-15 in May 1970.

In two reports, the U. S. Navy presents their conclusions that the increased number of caries-free recruits entering the Navy in recent years is related to the availability of fluoridated water in the areas where they lived during the years of tooth development.

The three other reports concern an investigation of adult dental health in a naturally fluoridated area of Great Britain which shows that residents up to age 65 have significantly less tooth decay, fewer missing teeth, and a lesser need for partial dentures than persons the same age living in a nonfluoridated area. The author calls attention to the fact that these favorable results were achieved even though there were "three times as many dentists, per head of pupulation, in York (nonfluoridated) than in Hartlepool (fluoridated." He concludes that "the beneficial effect of fluoride drinking water has been shown to persist throughout life."

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Enclosure
Annotated Bibliography on Adult Benefits
from Fluorides - Addendum 1

ANNOTATED BIBLIOGRAPHY ON ADULT BENEFITS FROM FLUORIDE

(Addendum 1, February 1972)

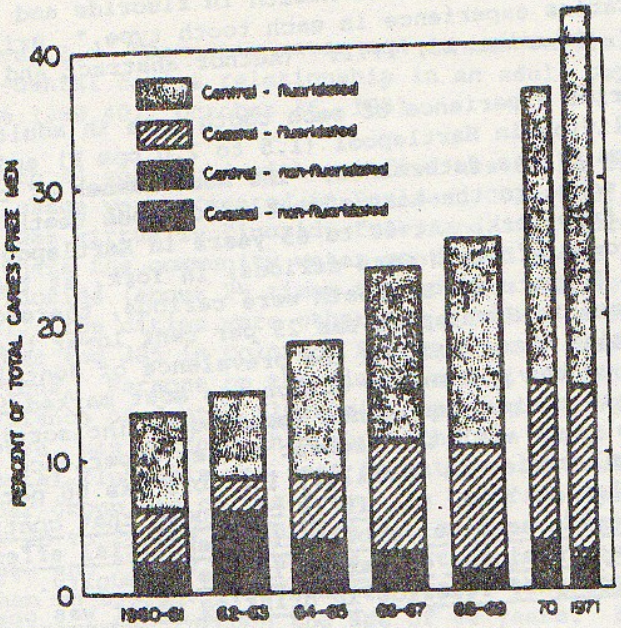
Keene, H. J., et all: "Prevalence, incidence and geographic distribution of caries-free naval recruits," Naval Dental Research Institute, Navel Training Center, Great Lakes, Illinois, Research Progress Report NDRI, PR 69-08, June 27, 1969. (Excerpts)

> For a number of years the Naval Dental Research Institute at Great Lakes has been conducting a longitudinal study on caries-free naval recruits to learn more about the factors which may be operating in their resistance to dental caries. Preliminary findings relating to the epidemiology, microbiology, biochemistry, and clinical aspects of this interesting group have been reported. . . . A 9-year survey on over 500,000 recruits at the Great Lakes Naval Training Center indicates a prevalence of caries-free men of about 0.2% or 2 men per 1000. . . . Marked variations occurred in the prevalence of caries-free men within the various geographic regions of the United States. These differences were partly related to regional variations in the availability of natural fluoride in public water supplies.

Keene, H.J., Shklair, I. L., and Hoerman, K. C.: "Caries Immunity in Naval Recruits and Ancient Hawaiians," Naval Dental Research Institute, Great Lakes, Illinois; paper given at the 138th meeting of the American Association for the Advancement of Science, Philadelphia, Pennsylvania, December 1971. (Excerpts)

> During the 12-year period from 1960 to 1971, in which 657,893 recruits came to Great Lakes for basic training, a total of 1,716 men were found to be caries-free, for an overall prevalance of 0.261%, or 2.6 men per 1,000. . . . . In the 1960-5 group of caries-free men. . . . the combined New England and Middle Atlantic states . . . accounted for close to 50% of the recruit population, but only 10.4% of the caries-free group. The West South-Central, West North-Central, Mountain, and Pacific states, on the other hand, provided Great Lakes with a relatively small number of recruits (7.1%), but these four regions accounted for 27.5% of the caries-free group. . . . The prevalence of caries-free men . . . was found to correlate. . . with the availability of natural fluoride in the public water supplies of 44 states. Where the availability of natural fluoride was low . . . the prevalence of caries-free men was also low. . . The increased prevalence of caries-free recruits at Great Lakes in recent years (9.1 per 1,000 in 1971) as well as the leveling off of regional differences seems most certain to be related to the gradual increase in population served with artifically fluoridated water in this country since the late 1940's.

Distribution of caries-free recruits from four groups of cities



The first thing that strikes us in this chart is the gradual increase in prevalence of caries-free men from large cities in general during this 12-year period. In 1960-61, less than 15% . . . came from these cities, as compared to approximately 40% by 1970-71. . . . Of the 1970-71 total recruit population, about 10% came from Central fluoridated cities and about 5.3% from Coastal fluoridated cities. . . . It is clear. . . that the effect is entirely the result of gains made by the Central and Coastal cities which started fluoridation in the early 1950's. The nonfluoridated cities have barely changed throughout this period, averaging less than 4% of all caries-free recruits.

Murray, J.J.: "Adult dental health in fluoride and non-fluoride areas. Part 1. Mean DMF values by age," British Dental Journal 131:391-5, November 2, 1971. (Author abstract)

The dental condition of 2,135 adults, aged 15 to 65 years, continuously resident in Hartlepool, a natural fluoride area, was compared with that of 2,639 adults from York, a low fluoride area. Mean DMF values for the general and dentate populations were consistently lower in Hartlepool than in York. Hartlepool DMF values were 40 to 50 per cent lower than those observed in York up to the 30 to 34-year age group. At ages beyond 34 years the percentage difference between the two communities diminished with age because of the increasing proportion of missing teeth in the DMF. In spite of this, observed DMF values in Hartlepool were lower than those observed in York for all ages up to and including the 60 to 65-year age group, demonstrating that continuous residence in a high fluoride area has lifelong beneficial effects.

Murray, J.J.: "Adult dental health in fluoride and non-fluoride areas. Part 2. Caries experience in each tooth type," British Dental Journal 131:437-42, November 16, 1971. (Author abstract and excerpt)

> The caries experience of each tooth type in adults aged 15 to 65 years living in Hartlepool (1.5 to 2.0 ppm F) and York (0.15 to 0.28 ppm F) was determined. The mean number of carious teeth in mately equal to the mean number of carious teeth in 20-year-old adults from York. At 60 to 65 years in Hartlepool, approximately 45 per cent of teeth were carious; in York, at the same age, approximately 60 per cent of teeth were carious, therefore maximum caries experience in Hartlepool was 25 per cent lower than in York. Fluoride in drinking water reduced the prevalence of dental caries in all tooth types, but the preventive action was most marked in those teeth with the lowest caries experience (mandibular incisors) and least marked in those teeth with the highest caries experience (first molars). Approximal caries in maxillary incisors was 66 per cent lower in Hartlepool than in York. . . It is concluded that continuous residence in a fluoride area has substantial beneficial effects in that it reduces the prevalence of caries in the community. The caries inhibitory property of fluoride in drinking water was observed throughout life.

Murray, J. J.: "Adult dental health in fluoride and non-fluoride areas. Part 3. Tooth mortality by age," British Dental Journal 131:487-92 December 7, 1971. (Author abstract)

> The mortality of teeth by age in Hartlepool, a natural fluoride area, and York, a low fluoride area, was determined. Throughout the whole age range, the mortality of each tooth type was lower in Hartlepool than in York. Tooth mortality in Hartlepool dentate people lagged approximately 10 years behind tooth mortality in York dentate people. The effect of the lower tooth mortality in Hartlepool was that the need for partial dentures was lower in Hartlepool than it was in York. The results of this study have shown that, even in an area with one of the lowest dentist/population ratios in the country, the presence of 1-5 to 2-0 ppm fluoride in drinking water resulted in a lower caries experience, a lower tooth mortality and a smaller need for partial dentures compared with a non-fluoride area with one of the most favorable dentist/population ratios in the country. These benefits were observed for all ages up to 65 years.

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NOTE. -- Underscore supplied.

Russell, A.L., and Elvove, E.: "Domestic water and dental caries. VII. A study of the fluoride-dental caries relationship in an adult population," Public Health Reports 66:1389,401, October 26, 1951.

Lists of persons 20 to 44 years old with verified histories of residence and water usage were prepared in Boulder, Colorado, where the community water was virtually fluoride-free, and in Colorado Springs, Colorado, where the community water contained about 2.5 parts per million fluoride (about 2½ times the optimum concentration for dental benefits). The cities were otherwise similar, and the two groups (155 in Boulder and 385 in Colorado Springs) were comparable in race and occupations. Persons on the lists were given dental examinations. The prevalence of dental fluorosis, varying in degree from questionable to severe, was uniform throughout the age range in Colorado Springs. No dental fluorosis was seen in natives of Boulder. No person in the Boulder group was caries-free. In Colorado Springs, 26.4 percent of the 20 to 24 age group were caries-free. Total rates for decayed, missing, and filled teeth were about 60 percent lower in Colorado Springs than in Boulder for each age group. The caries inhibition continued undiminished through the age of 44 years. Boulder natives had lost nearly four times as many teeth because of dental caries than had natives of Colorado Springs. The observed caries-inhibitory effect was similar in pattern and magnitude to that seen in children native to fluoride areas.

Englander, H.R., and Wallace, D.A.: "Aurora-Rockford, Illinois, Study III. Effects of naturally fluoridated water on dental caries in adults," Public Health Reports 77:887-93, October 1962.

Dental studies were conducted in 1960-61 on 896 white natives of Aurora, Illinois (fluoride content of water supply 1.2 part per million), and a comparable group of 135 persons in Rockford, Illinois (fluoride content of water supply 0.1 ppm). The age range was from 18 to 59 years. In the two groups, the mean age was 33.6 and 33.1 years, respectively, the percentage of subjects over 40 was 32.5 and 26.7, respectively, and the percentage of women was 61 and 63, respectively. Distribution as to socioeconomic status, education, dietary practices, and quality of dental care was similar in both groups. For all ages, there were about ten decayed-missing-filled (DMF) teeth and 22 DMF surfaces in natives of Aurora, while those of Rockford had 17 DMF teeth and 43 DMF surfaces. Thus, the dental caries experience of Aurorans was 40% less when evaluated by DMF teeth and 49% less by the DMF surface index. One person in 24 was decay-free in the Aurora group, while one person in 135 was decay-free in the Rockford group, for a ratio favoring Aurorans by 5.6 to 1. Also, there were about seven times as many persons who had lost all their teeth in Rockford as there were in Aurora. None of the persons examined had any objectionable dental fluorosis. This study provides evidence that children who consume water containing approximately one part per million of fluoride from birth can expect the benefits of reduced tooth decay to persist during their adult life.

Arnold, F.A., Jr., Litkins, R.C., Russell, A.L., and Scott, D.B.: "Fifteenth year of the Grand Rapids fluoridation study," Journal of the American Dental Association 65:780-85, December 1962.

The fluoride ion content of the public water supply in Grand Rapids, Michigan, has been adjusted to 1.0 part per million since January 1945. This report is a description of findings in a period of observation from 1956 through 1959, the twelfth through fifteenth years of fluoridation. Children aged 12, 13, or 14 years, who had used fluoridated water from birth, showed substantially few decayed-missing-filled (DMF) teeth when compared with children of the same age examined in Grand Rapids in 1944-45. The caries prevalence levels reached in Grand Rapids were nearly as low as those observed in Aurora, Illinois, where the natural fluoride content of the water was about 20% higher than the optimum concentration for dental benefits. Total caries experience was lowered by 50 to 63 percent in children aged 12 to 14 years, and by 48 to 50 percent in children aged 15 or 16 (1 to 2 years old at start of fluoridation). No undesirable dental fluorosis was observed. No such dramatic and persistent inhibition of caries in large population groups has even been demonstrated by any means other than fluoridation of a domestic water supply.

Hegsted, D.M.: "Fluoride and mineral metabolism" Annals of Dentistry 27:134-43, December 1968.

This article provides a review of the epidemiological studies and laboratory evidence which have suggested that relatively high intakes of fluoride may be beneficial in the prevention of osteoporosis and aortic calcification. The author concludes that the advantages which accrue to older people consuming appropriate levels of fluoride may have as much significance as does the prevention of dental caries by optimal intake of fluoride during childhood.

Shambaugh, G.E., Jr., and Petrovic, Alexander: "Effects of sodium fluoride on bone; application to otosclerosis and other decalcifying bone diseases," Journal of the American Medical Association 204:969-73, June 10, 1968. (Abstract from American Journal of Orthodontics 54:794, October 1968)

The authors conducted experiments on the effects of sodium fluoride on bone with a view to its possible use in certain decalcifying diseases of bone, including the disease peculiar to the labyrinthine capsule known as otosclerosis. These experiments were prompted by the report of the use of large doses of sodium fluoride for postmenopausal osteoporosis, corticoid-induced osteoporosis, and osteitis deformans (Paget's disease).

A sufficient intake of fluoride in early life is necessary for the formation of caries-resistant teeth. In the later years of life, a higher intake of fluoride appears to be necessary to maintain normal calcification of bone. Experimental studies indicate that the principle action of fluoride on bone is a slowing of the resorptive phase of the remodeling process, with an additional promotion of calcification. For the prevention of osteoporosis induced by heparin, cortisone, or fracture, previous medication with large doses of sodium fluoride over a

long period of time appears to be effective. When one of these forms of osteoporosis or localized osteoporosis of the labyrinthine capsule due to active otosclerosis develops in a patient not so protected, the favorable effect of fluoride appears to be enhanced by simultaneous administration of phosphates, as indicated by experiments still in progress.

The time may not be far distant when fluoride will be recognized as essential to health and when, in addition to being added to the water supply, it will be prescribed for older persons to prevent senile osteoporosis and frequent fractures.

National Research Council, Food and Nutrition Board: "Recommended dietary allowances," Seventh revised edition, National Academy of Sciences, Washington, D. C., 1968 (Publication No. 1694.) (Excerpts)

"Fluoride is present in small but widely varying amounts in practically all soils, water supplies, plants, and animals and thus is a normal constituent of all diets. Highest concentrations in mammals are found in bones and teeth.

"Fluoride is incorporated in the structure of teeth and is necessary for maximal resistance to dental caries. For these reasons, it is co-sidered to be an essential nutrient. Its protective role is particularly evident during infancy and early childhood and persists through adult life. Some studies have suggested a possible function of fluoride in the maintenance of bone structure, but further investigation is required.

"Extensive medical and public health studies have clearly demonstrated the safety and nutritional advantages that result from fluoridation of the water supply. In communities where fluoridation has been introduced, the incidence of tooth decay in children has been decreased up to 50 percent or more. The Food and Nutrition Board recommends fluoridation of public water supplies where it is needed because of low fluoride concentration."

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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Public Health Service

National Institutes of Health

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January 1972

ESSENTIALITY OF FLUORINE

At the 138th meeting of the American Association for the Advancement of Science, Klaus Schwarz, M.D., reported on "Trace Elements Newly Identified as Essential to Animals (Fluorine as an Essential Element)." Dr. Schwarz is Chief, Laboratory of Experimental Metabolic Diseases, Medical Research Programs, Veterans' Administration Hospital, Long Beach, California, and Associate Professor, Department of Biological Chemistry, School of Medicine, University of California at Los Angeles. The discovery of the essentiality of fluorine was reported as the latest in a series of findings on indispensable trace elements in animals. Excerpts from Dr. Schwarz' paper follow:

> The most recent result of systematic studies to identify new essential trace elements for mammals is the discovery that fluorine is an essential trace element. It is required for normal growth in the rat. Proof for an essential role of fluorine, normally supplied as fluoride, in growing animals was obtained in experiments carried out under rigidly controlled conditions in trace element sterile isolators. The rats were maintained on highly purified amino acid diets which contain all the known dietary agents in sufficient amounts. Under these conditions, supplements of 2.5 ppm (parts per million) of fluorine as potassium fluoride, stimulate growth by over 20%. The data are highly significant. Attempts to prove that fluorine is essential were made before, but under less carefully controlled conditions. The finding throws a new and different light on the use of fluoride. The element seems to be essential not only for the formation of teeth and bones -- in which it is normally contained in very high amounts (200-1,000 ppm) -- but appears of more general importance.
>
> The project was carried out at the Laboratory of Experimental Metabolic Diseases, Medical Research Programs, VA Hospital, Long Beach, California under the auspices of UCLA, and with the financial support from the National Institutes of Health. Drs. J. C. Smith, Jr., E. Vinyard, and D. B. Milne contributed significantly to its success.

NOTE, -- Underscore supplied.

The most sensitive indicator for deficiencies was growth. Three elements, namely tin, vanadium, and fluorine, have been firmly identified as essential for growth, while another one, silicon, is currently under investigation.

The discovery of an essential need for fluorine was made possible by further improvements in the purity of the diets after tin and vanadium had been recognized as being indispensable. Tin and vanadium were included in the basal diet, and the fluorine content of the diet was reduced to below 0.5 ppm. The growth promoting effect of fluoride was seen consistently in ten successive experiments, each carried out over a four week interval. Dose levels of 1, 2.5 and 7.5 ppm of fluorine were supplemented in the form of potassium fluoride. One ppm gave a significant but incomplete result. 2.5 ppm fluoride produced optimal results, not different from those obtained with 7.5 ppm in the diet. 20-30% increases in growth rates were obtained.

Normal fluorine levels in teeth and bone can easily reach 700-1000 ppm, while the concentration of fluorine in blood plasma is very effectively controlled at 0.1-0.2 ppm even if large amounts of fluoride are given. Any excess is rapidly deposited in the bone or excreted through the urine. The normal fluorine levels in tissues such as liver, heart, and kidney are approximately 2-5 ppm (on a dry basis). These levels are maintained steadily even if high amounts of fluoride are supplied over extended periods of time. The amounts in these tissues are quite similar to those in many nutrients. Cereal and other grains contain 1-3 ppm, cow's milk usually 1-2 ppm (on a dry basis), raw and peeled potatoes 1-2 ppm of dry matter, while ocean fish are reported to supply 5-10 ppm. The importance of various fluoride levels in drinking water is well known. A peculiar situation is presented by tea in which fluorine concentrations of 100 ppm are common. It is fair to assume that with the increasing refinement of our staple foods attention should be paid to the fluoride intake of growing animals and children to guarantee that the large amounts of fluorine needed during growth are adequately supplied.

Each of the elements newly identified as essential opens up new facets in biochemistry, nutrition, and also medicine. Thus the bio-inorganic and -organic chemistry of tin, vanadium, and fluorine are largely new, unexplored territory. The application and usefullness of these trace elements in animal and human nutrition can at this

point only be surmised. Also the medical implications of these findings will have to be worked out in detail. However, it is expected some of the newly identified essential elements may be clinically important, similar to those which have been known for a long time.

Division of Dental Health
Preventive Practices Branch

Report on: Food and Nutrition Board, National Research Council Recommended Dietary Allowances, Ninth Revised Edition, 1980. Washington, D.C., National Academy of Sciences, 1980 IX + 185 p.

FOOD AND NUTRITION BOARD OF NATIONAL RESEARCH COUNCIL REAFFIRMS ITS RECOMMENDATION OF FLUORIDATION AND REAFFIRMS ITS CONSIDERATION OF ESSENTIALITY OF FLUORIDE.

A. Fluoridation

The latest revision of the publication by the National Academy of Sciences concludes the section on fluorides with this endorsement:

> "Extensive medical and public health studies have clearly demonstrated the safety and nutritional advantages that result from fluoridation of the water supply (AAP, 1972). In communities in which fluoridation has been introduced, the incidence of tooth decay in children has been decreased by 50 percent or more. The Food and Nutrition Board (FNB, 1953) recommends fluoridation of public water supplies if natural fluoride levels are low."

The Food and Nutrition Board of the National Research Council, in a preceding paragraph of the discussion, additionally emphasized the safety, economy and efficiency of fluorides in drinking water at one part per million:

> "Standardization of water supplies by addition of fluoride to bring the concentration to 1 mg/liter has proved to be a safe, economical, and efficient way to reduce the incidence of tooth decay--an important nutritional public health measure in areas where natural water supplies contain less than this amount."

It must be emphasized that the Board has indicated that fluorides should be added to water to the concentration of one part per million. This confirmation of fluoridation by the Board and the recommendation for this optimal concentration of fluorides in water are contrary to the allegations that there is a necessity for reducing fluorides in water. These opinions are contrary to the recently reported rumors that the National Research Council will recommend a lowering of the daily fluoride intake and therefore suggesting a reduction of fluoride levels in water.

B. Essentiality of Fluorides

The National Research Council through its Food and Nutrition Board considers fluorine to be an essential element "for the growing organism on the basis of its proven beneficial effects on dental health." Also, there is discussion of essentiality of fluoride as a growth stimulant.

III. Essentiality of Fluorides (Continued)

Further, mention is made of the suggestive data that fluoride also may give a measured amount of protection against diseases of older age, such as periodontal disease and osteoporosis. The efficiency of the renal excretion mechanism of the body is emphasized since the kidneys are responsible for maintaining blood fluoride concentrations within a narrow range regardless of intake.

IV. Safety of Fluoride in Diet and Drinking Water

1. The "safe and adequate" category adopted by the Board indicates an intake of the various dietary components that is enough to meet nutritional requirements yet is safe in consumption. Nowhere is it stated that any margin of safety may be eliminated by an intake immediately above the recommended allowance. The report takes into consideration dental mottling in children but notes it is produced only through higher intakes as might be expected in areas with water of a natural content of two or more parts per million or at least twice the recommended concentration. The report states mottling is "a condition of cosmetic concern but of no health importance." It is also stated mottling of the teeth has been observed at fluoride concentrations in diet and drinking water of 2-8 parts per million, but a comment must be added that at the lowest part of this range mottling is not noticeable to the naked eye nor harmful to the structure and appearance of teeth.

   A study in Grand Rapids suggested a better formation and appealing translucency of teeth developed during ingestion of water with the optimal concentration (1 ppm) of fluoride.

2. The range of safety in fluoride intake is wide enough to accommodate normal fluctuations in the fluoride content of foods without inducing noticeable mottling. The report states that in areas where the fluoride content in drinking water is substantially less than 1 mg/liter, it will be difficult to achieve the recommended intake by dietary means alone. Fluorine, like other trace elements, is toxic when consumed in excessive amounts. The safety of fluoridation at one part per million undeniably is shown since the "daily intake of fluorides required to produce symptoms of chronic toxicity after years of consumption is 20-80 milligrams or more, far in excess of the average intake United States."*

V. General Observations About Recommended Dietary Allowances

In the preface of the booklet, the intent of Recommended Dietary Allowances is established. The primary purpose of the publication is to provide standards as a goal for good nutrition. It also describes RDA as a guide for planning and procuring food supplies for national defense since its first edition originated during World War II. Other examples of the use of RDA are listed as interpretation and evaluating the adequacy of food for planning and processing of food supplies, for development of new food products and for establishing various guidelines.

*Emphasis added

II-III

Recommended Dietary Allowances

NINTH REVISED EDITION, 1980

Committee on Dietary Allowances
Food and Nutrition Board
Division of Biological Sciences
Assembly of Life Sciences
National Research Council

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Bureau of Personal
Health Services

National Academy of Sciences
WASHINGTON, D.C.
1980

Preface

The *Recommended Dietary Allowances* (RDA) were first published in 1943 to "provide standards serving as a goal for good nutrition." Those allowances were not considered permanent but rather were recommendations based on the best scientific knowledge at the time. Since 1943, the report has been revised at approximately 5-year intervals, as additional data have become available.

Initially, the RDA were intended as a "guide for planning and procuring food supplies for national defense." Over the years, this purpose has been extended to such other areas as interpreting food consumption records of groups and evaluating the adequacy of food supplies in meeting nutritional needs, planning and procuring food supplies for groups and establishing guides for public food assistance programs, development of new food products by industry, establishing guidelines for nutritional labeling of foods, and developing nutrition education programs. As the applications of RDA continue to expand, it is increasingly important that their significance and limitations be clearly understood.

NOTICE: The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the Councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the committee responsible for the report were chosen for their special competencies and with regard for appropriate balance.

This report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the Academy of Engineering, and the Institute of Medicine.

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FLUORIDE

Fluorine* is present in small but widely varying concentrations in practically all soils, water supplies, plants, and animals. It is therefore a constituent of all normal diets. Because of the ubiquity of this element, a fluoride deficiency severe enough to result in growth depression is difficult to produce. Growth stimulation by fluoride in rats fed low-fluorine diets has been observed in some, but not all, experimental studies (Muhler, 1970). More recently, increased growth has been reported in young rats kept in an isolator environment and fed purified diets with 2.5 μg fluorine added per gram of diet, compared with controls consuming a diet with less than 0.5 μg/g (Schwarz and Milne, 1972). Although the results of these studies have not been confirmed independently and the mechanism of growth stimulation remains unknown, fluorine can be considered an essential element for the growing organism on the basis of its proven beneficial effects on dental health.

The main known target organs of fluoride in man are bones and the enamel of teeth, where the fluoride ion is incorporated into the crystalline structure of hydroxyapatite, resulting in increased caries resistance of the teeth (Sognnaes, 1965). Although this well documented protection affects mainly the pre-eruptive phase of the teeth, there are data suggesting that fluoride may also give a measured amount of protection against diseases of older age, such as periodontal disease and osteoporosis (BEAP, 1971). These reports remain to be confirmed.

The incorporation of fluoride into bone and enamel is proportional

*Fluoride is the term for the ionized form of the element fluorine, as it occurs in drinking water. The two terms are used interchangeably.

to the dietary intake; an efficient renal excretion mechanism is responsible for maintaining blood fluoride concentrations within a narrow range, regardless of intake (Spencer *et al.*, 1970). The protective effects of fluoride against caries have been observed only at a total dietary fluoride intake of 1.5 mg/day or more. A range between 1.5 and 2.5 mg in adolescents and between 1.5 and 4 mg in adults has been proven safe in a number of studies (BEAP, 1971). Higher intakes, such as might be expected in areas with water of a natural fluoride content of 2 or more mg/liter, produced mottling of the teeth in children, a condition of cosmetic concern but of no health importance. Still higher fluoride exposures, for example in an area with drinking water containing 4 mg/liter of fluoride naturally, may afford protection against osteoporosis in adults (Bernstein *et al.*, 1966). The well-defined chronic fluoride toxicity, fluorosis, is seen only in persons consuming in excess of 20 mg/day over extended periods of time (WHO, 1970).

As is true for other anionic trace elements (e.g., iodine, selenium), the geochemical environment strongly influences the fluoride content of foods grown in any one locality. This may explain in part the wide differences of fluoride concentrations reported for different diets. On the other hand, the free circulation of many foods from one region to another in the United States tends to reduce the influence of the local environment; thus it is not surprising that no direct correlation was found between the fluorine in local diets and in the local drinking water (Kramer *et al.*, 1974). However, it appears from recent studies that the fluoride intake from diets, as actually consumed (but exclusive of drinking water), is 2–3 times higher in fluoridated than in nonfluoridated areas. This difference is caused by the contribution of the local water used in the preparation of foods. The intake from diet alone in 12 cities with a fluoridated water supply ranged from 1.73 to 3.44 mg/day, with an average of 2.63 ± 0.17 mg, compared with 0.91 ± 0.05 mg in the nonfluoridated areas (Kramer *et al.*, 1974; Osis *et al.*, 1974). The drinking water would add from 1 to 1.5 mg of fluoride to the former intake but only from 0.1 to 0.6 mg to the latter, so the combined daily intake from diet and water can range from approximately 1 mg in low-fluoride areas to approximately 4 mg in areas with a fluoridated water supply.

Based on these considerations and taking into account the widely varying fluoride concentrations of diets consumed in the United States, a total intake (from food and drinking water) of 1.5–4 mg/day is tentatively recommended as safe and adequate for adults. For younger age groups, the range is reduced to a maximal level of 2.5 mg in order to avoid the danger of mottling of the teeth. Infants may

consume slightly less than 0.1 mg from breast milk or cows' milk and as much as 1.2 mg from certain infant formulas (Wiatrowski *et al.*, 1975). Ranges of 0.1–1.0 mg during the first year of life and 0.5–1.5 mg during the subsequent two years are suggested as adequate and safe.

These suggested ranges are obtained without difficulty in areas with a water supply containing at least 1 mg/liter of fluoride, either naturally or through fluoridation. Where the fluoride content of drinking water is substantially less, it will be difficult to achieve the recommended intake by dietary means alone unless excessive amounts of certain foods high in fluoride are consumed, such as small ocean fish with bones, and tea. It is evident that the daily fluoride intake in many areas of the United States is not sufficient to afford optimal protection against dental caries. Standardization of water supplies by addition of fluoride to bring the concentration to 1 mg/liter has proved to be a safe, economical, and efficient way to reduce the incidence of tooth decay—an important nutritional public health measure in areas where natural water supplies contain less than this amount.

Concentration of fluoride in public water supplies should be adjusted slightly to allow for differences in water consumption with seasonal temperature changes. The range of safety in fluoride intake is wide enough to accommodate normal fluctuations in the fluoride content of foods without risk of inducing that first identifiable indication of an undesirably high intake—slight mottling of the enamel (FNB, 1953; Waldbott, 1963).

Fluorine, like other trace elements, is toxic when consumed in excessive amounts. However, the daily intake required to produce symptoms of chronic toxicity after years of consumption is 20–80 mg or more, far in excess of the average intake in the United States. Mottling of the teeth in children has been observed at fluoride concentrations in diet and drinking water of 2–8 parts per million (BEAP, 1971).

Extensive medical and public health studies have clearly demonstrated the safety and nutritional advantages that result from fluoridation of the water supply (AAP, 1972). In communities in which fluoridation has been introduced, the incidence of tooth decay in children has been decreased by 50 percent or more. The Food and Nutrition Board (FNB, 1953) recommends fluoridation of public water supplies if natural fluoride levels are low.

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CHROMIUM

Trivalent chromium is required for maintaining normal glucose metabolism in experimental animals; it probably acts as a cofactor for insulin (Mertz, 1969). Several investigations have described chromium-responsive disturbances of glucose metabolism in man, suggesting that marginal deficiency states may exist within the United States (Glinsmann and Mertz, 1966; Levine *et al.*, 1968; Liu and Morris, 1978) and abroad (Hopkins *et al.*, 1968; Gürson and Saner, 1971) related to old age, pregnancy, and protein–calorie malnutrition. Chromium levels in human tissues were found to decline with age (Schroeder *et al.*, 1962) and in diabetics (Hambidge *et al.*, 1968; Morgan, 1972). As the predominant route of excretion of endogenous chromium is the urine, the minimal requirement for *absorbable* chromium can be estimated from the daily losses in urine. Recent studies found a mean 24 h chromium excretion of 0.8 ± 0.4 μg, with a range of 0.4–1.8 μg (Guthrie *et al.*, 1978). Although this value is lower by an order of magnitude than older published figures, it has been confirmed by an independent methodology (Veillon *et al.*, 1979). Taking into account estimated insensible losses of chromium, the mean

TABLE 10 Estimated Safe and Adequate Daily Dietary Intakes of Selected Vitamins and Minerals[a]

		Vitamins		
	Age (years)	Vitamin K (μg)	Biotin (μg)	Pantothenic Acid (mg)
Infants	0–0.5	12	35	2
	0.5–1	10–20	50	3
Children	1–3	15–30	65	3
and	4–6	20–40	85	3–4
Adolescents	7–10	30–60	120	4–5
	11+	50–100	100–200	4–7
Adults		70–140	100–200	4–7

		Trace Elements[b]					
	Age (years)	Copper (mg)	Manganese (mg)	Fluoride (mg)	Chromium (mg)	Selenium (mg)	Molybdenum (mg)
Infants	0–0.5	0.5–0.7	0.5–0.7	0.1–0.5	0.01–0.04	0.01–0.04	0.03–0.06
	0.5–1	0.7–1.0	0.7–1.0	0.2–1.0	0.02–0.06	0.02–0.06	0.04–0.08
Children	1–3	1.0–1.5	1.0–1.5	0.5–1.5	0.02–0.08	0.02–0.08	0.05–0.1
and	4–6	1.5–2.0	1.5–2.0	1.0–2.5	0.03–0.12	0.03–0.12	0.06–0.15
Adolescents	7–10	2.0–2.5	2.0–3.0	1.5–2.5	0.05–0.2	0.05–0.2	0.10–0.3
	11+	2.0–3.0	2.5–5.0	1.5–2.5	0.05–0.2	0.05–0.2	0.15–0.5
Adults		2.0–3.0	2.5–5.0	1.5–4.0	0.05–0.2	0.05–0.2	0.15–0.5

		Electrolytes		
	Age (years)	Sodium (mg)	Potassium (mg)	Chloride (mg)
Infants	0–0.5	115–350	350–925	275–700
	0.5–1	250–750	425–1275	400–1200
Children	1–3	325–975	550–1650	500–1500
and	4–6	450–1350	775–2325	700–2100
Adolescents	7–10	600–1800	1000–3000	925–2775
	11+	900–2700	1525–4575	1400–4200
Adults		1100–3300	1875–5625	1700–5100

[a] Because there is less information on which to base allowances, these figures are not given in the main table of RDA and are provided here in the form of ranges of recommended intakes.

[b] Since the toxic levels for many trace elements may be only several times usual intakes, the upper levels for the trace elements given in this table should not be habitually exceeded.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
ATLANTA, GEORGIA 30333

Refer: FL-
March 1979

Total Fluoride Intake

I. In January 1978, the Governor of Michigan asked the Departments of Public Health and Agriculture to conduct a joint study of the ingestion of fluoride in Michigan, to be completed by July 1, 1978. This study, as completed, was supported by 80 references ranging in date from 1942 to 1978. More than half the references were published in the '70's. This study concluded:

> "Evidence bearing on the question of an increase in background fluoride intake due to the general use of fluorides in commercial food processing prior to 1965 is scanty. However, the existing evidence is consistent with a hypothesis of a slight increase. Evidence will not support an increase since 1965. No evidence is available to indicate that there have been any adverse health effects that could be attributed to an increase in background fluoride. The possibility that such will occur is remote."

The sections of the report on "Changes in Dietary Fluoride" and "Effect of Increased Fluorides on Health" were summarized as follows:

Changes in Dietary Fluoride Summary

> "Estimation of whether or not there has been a general background increase in fluoridation in Michigan due to the use of fluoridated water in commercial food processing is difficult because of the absence of solid, comparable data that spans the time prior to and after general fluoridation of water. There has been an increase in fluoride intake through foods in fluoridated areas due to the use of fluoridated water for food preparation, but this is expected and actually built into the determination of optimal water fluoride levels from field studies.
>
> Review of studies analyzing foods directly raise the possibility of a small increase between the pre-fluoridation era and the mid-1960's, but

there is no evidence to support an increase since then. Review of studies on the effectiveness of fluoridation in reducing dental caries and in producing fluoride dental mottling do not support an increase in background fluoride consumption, but information is sparse. Review of information concerning appearance of fluorides in urine suggest that there may be a slight increase in fluoride excretion (and, therefore, intake) since the pre-fluoridation days.

Overall, it would seem reasonable to accept the premise that there has been a slight increase in fluoride ingestion by the general population since the pre-fluoride days. The amount cannot be accurately estimated but most likely is less than 0.5 mg/day."

Effect of Increased Fluorides on Health Summary

"Review of likely health effects from a slight increase in dietary fluoride fails to materialize any effects of concern. The only adverse effect within reasonable possibility might be bone abnormalities in persons with long-standing kidney failure. There is no evidence now that such has occurred, except for rare instances associated with greatly increased intake of fluoridated water and in connection with dialysis with fluoridated water."

III. "Fluorides and Dental Fluorosis," by Howard M. Myers, was published in 1978 as Vol. 7 of Monographs in Oral Science by S. Karger, Basel, Munchen, Paris, London, New York, Sydney. Approximately one-half of this monograph is devoted to a critical review of information on fluoride intake. The results, inadequacies, or inappropriateness of various studies of fluoride from all sources are discussed. This current review concludes that there is no convincing evidence that there is an increase in the concentration of fluoride in food. The author indicates that the calculations in Mc Clure's original work on dietary intake, with which current studies are frequently compared, had not adequately allowed for the additional fluoride that was being ingested at that time from fluids other than drinking water."

Dental Disease Prevention Activity
Bureau of State Services

REPORT ON FLUORIDE INTAKE IN MICHIGAN

"There has been increasing concern that the overall intake of fluoride may be too high. In response to these concerns I am directing the Department of Public Health and Agriculture to conduct a joint study of ingestion of fluoride in Michigan by July 1, 1978. I have asked the departments to pay particular attention to possible health hazards of increased intake."

Michigan State of the State Message
January 1978
Governor William G. Milliken

Prepared by:

The Department of Public Health, Maurice S. Reizen, M.D., Directo
The Department of Agriculture, B. Dale Ball, Director

REPORT ON FLUORIDE INTAKE IN MICHIGAN

INTRODUCTION

The questions posed are, first, whether or not there has been a significant increase in the fluoride in the diet of Michigan's people and, second, what possible effect increases in fluoride intake would have on the public's health. These two questions will be dealt with in turn.

The issue of changes in the amount of fluoride received in the food of Michigan's people cannot be answered directly for the following reasons:

1. There have been no comprehensive food analyses for fluoride done over a period of time in Michigan.

2. There may be considerable variation of dietary intake within Michigan; it would probably be impossible to extrapolate accurately from food taken in one or a few locations for analysis.

3. Diets vary so much that it is difficult to extrapolate accurately from analysis of individual foods or even composites.

4. Food preparation methods vary so greatly that it is difficult to predict how much fluoride is actually taken in the diet from analysis of food.

5. Fluoride levels in foods are likely to be higher in areas with fluoridated water because of the use of cooking water. However, this consideration has been built into the studies on determining the levels of fluorides needed for caries prevention and does not really represent an external, independent rise. Therefore,

food analysis by itself could be misleading without considering the fluoride picture as a whole.

It is necessary, then, to develop indirect information that would be helpful in at least answering the question as to whether it is likely that fluoride has significantly increased in the Michigan diet. There are three different types of information that are available to some extent that can speak indirectly to the question at hand:

1. Analysis of fluoride levels in foods elsewhere in the United States and Canada. A certain amount of information has been made available over the past decades concerning levels of fluoride in various foods. Although there are some differences in analytic techniques and methods of obtaining the food samples, some estimates of use may be obtained by a review of such information. The specific advantages and drawbacks will be discussed during the presentation of the data.

2. Response of teeth in more recently fluoridated areas. Examination of teeth may be an indicator of fluoride intake. If there is a significant increase in background fluoride in a non-fluoridated area, then there should be some reduction in caries. If such an area is then served with fluoridated water, the improvement should be less than expected because the baseline has changed. In like manner, if the background level of fluorides in food has significantly increased, the total intake in areas with fluoridated water will be increased and there should be an increased incidence of fluoride related mottling. The experience of Michigan communities initiating the addition of fluorides to their drinking water in more recent times may be of help in determining whether or not the background intake from food had changed.

3. The analysis of fluorides in the urine. In general, there is a good relationship between fluorides in the urine and the intake of fluorides. Comparison of the urinary fluorides reported in the past to be associated with given levels of fluorides in drinking water can be compared with urinary fluoride levels of a current population exposed to given levels of fluorides in drinking water. Significant differences would denote differences in fluoride intake related to food fluoride changes unassociated with water fluoridation.

The issue of the effect of an increase in fluoride intake on the public's health must be dealt with on the basis of information available to us from scientific literature. Review of the assessment of health measures in general populations with different fluoride exposures and the assessment of risks in persons with impaired ability to excrete fluoride will be necessary. The information gathered will present evidence from naturally occurring situations as to whether a given change in fluoride levels will produce any significant health changes in the population, since there have not been and are unlikely to be direct experimental studies comparing the health effects of long term fluoride administration at greater than recommended levels.

Throughout the discussion it will be apparent that definite information does not exist to answer some of the questions. The conclusions will attempt to reflect the firmness of the information and suggest further studies that would obtain additional relevant information if it would be considered useful.

CHANGES IN DIETARY FLUORIDE

Estimates of Changes in Fluoride Intake Based on Food Analysis

The most direct method to determine the intake of fluorides by the population would seem to be analysis of fluorides in common foods. Analysis of food fluoride is valuable to obtain general estimates of the fluoride intake. However, there are inherent problems in extrapolating these data to precise estimates or ranges for the population that can be used to answer the question of trends over a long period of time. Therefore, although useful as general indicators, analysis of foods cannot be looked upon to give us precise measures of the population's intake.

It must be kept in mind that one of the means of increasing fluoride intake is through foods prepared in fluoridated water. The increase of fluorides in foods prepared in fluoridated water has been amply demonstrated.[1-4] Therefore, a demonstration that fluorides are higher in food in fluoridated areas is not directly pertinent to the question at hand since such an increase can be expected and is inherent in a fluoridated area. The basic question is whether or not there have been background changes in food processing that increases the fluoride intake of the population irrespective of the amount of fluoride occurring in their water supply.[5-8]

There are some general problems of extrapolation from food analyses to population intake that are common to all studies. First, the sources of food are highly variable. If there are geographic differences in fluoride content of foods it is difficult to account for this because of the widespread and varied distribution patterns for food. Second, methods of preparation affect the fluoride content of foods, so that extrapolation to the general public is difficult.[9] Third, dietary habits of the public vary greatly and fluoride intake will vary accordingly.

Changes in fluoride ingestion are only significant if they occur over a long time. Brief elevations of intake are not effective in preventing

dental caries nor are they likely to cause toxicity, except in the extreme case of acute poisoning, which is not of concern to this discussion. Therefore, even analysis of individual meals could be misleading if not put in the long term perspective.

These general drawbacks are not pointed out to negate the usefulness of food analysis studies, but rather to indicate that a greater degree of precision should not be expected of them than is warranted by the condition of the study. In addition, great care must be taken if data are to be used out of their original context for purposes outside the design of the study. The studies furnish the basis for estimation which is quite rough, but useful as a general indication of levels to be expected.

Wherever possible, beverages and water are excluded from dietary intake. Few beverages, with the exception of tea, have fluoride levels much higher than water. Soft drinks made from fluoridated water may exceed 1 ppm but do not exceed approximately 1.5 ppm.[10-12] Since beverages are used as substitutes for water, their use will not affect the total intake of fluoride very much. Because of the variability in beverage intake, changes in fluoride intake due to beverage use is best considered in relation to total diet or urinary excretion studies.

The first type of study to be considered is the analysis of individual foods for fluoride content. Information concerning analysis of various specific foods is available from the 1940's.[13] However, there has not been a consistent sampling plan to obtain comparable data over time. With the understanding that sampling and testing methods have changed over time, the following table is presented to give an estimate of fluoride levels in comparable foodstuffs in the 1940's and 1960's.

Fluorides in Various Foods Cited by McClure (1949)[13] (ppm, fresh wt.)		Fluorides in Food Groups fro San Filippo & Battistone (19 (Range of 4 diet samples) (ppm fr
Whole Milk	0.7-0.22	Group I. Dairy Products, 0.11-0
Commercial Milk (Range 0.1-0.7)	0.1-0.3	
Chicken	1.4	Group II. Meat, fish and poultr
Beef	2.0-2.9	0.42-1.04
Pork	0.34-1.2	
Fish (filets)	1.49	
Salmon (canned)	4.5	
Codfish	7.0	
Tuna (canned)	0.1	
Eggs (Range 0.1-7.0)	0.13-0.46	
White bread	0.54-1.0	Group III. Grain and Cereal Pro
Bisquits (Range 0.54-2.0)	0-2.0	0.26-0.59
Potatoes	0.13-0.45	Group IV. Potatoes, 0.13-0.2
Cabbage	0.3	Group V. Leafy vegetables, 0.13-
Spinach	0.2-1.8	
Celery (Range 0.1-1.0)	0.1-0.7	
Green beans	0.11-0.15	Group VI. Legume vegetables, 0.1
Peas (Range 0.11-0.6)	0.6	
Beets	0.2	Group VII. Root vegetables, 0.06-
Carrots	0.4	
Onion	0.24, 0.6	
Turnips (Range 0.2-0.6)	0.3	
Tomatos	0.24	Group VIII. Garden Fruit, 0.07-0.
Cucumbers	0.2	
Eggplant (Range 0.2-0.4)	0.4	
Grapefruit	0.36	Group IX. Fruits, 0.10-0.11
Oranges	0.15-0.34	
Apples	0.035-1.3	
Apricots	0.02-0.22	
Peaches	0.21	
Grapes	0.16	
Plums	0.21	
Strawberries (Range 0.02-0.36)	0.18	
--		Group X. Oils & Fats, 0.12-0.45
Sugar	0.32	Group XI. Sugar & Adjunct, 0.3-0.5
Malt	1.0, 1.5	
Tea (brewed)	1.19	Group XII. Beverages, 1.1-1.22

While it is not strictly valid to compare mixtures of commodities (as from San Filippo and Battistone) with the older individual commodities, it can be seen that there does not appear to be a large or consistent elevation of present day foods above similar foods of a few decades ago. The effect of the use of fluoridated water for canning must be accounted for, however.[1] The following table illustrates some more recent analyses of canned foods and a comparison with similar foods from McClures' report:

	Canned Goods (Fluoride Content in ppm)			Fresh Goods
	Marier & Rose (1966)[1]		Osis, Kramer, Wiatrowski & Spencer (1974)[2] (Data from 1967-1972)	McClure (1949)[13]
	Canned in Non-Fluoridated Water	Canned in Fluoridated Water		
Green Beans	0.2	0.89	0.43 (0.32-0.72)	0.11-0.15
Potatoes	0.38	0.76	0.6 (0.32-0.95)*	0.13-0.2
Carrots	0.19	0.61	0.86 (0.34-2.02)	0.4
Peas	0.1	--	0.59 (0.24-1.07)	0.6
Tomatos	--	--	0.46 (0.14-0.63)	0.24
Pork & Beans	0.27	0.77	--	1.4**

* Prepared for serving in hospital menu in city with fluoridated water.
** Canned goods.

Again, differences in sampling and analysis prevent precise comparison, but it would appear that the use of fluoridated water in canning has resulted in some increase in the fluoride level of certain foods, as would be expected. However, the amount of this elevation for the diet as a whole cannot be ascertained from any available information.

The extrapolation from individual items to estimates of population's fluoride intake is another problem. McClure (1949) based his estimates on grouping foods roughly by fluoride value and estimating the likely mix that would give a diet of normal caloric intake.[13,15] His estimate was from [illegible] - 1.3 mg/day from food. An estimate from the later marketbasket survey was made by considering the likely mixture of amounts of twelve food commodities

in the diet for 16 to 19 year olds and estimating the total fluoride intake (San Filippo and Battistone (1970)).[14] This estimate, exclusive of beverages, ranged from 0.78 to 0.9. Although the individual foods or food groups are not strikingly different, the recent estimate is considerably higher than the old. With our limitation of information it is difficult to accept this alone as indicating a change in fluoride intake.

Although it would be useful to have comparable information concerning changes in individual foodstuffs over time, such is not available and other methods of comparison must be considered.

A specific concern has arisen about the use of a phosphate source for cattle feed that was high in fluoride. This occurred for a period in Michigan, but the change involved wide areas of the nation in addition. Although fluorides are not concentrated in milk, there was concern that the extra fluoride load might increase milk levels above that normally seen. However, analysis of milk from 23 dairies for fluorides in 1978 revealed levels from 0.12 to 0.16 ppm, well within the expected levels.

A second approach to estimation of dietary fluoride intake is the measurement of individual diets. This has generally been done by measuring either the diet of individual subjects under study or a standard diet, such as a hospital diet.

A study published in 1942 gave the food fluoride intake for one subject in a community with low water fluorides as 0.155 mg/day when measured over a 20 week period.[16] His average fluoride intake from fluids was about 0.3 mg/day. It was noted that he avoided many foods with relatively high fluoride content, such as fish, from natural food preference.

A study published in 1949 of five subjects tested for fluoride intake and excretion, gave the intake of fluoride in their normal diet as 0.3 to 0.5 mg/day from food.[17] When put on a high protein diet this rose to 0.8 mg/day.

A 1950 report gives the content of a daily adult diet in a community with low fluoride content (based on restaurant food) as 0.18 to 0.3 mg.[18] The same authors measured the normal diets of three subjects using a low fluoride water supply.[59] The meals were given as part of a metabolic study and contained 0.428, 0.448, and 0.760 mg/day for the three days (exclusive of water). Supplementation with Pablum brought the levels to .928-1.408 mg/day and with tea to 1.2 to 1.368 mg/day.

A fluoride intake and excretion study published in 1970 determined that the average dietary intake of fluorides for 10 men in a community fluoridating to approximately 1 ppm was about 2 mg/day and varied from 1.22 to 2.74. Drinking water was excluded from this total.[19]

A study of dietary fluoride in the food of children in Marin Co., California, was made in 1973.[6] Analysis was made of 17 daily diets eaten by 10 children ranging in age from 5 to 14 years. The average diet contained 1.085 mg/day, varying from 0.235 to 2.205 mg/day. This included beverages. The water supply contained approximately 0.1 ppm fluoride.

A 1974 study gives the results of fluoride analysis for meals served at a hospital metabolic ward over a period of six years:[2]

Year	No. of Diets Analyzed	Dietary Fluoride, mg/day Average	Range
1967	44	1.91	1.47-3.08
1968	49	1.60	1.26-1.83
1969	47	1.56	1.21-2.30
1970	53	1.76	1.46-2.06
1971	53	1.74	1.28-2.07
1972	41	1.60	1.33-1.80

In this study the diet analyzed included coffee, which contributed about 1.54 mg/day to the total.

In addition, analyses of 10 hospital meals were done in 1968, five whil fluoridation of the community water was maintained and five while fluoridatio was temporarily discontinued. The average daily fluoride content of meals during fluoridation was 1.96 (1.23 - 2.41) and during suspension of fluoridation was 0.86 (0.73 - 0.94). Presumably the usual coffee allowance of 0.54 mg/day can be deducted from the total during fluoridation, but the fluoride contributed by coffee made from non-fluoridated water was not given. Clearly, fluoridation of the water supply significantly increased the fluorid content of the prepared food, as anticipated.

Another study published in 1974 tested diets from hospitals in twelve ci having fluoridated water and four when they were not fluoridated.[20] Again, diets included coffee. The average daily fluoride intake for the fluoridated cities was 2.7 mg/day (1.73 - 3.44) and for the non-fluoridated cities was 0.9 mg/day (0.78 - 1.03). There was not a good correlation between the dietar fluoride and the level of water fluoride, probably because only one water samp was obtained from the fluoridated supply. It is reasonable to assume that the overall fluoride level of the water in these cities approaches 1 ppm. The actu average water fluoride level for the fluoridated cities was 0.9 ppm and for the non-fluoridated cities, 0.3 ppm.

Unfortunately, there is not good, comparable data on the analysis of food prepared as meals in non-fluoridated areas from before 1950 and currently. If one accepts the estimate of 0.3 to 0.5 mg/day for fluorides in food in unfluori areas in the 1940's and 0.9 mg/day in the 1960's, there appears to have been so increase in overall background fluoride in food. It seems unlikely, however, t this would amount to more than 0.5 mg/day, and so would represent a modest incr The major increase is due to fluoridation of water supplies and is included in the estimate of the level of fluoridation that is needed for optimal reduction of caries.

The third method of estimating the amount of fluorides in the diet is the marketbasket survey. These surveys are performed by taking samples of commodities from the marketplace and analyzing the foods for various constituents of interest. The values are expressed by twelve commodity

groups, as indicated in the first table. The intake of the constituent is estimated on the basis of a standardized intake for a healthy 16 to 19 year old boy to express the maximum intake normally expected. In four diets collected during 1967-68, the estimated total intake for the Baltimore area varied from 2.09 mg/day to 2.34 mg/day.(14) If beverages (including drinking water) are excluded, the intake from food varied from 0.78 to 0.9 mg/day. The Baltimore water supply is fluoridated to approximately 1 ppm of fluoride. A more recent collection involving a wider sampling in 1975 has estimated a total intake of 0.91 to 1.72 mg/day.(21) The details of the study are not available yet so that beverages cannot be excluded.

Although more detailed information about the recent survey will be needed, these marketbasket surveys do not support a supposition that there has been an increase in exposure during the past decade. The marketbasket approach will be a valuable approach for any future considerations because of its potential for broad representation of the population.

There is a continual controversy concerning whether or not there is enough or too much fluoride in the diet of infants and children.(22-34) The relevance of the differences in data presented in the literature to Michigan is not clear. For the present, it would seem reasonable to adhere to the recommendations of the Committee on Nutrition of the American Academy of Pediatrics who support fluoridation of water to maintain adequate fluoride intake and supplementation of the diet with fluoride if the water fluoride is low.(35) The information we have about Michigan is that the intake for infants and children may be lower than it should be. The recent marketbasket survey determined a range of intake for the country as from 0.174 to 0.554 mg/day for a 6 month old infant, with Grand Rapids being 0.207 mg/day.(21) The intake for a two year old child in Grand Rapids was estimated at about 0.61 mg/day, which is slightly lower than optimum. The evidence at present does not indicate a need for concern about excess fluorides in the diets of Michigan children.

To summarize the information concerning estimates of fluoride levels from food analysis, there is some evidence to support the contention that the background level of fluorides in food has risen slightly between the 1940's and the mid 1960's.

This is a reasonable assumption due to the fact that some food processing plan undoubtedly were furnished fluoridated water. The amount of the increase seems unlikely to be more than approximately 0.5 mg/day, which would be a rela small increment as compared to the effects of water fluoridation. The evidenc does not support, however, an increase between 1965 and the present. There is no evidence for a continual increase or escalation of the level of fluoride in at the present.

If there is a desire to obtain more accurate information on this aspect i the future, the following are possible approaches:

1. Carry out marketbasket studies in Michigan using techniques similar to those emplcyed in the past. This would permit longitudinal comparisons for the state and comparisons with prior information.

2. Perform analyses on hospital or institutional meals in various communities throughout the state. If this were done on a repeated or rotational basis, information comparable to that obtained elsewhere and on repeated observation into the future could be obtained.

3. Key samples of foodstuffs could be freeze-dried and held in a bank for repeated analyses in the future. This would allow direct comparison without concern for differences in analytic technique in the future. These could be composite samples if the composition could be duplicated in the future.

Estimate of Changes in Fluoride Intake Based on Dental Examinations

Dental enamel is a reasonably sensitive indicator of fluoride intake, particularly in children. The level of fluorides in fluoridated water supplies is designed to obtain optimum prevention of caries through incorporation of fluorides into the teeth.[35-38] At fluoridation levels that accomplish thi a small proportion of children will develop mild mottling.[37-39] Measurements

of the effectiveness of fluoride added to water supplies in preventing caries and the extent of mottling of the teeth could be used as estimates of whether or not there has been a significant increase in background fluoride intake from food. If such an increase has occurred then the improvement in the rate of caries occurrence after water fluoridation would be less than expected. In like manner, if there has been a significant increase in background fluoride, an increase in the degree of mottling due to fluoride should occur.

As background information for caries reduction, two early studies will be cited. The water supply of Newburgh, New York, was fluoridated to approximately 1.0 to 1.2 ppm in 1945.(40) The nearby community of Kingston continued to use water with a fluoride level of 0.05 ppm. The following table gives the average decayed, missing and filled teeth in different age groups for the two communities in 1954-55:

DMF Counts Per Child

Age	Newburgh, N.Y.	Kingston, N.Y.	Per Cent Reduction*
6-8	0.984	2.337	57.9%
10-12**	3.281	6.986	53.0
12-14**	6.101	11.703	47.9
15**	9.752	16.487	40.9

* $\frac{\text{Kingston rate - Newburgh rate}}{\text{Kingston rate}} \times 100$

** These children in Newburgh started drinking fluoridated water after infancy.

In Grand Rapids, Michigan, water fluoridation was started in 1945.(41) The following table illustrates the DMF counts for children examined prior to fluoridation (1944-45) and afterwards (1959):

DMF Counts Per Child, Grand Rapids, Mich.

Age	1944-45	1959	Percent Reduction*
12	8.07	3.47	57.0%
13	9.73	3.58	63.2
14	10.94	5.38	50.8
15	12.48	6.22**	50.2
16	13.50	7.03**	47.9

* $\frac{\text{1944-45 rate - 1959 rate}}{\text{1944-45 rate}} \times 100$

** These children started drinking fluoridated water after infancy.

Thus, as a baseline, one would expect to find a reduction of decayed, filled or missing teeth of from 50% to 60% after a period of time sufficient to permit lifetime exposure of children to fluoridated water based on studies done before fluoridation was widespread.

There is only one similar study in Michigan in recent times to compare with the older studies. In 1966 fluoridation of the water of Flint, Michigan was begun. In 1976, children in the same age group as those examined prior to the start of fluoridation were examined for DMF counts:

DMF Counts Per Child, Flint, Mich.

Age	1965-66	1976	Per Cent Reduction*
7	0.87	0.40	54.0%
8	1.55	0.50	67.7
9	2.14	0.77	64.0

$$* \frac{\text{1965-66 rate} - \text{1976 rate}}{\text{1965-66 rate}} \times 100$$

The reduction of counts in Flint was approximately the same as in Grand Rapids and Newburgh. This would not support a supposition that there had been a substantial increase in background fluorides due to food intake in these children by as late as 1965.

The occurrence of tooth enamal opacity due to fluorides can be considered in similar manner. Mild dental mottling may occur at fluoride doses needed for optimal prevention of dental caries. Such mild mottling is not injurious to teeth and has not been associated with any general toxicity due to fluorides. There must be a distinction made between opacities related to fluorides and those occurring naturally due to other causes.[39,41] These observations require examiners experienced in this type of work. The following table shows the opacities in the Newburgh and Kingston studies cited above.[40] Note that only the 7-10 year olds would have lived their entire lives under the influence of fluoridated water in Newburgh.

Age	% of Enamel Opacities Due to Fluorosis						Nonfluoride Opacities	
	Questionable		Very Mild		Mild			
	Newburgh (N)	Kingston (K)	N	K	N	K	N	K
7-9	14.4%	0.8%	6.6%	0	1.2%	0	4.2%	19.1%
11-12	4.1	0.6	6.2	0	1.6	0	10.3	18.4
13-14	0	0	0	0	0	0	22.2	21.1

Note: Newburgh began water fluoridation approximately 10 years before observations.

Similar information is available for fluoride opacities from Grand Rapids, Michigan, sixteen years (1961) after initiation of water fluoridation:(43)

% of Enamel Opacities Due to Fluorosis

Age	Questionable	Very Mild	Mild
11-12	13.6	9.1	0
13-14	13.1	5.9	1.4
15-16	6.1	4.1	0

From the above information, one would expect enamal opacity rates due to fluorides in children who are lifetime residents receiving fluoridated water of approximately 13-15% questionable, 6 to 9% very mild, and 1 to 2% mild. Moderate or severe fluorosis opacities should not be present to any significant amount. Older literature reviewing the occurrence of mottled enamel due to fluorosis would support an estimate of 10% very mild or mild mottling (excluding questionable) for persons with a water supply at about 0.9 ppm. This same estimate for water supplies having 1.7 ppm would rise to about 40% and for supplies having 2.5 ppm to about 65%.(39) Therefore, the extent of mottling would be a reasonably sensitive measure of significant increases in overall fluoride intake.

Unfortunately, there are no recent Michigan studies on a systematic to measure the fluorosis opacities in children served by fluoridated wat The most recent such examination was carried out in Escanaba and Gladston in 1966, about 12 years after fluoridation had been started. The fluoride opacity rate for children in these cities was 9.4%.

Considerations of the appearance and health of teeth cannot resolve the question of an increase in background fluoride levels at the present t From the caries studies, it would not seem likely that there had been a substantial, if any, increase prior to 1965 and the opacity studies do not indicate evidence of an increase prior to 1955. It must be realized that measure applies only to children and their dietary intake and would probably most effectively be measured in children born during the period in questi It thus does not speak to the whole question.

The following future activities suggest themselves if it is felt wort pursuing this as an indicator of increasing background fluoride intake:

1. Fluorosis opacities could be measured now and in the future for comparison to expected values. This might be a sensitive measure of possible changes in dietary fluoride intake applied to children.

2. If fluoridation is undertaken in communities with very low fluorides, it would be well to study the caries rates before and after fluoridation to see if there is any decrease in the increment below that expected.

Estimate of Changes in Fluoride Intake Based on Urinary Fluoride Excretion

In previous studies on the balance of intake and excretion of fluorid it has been shown that urinary excretion of fluorides is a good general indicator of fluoride intake.[44-53] Another measure of intake of our

population would be a comparison of their urinary levels with levels established in the past to be associated with various intakes. This measurement has the advantage of more accurately reflecting actual intake rather than depending upon extrapolations from foods to diets that people are projected to consume.

There are other indicators of exposure that might be analyzed to provide similar information. Blood plasma is felt to reflect intake accurately and is useful for some purposes.(5, 54) However, urine offers ease of collection and analysis. Analysis for fluoride in teeth or bones might be used, but again it is much more difficult to obtain appropriate samples and the analysis is more difficult.(55-58) These also represent cumulative amounts of fluoride and may be difficult to relate to current intake.

Fluoride is readily excreted in the urine, but varies from specimen to specimen during a given day.(48-53) The excretion level of an individual should be obtained by analyzing a 24 hour sample for accurate results. However, for purposes of population surveys, single voidings may be analyzed because the variations tend to be offset when the results are combined by groups.

Estimates of the expected background levels of fluorides that can be expected in the urine at various levels of fluorides in the drinking supply can be obtained from studies done before fluoridation was widespread. The following is representative of findings at given water fluoride levels:(45,47,57,60)

Water F level (ppm)	Urine F level (ppm)
0 or very low	0.2-0.3
1.0	0.9-1.1
2.0	1.9-2.0
4.0-5.0	2.3-4.8
8.0	6.7-7.7

To compare current fluoride excretion with these historical levels, a limited number of determinations were done in 1978 by the Michigan Depart of Public Health on persons with various water fluoride levels:

No. Persons	Water F Level (ppm)	Urine F. Level (ppm) Average	Range
12	0 - 0.2	0.435	0.1 - 0.75
17	0.9 - 1.1	1.28	0.58 - 1.9

Comparison of these levels with those expected would indicate that th may be some slight increase in background fluoride level such that current levels are slightly higher than historical levels would indicate. Precise quantitation of these differences or statistical testing for differences is not warranted because of the size of sample and possible differences in analytic technique. However, it seems unlikely, for instance, that if there is an increase in background that it would elevate intake to as high as that equivalent to 1.5 ppm in the water supply prior to widespread fluori The indication is that the change, if present, is small.

If it is felt that more precise measure of urinary fluoride output as a measure of fluoride intake is needed, there are two types of study that wo be appropriate:

1. Measurement of the concentration of fluorides in single voided specimen from larger number of persons having various levels of fluoride in their drinking water.

2. Measurement of the amount of fluorides in 24 hour urine collections from persons having various levels of fluoride in their drinking water. This would have the advantage of having more precise measurements on individuals and of enabling more accurate comparisons with intake and excretion studies that are in the literature.

Summary

Estimation of whether or not there has been a general background increase in fluoridation in Michigan due to the use of fluoridated water in commercial food processing is difficult because of the absence of solid, comparable data that spans the time prior to and after general fluoridation of water. There has been an increase in fluoride intake through foods in fluoridated areas due to the use of fluoridated water for food preparation, but this is expected and actually built into the determination of optimal water fluoride levels from field studies.

Review of studies analyzing foods directly raise the possibility of a small increase between the pre-fluoridation era and the mid-1960's, but there is no evidence to support an increase since then. Review of studies on the effectiveness of fluoridation in reducing dental caries and in producing fluoride dental mottling do not support an increase in background fluoride consumption, but information is sparse. Review of information concerning appearance of fluorides in urine suggest that there may be a slight increase in fluoride excretion (and, therefore, intake) since the pre-fluoridation days.

Overall, it would seem reasonable to accept the premise that there has been a slight increase in fluoride ingestion by the general population since pre-fluoride days. The amount cannot be accurately estimated but most likely is less than 0.5 mg/day.

EFFECT OF INCREASED FLUORIDES ON HEALTH

Consideration of the possible health effects of increased fluorides will be confined in this presentation to events that might occur as a result of the increases projected in the discussion above. If the increment in dietary fluoride is less than 0.5 mg/day, the equivalent fluoride intake prior to general fluoridation would be less than 1.5 ppm in the water. Therefore,

any of the older studies on health effects at 1.5 ppm in water or higher should be applicable. Any newer surveys comparing fluoridated and non-fluoridated supplies would also apply because this increment of fluoride intake would be included in both areas.

The chronic toxic effects of high doses of fluorides are generally considered to be limited to the teeth and bones and the neurological system in cases of severe, crippling bone fluorosis. There have been many reviews and reports dealing with the health effects.[61-70] Damages shown to be due to other organs have not been noted in studies of persons on relatively high fluoride intake in this country.[56,63,69] The likelihood of the occurrence of such disease in the general public exposed to 1 ppm in water is so remote that the discussion will focus on possible bone effects.

There are two special groups of persons that must be mentioned. The first are persons with marked increases in fluid intake coupled with marked kidney insufficiency. There are several case reports of such young adults who have bony changes undoubtedly due to excess fluorides.[71-75] In some cases they have lived in areas with elevated water fluorides and in other cases in areas with normally fluoridated water. Characteristically they have had severe underlying kidney disease. Changes in bone were detectable b x-ray or an autopsy, but they did not have health problems related to the bon changes. These rare, special cases need medical assistance and are not primarily of relevance to a discussion of health effects on the general publi

The second group needing special consideration are those with kidney damage so severe that they must undergo dialysis.[76-79] These individuals may receive relatively large amounts of fluoride in dialysis water and have no means to excrete it except through minor routes, such as perspiration and saliva. Again, these persons are under medical care where individual decisio can be made. The recommended standard for dialysis water is 0.2 ppm or less to avoid problems with excessive absorption of fluoride in bone.

Comparison of bone disease in populations with low water fluoride and [illegible] water fluoride levels of 1.0 ppm, 2.5 ppm, 4-5.8 ppm, and 8 ppm have [illegible] no significant differences of bone disease or complaints.(62,64,66,69,80) [illegible] exposures to the higher concentrations there is evidence of some increased [illegible] of persons having increased bone density, but this is not associated [illegible] disease. The likelihood of structural bone changes related to the [illegible]ively small background increase in fluorides that may have occurred [illegible] remote.

There is evidence that older persons having severe, chronic pyelonephritis [illegible] marked decrease in kidney function accumulate fluorides in the bone to [illegible] levels than those without kidney disease.(56) The average bone fluoride [illegible] in such persons was a little more than twice those in the same age [illegible] without kidney disease. It is possible that rare persons presently [illegible] water supplies having 1 ppm and having prolonged chronic kidney [illegible]ency could accumulate substantial amounts of fluoride in their bones. [illegible], there have been no reports of bony abnormalities in such cases, [illegible] though persons exposed to higher levels of water fluoride have been [illegible], including some with renal disease.

[illegible] it is felt that the remote possibility that older persons with [illegible] kidney disease may have elevation of fluorides to such an extent that [illegible] bone disease should be explored, it would be feasible to perform [illegible] that would periodically examine the bones of persons dying from [illegible] kidney disease for structure and fluoride content. Such a study [illegible] detect a trend toward an unexpectedly high fluorine absorption.

[illegible] detect illnesses or diseases in the general population that might [illegible] related to fluorides, requests have been made in the journals of the [illegible] and osteopathic societies of the state for physicians to report [illegible] related illnesses. Such reports may permit an evaluation of the [illegible] of health effects occurring currently.

Summary

Review of likely health effects from a slight increase in dietary fluoride fails to materialize any effects of concern. The only adverse effect within reasonable possibility might be bone abnormalities in persons with long-standing kidney failure. There is no evidence now that such has occurred, except for rare instances associated with greatly increased intake of fluoridated water and in connection with dialysis with fluoridated water.

OVERALL SUMMARY

Evidence bearing on the question of an increase in background fluoride intake due to the general use of fluorides in commercial food processing prior to 1965 is scanty. However, the existing evidence is consistant with a hypothesis of a slight increase. Evidence will not support an increase since 1965. No evidence is available to indicate that there have been any adverse health effects that could be attributed to an increase in background fluoride. The possibility that such will occur is remote.

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Methodologic Problems in Evaluating the Carcinogenic Risk of Environmental Agents

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[illegible] scientific papers [illegible] potential environmental [illegible] (cancer-causing [illegible] have appeared with increasing frequency. Many of these [illegible] statistical analyses [illegible] has not always been of primary concern. Sometimes in the presentation [illegible] and obvious that [illegible] is readily seen; [illegible] the analysis may be [illegible] by subtle methods of [illegible] which only experts can [illegible]. Unfortunately, the [illegible] called on to evaluate and [illegible] more and more sophisticated [illegible] and statistical [illegible]. Many papers are [illegible] by the scientific community [illegible] public in general without [illegible] proper scrutiny which [illegible] any scientific investigation. The following discussion [illegible] paper from the National [illegible] Federation[1] for the purpose [illegible] several pitfalls of [illegible] which may occur.

Background

During a recent election in the [illegible] area, a proposal for [illegible] the water supply was [illegible] the ballot. This proposition became a heated topic for debate [illegible] the opponents of this proposal felt that fluoridation would have a deleterious effect on the health of the community. Some of their arguments were based on publications purporting to show a link between fluoride and cancer. (1-3) One paper entitled, "A Definite Link Between Fluoridation and Cancer Death Rate," by J. A. Yiamouyiannis, Ph.D. (Biochemistry), was popularly circulated by the National Health Federation. Despite the fact that this paper was not published in a scientific journal, it may have influenced the defeat of the fluoridation proposal in this election. A number of politicians quoted freely from this paper, and they felt that sufficient evidence was provided to incriminate fluoride as a carcinogenic agent.

In his paper Dr. Yiamouyiannis wrote that "comparing the 25 largest fluoridated and nonfluoridated cities leads to the conclusion that there exists a definite link between fluoridation and cancer death rates." He went on to state that about 90 percent of the increased cancer death rate in fluoridated cities is due to cancer of the mouth and tongue, esophagus, stomach, large intestine, rectum, kidney, bladder, urinary organs, female breast, ovary and fallopian tube. He attributed this increase to the addition of fluoride to the water supply in those cities. His claims of a link between fluoridation and cancer death rates were principally based on the relationship between the presence or absence of fluoridation in 20 cities and the cancer death rates among white males. This was accomplished by showing that, among the ten largest cities having fluoridated water supplies (prior to 1960), all had cancer death rates from 17 percent to 34 percent higher than the national average. This compared with ten *selected* cities with nonfluoridated water supplies which had cancer death rates ranging from 6 percent less to 8 percent higher than the national average (Table 1). A cursory examination of the data in this table might lead one to think that fluoridation and cancer are causally associated.

Evaluation

In evaluating any study design purporting to deal with the relationship between cancer and potential carcinogens, several crucial points must be addressed.

1. Exclusion of particular data may bias study results; therefore, if any such exclusions are made, they must be carefully justified.

2. Claims that a new specific agent has brought about changes in a group of death rates must be examined in terms of rates both prior to and after time of exposure to the agent.

3. In any epidemiological observation, other variables of import (potential confounding variables) need to be considered; therefore statistical associations must be examined closely before causation can be inferred.

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[illegible] UCLA

[1]The National Health Federation, located at 212 West Foothill Boulevard, Monrovia, California 91016, is a nonprofit organization engaged in health research and health promotion.

First, three nonfluoridated cities (Boston, Cincinnati, and New Orleans) were excluded from Dr. Yiamouyiannis' study. It is interesting to note that these three nonfluoridated cities have cancer death rates which are 20 percent, 26 percent, and 27 percent higher, respectively, than the national average. These three cities were excluded from the study because the author felt that they were "aberrant" cities. The author claims that the higher cancer rates in these cities had been previously linked to other waterborne contaminants such as chlorine, chlorinated hydrocarbons, pesticides and herbicides. To exclude these cities without applying the same criteria to other cities in the study renders the subsequent statistical analysis invalid. In fact, a recent study by the Environmental Protection Agency shows that several fluoridated cities examined by Dr. Yiamouyiannis had levels of chlorinated hydrocarbons equal to or higher than the nonfluoridated cities he excluded (4).

Secondly, in order to provide evidence that fluoridation was responsible for the higher rates in the fluoridated cities, it would be necessary to show that these cities did *not* have the highest cancer rates in 1950, before fluoridation was introduced. However, on examination, the fluoridated cities had the highest cancer death rates in 1950 as well as in 1970 (Table 2). Furthermore, cancer death rates increased all over the United States from 1950 to 1970. The rate of increase in the nonfluoridated cities from 1950 to 1970 was exactly the same (15 percent) as the rate of increase in the fluoridated cities. This makes it even more doubtful that fluoridation was responsible for any increase observed in the fluoridated cities.

Thirdly, statistical association does not necessarily imply causation. It is a common error to claim a causal relationship between a study factor and an effect based on a noncausal or secondary association between the variables. There may be a confounding factor that is the actual cause of a specific effect, and the association between the study factor and the disease may only be an artifact of the association of the study factor with the confounding factor. As an example, consider the familiar story of the decrease in the number of storks in Belgium being closely followed with a drop in the human birth rate in that country. In this case, modernization (in the form of newer style homes with roofs unsuitable for stork nests and new techniques for birth control) was the cause of the change in the number of storks and births. Clearly modernization was a confounding variable producing a secondary noncausal association between the declining number of storks and the declining number of births.

In the present study, industrialization is a similar example of a confounding factor. In examining the list of fluoridated and nonfluoridated cities, one quickly observes that the fluoridated cities are much more industrialized than the nonfluoridated cities. Figure 1. Environmental pollutants resulting from industrialization are thought to have carcinogenic effects on the exposed populations and contribute to the higher cancer mortality rates in those cities. One would expect that those cities which are higher in industrialization would also have higher cancer rates. In this case, one would be observing the effect of industrialization rather than fluoridation in observing the higher cancer mortality rates.

Other variables that may confound comparisons and must be taken into consideration are demographic factors that are known to affect the development and progression of cancer. For example, the age structure of a population has a direct connection to its cancer rate, while social class structure and

TABLE 1[1]

Cancer Death Rate of White Males as Compared to the National Average
(Dates refer to the year in which that city's water supply was fluoridated)

Ten Largest Cities Fluoridated Before 1960(a)			Ten Largest Nonfluoridated Cities Excluding Aberrant Cities (b)	
1. Chicago	1956	18% Higher[2]	1. Los Angeles	0% Average[2]
2. Philadelphia	1954	27% Higher	2. Houston	8% Higher
3. Baltimore	1952	34% Higher	3. San Antonio	3% Lower
4. Cleveland	1956	22% Higher	4. San Diego	6% Lower
5. Washington, D.C.	1952	17% Higher	5. Seattle	4% Higher
6. St. Louis	1955	26% Higher	6. Memphis	8% Higher
7. Milwaukee	1953	17% Higher	7. Atlanta	7% Higher
8. San Francisco	1952	22% Higher	8. Kansas City	4% Higher
9. Pittsburgh	1953-8	16% Higher	9. Columbus	7% Higher
10. Buffalo	1955	19% Higher	10. Phoenix	8% Lower
Average		22% Higher	Average	2% Higher
20% Higher Death Rate in Fluoridated Cities				

Two major alterations are made:
(a) The ten largest cities fluoridated before 1960 were chosen since the effect of 2 or 4 years of fluoridation on a 20-year cancer mortality rate may be questionable.
(b) The ten largest nonfluoridated cities (excluding Boston, New Orleans, and Cincinnati) were chosen because the higher cancer death rates in these cities have already been linked to other waterborne contaminants (chlorine, chlorinated hydrocarbons, pesticides, and herbicides, etc.; . .).

Numerical subscripts were added by the authors.
1. Reproduced from J. A. Yiamouyiannis' paper.
2. Represents percentage differing from the national average.

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TABLE 2

Cancer Death Rates[1] for Fluoridated and Nonfluoridated Cities as Compared to National Average, 1950 to 1970

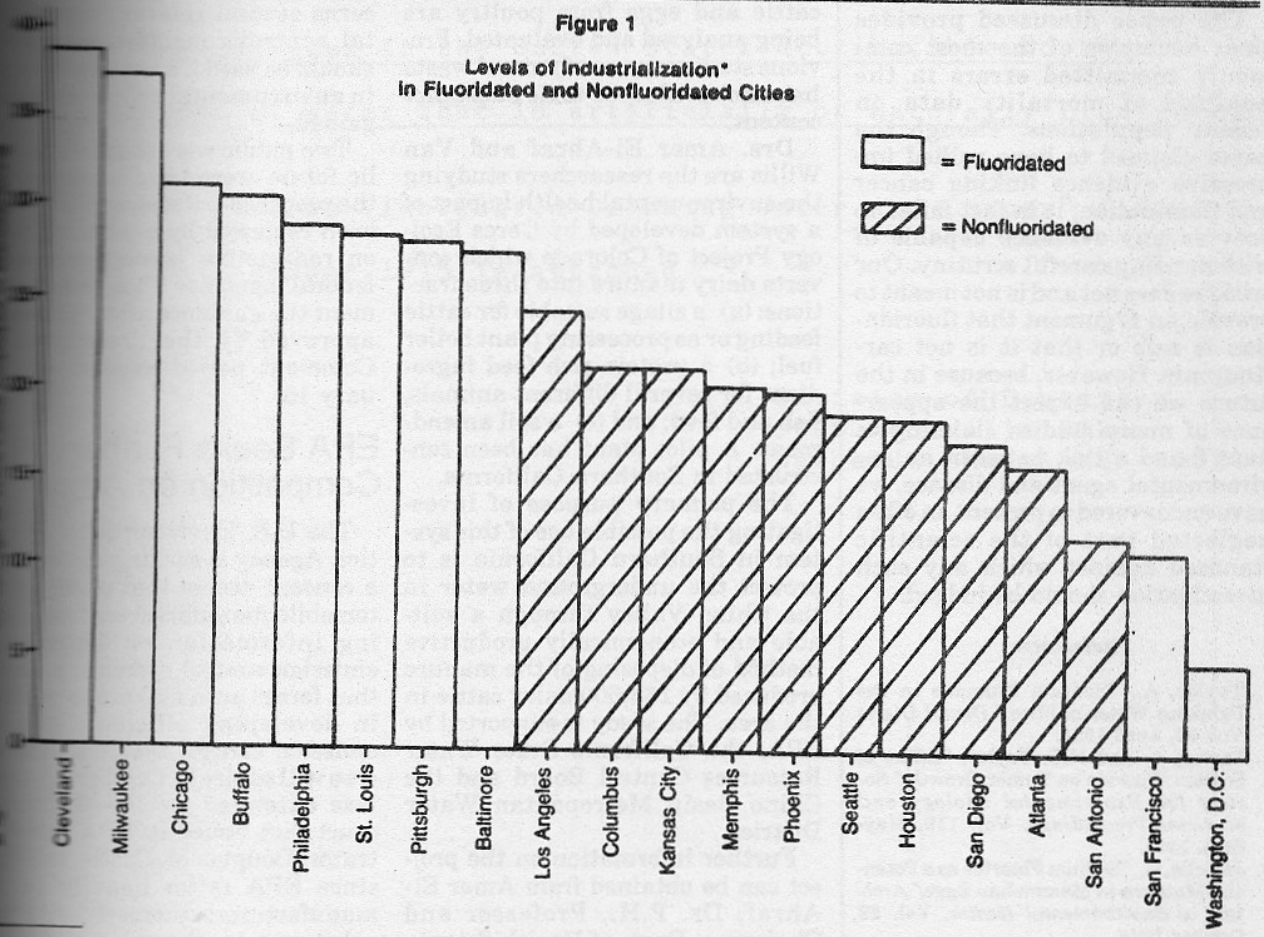
	Year Fluoridated	1950 % Difference From National Average[3]	1970 % Difference From National Average[4]	Nonfluoridated Cities[2]	1950 % Difference From National Average[3]	1970 % Difference From National Average[4]
	1956	+23%	+17%	Los Angeles	+01%	+04%
	1954	+19%	+19%	Houston	+14%	+06%
	1952	+18%	+29%	San Antonio	+03%	+03%
	1956	+15%	+27%	San Diego	+03%	+01%
, D.C.	1952	+12%	+28%	Seattle	+15%	+07%
	1955	+17%	+20%	Memphis	−01%	+13%
	1953	+21%	+08%	Atlanta	+14%	+16%
	1952	+08%	+18%	Kansas City	+09%	+04%
	1953-58	+17%	+16%	Columbus	+03%	+24%
	1955	+18%	+23%	Phoenix	−02%	0%
		+19%	+20%		+05%	+06%
RATE/1,000		1.71	1.94		1.51	1.72

largest cities (1960 census ranking) which were fluoridated before 1960. Rates are for males and females of all races and are age adjusted.
largest nonfluoridated cities, excluding the so-called "aberrant cities": Boston, New Orleans, and Cincinnati (1960 census ranking). Rates are for males and
and are age adjusted.
for 1950 was 1.44 cancer deaths per 1000 persons.
for 1970 was 1.62 cancer deaths per 1000 persons.
weighted by size of population.

U.S. Population Census and 1950 Vital Statistics, Vol. III.
U.S. Population Census and 1970 Vital Statistics, Vol. II.

Figure 1

Levels of Industrialization* in Fluoridated and Nonfluoridated Cities



States Bureau of Census County & City Data, 1972 (A Statistical Abstract Supplement), United States Government Printing
Washington, D.C., 1973.

ethnic composition may influence cancer mortality through effects on diet, access to medical care, and occupational exposure to a carcinogen.

Other Considerations

There are other considerations to be made in evaluating research papers. For example, authors frequently cite a large number of references as supportive of their findings. These references may have been poorly screened and may have limited relevance. The National Health Federation paper concludes that fluoride and cancer are linked in humans, even though many of the references are studies performed on invertebrates and plants, involving massive doses of fluoride. (5,6)

Conclusions

The paper discussed provides clear examples of the most commonly committed errors in the analysis of mortality data on human populations. Though the paper claimed to have rallied impressive evidence linking cancer and fluoridation, it in fact failed to provide any evidence capable of withstanding careful scrutiny. Our critique does not and is not meant to provide an argument that fluoridation is safe or that it is not carcinogenic. However, because in the future we can expect the appearance of many studies claiming to have found a link between an environmental agent and disease, we have endeavored to present an often neglected part of the scientific standard against which any such investigation should be judged.

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Dairy Farm Manure Studied for Toxicity

A study is being conducted in California to determine the amount of toxic substances in dairy farm manure in order to evaluate the feasibility of recycling such waste to animal feed. Emphasis is on 10 trace metals—lead, arsenic, mercury, zinc, manganese, copper, iron, chromium, nickel and cadmium and its impact on animal and human health. Animal tissues from beef cattle and eggs from poultry are being analyzed and evaluated. Previous studies on use of animal waste have not evaluated toxic substance content.

Drs. Amer El-Ahraf and Van Willis are the researchers studying the environmental health impact of a system developed by Ceres Ecology Project of Colorado which converts dairy manure into three fractions: (a) a silage suitable for cattle feeding or as processing plant boiler fuel; (b) a protein-rich feed ingredient for several different animals, fish and fowl; and (c) a soil amendment. A pilot plant has been constructed in Southern California.

The primary purpose of investigating the possible use of this system in Southern California is to protect the underground water in the Chino Valley through a suitable and economically productive method of disposing of the manure produced by 163,500 dairy cattle in the area. The study is supported by EPA, the California State Water Resources Control Board and the Chino Basin Metropolitan Water District.

Further information on the project can be obtained from Amer El-Ahraf, Dr. P.H., Professor and Chairman, Dept. of Health Science & Human Ecology, California State College, 5500 State College Parkway, San Bernardino, CA 92407.

Criteria Set For Making N Waste Standards

EPA has issued six proposed cri ria for guiding federal agencies developing radioactive wa standards. The first defines wa indicates which ones should be co trolled and gives source exam The second defines the fundamen goal of waste control and the us institutional and natural barr control over certain time perio The third criterion states that m is the primary basis for maki radiation protection decisions radioactive wastes and discus what factors should be taken i account in assessing the risks to dividuals and populations. T fourth addresses the subject of termining when risks from the d posal of radioactive wastes are acceptable. The fifth recommen factors which disposal locati should satisfy. And, the sixth co cerns several relevant supplem tal control considerations whi should be used if a net improvem in environmental protection can gained.

Two public workshops and a pu lic forum were used in develop the proposed criteria, and they ha been reviewed by a working gro on radioactive waste composed federal agencies that will imp ment the guidance after it has be approved by the President. T Comment period expired on Ja uary 15.

EPA Seeks Further Competition on Autos

The U.S. Environmental Prot tion Agency is seeking extensio a consent decree that prevents a tomobile manufacturers from sh ing information on automob emission control systems, a dec that forces auto makers to comp in developing efficient, low-co emission control systems. The d cree will expire in October, 1979 less extended by the Californ court that issued it. EPA Admin trator, Douglas M. Costle, said th since EPA relies heavily on t manufacturers themselves to fi solutions to the auto pollut problem, it is important to kind competitive atmosphere in th search for effective technologies

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Refer: FL-83
January 1976

CANCER MORTALITY TRENDS NOT ATTRIBUTABLE TO FLUORIDATION

The National Cancer Institute (NCI) recently completed and released a report clarifying issues raised by the National Health Federation, an organization long and actively opposed to fluoridation. The conclusions of NCI continue to support previous analyses which indicate that there are no trends in cancer mortality patterns in the United States attributable to the consumption of water that is artificially or naturally fluoridated.

The "Statement on Fluoridated Drinking Water and Cancer" issued by NCI in December 1975 is attached.

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Enclosure

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
NATIONAL INSTITUTES OF HEALTH
BETHESDA, MARYLAND 20014

NATIONAL CANCER INSTITUTE

STATEMENT ON FLUORIDATED DRINKING WATER AND CANCER

An examination by National Cancer Institute (NCI) scientists of trends in cancer death rates in the United States during 1950-1969 has failed to produce evidence linking natural or artificial fluoridation of public water supplies to cancer.

The scientists also found no evidence of cancer risk attributable to fluoridation from a comparison of the numbers of cancer cases diagnosed in 1947-48 and 1969-71 in two major metropolitan areas, one fluoridated and the other nonfluoridated.

The study indicated that well known risk factors in cancer, such as urbanization, industrialization and socioeconomic, racial and cultural characteristics of the population, appeared to explain reported variations among fluoridated and nonfluoridated areas.

Cancer death rates over a 20-year period were studied in two groups of counties in the United States: counties in Texas long exposed to natural fluoride, and U.S. counties first fluoridated in one of three five-year periods (1950-54, 1955-59, or 1960-64).

In the naturally fluoridated counties, the scientists looked for increased risk of cancer in both males and females that could be associated with exposure to low, medium or high levels of fluoride. They found little variation from expected risk for any type of cancer except cancer of the brain and nervous system, for which death rates were lower than expected in counties with high natural levels of fluoride.

In counties where the majority of the population was exposed to artificial fluoridation, the scientists looked for an increase in cancer death rates in five-year time periods following fluoridation. They found no trends attributable to fluoridation, even in counties fluoridated in 1950-54 and thus having death rates available for 15 years following fluoridation.

To study cancer occurrence for a possible relationship to fluoridation, the NCI scientists compared the numbers of cancers diagnosed in Denver, Colorado, and Birmingham, Alabama, in 1947-48 as compared to 1969-71. Denver was fluoridated soon after the 1947-48 survey. Birmingham has remained largely unfluoridated. Again, no fluoridation-associated differences in cancer risk were apparent.

On the basis of their findings, the scientists concluded that fluoridation has not increased the risk of cancer, either in counties long exposed to varying levels of natural fluoride, or in counties relatively recently exposed to fluoride by artificial means.

The NCI study was conducted by Robert N. Hoover, M.D., Joseph F. Fraumeni, Jr., M.D., and Frank W. McKay of the NCI Epidemiology Branch.

# # # # #

December 1975

Fluoridation-Cancer Relationship

The original Burk-Yiamouyiannis report of 1975, suggesting a link between fluoridation and cancer, has been a question of serious debate and study since it was originally reported in the Congressional Record, July 21, 1975. This study was based on crude cancer death rates in a number of fluoridated and non-fluoridated cities. The report took no account of the age and other demographic differences in the cities they compared. Since cancer incidence and mortality are related to age, sex, race, and other demographic characteristics, these omissions seriously jeopardized the credibility or validity of the report and were the major source of criticism generated by a number of scientists and epidemiologists.

In 1977, another report of a possible cancer-fluoridation link was completed by Drs. Yiamouyiannis and Burk. This study, "Fluoridation and Cancer: Age-Dependence of Cancer Mortality Related to Artificial Fluoridation," was published in Fluoride, Vol. 10, No. 3, July 1977, and reprinted in the Hearings Before a Subcommittee of the Committee on Government Operations, House of Representatives, Ninety-Fifth Congress, September 21 and October 12, 1977. Dr. Yiamouyiannis, in his presentation to Rep. Fountain's Subcommittee, stated, "In order to clear up these legitimate questions (those of adjusting for age, race, and sex), we conducted a detailed study taking age, race, and sex into account. These findings further substantiate the fluoridation-cancer relationship." (p. 71)

Dr. Marvin Schneiderman's review of the 1977 study indicated that the authors made a rudimentary age standardization by using wide age groupings of 0-24, 45-64, and 65+ cancers into one group. In Dr. D.J. Newell's review of the Burk-Yiamouyiannis studies, he states, "Using the same set of data, they claimed in July 1975 that 22,500 excess cancer deaths in the U.S. per year were linked with fluoridation. By December, this number rose to 25,000, and by April 1976, it had risen to 35,000. By 1977, the figure had fallen to 10,000. Although the first of these papers claimed to use age-adjusted rates, this may not be so and it looks as if the dramatic fall between 1976 and 1977 can be attributed to the use of age-adjustment, since the 1977 paper includes in its title 'Age Dependence of Cancer Mortality...'. I would suggest that if B-Y could have brought themselves to write a paper 'Age, Race and Sex Dependence of Cancer Mortality Related to Artificial Fluoridation,' it might have been similar to ours, and reduced the 10,000 figure to zero." If other demographic factors were considered, they are not evident in the study (pp. 18-40), nor in the principal author's prepared statement to the Subcommittee (pp. 61-71).

RANDUM

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
NATIONAL INSTITUTES OF HEALTH

Director, Division of Dentistry
Bureau of Health Resources Development
Health Resources Administration

DATE: March 5, 1975

Epidemiology Branch
National Cancer Institute
National Institutes of Health

Evaluation of statistical presentation from the National Health Federation

The recent one-page handout from the National Health Federation lists 8 major U.S. cities and implies that there is some relationship between the presence or absence of artificial fluoridation in these cities and their cancer death rates among white males. This is done by noting that 6 of the 8 cities have fluoridated water systems and that the counties containing these cities all have a cancer death rate among white males from 18 to 34 percent higher than that for the total U.S. In addition, the 2 cities listed without fluoridation are stated to have death rates which are equal to or lower than the total U.S. rate.

The criticism of this handout can be broken into three parts:

1. Pointing out factual errors in the presentation, 2. Briefly discussing the difficulties in going from these observations to statements concerning association and causality, and 3. Presenting some additional data which lead to a contrary conclusion than that offered in this handout.

First of all, this listing states that it is concerned with cities of over 1,000,000 population. It is difficult to see how this was determined since the 1960 census does not indicate that Baltimore, Cleveland or Houston had 1,000,000 or more population. Secondly, the cancer death rate for Houston, which is quoted at being 27% lower than the U.S. rate, is incorrect. The NHF evidently used the rate for Houston County, which does not contain Houston city. The rate for Harris County, Texas, which does include Houston, is in fact 8% higher than the national average for white males.

Interpretation of the data presented should be done bearing in mind two major points. Much of the excess in the cities with high rates that are cited is due to an excess of lung cancer. The reasons for this are undoubtedly various parameters associated with the industrialization of these cities and not related to anything in the drinking water. The second point to keep in mind, in any epidemiologic observation, is that other variables of import must be considered. For instance, in the series presented in this handout, the cities that are fluoridated are also cities that have been industrialized much longer than the nonfluoridated cities that are selected. In addition, there are social class and ethnic differences between the fluoridated and nonfluoridated areas that

need to be accommodated in any critical review of an hypothesized role of fluoridation.

With available data, some of the difficulties outlined in the above paragraph may be minimized. Specifically, if one includes all cities greater than 500,000 in 1960, the number of nonfluoridated cities available for comparison is increased. In addition, three of these nonfluoridated cities (Boston, Cincinnati, and New Orleans) are more similar to the fluoridated cities used in the current study with respect to socio-economic class and duration of industrialization. In fact, these three cities have rates which are 28%, 17%, and 32% higher respectively, than the for the total U.S.--all of these being in the general area of the excess rates for the fluoridated cities quoted. We were also able to characterize the mortality rates from cancer for these cities greater than 500,000 for each of four 5-year periods making up the total 20-year rate. There were 8 cities in which we could compare a rate in a nonfluoridated period with that for the total. When this is done, the average excess of mortality (compared with the total U.S. mortality) in the nonfluoridated period was equal to or greater than the excess in the entire 20-year period for 7 of the 8 cities. This methodology, comparing each city with itself, allows for at least partial control of many of the factors mentioned in the previous paragraph. Results of this analysis fail to support any suspicion of hazard associated with fluoridation. In fact, the results in themselves might rather suggest protection. The situation is obviously much more complex than this, but it can be confidently concluded that these data do not support any suspicion of carcinogenic hazard associated with fluoridation.

Robert Hoover

Robert Hoover, M.D.

Thomas J. Mason

Thomas J. Mason, Ph.D.

A summation of the "controversy" from The Canberra Times 30.8.79

FLUORIDE AND CANCER: NO LINK AND A NON-ISSUE

PETER COOPER

The recent mini-drama in Canberra over the rejection of the water fluoridation issue was educational for me, and I would like to make some attempt at an impartial summary.

The scientific outcome is trivial (no foundation of any link between fluoride and cancer is visible), but as an exercise in the sociology of science it is fascinating, even amazing.

Dozens of world-wide studies since 1944 cover the human effects of fluoride in water. All attempted to extract meaning from data on very mixed groups of people. The variables included different cancer incidence and mortality rates among men and women, black people and white, young, middle-aged and old, whose numbers fluctuate in large populations over many years.

Statistical tests were applied to seek any real change in cancer rates caused by fluoride. As one author put it, "fluoridation is probably the most extensively researched public health issue in history".

All studies show that fluoridation of domestic water is safe, not only for cancer but also many other diseases. A very recent Australian study has confirmed this for our own environment.

Since one can never prove a negative, the carefully accurate conclusion is that "no link between fluoride and cancer has been found, within the 1 or 2 per cent error caused by variables in the very large populations needed for statistical accuracy".

Some studies were of pilot communities with fluoride artificially added to their water compared with closely similar control groups. Others were of towns with naturally occurring fluoride in their water, up to 10 times the 1 part per million recommended; these people had consumed high levels of fluoride literally for generations, yet in careful tests were as healthy as matched control communities, except that they had much better teeth.

Despite these earlier fully-reassuring studies, a major 1975 statement surprisingly reawakened the whole issue. Dr. Burk and Dr. Yiamouyiannis claimed a frightening 15 per cent increase in cancer deaths between 1950-70 in 10 US cities that were fluoridated, compared with 10 US cities that were not.

The graph of their crude data (suggesting a 15 per cent increase) was presented to us (The Canberra Times, June 25, 1979), dramatically but misleading because the small print of their article only claimed 5 per cent excess cancer deaths.

Even so, 5 per cent excess cancer deaths due to fluoride (if true) are disturbing, and so one must look more closely at the presentation. One then finds that several crucial factors were neglected, mainly the differences in cancer incidence rates with age, sex and race already mentioned; the fluoridated and unfluoridated cities, changed very differently in composition between 1950 and 1970.

However, when these factors were properly corrected for (to obtain the "standardised mortality ratio", the ratio of observed deaths to the sum of deaths expected from the national average worked out separately each year for different age, sex and race components) then the excess cancer deaths in this study disappeared, and cancer rates stayed absolutely steady in the two groups of cities over the entire 20 years.

Actually, the unfluoridated cities were less industrial than the fluoridated and industry alone can account for the demographic shifts found, so that the basis of city selection was not random but has a hidden bias. Claims from Dr. Yiamouyiannis's study were incompatible with a solid body of cancer experimentation.

Unsupported

The study was quite unsupported by normal scientific safety mechanisms, since no credible research institution has backed it, nor has Dr. Yiamouyiannis's submitted his paper to an independent reputable journal for criticism by other scientists. Instead, it was published (in 1977) in the obscure private journal Fluoride, of which he himself is editor.

The validity of this study is thus for many reasons quite unacceptable. Despite this it has had huge publicity, and caused extensive re-examination of

Dr. Cooper is chairman of the ACT Cancer Society and Senior Fellow in Microbiology at the John Curtin School of Medical Research, ANU.

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FLUORIDE AND CANCER

(continued)

the fluoride issue since 1975 in the US, Britain and Europe. The outcome has confirmed quite thoroughly the earlier findings of "no link between fluoride and cancer", and made the deficiencies of the Burk-Yiamouyiannis study.

Although Dr. Yiamouyiannis raised several points to attack his critics, none has stood close examination. No other group of scientists has produced experimental support for him.

It is now clear that all relevant health organisations, including the WHO, are unanimous in their conclusion of the valuelessness of his interpretation. This is despite court cases and Congressional inquiries seeking to prove the contrary.

Many other things go into drinking water besides fluoride, but fluoride has always been a focus of public resentment against majority-rule medication. It is very sad that this emotive issue and the anguish-centred cancer problem should be so cynically married for motives that are deeply suspect.

Is the real issue to distract attention from the highly profitable (and truly cancer-dangerous) many new chemical additives to food and environment, of nuclear engineering and of tobacco smoke? Let us pursue the important problems and allow water fluoridation to rest in peace.

Display at Kuala Lumpur



At the 9th Asian Pacific Dental Congress held in Kuala Lumpur during April a display of Foundation educational material and a Plaque Disclosing Unit was demonstrated by dentistry students of the University of Malaya under the direction of Professor B.R. Gillings, Head of Prosthetics Department.

Appreciation

The Foundation is grateful to Dr. A.T. Taylor (retired) for his contribution of some thousands of plastic toothbrush holders. The holders are given to high school pupils following a plaque disclosure demonstration and they create much interest.

OUR SPECIAL THANKS TO STAFFORD MILLER LIMITED FOR THEIR CONTINUING SUPPORT IN THE MAILING OF THIS DENTAL HEALTH FOUNDATION PUBLICATION.

(Fluoridation Reporter - November-December 1963)

Michigan Health Director Bites Right Back on Opposition Claims

Playing the statistical game according to antifluoridation rules, a Michigan public health director has come up with some unique new claims for fluoridation.

A California opposition group claims in its literature that fluoridation caused an increase in death rates in Grand Rapids, one of fluoridation's first cities. The statement based on Michigan's health statistics prompted Richard S. Ryan, M.D., director of public health in Saginaw, Michigan to write the group and make some counter claims.

Dr. Ryan agreed that there are more deaths from all causes in Grand Rapids than in Flint, selected by the antis as the unfluoridated comparison city. Digging into the statistics, using the same control city, and the same statistical argument Dr. Ryan came up with these brand new facts:

(Editor's note: Put tongue in cheek before reading)

"In Flint, there were born 314 illegitimate babies as compared to Grand Rapids where only 216 illegitimate babies were born. This proves that fluoridation in Grand Rapids prevents illegitimate babies," Dr. Ryan reported.

"Also in Flint there were born 436 premature babies for the year under study as compared to only 258 in Grand Rapids. This proves that fluoridation of the water promotes the development and birth of normal children."

Dr. Ryan also showed that the Grand Rapids death rate for children under age one was lower than in Flint. "This proves that fluoridation of the water in Grand Rapids prevents death in infants under one year."

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Public Health Service

National Institutes of Health

Refer: PPB-[illegible]
Novem[illegible]

MISREPRESENTATION OF STATISTICS ON HEART DEATHS IN ANTIGO, WISCONSIN

Recently, a news release suggesting that increased heart [illegible] in Antigo, Wisconsin, and other communities might be linked [illegible] fluoridated water has been issued by the Citizens' Action Program for Safe Wisconsin Water, Inc. The president of [illegible] is Ms. Isabel Jansen, an Antigo resident opposed to fluoridation. The National Heart and Lung Institute of the National Institutes of Health has reviewed the data presented in the news release together with other relevant information from various sources. Their conclusion is that there is no evidence of any relationship between the intake of fluoridated water and heart disease mortality in Wisconsin or elsewhere. The following is quoted from the Institute's statement:

> The professional staff of the Epidemiology Branch of the National Heart and Lung Institute has recently reviewed the available literature and various unpublished data from the States of Wisconsin and New York which have a bearing on cardiovascular health in relation to fluoridated water. No evidence has been found suggesting any relationship between the intake of fluoridated water and heart disease.
>
> Recent surveillance of Wisconsin cities with populations over 10,000 has shown that mortality rates in the cities with fluoridated water were no higher than in those without fluoridated water. This confirms previous studies in Illinois cities, and in a United States national sample of 32 matched pairs of cities where the mortality of residents for major causes of death was compared for cities whose water supplies contained naturally high concentrations of fluorides and cities with low fluoride containing water. Neither heart disease nor other major causes of death appeared to be related to fluorides.
>
> Vital records of the populations of Grand Rapids, Michigan, and Newburgh, New York, where fluoridation began in 1945, have been closely followed with no

evidence of any unfavorable trends in heart disease or general mortality. Children in Newburgh and a comparable non-fluoridating city, Kingston, New York, were followed with annual medical examinations for ten years after the initiation of fluoridation in Newburgh, and no differences of medical significance could be detected between the children of the two cities.

Autopsy surveys as well as mortality studies have been conducted in areas of the United States where residents have been exposed for a lifetime to water with naturally high fluoride content, and no cardiovascular effects have been observed. Symptoms of heart disease have not been evident in the fluorosis syndrome, whether the result of acute accidental industrial exposure or prolonged ingestion of water in areas of the world with excessively high natural fluoride content.

The Division of Dental Health of the Bureau of Health Manpower Education, National Institutes of Health, maintains records of communities fluoridating their water supplies in the United States and is notified of any discontinuance of fluoridation. Discontinuation has been uncommon in recent years and has never been attributed to any documented adverse effects on health. Currently, approximately 95 million individuals in more than 8000 United States communities are served by fluoridated water supplies. Much of this coverage has been achieved in the last ten years, at a time when the earlier rapid rise in national coronary death rates has begun to slow and reach a plateau.

Thus, the evidence from comparison of the health of fluoridating and non-fluoridating cities, from medical and pathological examination of persons exposed to a lifetime of naturally occurring fluorides or persons with high industrial exposures, and from the broad national experience with fluoridation all consistently indicate no adverse effect on cardiovascular health.

The Dental Health Section of the Wisconsin Division of Health, P.O. Box 309, Madison, Wisconsin, 53701, has available upon request a detailed critical analysis of the data and statistical methods used in preparing the material distributed by Ms. Jansen.

Division of Dental Health
Preventive Practices Branch
9000 Rockville Pike
Bethesda, Maryland 20014

DEPARTMENTAL CORRESPONDENCE

Date: October 9, 1972

To: Joseph Doherty, D.D.S. - Dental Health Section

From: Henry C. Krebs, Research Analyst - Statistical Services Section

Subject: Antigo Heart Mortality

We have a large file of requests from Ms. Jansen for data, and of our replies that carefully warn of the pitfalls in the data and of the care required to avoid misinterpretation. Her latest effusion demonstrates that she continues heedlessly to abuse the data in her singleminded crusade to blame everything untoward that has happened to Antigo since 1949 on fluoridation of the water supply.

GENERAL EXAGGERATION DEVICES

Her latest release suffers from two general faults:

1. Every graph uses a truncated scale (as Ms. Jansen quaintly says in a footnote,"0 arbitrarily moved up"). This is the oldest device in graphics for exaggerating small differences. The graph on under thirty age deaths exaggerates by a factor of forty to one and the others are only slightly less gross.

2. The other general fault is her exclusive use of rates without reference to the number of events represented. This obscures the most serious deficiency, the inherently erratic behavior of small numbers (see below). The use of rates per hundred thousand exaggerates. The impression given that there are hundreds of heart disease deaths each year -- when in fact there are a few dozen deaths in Antigo each year.

FALSE DATA USED

The fundamental error in Ms. Jansen's case can best be seen by examination of the only table of data in her release, in which she purports to compare five year moving average rates of heart disease deaths per hundred thousand for Antigo and for the U.S. for the period 1946-1970. She doesn't show number of deaths but only the rates. The table apparently shows that Antigo had rates much lower than the U.S. average in the early period and rapidly rising rates for Antigo in the middle period. Using Census population figures we can compute the number of deaths Ms. Jansen used in computing the rates. The following table shows by year the Jansen rate and number of deaths and the State reported heart deaths for Antigo and rates computed from them.

	Jansen			Actual		
	Central Year	Deaths	Rate	Central Year	Deaths	Rate
1946-50	1948	24	244.5	1948	32	
1	1949	28	282.4	1949	32	
2	1950	28	283.9	1950	33	389.9
3	1951	27	275.7	1951	51	
4	1952	29	296.2	1952	45	
5	1953	33	337.5	1953	36	
6	1954	35	352.6	1954	48	
7	1955	35	359.4	1955	48	449.0
8	1956	40	409.3	1956	52	
9	1957	40	410.0	1957	36	

Note two conclusions evident from the comparison:

1. By using false and low numbers and rates for the early (base) period, the rise in rates is vastly exaggerated, the city/nation is entirely false -- Antigo was higher to begin with and remains higher (see "Age Distribution" below).

2. The differences are so substantial and consistent as to preclude an innocent mistake - either Ms. Jansen is incompetent to analyze mortality data or she is deliberately perpetrating a fraud. In either case it casts a cloud of incredibility over everything she says.

PITFALLS OF LOCAL MORTALITY STUDIES

1. LOCAL RECORDS. The death certificates available at the County Court House can easily mislead, first because of geographic coverage and second because of cause-of-death interpretation. As to the first, the local record will be incomplete for local residents who die elsewhere, and besides will include residents of other places who happen to die locally. As to cause-of-death interpretation, the unskilled is likely to count as a heart disease death anyone whose death certificate contains mention of heart disease whether or not the heart disease was the underlying cause of death. With an older population living long enough for most to have some symptoms of heart disease regardless of the cause of death, this will substantially overestimate heart disease deaths. State and Federal studies are based on elaborate and careful analysis which avoids this problem.

2. SMALL NUMBERS. Small populations (such as Antigo) have small numbers of deaths, and small numbers of deaths behave erratically year to year. This characteristic is called random variability and can be measured. Thus, for Wisconsin the number of deaths might vary year to year by plus or minus one percent, but for Antigo the number would be expected to vary by twenty percent from random variation alone. What this means is that even substantial year to year changes are not significant.

3. EFFECT OF AGE DISTRIBUTION. As everyone knows, the risk of death from heart disease increases with age. For Wisconsin in 1970 the numbers of heart deaths for those under 35 are so small as not to justify the computation of rates. The following table shows the rates by sex for ages 35 and over.

Age Groups	Male	Female
35-44	82.5	17.4
45-54	328.5	71.4
55-64	931.3	273.6
65-69	1736.1	712.6
70-74	2734.5	1329.2
75-79	3807.7	2315.2
80-84	5514.9	3803.7
85+	10665.9	9759.0

If a particular population has a higher than average proportion of older people, they will have higher heart disease death rates. And if the same place, over several decades, increases its proportion of older people its heart death rate will rise from this aging process alone.

In 1970, Antigo had a population 75 and older of 656 or 7.2% compared to 2.1% for the State as a whole. And as a proportion of Antigo's total population, the 75+ represented 3.5% in 1950, so the increase in that proportion in twenty years is 92.5%.

Conclusions:

1. The Jansen study is based on false data which distort both her trend and national conclusions.

[redacted]clusions: (Continued)

2. The study suffers from several technical deficiencies which make it exaggerate differences.

3. Antigo, because of its age distribution and the changes occurring over time in that distribution, must expect its rate of death from heart disease to be higher than the State or the nation.

4. There is no reason to believe that the age-sex specific heart mortality rates for Antigo are any higher than the State or the nation.

[redacted]

Comparison of mortality rates in fluoridated and non-fluoridated communities.

Authors (Affiliation)	Population Compared	Location	Conclusions
Hagan et al. 1954	893,000 F	32 pairs of cities (F > 0.7 ppm)	No difference in mortality [illegible] causes, or for cancer, heart [illegible] nephritis, or liver cirrhosis between [illegible] non-F cities.
(USPHS)	1,298,000 low F	Low F (< 0.25 ppm) in USA	
Heasman & Martin (Ministry Hlth. London)	498,960 F	18 F areas	Overall mortality rates same in F [illegible] trol areas. Differences in certain [illegible] causes of death between communities [illegible] differences were conflicting. F [illegible] sidered as the cause.
	368,580 low F	18 low F areas (< 0.2 ppm) in England	
Nixon & Carpenter, 1974 (London Sch. Hyg.)	34 towns 17 F 17 non-F	England Wales	No significant correlation between [illegible] content of water and mortality [illegible] all causes or from cancer and [illegible] cular disease.
Kinlen, 1975 (Oxford University)	482,000	1 ppm F	No correlation between cancer [illegible] and concentration of fluoride [illegible]
	779,000	0.5-0.99 ppm F	
	510,000	<0.2 ppm F	
	896,000	<0.1 ppm F	
		England and Wales	
Hoover et al. 1976	53 Texas counties	Suboptimal<0.7 ppm F optimal 0.7-1.2 ppm F high 1.3-1.9 ppm F very high<2.0 ppmF	No statistically significant [illegible] standardized mortality ratio [illegible] each fluoride level.
(Nat. Cancer Institute)	36 counties F since 1954 17 counties F since 1959	26 states in U.S.A.	No increase in cancer mortality [illegible] to 15 years after fluoridation.
Doll & Kinlen	11,000,000	10 F cities	Proportion of population [illegible] over 65 increased more rapidly [illegible]
(Oxford University)	7,000,000	10 non-F cities in USA	No effect of fluoridation on [illegible] tality.
Oldham & Newell, 1977	11,000,000	10 F cities	2 groups of cities differed demographically (age-sex-race) in 1950 and even more by 1970.
(Royal Statistical Society)	7,000,000	10 non-F cities in USA	No evidence that fluoride increased mortality.
Newbrun, 1977 (Univ. California)	706,000	San Francisco, California.	Proportion of population over [illegible] between 1950-1970.
			No trend in age-adjusted cancer [illegible] rate following water fluoridation.
Health Protection Branch, 1977.	79 municipalities	Canada	No differences in death rates from all [illegible] of cancer between F and non-F [illegible] ities.
(Environ. Hlth. Dir.)			
Taves, 1977 (Univ. Rochester	20 largest F cities	USA	No change in cancer mortality [illegible] 20 year period in 20 largest F cities.
	15 largest non-F cities		F and Non-F cities had different [illegible] rates before introduction of F.
Erickson, 1978	16,000,000	24 F cities	Mortality rates adjusted age, sex, race, population density and education.
(Center for disease Control)	11,000,000	22 non-F cities in USA	No difference in adjusted death rates from all causes, including cancer between F and non-F cities.
Rogot et al., 1973	71,000,000	227 F cities 187 non-F cities in USA	No difference between F and non-F [illegible] in mortality trends from all causes, heart disease and cancer between 1960-1970.
(Nat. Heart, Lung & Blood Inst.)			

Newbrun, Ernest, Systemic fluorides: an overview. Can. Dent. A.J. 46:31-7, June 1980.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

PUBLIC HEALTH SERVICE

NATIONAL INSTITUTES OF HEALTH

Refer: PPB-24
May 1971

NO EVIDENCE OF ALLERGY TO FLUORIDES

IN OPTIMALLY FLUORIDATED WATER -- AMERICAN ACADEMY OF ALLERGY

Opponents frequently cite the possiblility of an allergy to fluoride as their reason for opposing fluoridation. Despite repeated statements by the Public Health Service that there has never been a clinically substantiated case of allergy caused by drinking optimally fluoridated water, this argument has continued in vogue.

The American Academy of Allergy has recently evaluated the question of allergy to fluoride as used in the fluoridation of community water supplies. This evaluation included a review of clinical reports. As a result of this evaluation, the Executive Committee of the American Academy of Allergy unanimously adopted the following statement:

> "There is no evidence of allergy or intolerance to fluorides as used in the fluoridation of community water supplies."

The complete statement is enclosed.

Division of Dental Health
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Enclosure

A STATEMENT ON THE QUESTION OF ALLERGY TO FLUORIDE AS USED IN THE FLUORIDATION OF COMMUNITY WATER SUPPLIES

A request to the American Academy of Allergy has been made by the United States Public Health Service for an evaluation of the question of allergy to fluoride as used in the fluoridation of community water supplies. It was further requested that such an evaluation include a review of clinical reports on allergy to fluoride and express an opinion whether or not such reports constitute valid evidence of a hypersensitivity reaction.

The response to this request has been handled as follows:

Reports of allergic reactions have been reviewed. First, these reports were evaluated in an attempt to determine whether or not there is sufficient clinical or scientific information to classify any case of presumed fluoride allergy in one of the four major classes of hypersensitivity reaction (Type I-IV) (1). These immunologically mediated reactions are the anaphylactic or reaginic, the cytotoxic, the toxic complex and the delayed-type of reactivity (1). Second, the reports were evaluated to determine whether or not there was sufficient clinical evidence to support the possibility that intolerance or allergy to fluorides might occur as one of the less-well understood types of drug reactions that may or may not be immunologically mediated (2).

The reports of fluoride allergy reviewed (3, 4, 5, 6, 7,)listed a wide variety of symptoms including vomiting, abdominal pain, headaches, scotomata, personality change, muscular weakness, painful numbness in extremities, joint pain, migraine headaches, dryness in the mouth, oral ulcers, convulsions, mental deterioration, colitis, pelvic hemorrhages, urticaria, nasal congestion, skin rashes, epigastric distress and hematemesis.

The review of the reported allergic reactions showed no evidence that immunologically mediated reaction of the Types I-IV had been presented. Secondly, the review of the cases reported demonstrated that there was insufficient clinical and laboratory evidence to state that true syndromes of fluoride allergy or intolerance exist.

As a result of this review, the members of the Executive Committee of the American Adademy of Allergy have adopted unanimously the following statement:

> "There is no evidence of allergy or intolerance to fluorides as used in the fluoridation of community water supplies."

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E. Middleton, Jr.
M. M. Miller
Roy Patterson
C. E. Reed
S. C. Siegel
P. P. Van Arsdel, Jr.

February 18, 1971

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U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Public Health Service

Health Resources Administration

Refer: PPB-63
December 1973

MAYO CLINIC DOCTORS RESTATE ENDORSEMENT OF FLUORIDATION AND REFUTE MISINTERPRETATION OF KIDNEY DISEASE RESEARCH

The September 8, 1973, Letters to the Editor column of The Boston Globe carried a letter from Dr. Phillip Zanfagna, alleging that there are medical hazards to consumers of fluoridated water. This letter cited some reports on kidney disease studies from the Mayo Clinic. A letter from Mayo Clinic staff members, published in the Globe on November 6, stated that Dr. Zanfagna had, in his letter, presented the facts incorrectly, drawn inaccurate conclusions, and "dismayed" the authors of the reports by his interpretation of their research. Their letter also noted that the Board of Governors of the Mayo Clinic has since 1959 unanimously endorsed a program of water fluoridation for Rochester, Minnesota. Rochester, the city where the Mayo Clinic is located and where essentially all of its staff physicians and employees reside, has been fluoridated since 1960.

Copies of the full text of both letters are attached.

Division of Dental Health
Preventive Practices Branch
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Reprinted by
U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
CENTER FOR DISEASE CONTROL
Bureau of State Services
Dental Disease Prevention Activity
Atlanta, Georgia 30333

LETTER TO THE EDITOR
BOSTON GLOBE (MORNING)
SEPTEMBER 8, 1973

Fluoride dangerous

Medical hazards of fluoridated water to consumers are being reported with increasing frequency by researchers throughout the world including scientists from the famed Mayo Clinic.

A recent article by Mayo Clinic physicians in the Nov. 13, 1972 issue of the Journal of the American Medical Assn., for instance, reported crippling bone changes in two young persons with kidney disease from fluoride in drinking water at or near the so-called safe concentration, and the death of one of them. At least four similar deaths are recorded in the US medical literature.

In a more recent report (July 16) another Mayo Clinic physician states that 11 of 12 patients exposed to fluoride for two years or more developed symptomatic bone disease with severe pain and rib fractures. In addition, two patients experienced extreme wasting, suggesting other poisonous effects of fluoride.

"We are convinced," the report concludes, "that fluoride is harmful to long-term dialysis." Another patient with fluoride poisoning caused by the use of freeze-dried tea is also under their treatment. Fluoride poisoning in habitual tea drinkers has been reported from England.

In view of these facts, Dr. William J. Bicknell, as Commissioner of Public Health, should immediately stop the addition of any fluoride chemical to the water systems of the MDC and other communities in Massachusetts or disprove the Mayo Clinic research. Entrusted with the health of all individuals he has no alternative.

PHILIP E. ZANFAGNA, MD
Lawrence

LETTER TO THE EDITOR
BOSTON GLOBE (EVENING)
NOVEMBER 6, 1973

Report misinterpreted

You published a letter to the Editor entitled "Fluoride dangerous," by Dr. Philip Zanfagna. In it, he quoted reports from the Mayo Clinic about the supposed hazards of fluoridation.

As co-authors of these reports, and as Mayo Clinic physicians, we are dismayed by Dr. Zanfagna's interpretation of our research. Not only did he present the facts incorrectly, he drew inaccurate conclusions, to which we do not subscribe at all. According to Dr. Zanfagna, our two young patients with kidney disease had "crippling bone changes" from fluoride in their drinking water "at or near the so-called safe concentration."

In reality, these two patients had no clinical symptoms of bone disease whatsoever. Only their x-ray films showed evidence of fluoride effects. Both patients had their kidney disorders since birth. Their disease made them abnormally thirsty much of the time, so they drank extremely large quantities of water — which, in their community, happened to contain a high concentration of naturally occurring fluoride. Because their kidneys were unable to dispose of the fluoride as a normal person's do, some of the excess reached their bones. We wish to emphasize, however, that neither patient has experienced any bone symptoms. Furthermore, both are alive today and doing well, contrary to Dr. Zanfagna's statement that one died.

The doctor says that "another Mayo Clinic physician states that 11 of 12 patients exposed to fluoride for two years or more developed symptomatic bone disease with severe pain and rib fractures." What he failed to point out was that these patients had advanced kidney disease and that they were being treated with an artificial kidney machine, which uses water to remove waste materials from the blood — ordinarily a function of normal kidneys. Although it was not recognized at the time, the use of fluoridated water in the artificial kidney resulted in excessive bone absorption of fluoride. And these patients did, indeed, have serious bone problems. However, this degree of absorption would be virtually impossible from drinking fluoridated water, even in patients with kidney disease. And since we discovered the problems created by using fluoridated water in the artificial kidney machine, we have advocated substituting specially treated fluoride-free water for this purpose.

Certainly, we never implied that fluoridated water is harmful to the general population. Our reports referred only to a very limited group of patients — those receiving special treatment for advanced kidney disease. For comparison, consider the patient with diabetes, who must limit the sugar in his diet. Or the kidney patient, who must cut down on the salt he uses. Even sugar and salt at certain levels can be harmful to some types of patients.

To give Globe readers an idea of Mayo Clinic's stand on fluoridation, members of our Department of Dentistry favor fluoridation of public water supplied. Moreover, since 1959 the board of governors of the Mayo Clinic has unanimously endorsed a program of fluoridation for Rochester, Minn. — the city where the Mayo Clinic is located and where essentially all of its staff physicians and employees reside.

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JAMES V. DONADIO, JR., MD
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Refer: FL-85
April 1976

British Physicians Confirm Safety and Effectiveness and Urge Fluoridation

In January 1976, after nearly two years of study, the Royal College of Physicians (RCP), London, England, published a report titled "Fluoride, Teeth and Health" (Publisher: Pitman Medical Publishing Co. Ltd., 42 Camden Road, Tunbridge Wells, Kent TN12QD). A mass of data, including literature published by organizations opposed to fluoridation and some yet unpublished data, was examined in detail. Comments on this report which appear in the January 8 issue of New Scientist under the headline, "Medics Take the Myths Out of Fluoridation" indicate that this report comprises "the first authoritative analysis in Britain of the strictly medical aspects of fluoridation." New Scientist further commented that the RCP had been unable to find evidence to substantiate any alleged ill effects of fluoridation.

The Royal College of Physicians concluded its report as follows: "There is now an enormous body of information bearing on the subject of fluoride and health which amply justifies the following conclusions--

1. Fluoride in water added or naturally present at a level of approximately 1 mg/litre over the years of tooth formation substantially reduces dental caries throughout life.

2. There is no evidence that the consumption of water containing approximately 1 mg/litre of fluoride in a temperate climate is associated with any harmful effect, irrespective of the hardness of the water.

3. In comparison with fluoridation, systemic fluoride supplements such as tablets, drops and fluoridised salt have not been shown to be as effective on a community basis.

4. There is no evidence that fluoridation has any harmful environmental effect."

In addition, the College recommended "fluoridation of water supplies in the United Kingdom where the fluoride level is appreciably below 1 mg per litre."

Dental Disease Prevention Activity
Bureau of State Services

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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
from The New York Times, Wednesday, February 13, 1980

Personal Health

By Jane E. Brody

ALTHOUGH tooth decay is not life threatening, we pay a bigger price for rotten teeth than most people realize. Dental decay is the nation's most prevalent disease, afflicting 98 percent of Americans and costing more than $8 billion a year in dental bills and 160 million hours of lost labor. That's not counting the estimated one billion decayed teeth in American mouths that have not been treated.

Dental decay often leads to loss of teeth and the need for dentures, which may interfere with good nutrition. Besides, it hurts.

Dentists have known for more than a quarter of a century that up to two-thirds of tooth decay is preventable by a simple, safe, inexpensive public health measure — the addition of tiny amounts of fluoride to the water supply. For every dollar invested in fluoridation, approximately $50 is saved.

Yet today, 35 years after the first American community — Grand Rapids, Mich. — had its water fluoridated, only half the nation's population is receiving such benefits. The main impediment to wider use of fluoridation has been a campaign by small but vociferous groups who maintain that fluoride causes a host of disorders, including birth defects, heart and kidney disease, allergies and cancer.

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According to Dr. Julius B. Richmond, Surgeon General of the United States, careful, extensive research has shown these claims to be false and misleading.

The studies on which the claims of hazard are based have been reviewed by the American Dental Association, the American Medical Association, the National Cancer Institute, the National Heart, Lung and Blood Institute, the American Academy of Allergy and the United States Public Health Service, among others, and found to be inadequate to prove the conclusions drawn. Yet they have led many communities, including Los Angeles, to vote down fluoridation. A few communities have even decided to abandon fluoridation after it had been in effect for a number of years.

In evaluating fluoridation, it pays to know the facts about its effectiveness and safety.

Fluoride is considered an essential nutrient. It protects the teeth by increasing the formation of crystals of the mineral hydroxyapatite in the tooth enamel. These crystals on the tooth surface resist the action of decay-causing acids produced by bacteria that live on teeth.

Fluoride also inhibits the ability of these bacteria to become attached to teeth and to produce acid. Although fluorides are most effective if consumed from birth onward, allowing them to become part of the teeth as they form, fluorides also help to reduce tooth decay in adults.

Bones may also benefit from fluori-

Fluoridation: Studies amass evidence that it protects the teeth.

dated water. Adults who live in communities where the water is naturally high in fluorides have been found to have fewer problems with osteoporosis, the bone loss of aging that causes shortening of the spinal column and costly, painful and life-limiting fractures. Fluoride combines with calcium in bones to form a mineral, fluorapatite, that slows the loss of calcium and softening of bones with age.

Fluoride is a ubiquitous substance, found in varying amounts in water, air, plants and animals. Numerous studies have shown that a level of about one part of fluoride per million parts of water will protect teeth against decay without any risk of toxic effects.

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The benefits have been clearly demonstrated in numerous studies involving whole communities. In some studies, dental disease in communities with fluoridated water was compared with that in neighboring communities that lacked fluorides. In others, communities were compared before and after fluoridation. The benefits attributable to fluoridation include the following:

¶A reduction of up to 65 percent in the number of dental cavities in school-age children who consume fluoridated water from birth, and an increased resistance to decay that continues

Fluoride inhibits the action of decay-causing bacteria.

throughout life.

¶A decrease of about 75 percent in the loss of first permanent molars in children from 12 to 14 years old.

¶A sixfold increase in the number of children who reach their teens with no cavities.

¶A decrease of at least 30 percent in the number of adults who need dentures.

Perhaps the most dramatic demonstration of fluoride's dental benefits took place in the town of Antigo, Wis., which first added fluoride to the city water supply in 1949. The activities of an antifluoridation group brought fluoridation to a halt in 1960. The proportion of kindergarten children free of cavities decreased from 39 percent in 1960 to 18 percent by 1968, and the number of decayed, filled or missing teeth in second-graders increased more than 200 percent in the same period. In 1965, Antigo voted to resume fluoridation.

As for fluoride's purported health hazards, at the levels used in water fluoridation, they are simply nonexistent, according to the American Dental Association and the Center for Disease Control. You'd have to consume 2,500 quarts of water at one time to obtain a lethal dose of fluoride, the dental association says.

Studies of whole communities of children raised on fluoridated water showed no harm to growth, hormones, sexual development, blood, bones, skin, kidneys or any other organ system or aspect of development.

Supposed links to heart disease and the birth of babies with Down's syndrome (mongolism) were based on wholly inadequate studies that failed to take into account the myriad other factors, such as age and residence, that influence the rates of these disorders, Dr. Ernest Newbrun, a San Francisco dental researcher, has pointed out. Nor is there any effect on the kidneys, liver, blood, maternal milk supply or hormone-producing glands, the dental association says.

The most terrifying of the charges against fluoridation involves cancer.

These charges are invoked by such antifluoridation groups as the National Health Federation when fluoridation is put to a community vote. Regardless of how the matter has been looked at by researchers, no relationship could be found between cancer and [illegible] of fluoridated water.

In studies by the National [illegible] stitute, when such factors [illegible] and residence were taken [illegible] cancer death rates were [illegible] fluoridated communities [illegible] without fluoride in the water [illegible] ly, comparisons of cancer [illegible] and after fluoridation showed [illegible] tionship.

The only known adverse [illegible] fluoride — a mottling, or discoloration of teeth and bones — occurs among people whose water is naturally heavily fluoridated (about eight times the dose used in artificially fluoridated water supplies). No such mottling effect occurs from drinking artificially fluoridated water.

The benefits of fluoridation may be supplemented by periodic [illegible] "treatments," including the [illegible] use of a fluoridated toothpaste, the American Dental Association [illegible] ment, and periodic application of fluoride paste or solution by the dentist. Adults as well as children can benefit from such fluorides, studies have shown.

108 Million Americans Drink Fluoridated Water

About 10 million Americans live in communities where the water is naturally fluoridated to a level of one part per million or more. For another 98 million, fluoride is added to the community water supply to approximately that level. (The actual amount varies from 0.7 to 1.2 parts per million, depending on the climate and amount of water residents can be expected to consume.)

There are state laws requiring fluoridation in Connecticut, Delaware, Georgia, Illinois, Michigan, Minnesota, Nebraska, Ohio and South Dakota. Although there is no statewide fluoridation program in New York State, New York City water is fluoridated.

For most areas of the country, fluoridation is decided by a municipal ballot, and as of the end of 1979, 6,000 American communities with a population of 1,000 or more were not fluoridated. In addition, about a quarter of Americans — those who use well water — cannot benefit from community-wide fluoridation, although in some cases well water is naturally fluoridated.

The Public Health Service now has about $6 million appropriated by Congress to help communities that want to fluoridate their water supplies. The program is administered by the Center for Disease Control in Atlanta.

If your water is not fluoridated, your children can still benefit from fluorides through tablets (or drops for infants) or vitamin-fluoride combinations available on prescription from a dentist or physician.

Be sure the brand you buy is not prepared in a sugar base, lest you partly defeat the purpose. Choose one with a base such as sorbitol, which does not promote tooth decay.

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Public Health Service

National Institutes of Health

Refer: PPB-51
February 1973

ENVIRONMENTAL PROTECTION AGENCY SUPPORTS FLUORIDATION

Opponents of fluoridation frequently allege that fluoridation is pollution and may have detrimental environmental effects. In response to such allegations the U.S. Environmental Protection Agency has issued the following statements:

"Since the safety and efficacy of water fluoridation have been well established, the Environmental Protection Agency endorses the principles of such practice.

"The Environmental Protection Agency does not consider the adjustment of the fluoride content of drinking water for purposes of dental decay reduction to be a form of pollution. By definition, water pollution is the addition of a substance to water which makes such water unfit for its intended use. Since adjusting the natural fluoride content of drinking water to a level which is optimal for the reduction of dental decay does in no way make the water unfit for drinking, water fluoridation cannot be considered to be pollution.

"At the concentrations used in water fluoridation, the fluoride ion has no detrimental effects on the environment. Fluoride is a natural constituent of fresh water, soil, sea water and most living organisms, often at higher concentrations than are used in water fluoridation. A recent study on the environmental impact of fluorides, conducted by the National Research Council under contract to the Environmental Protection Agency, has confirmed that the only hazard to our environment from fluorides is from industrial discharges.

Division of Dental Health
Preventive Practices Branch
9000 Rockville Pike
Bethesda, Maryland 20014

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Public Health Service

Health Resources Administration

Refer: FL-77
July 1975

MISINTERPRETATION OF "SAFE DRINKING WATER ACT"

Public Law 93-523, December 16, 1974

The purpose of this law is "to assure that water supply systems serving the public meet minimum national standards for protection of public health."* One of the requirements of the law is that the Administrator, Environmental Protection Agency (EPA), must prescribe a maximum level for contaminants which may have an adverse effect on the health of persons.

The following statement, which has been misinterpreted by some opponents of fluoridation as a basis for banning fluoridation, is contained in the law:

> "No national primary drinking water regulation may require the addition of any substance for preventive health care purposes unrelated to contamination of drinking water."

The report of the House Committee on Interstate and Foreign Commerce clearly indicates that there is no intention to ban the proven public health measure of fluoridation. It states:

> "Limitation on standard setting authority
>
> "The Administrator under this section would be prohibited from requiring the addition of any substances other than for the purpose of treating contaminants. Thus, EPA could not require the addition of fluorides or other substances to a public water system for medicinal purposes. Nor

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*Report #93-1185 from Committee on Interstate and Foreign Commerce to House of Representatives, July 10, 1974.

could EPA prevent the addition of fluorides or other substances up to the maximum amount allowable under a maximum contaminant level. While EPA could not require the addition of a substance for medicinal purposes, the Agency would have full authority to limit the addition of such a substance from interfering with the effectiveness of any required treatment techniques."

Division of Dentistry
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Bethesda, Maryland 20014

DEPARTMENT OF HEALTH, EDUCAITON, AND WELFARE

PUBLIC HEALTH SERVICE

Refer To: PS, CFB-III
Septe[illegible]

RELATIONSHIP OF AIR POLLUTION TO COMMUNITY WATER FLUORIDATION

Fluoride concentrations in ambient air (airmosphere) post no problem for communities with water fluoridation.

Ambient fluoride concentrations are routinely measured at all of the National Air Sampling Network Stations. The data collected do not support claims of hazards from inhaled fluoride to people living in communities with fluoridated water supplies.

The following statement has been prepared by the National Air Pollution Control Administration:

> Assuming that the maximum fluoride concentration of approximately 2.0 micrograms per cubic meter, reported by the National Air Sampling Network was present continuously in the atmosphere of a city having 1.0 ppm fluoride in its water supply, intake of this atmospheric fluoride concentration could increase the total fluoride intake by only five percent. This figure was derived as follows: If an individual breathes 0.8 liters per breath at a rate of 20 breaths per minute for 24 hours per day and lives in an atmospheric fluoride concentration of 2.0 micrograms per cubic meter, he would absorb 46 micrograms of fluoride in one day. This assumes that 100 percent of inhaled fluoride was absorbed into the blood stream.

CONSUMER REPORTS

A TWO-PART REPORT ON FLUORIDATION

"There are three kinds of lies," remarked 19th-century British statesman Benjamin Disraeli, "Lies, damned lies, and statistics." Probably every type of misrepresentation known to Disraeli, and some he may have overlooked, have been used to attack fluoridation. Misleading information about it appears regularly in a paper called the National Fluoridation News, and the entire gamut of hokum has been published in a 176-page issue of the Health Control Journal, a pro-Laetrile magazine based in Los Angeles. This two-part report, reprinted from the July and August, 1978, issues of CONSUMER REPORTS, responds to the lies and false claims that have been made in the attack on fluoridation.

PART I: THE CANCER SCARE

On the evening of February 10, 1976, millions of Dutch television viewers were watching their sets with more than usual attention. News of a bribery scandal in the United Kingdom had just reached Europe, along with rumors that the Prime Minister of Holland was implicated. Those who tuned in were unaware, however, that an unrelated interview in the newscast would soon affect many of them more directly than the scandal.

The interview involved Dean Burk, Ph.D., an American biochemist formerly with the National Cancer Institute, the research agency that conducts or sponsors much of the cancer research in the U.S. Dr. Burk's message was a troubling one. Fluoridation of drinking water as a dental health measure, he asserted, was causing thousands of cancer deaths annually in the U.S. He claimed that statistical studies done by himself and another biochemist, John Yiamouyiannis, had revealed a link between fluoridation and cancer. Dr. Burk expressed no reservations about his conclusion. "Fluoridation," he told the audience, "is a form of public poisoning."

Copies of the Burk-Yiamouyiannis report had been circulated among members of the Dutch Parliament before the TV broadcast. Soon after, a proposal by the Minister of Health to fluoridate all drinking-water supplies in Holland died in Parliament. By September 1976, a Royal Decree ended fluoridation in Rotterdam and other Dutch cities that had been treating their water for years.

A GROWING SENSE OF ALARM

What happened in Holland is not an isolated incident. Despite widespread endorsement of fluoridation by medical, dental, and public health officials, the practice has come under increasing attack both in the United States and abroad as a potential cause of cancer and other diseases. Three years ago, after a publicity campaign linking fluoride to cancer, Los Angeles voters defeated an ordinance to fluoridate the city's water supply. Since 1973, voters in hundreds of smaller U.S. cities and towns have taken similar action, often out of fear of cancer or other disorders attributed to fluoridation.

How valid are those fears? Is there a genuine scientific controversy surrounding the safety of fluoridation? According to Representative James J. Delaney (D., N.Y.), chairman of the powerful House Rules Committee, the answer is an emphatic "yes." A long-time opponent of fluoridation, Delaney has urged Congress to halt the practice, pending

further investigation of its safety. Last fall, a subcommittee of the House's Committee on Government Operations held hearings on the issue. Drs. Burk and Yiamouyiannis testified, as did representatives of the American Dental Association, the National Cancer Institute, and authorities on fluoride research. An extensive array of scientific studies and expert commentaries on fluoridation was also presented.

What emerged from the testimony, in CU's opinion, was an unmistakable sense that millions of Americans are being grossly misled about an issue important to both their health and the cost of their dental bills. Water fluoridation is the only public-health measure that many Americans vote on directly. Yet last fall's hearings received only scant coverage by the press, except in publications that commonly run anti-fluoridation stories. Accordingly, in this two-part report we will tell you the facts about fluoridation—what it is, how it developed, and what it does. This month we will also examine the claims about fluoridation and cancer and consider the people behind those claims. Next month we'll take a look at other charges frequently leveled at fluoridation, including claims about allergies, birth defects, and heart disease.

ON THE TRAIL OF COLORADO STAIN

Fluorides are compounds containing the element fluorine. In its various forms, fluoride is found in practically all soils, plants, and animals, as well as in human blood, bones, and teeth. It's also present in at least trace amounts in all natural water supplies. The concentration in water varies widely, however. In the U.S., natural fluoride levels range from a high of about 8 parts per million (ppm) in areas of the Southwest to as little as 0.05 ppm in the Northeast.

Fluoridation is simply an adjustment of the natural fluoride content to about 1 ppm—a level of intake that strengthens tooth enamel and sharply reduces dental decay, especially among those exposed to fluoridated water from early childhood. The nominal 1-ppm level (actually 0.7 to 1.2 ppm, according to local conditions) isn't an arbitrary one. Its selection involved a scientific detective story complete with a twist ending.

Water fluoridation is the only public-health measure that many Americans vote on directly. And since 1973, hundreds of towns and cities have voted against fluoridating the water supply.

The initial clue was uncovered early in the century by two scientists investigating a cosmetic defect. F.S. McKay and G.V. Black were trying to find out what caused a mottling of the tooth enamel, a discoloration variously known as "Colorado brown stain" and "Texas teeth." By 1916 they had narrowed the search to something in domestic water supplies. The next step was to identify the substance and get it out of the water. It took until 1931, however, before the substance was identified as fluoride.

Meanwhile, McKay had noticed something else. While practicing dentist, he observed that patients with mottled teeth also had remarkable resistance to tooth decay. The attitude of public health officials at the time was still how to get fluoride out of the water. But McKay's observations spurred further research by the Public Health Service to learn more about fluoride's effect on teeth.

Over the next ten years, research teams led by Dr. H. Trendley Dean of the Public Health Service studied the dental records of 7257 children in 21 cities having various levels of natural fluoride in their water. The results were unequivocal. The more fluoride in the water, the fewer dental cavities the children experienced. When the water contained approximately 1 ppm or more of fluoride, the children developed about 60 percent fewer cavities than did those who drank water with negligible fluoride content. Furthermore, at the 1-ppm level, the unattractive mottling did not occur. It was associated with levels above 2 ppm. Thus, 1 ppm of fluoride became the benchmark level.

Tooth decay was no minor health problem. During the war year of 1942 some 2,000,000 men were examined as potential members of the armed forces. Almost 50 percent of them were rejected because they didn't have 12 sound teeth in proper position out of a possible 32.

Although the potential dental advantages of fluoridation were obvious, there was a natural reluctance to add anything to community water supplies. In the early 1940's, there was no background of scientific data about possible side effects. There were some practical reassurances, though. People had been ingesting fluoride in food and water since the dawn of the human race. Many Southwesterners had been drinking water containing several times the 1-ppm level of fluoride for a lifetime without any discernible side effects except mottled teeth. Eventually, a few cities decided to take the chance.

THE NEWBURGH-KINGSTON EXPERIMENT

Among the pioneers was the New York State Department of Health. Before attempting any widespread introduction of fluoridation, the department proposed a long-term, controlled study of a limited group of children who would be carefully monitored by physicians. After considering various communities, the department chose the cities of Newburgh and Kingston as ideal candidates for the study.

Located some 35 miles apart near the Hudson River, the cities had populations of about 30,000 and were similar in racial, economic, and other demographic characteristics. Each also used reservoirs with water deficient in fluoride.

One city's water supply was to be fluoridated, the other not. Meanwhile, matched groups of children from the two cities were to be followed from infancy onward by means of comprehensive pediatric checkups to detect any ill effects from fluoride. Special attention was to be given to growth rates, bone development, blood chemistry, function of the thyroid gland, vision, and hearing. Each child would also receive meticulous, regular dental exams.

In March 1944, the City Council of Newburgh voted to participate in the study and approved the fluoridation of its water to 1 ppm. Kingston agreed to serve as the

[illegible] and use its fluoride-deficient water without change. [illegible] of 817 children were enrolled in the Newburgh group [illegible] in Kingston. Although most entered at the start of [illegible] study, several infants were added during each of the first [illegible] years to ensure having some children whose mothers were exposed to fluoridated water throughout pregnancy.

The study went on for 10 years, and a majority of the [illegible] in both groups participated through the final examination. The findings can be summarized briefly: The examinations disclosed no differences of medical significance between the two groups that could even remotely be attributed to fluoride. There was one difference of dental significance, however. The Newburgh children experienced nearly 60 percent fewer cavities than the Kingston children.

Numerous studies have since confirmed the benefits of fluoridation. "Fewer cavities" means fewer costly fillings, fewer lost teeth, and, eventually, fewer dentures or partial plates. The cost of fluoridation to a community, according to a report last year in the New England Journal of Medicine, is only about 10 to 40 cents a year per capita.

THE EVIDENCE FOR SAFETY

Since the early days of the Newburgh-Kingston project, literally thousands of scientific studies have examined the effectiveness and safety of fluoride. Virtually every doubt or question that has been raised, however scanty the evidence, has been studied in depth by one or more groups of researchers. As a dentist representing the American Dental Association noted in the House subcommittee hearings last fall, "Fluoridation may well be the most thoroughly studied community health measure of recent history."

In the late 1960's, the World Health Organization accomplished the Herculean task of pulling much of the known information together. The objective was to provide an impartial review of the scientific literature on fluoridation—a broad international aggregation of population studies, experimental research, animal studies, and clinical investigations, including human autopsy studies, clinical trials, and biochemical research.

The report, "Fluorides and Human Health," came out in 1970. It addressed numerous questions raised up to that time about the possible effects of fluoride on different organs and its alleged association to various diseases. Again, the conclusions can be summarized briefly: The study found no substantiating evidence that any ill effects or symptoms resulted from drinking water fluoridated at recommended levels.

Since the report's publication, the World Health Organization has uncovered no evidence to alter its judgment. In a statement issued in 1975, the organization noted: "The only significant physiological or pathological change in life-long users of optimally fluoridated water supplies . . . is that they suffer less from tooth decay."

THE ORIGINAL OPPOSITION

The amount of study, however, has managed to quiet the opposition of fluoride that has been present from the beginning. Writing in the Journal of the American Dental Association in March 1956, the commissioner of New York State Department of Health, Dr. Herman E. Hilleboe, told of some of the troubles his agency had encountered in the early days of the Newburgh-Kingston project. Soon after the project's approval in March 1944, the local health officer in Newburgh began receiving complaints from some of the town's citizens.

Some protested that the fluoridated water was discoloring their saucepans. Others complained that it was giving them digestive troubles. One woman complained to her dentist that the "fluoride water" had caused her denture to crack. "These incidents all occurred before fluoride was added to the water supply," notes Dr. Hilleboe. The complaints stopped abruptly after a Newburgh newspaper criticized the town's imaginary ills.

> "The only sign of physiological or pathological change in life-long users of optimally fluoridated water supplies . . . is that they suffer less from tooth decay." [from a World Health Organization report]

Despite fluoridation's success in Newburgh, protests against it elsewhere weren't collapsing so readily a decade later. The rise of "a vociferous minority," said Dr. Hilleboe, had succeeded in delaying, or even reversing, the start-up of fluoridation in several areas. The opposition, he reported, came chiefly from food faddists, cultists, chiropractors, and people who misunderstood what fluoridation was. But the efforts of antifluoridationists have also been aided by the caution of various physicians, dentists, and scientists of good standing who initially questioned the safety of fluoridation. Opposition has also come from other professionals and lay people who view fluoridation as a government infringement of individual freedom.

Various groups have been formed for the sole purpose of fighting fluoridation, but none has had much impact outside of its local community. Generally, the real steam behind the antifluoridation movement has come from well-funded, national, multi-issue organizations that have been able to disseminate large amounts of scare propaganda around the country. One such group is the John Birch Society. Another, up until the early 1970's, was the Rodale Press, publisher of Prevention magazine and a frequent proponent of unproved nutrition concepts. The most active and effective group today, however, is the National Health Federation, whose roots run deep into the soil of medical quackery. Those roots are worth a brief examination.

WHEN ROOSTERS HAD BAD TEETH

In the early 1950's, an organization called the Electronic Medical Foundation ran a lucrative diagnosis-by-mail service and also sold electronic treatment devices for "curing" numerous disorders. An estimated 3000 practitioners, mainly

chiropractors, would send dried blood specimens from their patients to the foundation. There, the blood spot would be checked by an electronic gadget and a "diagnosis" mailed back by postcard.

This eventually aroused a certain skepticism at the U.S. Food and Drug Administration. Accordingly, the FDA arranged to send a few blood spots of its own.

The first, from a man who had lost his right leg, elicited a diagnosis of arthritis in the right foot and ankle. The blood of a dead man brought back a diagnosis of colitis, and that of a rooster resulted in a report of sinus infection and bad teeth.

The FDA inspectors also investigated the treatment devices. They found that the gadgets simply contained circuits resembling those of an electric doorbell or a small radio transmitter. None could cure anything, reports FDA historian Wallace Janssen.

In 1954 a U.S. District Court ordered the president of the firm, Fred J. Hart, to stop distributing the treatment devices. Shortly thereafter, Hart founded the National Health Federation. Hart continued to distribute the devices, however, and was subsequently prosecuted for criminal contempt and fined $500 in 1962. Between 1957 and 1963, several other officials of the NHF were convicted of misbranding dietary products with false medical claims and received fines or prison sentences. In 1963, the FDA released a report on the NHF that said in part:

> The stated purpose of the federation is to promote "freedom of choice" in health matters. The record shows that what this frequently means is freedom to promote medical nostrums and devices which violate the law. From its inception, the federation has been a front for promoters of unproved remedies, eccentric theories and quackery.

In an updated report on the NHF issued in 1973, the FDA reiterated virtually the same judgment. Throughout its history, the NHF has crusaded against any Government interference with unproven remedies or treatments. At the same time, it has also opposed proven public-health measures—smallpox vaccination, pasteurization of milk, polio vaccination, and fluoridation of drinking-water supplies.

For the most part, the NHF's opposition to public-health measures has been a losing cause. Until recent years, even fluoridation was slowly gaining acceptance in more communities. About 105 million Americans now have fluoridated water. But in 1974 the NHF decided to mount a new national campaign to "break the back" of fluoridation efforts. It hired Dr. Yiamouyiannis to do the job.

RAISING THE SPECTER OF CANCER

The first big target was Los Angeles, whose City Council had voted in September 1974 to fluoridate the water supply. The NHF's ammunition was a study by Dr. Yiamouyiannis that purported to link fluoridation to an increase in cancer deaths. The study and a couple of publicity handouts that accompanied it were eventually reviewed by various public-health officials, including Thomas Mack, M.D., of Los Angeles, an associate professor of community medicine and an expert in cancer epidemiology. (Epidemiology is a branch of medicine that studies the incidence, causes, and control of a disease in specific populations.) The nature of the Yiamouyiannis study is apparent in an excerpt from Dr. Mack's review:

"I cannot begin without commenting on the form of the documents you sent me," Dr. Mack stated. "Despite the gravity of the question addressed, the form of these documents is that of a propaganda flyer rather than a serious scientific effort. Specifically, there is no indication that any of the material was ever prepared for submission to a reputable scientific journal. . . . All over the documents one finds conclusions emblazoned essentially in the form of slogans, without cautious interpretation or restrictions. For these reasons the reader must immediately presume that objectivity has not been considered. . . . At the same time this bias is so gross and obvious, the mistaken logic so gross and naive, that the reader assumes the author to be, however competent in his Ph.D. field, totally unaware of the principles of epidemiology."

Most people are unfamiliar with the principles of epidemiology, however, and a Ph.D. degree can sometimes lend credibility even to claptrap. In Los Angeles it evidently did. The scare tactics of the NHF and other antifluoridationists scored a stunning victory over dental health.

"There is no evidence that fluoride increases the incidence or mortality of cancer in any organ." [from a study by the Royal College of Physicians]

Around the beginning of 1975, Dr. Yiamouyiannis joined forces with Dr. Burk. Like the National Health Federation, Dr. Burk is a leading advocate of the controversial cancer drug Laetrile (CONSUMER REPORTS, August 1975) and he shares the NHF's aversion to fluoridation.

The collaboration produced a study claiming that 10,000 or more excess cancer deaths occur annually in the U.S. cities that fluoridate their water. The assertion was based on a comparison of death rates for specific cancers in some 50 cities that were fluoridated compared with some that were not. In July 1975, Representative Delaney entered the study into the Congressional Record and called for "an immediate suspension of all artificial fluoridation."

The National Cancer Institute reviewed the study and was unimpressed. Unlike a proper epidemiological study, it had failed to take into account widely recognized factors known to affect the death rate from specific types of cancers. Using the same data, the NCI reanalyzed the study, taking into account such influences as ethnic composition of the population, geographic location, socioeconomic status, and other fundamental risk factors. The purported differences in the cancer death rates promptly disappeared.

Undaunted, Drs. Burk and Yiamouyiannis bounced back with another study. This time they compared overall cancer death rates for 10 large cities that were fluoridated with 10 large cities that were not. Again, the fluoridated cities

[illegible] Over the 20-year period studied, cancer [illegible] in the fluoridated cities purportedly increased [illegible] than in the unfluoridated ones. In Decem- [illegible] Representative Delaney entered the study into the [illegible] Record and demanded that all fluoridation be [illegible]

[illegible] the new study was even more amateurish than [illegible]. In the judgment of one NCI official at the [illegible] committee hearings, it represented "the worst [illegible] that has been done to date on fluoride." Drs. [illegible] Yiamouyiannis had somehow managed to ignore [illegible] fundamental factors involved in cancer mortality [illegible], age, and race. Old people die from cancer more [illegible] than young people; men have a higher cancer death [illegible] women; and blacks a higher one than whites. Un- [illegible] factors are taken into consideration, the results [illegible] mortality comparison would be meaningless.

[illegible] NCI scientists reanalyzed the Burk-Yiamouyiannis [illegible] and found that the difference in the cancer death rate [illegible] due to the age and racial makeup of the respec- [illegible] areas. Fluoridation was irrelevant.

[illegible] TO EUROPE

[illegible] the NCI scientists, Dr. Burk took the National [illegible] Federation studies to Holland and England. As noted [illegible], the Dutch trip was a smashing success. But the [illegible] failed to panic. Both the Royal College of Phy- [illegible] and Oxford University had recently completed [illegible] on fluoridation and cancer. The Royal College of [illegible] in January 1976 concluded: "There is no evi- [illegible] that fluoride increases the incidence or mortality of [illegible] any organ." The Oxford study reached a similar [illegible].

[illegible] British scientists had learned of the NCI's re- [illegible] the Burk-Yiamouyiannis studies. They also were [illegible] of an independent study conducted for the National [illegible] Sciences at the University of Rochester, N.Y., [illegible] the NCI's findings.

[illegible] normal course of events," reported an Oxford [illegible], "that would have been the end of the mat- [illegible]. Fortunately, however, it has not been." What the [illegible] hadn't realized was that the facts were [illegible].

[illegible] goal of antifluoridation groups, explains an [illegible] Dental Association official, "is to create the il- [illegible] scientific controversy." The "studies" are merely [illegible]. The accuracy of that judgment was evidenced by [illegible] treatment. According to an account in The Lancet, [illegible] medical journal, Drs. Burk and Yiamouyiannis be- [illegible] publicizing their cancer claims in Britain. Through the [illegible] National Anti-Fluoridation Campaign, their [illegible] were circulated to members of Parliament, [illegible] councils, and water boards as evidence that fluori- [illegible] causing many cancer deaths.

[illegible] the National Health Federation began claim- [illegible] that NCI officials were concealing data, a [illegible] that eventually had an impact in Britain. In Parlia- [illegible] a number accused British health officials of mis- [illegible] scientific about fluoridation and of denying people [illegible] because of the Official Secrets Act."

THE NCI 'COVER-UP'

According to testmony at the House subcommittee hearings, the NCI refused to disclose certain information to the National Health Federation. That refusal, however, was far less sinister than some members of the British Parliament were later led to believe.

The NCI initially gave Dr. Burk a copy of the publication "U.S. Cancer Mortality by County: 1950-1969," which he later used in preparing the first Burk-Yiamouyiannis report. After the NCI reviewed that report, Dr. Yiamouyiannis asked for a copy of the NCI's analyses. Those were also dispatched. Then, according to NCI testimony, Dr. Yiamouyiannis used that information to attack the NCI's review. Consequently, when he requested their analyses of his subsequent study, NCI officials denied the request. They pointed out that the basic sources were routine publications of the Bureau of the Census and the National Center for Health Statistics, and they told him, in effect, to do the calculations himself. "The data," said NCI's Dr. Robert N. Hoover at the hearings, "are generally available to anyone with a public library card."

To check that claim, a CU staff member visited the local public library. All but two of the volumes needed, both from 1950, were on the shelves of a suburban library within walking distance of our offices. A phone call by one of the librarians located the two remaining volumes at another nearby branch.

As a result of the charges and the wide publicity the National Health Federation gained in Britain, Drs. Richard Doll and Leo Kinlen of the Department of Regius Professor of Medicine at Oxford decided to undertake still another study. Their reason, they explained, was "to be sure about the truth of the matter, and because we feared that Burk and Yiamouyiannis's abuse of statistics might be detrimental to the future health of British children." At the same time, the Royal College of Physicians requested a formal opinion of the cancer data from the Council of the Royal Statistical Society in Britain.

The resulting studies appeared respectively in The Lancet and in the Journal of Applied Statistics in 1977. In The Lancet, Drs. Doll and Kinlen reported that none of the evidence "provides any reason to suppose that fluoridation is associated with an increase in cancer mortality, let alone causes it." The study conducted for the Royal Statistical Society, which undertook an even more comprehensive statistical analysis than the NCI or Oxford, came to the same conclusion.

Furthermore, additional studies by the NCI in 1976, the U.S. Center for Disease Control in 1977, and the National Heart, Lung, and Blood Institute in 1977 each found no evidence linking fluoridation and cancer. In short, independent investigations by seven of the leading medical and scientific organizations in the English-speaking world have unanimously refuted the National Health Federation's cancer claims.

Meanwhile, other allegations against fluoride are in wide circulation. Fluoride is said to cause allergic reactions, birth defects, mutations, heart disease, and cancer in animals. We'll examine those allegations in the second part of this report.

PART II: THE MISLEADING CLAIMS

In addition to frightening the public with a baseless claim that fluoridation of the public water supply causes cancer, the opponents of fluoridation have issued many other misleading charges accusing fluorides of causing ills that range from brittle nails to birth defects. Since such claims are resurrected whenever fluoridation comes up for a vote, we'll discuss the most persistent ones and examine the evidence behind them.

CLAIM: FLUORIDE IS A POISON

Like iron, zinc, and several other minerals, fluorine (in the form of fluoride) is classified by the National Academy of Sciences as an essential trace element in human nutrition. And like many substances essential to life or good health—iron, vitamins A and D, oxygen, and even water itself—fluoride can be toxic in excessive quantities. At high concentrations, fluoride has been used as a poison for insects and rodents. However, at the level in fluoridated water—one part per million (ppm)—you'd have to drink at least several hundred gallons at one sitting to get a lethal dose. The water alone would kill you first.

But what about the possibility of slow poisoning—a little bit at a time over long periods? According to the National Academy of Sciences, the daily intake required to produce symptoms of chronic toxicity after years of consumption is 20 to 80 milligrams or more—far in excess of the average intake in the U.S. Such heavy doses are associated with water supplies that contain at least 10 ppm of natural fluoride, as in some parts of India. There is absolutely no danger of poisoning from imbibing water fluoridated to prevent dental cavities.

An occasional tactic in antifluoridation tracts is [illegible] pictures of cattle or other animals harmed by fluoride poisoning. The photographs are authentic, but the impression conveyed is false. Years ago, steel mills and clay furnaces in England and Wales sometimes polluted nearby vegetation with tons of fluoride emissions. Similar incidents have also occurred in the U.S. Cattle and other animals that grazed on the vegetation would ingest enormous amounts of fluoride and develop bone fractures and lameness. These pictures are the ones antifluoridationists use.

In contrast, a controlled experiment with cattle produced far different results. The cattle were fed various amounts of fluoride in their diets for nearly 7½ years. Even at fluoride levels as high as 27 ppm, the cattle did not experience fractures, lameness, or any adverse effects on [illegible] fertility, or milk production. Nor were there any adverse effects on their offspring through successive generations.

CLAIM: FLUORIDE CAUSES BIRTH DEFECTS

In the late 1950's, a French physician named Rapaport reported that mongolism occurred more frequently in some cities with fluoridated water than in some cities with little or no fluoride in their water. Experts who reviewed the study found it seriously flawed, however, especially in its method of locating cases. According to Dr. Rapaport's figures, the incidence of mongoloid births in both the fluoridated and unfluoridated cities was less than half the usual rate—a highly questionable finding in itself. Thus, there was a strong likelihood that Dr. Rapaport had failed to uncover the majority of mongoloid births in the cities he chose to study.

That conclusion was soon confirmed by a more extensive controlled study in England. Using more exacting methods of case-finding, the British researchers reported no difference in the incidence of mongolism whether the water was high or low in fluoride.

Since then, two extensive studies have substantiated the British findings. One surveyed virtually all mongoloid births in Massachusetts from 1950 through 1966. The results, published in the New England Journal of Medicine in 1969, showed no link between fluoridation and mongolism.

study published in 1976 covered approximately million births in six major U.S. cities. Researchers at for Disease Control investigated not only mon- but also cleft palate, heart abnormalities, clubfoot, and other common birth defects. Again, there was no association between fluoride and any of the defects. In short, the antifluoridationists' claim is based solely on the discredited Rapaport study.

CLAIM: FLUORIDE IS MUTAGENIC

on the birth-defects theme is the charge that a genetic hazard. Until recently, this claim was irrelevant or questionable experiments with fruit flies. Then, in 1976, two researchers in Kansas reported that various levels of fluoride damaged in the bone-marrow cells and sperm cells of Although experts who reviewed the experiment noted inconsistencies in the results, the question it raised important enough to warrant further research. joint studies were undertaken by the Lab- Developmental Biology and Anomalies at the Institute of Dental Research, the Department of at the University of Minnesota, and the Laboratory of Cellular and Comparative Physiology at the National Institute on Aging. The scientists conducted four separate experiments, including tests on mice receiving acute doses of fluoride and mice raised for several generations on water containing 50 ppm of fluoride. None of the studies produced any evidence that fluoride damages chromosomes, even at levels 100 times that in fluoridated water supplies.

In Germany, meanwhile, an independent group of researchers reported similar results with human white blood cells, which are especially sensitive to mutagenic agents. Not only did fluoride fail to produce damage, it also evidenced an antimutagenic effect by *protecting* chromosomes against a known mutagen.

CLAIM: FLUORIDE CAUSES ALLERGIC REACTIONS

that people can suffer allergic reactions or "in- to fluoride gained prominence from anecdotal by George L. Waldbott, M.D., an early opponent who founded the National Fluoridation Between 1955 and 1965, Dr. Waldbott reported instances of patients experiencing nausea, head- "gastric crisis," or various other symptoms that he fluoride ingestion.

The World Health Organization study described last month, a review of the Waldbott reports found no reliable evidence to support his contentions. The cases were judged to represent "a variety of unrelated conditions." Following the WHO study, the Public Health Service asked the American Academy of Allergy to evaluate the issue. After a review of the existing clinical reports, the executive committee of the academy concluded unanimously: "There is no evidence of allergy or intolerance to fluorides as used in the fluoridation of community water supplies."

CLAIM: FLUORIDE CAUSES CANCER IN ANIMALS

almost absurd evidence marshalled against fluori- material purporting to show that fluoride induces animals. One series of studies frequently quoted by was conducted by researchers in Texas The first study involved a strain of mice that gum cancer. Supposedly, the mice given fluori- developed tumors slightly earlier than similar fluoride-free water. There were a few minor hitches experiment, however. All the mice were also fed a that, unknown to the investigator, contained 42 fluoride—or 10 to 100 times the amount any of the in their water, thus making any comparison be- groups invalid. A further botching occurred investigator miscalculated the amounts of fluoride in the water. Two scientists from the National Institutes of Health reviewed the study in 1951 and dismissed it. Other experiments by the same investigator and a co-worker have long been discredited by subsequent research. Nevertheless, opponents of fluoridation still cite the Texas experiments as significant evidence that fluoride is carcinogenic.

Another study currently getting star billing in antifluoridation tracts is an experiment conducted with fruit flies in 1963. This time, legitimate findings are being substantially distorted. In that study, two strains of fruit flies exposed to 20 to 50 ppm of fluoride in their food experienced an increased incidence of melanotic tumors. Opponents of fluoridation interpret that to mean that fluoride can cause cancer. That's not so, according to scientists working at the National

Cancer Institute. While humans may be physiological cousins to the mouse and other mammals, their kinship to the fruit fly is somewhat more distant.

Specifically, a *melanotic* tumor in a fruit fly is not the same as a cancerous tumor in a human or mammal. It is more akin to scar tissue, and, unlike a cancerous tumor, it's not malignant or harmful. It can be induced by a wide range of substances, including some vitamins and even [illegible] tryptophan, two amino acids essential for human [illegible] and health. Fruit flies can also get malignant tumors, but there's no evidence that fluoride has ever caused any [illegible] fluoride has never proved to be carcinogenic in [illegible] variety of animals, including rats, mice, guinea pigs, [illegible] hamsters, dogs, and sheep.

CLAIM: FLUORIDE CONTRIBUTES TO HEART DISEASE

In Wisconsin, opponents of fluoridation have often charged that it increases the number of deaths from heart disease. They base their claim on statistics that show a rise in heart deaths in the town of Antigo, Wis., since the introduction of fluoridation there.

The National Heart and Lung Institute has called the data a "misrepresentation of statistics." As one scientist points out, "The well-known fact that deaths from heart disease become more frequent as people grow older was overlooked." Since fluoridation was introduced in Antigo in 1949, the percentage of elderly people there has doubled. Between 1950 and 1970, for example, the segment of the population 75 years old or older increased [illegible]. When that factor is taken into account, the alleged [illegible] of fluoride vanishes.

According to a 1972 study by the National [illegible] Lung Institute, comparisons of fluoridated and unfluoridated communities reveal no difference in the rate of heart [illegible]. Furthermore, reported the institute, evidence from animal studies, from examinations of people exposed to accidental [illegible] of fluoride in industrial accidents, and from medical [illegible] people who have drunk water naturally high in fluoride [illegible] a lifetime "all consistently indicate no adverse effects [illegible] diovascular health."

THE FACTS: ANTIGO LEARNED THEM THE HARD WAY

Of all the numerous ills that have been attributed to fluoridation—from cancer in humans to constipation in dogs—none has ever been shown to be valid. In fact, the only known hazard of fluoridated water has nothing to do with drinking it. Patients undergoing kidney dialysis can be exposed to about 50 to 100 times the amount of fluid consumed by the average person. Accordingly, the National Institute of Arthritis and Metabolic Disease recommends that fluoride—as well as calcium, magnesium, and copper—be removed from the tap water *before it is used in an artificial kidney machine.* Aside from that precaution, there is no genuine reason to worry about fluoridation.

In 1960, however, the residents of Antigo, Wis., didn't realize that scare stories being circulated by local opponents of fluoridation were false. Antigo voted to discontinue its 11-year practice of fluoridating the water supply. The decision eventually led to a study by public health officials, who wanted to learn what effects the end of fluoridation would have on the dental health of Antigo youngsters.

During 1960, dental personnel from the Wisconsin Division of Health examined nearly all children in the kindergarten, second, fourth, and sixth grades of Antigo [illegible]. The examiners recorded the number of decayed, [illegible] filled teeth for each child. Four years later, they [illegible] the examination among children in all of the same [illegible] except the sixth.

The kindergarteners in 1964 had a rate of dental [illegible] lems 92 percent higher than their counterparts [illegible] earlier. Among second-graders, the decay rate in [illegible] teeth was up 183 percent. Among fourth-graders, it [illegible] 41 percent. A subsequent examination of sixth-[illegible] showed a 91 percent increase in decay rates. In 1965, [illegible] voted to reinstate fluoridation.

Despite persisting claims about heart deaths by [illegible] fluoridationists, the people of Antigo today still drink [illegible] dated water. Meanwhile, about 100 million Americans [illegible] not, largely because of the fears raised by opponents [illegible] fluoridation. The simple truth is that there's no "[illegible] controversy" over the safety of fluoridation. The [illegible] safe, economical, and beneficial. The survival of this [illegible] controversy represents, in CU's opinion, one of the [illegible] triumphs of quackery over science in our generation.

This report was reprinted, for educational purposes only, from the July and August, 1978, issues of Consumer Reports, the [illegible] magazine published by Consumers Union, a nonprofit organization. © 1978 by Consumers Union of United States Inc. [illegible] Vernon, N.Y. 10550. Additional copies of this reprint are available, postpaid, at 50¢ each, 10/$4.50, 100/$40, 1000/$300. Send [illegible] with remittance to: CU Reprints, Consumers Union, Orangeburg, N.Y. 10962. Allow 4 to 6 weeks for delivery.

THE HEALTH ROBBERS

STEPHEN BARRETT AND GILDA KNIGHT *

In the recent public discussions on fluoridation an organization known as the National Health Federation was mentioned quite frequently, particularly in connection with [illegible] (who is the Federation's scientific consultant). Stephen Barrett M.D. and Gilda Knight, under the auspices of the Lehigh Valley Committee Against Health Fraud, have compiled data on fraudulent health practices. Their book "The Health Robbers" contains sections written by physicians, nutritionists, journalists and health educators. One chapter is devoted to the National Health Federation and its activities whilst another analyses some of the methods and techniques used by anti-fluoridationists. Both chapters are reproduced below by permission of the Lehigh Valley Committee Against Fraud Inc., P.O. Box 1602, Allentown, PA 18105, U.S.A.

THE HEALTHY ALLIANCE†

During the past four years, Congress has been deluged with mail urging it to *weaken* government regulation in the field of health. Responding to this pressure, most Congressmen became sponsors of legislation which would do exactly that. This strange turnabout was the result of an intense campaign led by an organization called the National Health Federation.

Millions of Americans waste money on vitamins, minerals and other "food supplements" which they purchase by mail. Some buyers fear that the American food supply cannot give them enough nourishment. Others hope that nutritional "gimmicks" are the key to superior health. About four years ago, after a two-year study, the U.S. Food and Drug Administration (FDA) proposed a number of marketing regulations to combat this public confusion. Under these rules, many misleading tactics commonly used by health food marketers would be forbidden.

The industry responded immediately with an all-out campaign to weaken the FDA. Lawsuits were filed to challenge the new FDA rules and Congress was urged to limit FDA jurisdiction over food supplements and practices which help to sell them.

NHF's Leaders

The reason for NHF involvement in this issue is suggested by the backgrounds of its leaders. Many of them write or publish books and other materials which support unscientific health theories and practices. Many sell questionable "health" products and some have even been convicted of crimes while engaged in this kind of activity.

- Fred J. Hart, NHF's founder, was for many years the president of the Electronic Foundation. In 1954, Hart and the Electronic Medical Foundation were ordered by a U.S. District Court to stop distributing 13 electrical devices with false claims that they could diagnose and treat hundreds of diseases and conditions. In 1962, Hart was fined by the court for violating this order. Hart died in 1975.

- Royal S. Lee, a non-practicing dentist who died in 1967, helped Hart found NHF and served on its board of governors. In 1962, he and the vitamin company which he owned were convicted of misbranding 115 special dietary products by making false label claims for the treatment of more than 500 diseases and conditions. Lee received a one-year suspended prison term and his company was fined $7,000.

- Andrew G. Rosenberger, a "nature" food store operator, has been listed as NHF "nutrition chairman" and has been a featured speaker at NHF conventions. In 1962, he and his brother Henry were fined $5,000 each and were given six-month suspended prison sentences for misbranding dietary products. Their corporation, Nature Food Centers, was fined $10,000.

- Kurt W. Donsbach, chairman of NHF's board of governors, is a chiropractor and naturopath by background. In 1970, while Donsbach operated a "health food" store, agents of the Fraud Division of the California Bureau of Food and Drug observed him represent that vitamins, minerals and herbal tea would control cancer, cure emphysema and the like. Charged with nine counts of such illegal activity, Donsbach pleaded guilty to practicing medicine without a license and agreed to cease "nutritional consultation". Most of the products which Donsbach was "prescribing" to his "patients" were packaged by a company which he operated at that time. At present, Donsbach is president of Metabolic Products, a company which "specializes in orthomolecular concepts". Literature from Metabolic Products

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[illegible] and Knight, G., Eds., (1976) The Health Robbers. Philadelphia, George F. [illegible] Company

[illegible] is Chairman, Board of Directors, Lehigh Valley Committee Against Health Fraud Inc.

[illegible] is Executive Assistant, American Council on Nutrition.

† Stephen Barrett M.D. (Chapter 13)

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(continued)

suggests that its garlic extract can "prevent cellular deterioration", that its alfalfa product has "anti-toxin properties" which can help overcome "-itis" diseases, and so on.

- V. Earl Irons, vice-chairman of NHF's board of governors, received a one-year prison sentence in 1957 for misbranding "Vit-Ra-Tox", a vitamin mixture sold door-to-door.
- Roy F. Paxton, while serving as an NHF governor in 1963, was sentenced to three years in prison for misbranding "Millrue" as effective in treating cancer, arthritis and other serious diseases. One way Millrue was sold was by mail through ads in an NHF publication.
- Clinton Miller, vice-president and Washington lobbyist, had a quantity of "dried Swiss whey" seized from his Utah wheat shop in 1962. The FDA charged that the product was misbranded as effective in treating intestinal disorders. The whey was returned when Miller agreed to change its labeling. In 1976, NHF announced that Miller was a candidate for the United States Senate.
- Bruce Helvie, an NHF governor, had vitamin and mineral products seized by the FDA because they were marketed with false and misleading claims for treatment of more than 25 diseases and conditions. The seized products were destroyed by consent decree in 1960.
- Bob Hoffman, another governor, owns a publishing firm and sells "health" products through his company, York Barbell Co. In 1960, the company was charged with misbranding its "Energol Germ Oil Concentrate" because literature which accompanied the oil claimed falsely that it could prevent or treat more than 120 diseases and conditions, including epilepsy, gallstones and arthritis. The material was destroyed by consent decree. In 1961, fifteen other York Barbell products were seized as misbranded. In 1968, a larger number of products came under attack by the government for similar reasons. In the consent decree which settled the 1968 case, Hoffman and York Barbell agreed to stop a long list of unproven health claims for their products. In 1972, the FDA seized a shipment of three types of York Barbell protein supplements, charging that they were misbranded with false and misleading body-building claims. A few months later, the seized products were destroyed under a default decree.
- Emory Thurston, another NHF governor, has been an active promoter of "Laetrile", a worthless cancer "remedy". Pro-Laetrile pamphlets edited by him were displayed at his booth at an NHF convention at Anaheim, California, in 1973. When approached by an agent of the California Bureau of Food and Drug, who told him she had cancer of the uterus, Thurston said he could supply her with Laetrile. He instructed the agent to contact him at his office at the Institute for Nutritional Research in Hollywood. She did. During their next meeting, Thurston sold Laetrile to the agent – *and advised her not to have surgery!* After additional evidence against Thurston was gathered, he was convicted, fined $500 and placed on probation for two years.

Others who now serve, or who have recently served, on the 27-man NHF board of governors include:

- Harald J. Taub, editor of *Let's Live*, a magazine whose articles strongly promote the use of food supplements. Taub is a former editor of Rodale Press' *Prevention* magazines.
- John Hemauer, past-president of the California Chiropractic Association.
- John W. Noble, past-president of the National Association of Naturopathic Physicians, who died in 1976.
- L.P. DeWolf, who, according to NHF, has had "40 years of experience in the organic produce field".
- Betty Lee Morales, president of the Cancer Control Society, a group which promotes unproven cancer "remedies". She is also a publisher and a co-owner of Eden Ranch, a firm which sells *Betty Lee Morales Signature Brand* food supplements. Promotional material from Eden Ranch suggests that Americans who do not use food supplements run a significant risk of developing deficiency diseases.

How NHF is Organized

The National Health Federation is a membership organization with headquarters in Monrovia, California, and a legislative office in Washington, D.C. Its members pay from $8 per year for "regular" membership to a total sum of $1,000 or more for "perpetual" membership. Many of the larger donors have financial interests in the matters promoted by NHF.

Because of the extent of its political activities, NHF could not qualify as a charitable organization so that contributions to it would be deductible for federal income tax purposes. However, NHF advertisements and letters of welcome to new members have stated otherwise. In 1972, responding to a complaint from the Lehigh Valley Committee Against Health Fraud, Inc., the Internal Revenue Service ordered NHF to stop misrepresenting its tax status.

NHF members receive a monthly 32-page *Bulletin* and occasional brief mailings. They are also invited to frequent conventions, most of which take place in the Western part of the U.S. Visitors to such meetings have noted that most of their participants are persons of middle-age or older who are preoccupied with their health. Many exhibit a rigidly suspicious outlook, fearing that government is thoroughly failing to protect them from "poisons"

and from exploitation by medical and
In November 1974, during a brief
NHF convention in New York City, I
least five of its 34 exhibitors were
misleading sales claims for their products.
was the claim that a sea-water concen-
prevent cancer.

the *National Health Federation*
available for ten cents, any two members
local chapter by adopting the NHF con-
and bylaws, naming temporary officers and
assistance from NHF headquarters. The
envisions a pyramidal national structure
groups selecting a county board of direct-
boards selecting a state board of govern-
boards selecting one delegate each to
governors at the national level. This
mainly hypothetical, however, since the
chapters is too small. (An article in
Bulletin reported the formation of
local chapter). National membership,
from *Bulletin* circulation figures was about
20,750 in 1974 and 18,500 in 1975.
was reported to be $345,000 in both

formation in 1955, the steadfast purpose
seem to promote what it calls "freedom
by health consumers. As stated in each
monthly *Bulletin:*

"NHF opposes monopoly and compulsion in
related to health where the safety and
of others are not concerned. NHF does
recommend or approve any specific healing profes-
or their methods, but it does oppose the
efforts of any one group to restrict the freedom
of qualified members of another
thus attempting to create a mono-

this credo may seem harmless and
opposing unfair business compe-
NHF really means, however, is that
methods of treatment should not be allow-
machinery out of the marketplace. Under
anyone who has a product or a
which he claims can help sick people
allowed to sell it. Proof that a particular
should not be required. People
decide for themselves which health
they will use. Unless a method causes
death or serious injury, our government
interfere.

In its simplest terms, what the National
wants is for quackery to be made

The Scope of NHF Activity

NHF's publications and convention programs make it clear that NHF promotes the gamut of questionable health methods and has little interest in medically acceptable types of treatment.

Nutritional fads, myths and gimmicks are given favorable mention by NHF *Bulletin* articles, by convention speakers and special mailings and by pamphlets available at conventions and by mail. Worthless cancer treatments such as Laetrile and Krebiozen are promoted in the same ways. *Bulletin* articles look with disfavor upon such proven health measures as pasteurization of milk, smallpox vaccination, polio vaccination and fluoridation of water. Use of nutritional supplements is encouraged by claims that our food processing depletes its nutrients. Use of "natural" products is encouraged by exaggerated claims that our food supply is "poisoned". Chiropractic is regarded favourably. Books which promote questionable health concepts are reviewed favorably in the *Bulletin.* Underlying all these messages is the idea that anyone who opposes NHF ideas is part of a "conspiracy" of government, organized medicine and big business against the little consumer.

NHF files many lawsuits against government agencies and joins in the defense of people accused of frauds in the sale of questionable "health" products. It also has an active legislative program with a Washington based lobbyist.

NHF was active in support of chiropractic inclusion under Medicare and in opposition to federal subsidies to communities who want fluoridation. To bolster the influence of its lobbyist, the *Bulletin* and special mailings include form letters and instructions to write to Congressmen and Federal officials in support of NHF positions. Letter-writing requests invariably contain misinformation about the issues and contain underlying themes of persecution, discrimination and conspiracy. For example, to arouse support for the anti-FDA vitamin bill, NHF suggested that FDA regulations would drive up prices, "take away our vitamins" and even make it illegal to manufacture most of the supplements now available.

Crying, "Fight for your freedom to take vitamins!", NHF organized its members and allies into unprecedented political activity. Article after article urging support of the anti-FDA bill appeared in the NHF *Bulletin*, in *Prevention* magazine and other health food industry publications, and in chiropractic journals. Letter-writing kits were distributed by chiropractors, health food stores and in special NHF mailings. At a Congressional hearing held on this issue, several Congressmen reported that they received more mail about vitamins than about Water-

(continued)

gate! As the mail piled up, most Congressmen lost sight of why it was coming -- that their constituents had been confused and frightened by health food industry propaganda. In 1976, a modified form of NHF's anti-FDA bill was passed by Congress.

In 1973, a New Jersey-based group called Citizens for Truth in Nutrition (CTN) was formed. Although apparently independent from NHF, it was led by many NHF activists. Its major activities included anti-FDA meetings, media appearances and anti-FDA lawsuits. Like NHF, CTN's promotional literature claimed falsely that its contributions were tax-deductible until it was ordered to stop these claims by the Internal Revenue Service.

NHF's Fight Against Fluoridation

Scientists know that if children get the proper amount of fluoride in their diet, they will get many fewer cavities in their teeth. Adjusting community drinking water to about one part fluoride to one million parts water is a safe and simple way to accomplish this. Although NHF's leaders claim to be interested in preventing disease by "proper" nutrition, they fight hard against water fluoridation.

Over the years, NHF has assembled a great many "documents" which it claims are "proof" that fluoridation is dangerous (which it is not). Close examination of these documents, however, shows that they contain reports of poorly designed "experiments", twisted accounts of actual events, statements by respected scientists taken out of context to change their meaning, misinterpreted statistics and other forms of faulty reasoning. Given enough publicity, however, these items can convince many communities that fluoridation is too risky. Many innocent American children have NHF to thank for their toothaches.

In January 1971, NHF granted $16,000 for a fluoridation study to the Center for Science in the Public Interest (CSPI), a group led by former associates of Ralph Nader. To help raise this money, a special mailing was sent to NHF members:

> "SPECIAL URGENT APPEAL = NHF is proud to announce that it has undertaken to underwrite $16,000.00 in costs for CLINICALLY controlled investigation of the long-term effects of fluorides in the human. This test is being conducted by FRIENDS of indisputable, scientific reputation. With this information we will be armed with unassailable, up-to-date, scientific data to help defeat fluoridation! There is NO such study available in the world at this time and the costs are amazingly low. The Executive Committee committed us to this obligation in emergency session. . ."

When CSPI learned about this fund-raising message it protested, stating that its study would be a scientific review of available knowledge and that the outcome was certainly not fixed against fluoridation. NHF apologized, claiming that the fund-raiser had been mailed "without being cleared by appropriate officials" and contained "serious errors" about the nature of the study.

In August, 1972, a preliminary draft of the CSPI study was released to activists on both sides of the fluoridation controversy. This was done so that its author could get suggestions and criticisms from knowledgeable individuals before he wrote his final report. The final report was issued at about the same time as the December 1972 NHF *Bulletin* went to press stating:

> "A good many months ago, NHF voted a grant to the Center for Science in the Public Interest to underwrite an unbiased study of total fluoride consumption and its influence on health. This was done on the anticipation that such a study, never before undertaken by a scientific body, would put the fluoride controversy into proper perspective. That study is nearing its completion. Two preliminary, interim reports have been issued. It begins to appear as if most of the contentions of NHF on this question will be validated in this unbiased study".

CSPI's final report, however, did not "validate most of NHF's contentions". Rather, it concluded that ". . . the known benefits of fluoridation far outweigh any risks which may be involved".

The study was never again mentioned in NHF publications. In private communications, however, NHF claimed first that the study "was never completed" and later that it was unacceptable because its author ignored too much anti-fluoridation "evidence". A Rodale Press editor suggested that the author had been "intimidated" or "bought off".

Thus, having invested $16,000 in an "unbiased" study by "FRIENDS of indisputable, scientific reputation", NHF ignored its conclusions.

During 1974, NHF announced that opposing fluoridation would be its number two priority and that a biochemist named John Yiamouyiannis had been hired to "break the back" of fluoridation promotion.

The Unique Alliance

NHF thus stand revealed. Its policies disregard medical science and proven public health measures. Its leaders promote questionable "health" methods,

(continued)

often at personal profit. Its followers, although confused about the issues in which they involve themselves, are active in the arena of politics.

NHF is well-organized and working hard. Its leaders probably hold sincere beliefs in their health methods. Its followers sincerely believe they can improve their health by following the methods of their leaders.

Sincere or not, however, NHF may be dangerous to your health!

THE POISONMONGERS*

On May 27, 1975, 213,573 people in Los Angeles exercised their democratic privilege – *and voted against healthier teeth!* Since 1973, more than 270 Nebraska communities have done the same. In cities from coast to coast, citizens have voted to deprive themselves, their children, and their neighbours' children of the proven health benefits of fluoridation.

Of course, none of these negative voters meant to inflict cavities upon anyone. They were confused – influenced by alarmists who claim that adding fluoride to a city's water supply will "poison" people.

These alarmists are the "poisonmongers". Antagonistic to scientific research, they are commonly known as "antis" (short for "antifluoridationists"). Leaders of the 30-year struggle for fluoridation are frustrated by their tactics. Newspaper editors are commonly taken in by their publicity stunts. And legislators are often overwhelmed by their various and sometimes shrill arguments.

G. Herbert Seberg, D.D.S., knows the antis well. Past-President of the Nebraska Dental Association, he has been fighting to fluoridate Nebraska since 1950. In 1973, Dr. Seberg received two awards for his work in gaining passage of a bill which would order statewide fluoridation by January 1, 1975.

Promoting the bill, the Nebraska Dental Association led a five-month campaign which had the editorial support of most of the state's newspapers. Opposing the bill was the Nebraska Pure Air and Water Committee. Though loosely organized, its members distributed scare pamphlets, wrote letters to newspaper editors and paid for misleading advertisements.

Though the fluoridation bill passed, Dr. Seberg and his allies could not stem the dogged opposition of a few senators who attached an "escape clause" to it. Fifteen percent of a town's voters could petition for a referendum which would decide the fate of fluoridation in their community. By 1975, althoug 69 percent of Nebraska's one and one-half million people were drinking fluoridated water, more than 300 of its communities put the issue to a vote. Most of these were small, conservative prairie towns. Fewer than ten percent of these communities voted to fluoridate.

Los Angeles was the largest city ever to vote on this issue. Because of this, its referendum defeat was a great disappointment to fluoridation proponents. In September 1974, the Los Angeles City Council had voted 10-5 to fluoridate. But a few weeks later, pressure from frightened constituents persuaded the Council to allow the public to vote. After the referendum was defeated, 213,573 to 166,549, councilmen voted unanimously to rescind the fluoridation ordinance. Labeling the referendum defeat "a victory of strident scare tactics over medical evidence", a *Los Angeles Times* editorial criticized City Council for "retreating from its best judgment".

To date, more than 2,000 American communities have decided the matter of fluoridation at the voting booth. In thousands of other communities, the decision to fluoridate was made by city council. In recent years, most voters have been rejecting fluoridation. Though this trend is discouraging, public health leaders are not surprised by it. As far back as 1951, Dr. Frank A. Bull, Director of Dental Education for the Wisconsin State Board of Health, summed up the problem quite well. Speaking at the Fourth Annual Conference of State Dental Directors, Dr. Bull said:

"I don't believe that you can win approval of any public health program where this is organized opposition. I mean clever, well thought-up opposition. I think it is possible to beat almost anything".

In the years since this statement was made, antifluoridationists have developed clever political tactics which can play on the fears of ordinary citizens. Increasingly, these tactics have been employed to bring about referenda – to defeat fluoridation. The sad fact is that people can easily be frightened by things which they do not understand and can easily be confused by contradictory arguments.

Fluoridation's Credentials

There should be no mystery about what fluoridation is. Fluoride is a mineral which occurs naturally in most water supplies. Fluoridation is the adjustment of the natural fluoride concentration to about one part of fluoride to one million parts of water. More than 10,000 scientific studies attest to fluoridation's safety and effectiveness in preventing tooth decay.

* Written by Mary Bernhardt, Secretary, Council on Dental Health, American Dental Association and Bob Sprague (Chapter 11).

THE HEALTH ROBBERS

(continued)

The history of fluoridation in the U.S. underlines its unique standing as a public health measure copied from a natural phenomenon. In the early 1900's, Dr. Frederick S. McKay began an almost 30-year search for the cause of the staining of teeth which was prevalent in Colorado where he practiced dentistry. Travelling to trace this condition, he found it was known as "Texas teeth". In 1928, he announced that these teeth, although stained, showed a "singular absence of decay". He concluded that both the staining and the decay resistance were caused by something in the water. In 1931, the "something" was identified as fluoride.

The Public Health Service then took over to determine precisely what amount of fluoride in the water would prevent decay without causing staining. Years of "shoeleather epidemiology" by Dr. H. Trendley Dean traced the dental status of 7,000 children drinking naturally fluoridated water in 21 cities in four states. In 1943, he reported that the ideal amount of fluoride was one part per million parts of water. This concentration was demonstrated to result in healthy, attractive teeth which had one-third as many cavities as might otherwise be expected and no staining. Dean, later known as the "father of fluoridation", thus paved the way for the control and public use of this natural phenomenon.

The next step was to determine whether water engineering could copy nature's amazing dental health benefit. At several test sites, the fluoride concentration of the public water supply was adjusted to one part per million.

One such test was conducted in the neighbouring cities of Newburgh and Kingston, New York. First, the children in both cities were examined by dentists and physicians. Then fluoride was added to Newburgh's water supply. After ten years, the children of Newburgh had 58% fewer decayed teeth than those of unfluoridated Kingston. The greatest benefits were obtained by children who drunk the fluoridated water since birth. Other studies showed that teeth made stronger by fluoride during childhood will remain permanently resistant to decay.

As the evidence for fluoridation piled up, thousands of communities acted to obtain its benefits. By 1975, more than 100 million Americans were drinking fluoridated water. But 100 million other Americans were receiving public water supplies which were not fluoridated -- thanks largely to the efforts of poisonmongers.

Opposition to Fluoridation

Since it began, fluoridation has encountered opposition from scattered groups and individuals. Many of them have been associated with the health food industry – which aligns fluoridation with its general propaganda that our food supply is being "poisoned". Chiropractors have opposed fluoridation as an intereference with "free choice of health care". Christian Scientists have regarded it as "forced medication" and the John Birch Society has seen it as a "Communist plot".

By the early 1950's, individuals and local groups began exchanging ideas and experiences with each other. A few physicians and dentists became very vigorous in opposing fluoridation and began travelling around the U.S. to appear at court hearings and public meetings. One of them, George Waldbott, M.D., started the *National Fluoridation News*, a four-page newspaper now edited by Mrs. Ethel Fabian of Gravette, Arkansas.

Several national groups have been formed for the sole purpose of fighting fluoridation, but it appears that none of these has achieved sufficient funding to have much impact outside of the communities of their leaders. However, several well-funded national multi-issue organizations have managed to disseminate large amounts of scare propaganda throughout the country. Among them are Rodale Press, the John Birch Society and the National Health Federation.

The early efforts of the antifluoridationists were assisted by the caution and conservatism of many physicians, dentists and other scientists who felt that not enough research had been done for them to take a positive stand. As time went on and data piled up, however, the overwhelming majority of health scientists concluded that fluoridation is safe and effective.

But while scientists were refining and publishing their experiments, the antis were refining and publishing their battle plans. In the mid-1960's, the National Health Federation published *An Action Guide . . . On How to Fight Fluoridation in Your Area.* Available for 25c, this four-page leaflet details the strategy which can be used in any community where fluoridation is being considered.

"Neutralizing Politicians"

Once fluoridation proponents are known to be active, the leaflet says, antis should immediately send a letter to each member of governing bodies. The letter should emphasize "the most recent evidence" that fluoridation is "harmful". Most important, it should urge the officials to "remain absolutely neutral" by putting the matter to public vote. "When this is done", the leaflet states, "whatever political figures may be concerned are relieved of any and all responsibility in the matter".

This opening blast is designed to neutralize politicians. It aims to arouse doubt about the safety of fluoridation. It also offers an easy excuse for delaying favourable action – while the antis begin their hatchet job on public opinion.

How Poisonmongers Work

The antis' basic technique is *the big lie.* Made infamous by Hitler, it is simple to use, yet surprisingly effective. It consits of claiming that fluoridation causes cancer, heart disease, kidney disease and other serious ailments which people fear. The fact that there is no supporting evidence for such claims does not matter. The trick is to keep repeating them – because if something is said often enough, people tend to think there must be some truth to it.

A variation of the big lie is the *laundry list.* List enough "evils" and even if proponents can reply to some of them, they will never be able to cover the entire list. This technique is most effective in debates or letters to the editor.

A key factor in any anti campaign is the use of printed matter. Because of this, antis are very anxious to have their views printed in any publications. Scientific journals will rarely print them, but most local newspapers are sympathetic toward the expression of minority viewpoints regardless of whether they are supported by facts. A few editors even welcome the controversy the antis generate – on the theory that it will increase readership.

The aim of anti "documents" is to create the illusion of scientific controversy. Often they quote statements which are *out of date* or *out of context.* Quotes from obscure or hard-to-locate journals are particularly effective. Another favoured tactic is to *misquote* a pro-fluoridation scientists, knowing that even if the scientist himself protests, his reply will not reach all of the people who saw the original misquote.

Half-truths are commonly used. For example, saying that fluoride is a rat poison ignores the fact that poison is a matter of dose. Large amounts of many substances – even pure water – can poison people. But the trace amount of fluoride contained in fluoridated water will not harm anyone.

"Experts" are commonly quoted. It is possible to find someone with scientific credentials who is against just about anything. Most "experts" who speak out against fluoridation, however, are not experts on the subject. There are, of course, a few dentists and physicians who oppose fluoridation. However, many of them oppose it on the basis of government action rather than on safety. Curiously, when anti experts change their minds in favour of fluoridation, they sometimes find that the antis keep on quoting their earlier positions.

Innuendo is a technique that had broad appeal because it can be used in a seemingly unemotional pitch. Some antis admit that fluoridation has been found safe "so far", but claim that its long-range effects have "not yet" been fully explored. *The waiting game* is a related gambit in which anti suggest that waiting a bit longer will help to resolve "doubt" about fluoridation's safety. No doubt, some antis will continue to use this argument for a few hundred more years.

The *bogus reward* is a fascinating technique. Some antis offer large rewards to anyone who will prove that fluoridation is safe. If the wording is not extremely careful, however, the pros can actually collect. In 1965, a California chiropractor offered $1,000 to anyone who could produce an expert from California "who has done any conclusive research proving the safety" or who could produce documentary evidence that fluoridation is safe. A local dental group assembled a barrage of experts and more than 100 research reports testifying to fluoridation's safety and effectiveness. When the chiropractor refused to pay, the dental group filed suit and later settled out of court for $500.

A $100,000 reward offer has survived for a long time – but a close look will show why. In order to collect, pros must post a bond "to cover any costs which the offerers of the reward might incur if the proof is deemed invalid". The offer does not state who would judge the evidence, but of course the judges would be appointed by the antis themselves. If a suit were to be filed to collect the reward, the court might rule that the offer was a gambling bet which should not be enforced by a court. Such a suit would require at least $25,000 for the bond and legal fees. Even if it were won, however, there is no assurance that the money could be recovered from the individuals who sponsor the reward. Most of them are elderly and scattered widely throughout the United States and Canada.

Since the scientific community is so solidly in favour of fluoridation, antis try to discredit it entirely by use of the *conspiracy gambit.* The beauty of the conspiracy charge is that it can be levelled at anyone and there is absolutely no way to disprove it. After all, how does one prove that something is not taking place secretly? Favourite "conspirators" are the U.S. Public Health Service, the American Dental Association, the American Medical Association, the Communist Party and the aluminium industry. Apparently, in the minds of the antis, these groups could all

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be working together to "poison" the American people!

Local promoters are often accused of being in the employ of "vested interests". An individual is rarely accused directly since that could trigger a lawsuit for defamation of character. Instead, a question is asked: "Could it be that Dr. So-and-so is really working for the aluminium industry?" Years ago, the conspiracy gambit would work primarily with the very paranoid. But in the post-Watergate era, it may seem realistic to a wider audience.

"This is only the beginning!" is a related gambit. "First *they* will add fluoride, then vitamin pills and the next thing you know it will be birth control pills!" Who *"they"* are does not need to be specified.

Scare words will add zip to any anti campaign. Not only the more obvious ones like "cancer" and "heart disease", but also more specialized ones like "mongoloid births" and "sickle cell anemia". *Ecology words* are currently in vogue. Calling fluoride a "chemical" can strike fear in the minds of any Americans who fear we ware already too "chemicalized". The fact that water itself is a chemical and the fact that chemists will be sensible and selective will not reassure everyone. Fluoride is called "artificial" and "a pollutant" which is "against nature". Faced with the fact that fluoridation merely copies a natural phenomenon, the antis reply that "natural" fluoride differs from "artificial" fluoride – a fact as yet undiscovered by scientists.

The "against nature" concept led to an exchange which was reported in the Lincoln, Nebraska *Star*. During the fluoridation bill debate, Nebraska State Senator Richard Proud suggested that God would have fluoridated water if he wanted it so treated. Senator Ernest Chambers answered, "And if He had wanted you to smoke, He'd have put a chimney on your head".

Once fluoridation has begun in a community, antis can resort to the *"cause of all evil" gambit* – blaming fluoridation for everything that occurred after it started. An example of this tactic, one that backfired on opponents, took place in Cleveland on June 1, 1956. That was the day fluorides were to be added to the city's water supply. That day, the phone calls began – "My goldfish have died". – "My African violets are wilting". – "I can't make a decent cup of coffee". – "My dog is constipated". Although reactions like this would usually be recognized as psychological, this time their nature was beyond question. Last minute problems had delayed the start of fluoridation for a month!

"Let the People Decide"

The antis' most persuasive argument, both to legislators and to the public, is to call for a public vote. On the surface, this appears to be the democratic way to settle the issue. But the antis are dealing from a stacked deck. First, the people who need fluoridation the most – the children – do not vote. Second, it is not difficult to confuse voters by flooding their community with scare propaganda. The average citizen does not have the educational background to sort our claim and counterclaim or to judge which "authorities" to believe. To turn against fluoridation, he does not need to accept *all* the anti arguments – *just one*. The sheer bulk of the controversy is itself likely to arouse doubt in the minds of most voters.

Occasionally, a brave profluoridation group will attempt a referendum as a last resort to overcome the resistance of its local government. But make no mistake about it – the referendum is *primarily* an anti-fluoridation device. Antis who say, "Let the people decide", may sound as if they wish to use a democratic process to make the decision. But experience in many cities has shown otherwise. If fluoridation wins a referendum, the usual anti response is to work for another one. In a few states where local laws allow repeated referenda on the same subject, fluoridation has been in and out, and in and out again. When this happens, not only do children suffer unnecessary dental costs, but their tax-paying parents pay the high costs of the referenda.

Curiously, studies have shown that referenda can lose even in communities where public opinion favours fluoridation. People will usually go to the polls to vote against whatever they *don't* like. So the crucial factor in many referenda is the ability of proponents to mobilize their supporters.

The value of getting out the vote was never more strikingly demonstrated than in the 1973 referendum in Seattle, Washington. The vote was 115,000 for fluoridation and 49,000 opposed. The key to victory was an unprecedented move by Sheldon Rovin, D.D.S., Dean of the University of Washington School of Dentistry. Two weeks before the election, Dr. Rovin excused students and faculty members from class so that they could participate in a door-to-door campaign. In all, 500 doorbellers saturated the city with their pleas to residents. Person-to-person contact just before the vote worked in Seattle just as it might for any political candidate anywhere – by instructing voters on how to cast their ballots and by giving them a brief opportunity to share their concerns. One homeowner agreed to vote for fluoridation if the

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...would help him move his television set ...the basement.

The Seattle fluoridation forces were extremely well-organized and were very sophisticated politically. They had a broad base of support from community organizations such as unions, the PTA and the Chamber of Commerce. But they also had *no sizeable* opposition.

The Devout Anti

Most people who power local and national anti-fluoridation movements see themselves as saviours of their fellow men. Many of them make opposing fluoridation their single great mission in life. Others combine fluoridation among a variety of causes related to health. Antifluoridationists are often active against mental health programs, compulsory immunization and animal research.

Most damaging to the cause of fluoridation are the few antis who are physicians, dentists or others who professionally should be able to judge fluoridation on the merits. Some of them are simply misinformed. Others are alienated for reasons unconnected with fluoridation, but take this cause to get back at the scientific community which they feel has "slighted" them.

What makes a devout anti tick? Three prominent psychiatrists suggested an answer in *Psychodynamics of Group Opposition to Public Health Programs*, an article which appeared in 1960 in the *American Journal of Orthopsychiatry*. Some are motivated by lust for personal power, prestige or gain. Some are motivated by great anxieties or hostilities, the sources of which are unconscious. Antis commonly perceive public health measures as a threat to their "sense of wholeness", and must passionately defend themselves against the "forcible entry" of any "foreign body" or "foreign agents" — whether this be a vaccination, an interracial contact or a wave of immigrants from overseas. Any of these is apt to be a mortal threat to their "whole way of life".

It is important to realise that a devout anti cannot be disillusioned by facts.

The Cancer Scare

The most active anti in America today is John Yiamouyiannis, Ph.D., "Science Director" of the National Health Federation. Yiamouyiannis is a biochemist who was hired by NHF on June 1, 1974, for the purpose of opposing fluoridation. Since that time, he has written several reports and has travelled throughout the country to give speeches, testify at hearings and meet with legislators. NHF attributes the defeat of the Los Angeles referendum to his vigorous leadership.

Yiamouyiannis is often accompanied by Dean Burke, Ph.D., another biochemist. Burk is a retired emplyee of the National Cancer Institute, the highly respected branch of the U.S. Public Health Service which evaluates proposed cancer treatments to see if they work. But in recent years, Burk has been a major promoter of the worthless cancer remedy Laetrile.

Yiamouyiannis and Burk claim that fluoridation causes cancer. But their claim is based upon a *misinterpretation* of certain government statistics. In true anti fashion, they compared cancer death rates in fluoridated and non-fluoridated cities. But they failed to consider various factors in each city (such as industrial pollution) which are known to raise the cancer death rate. When the National Cancer Institute did a *genuine* comparative study, it found *no* link between fluoridation and cancer. Undaunted, Yiamouyiannis and Burk charged NCI with a "cover-up". They were joined in this hoax by Congressman James Delaney, who is an anti of long-standing.

Curiously, the National Health Federation has itself been concealing information about fluoridation. In 1972, NHF granted $16,000 for a study to the Center for Science in the Public Interest, a group founded by former associates of Ralph Nader. While it was under way, NHF proudly announced that the study would "put the fluoride controversy into proper perspective". When the study came out *favourable* to fluoridation, however, NHF suddenly became silent about it.

Don't Be Misled

As a public health measure, fluoridation is unusual in several ways. It is a copy of a naturally occurring phenomenon. It is supported by libraries full of articles which document its safety and effectiveness — more so than any other public health measure. It is supported by a variety of health, scientific and other civic groups which could hardly be expected to agree on any other single measure. But most significant, it is the only health measure which is often put to public vote.

If you live in a community with fluoridated water, consider yourself lucky. If you do not, don't let the poisonmongers scare you. Fluoridation is a modern health "miracle".

CONGRESSIONAL RECORD

NATIONAL HEALTH FEDERATION: THE QUESTIONABLE VITAMIN LOBBY

Hon. Paul G. Rogers

of Florida

IN THE HOUSE OF REPRESENTATIVES

Monday, December 16, 1974

Mr. Rogers. Mr. Speaker, I understand that Members have received thousands of form letters which have been circulated by Clinton R. Miller, lobbyist for the National Health Federation. These letters urge support for the industry-oriented Proxmire-Hosmer bill (H.R. 10093) and oppose the consumer-Oriented Kyros bill (H.R. 1617). Mr. Miller and the National Health Federation have been misrepresenting, distorting, and emotionalizing the vitamin issue in order to try to pass a bill backed by certain irresponsible members of the health foods industry.

Mr. Miller and the National Health Federation have been passing themselves off as "consumer representatives", even though they support an industry-oriented bill, which is opposed by genuine consumer groups such as the American Association of Retired Persons, the National Retired Teachers Association, and the Noner-backed Health Research Group of Public Citizen.

For further information on the vitamin legislation, Members and their staffs should refer to other information which my colleague, Mr. Kyros and I inserted in the CONGRESSIONAL RECORD on October 16, 1974, pages E6583-E-6584; Tuesday, December 10, 1974, pages H11552-H11554; and Friday, December 13, 1974, pages E7112-E7113.

Why is the National Health Federation and Mr. Clinton Miller taking an industry-oriented position on vitamin legislation? Members should read the attached memorandum from the Deputy Assistant Commissioner for Public Affairs to the Acting Commissioner of Food and Drugs of the Food and Drug Administration, Department of Health, Education, and Welfare, regarding the criminal and other legal actions taken against individuals associated with the National Health Federation, which Clinton Miller represents.

The memorandum follows:

DEPARTMENT OF HEALTH, EDUCATION
AND WELFARE

May 15, 1973

TO: Acting Commissioner of Food and Drugs

FROM: Deputy Assistant Commissioner for Public Affairs; Director, Office of Legislative Services

SUBJECT: Report on the National Health Federation--Information Memorandum

This memorandum updates a previous memorandum issued October 21, 1963, and is intended to provide you with background on the activities of the National Health Federation. Currently, this organization is promoting a mass write-to-Congress campaign against the recently issued special dietary food regulations, and urging support for H.R. 643, a bill which would virtually destroy all FDA control over the health claims made for special dietary foods. The Agency is receiving numerous Congressional and public inquiries as a result of this campaign.

The National Health Federation was founded in 1955 by Fred J. Hart, shortly after he consented to a Federal court injunction prohibiting him from making further shipments of 13 electrical devices which had been widely distributed for the diagnosis and treatment of disease. Mr. Hart had for many years been president of the Electronic Medical Foundation, Previously known as the College of Electronic Medicine. The "College" was established by the late Dr. Albert Abrams, inventor of a "blood spot" system of diagnosis known as Radionics."

Following the injunction, the Food and Drug Administration investigated reports that Hart was continuing to distribute the devices. He was prosecuted for criminal contempt of the injunction and on July 27, 1962, he was fined $500 by the U. S. District Court at San Francisco. At that time the court was informed that the Electronic Medical Foundation had been discontinued on June 16, 1962, leaving Mr. Hart free to devote his efforts to the National Health Federation.

The major stated purpose of the Federation is to promote "freedom of choice" in health matters. The record shows that what this frequently means is freedom to promote medical remedies and devices which violate the law. From its inception the Federation has been a front for promoters of unproved remedies and quackish theories. It has consistently supported discredited medical treatments such as the outlawed Hoxsey cure for cancer and other equally worthless treatments. Currently they are promoting Laetrile.

RESULTS OF COURT ACTIONS

Court records show that a number of the founders, officers, directors and active members of the National Health Federation have been involved in court actions under the Federal Food, Drug, and Cosmetic Act.

Among those prosecuted, fined and/or imprisoned have been the following:

Fred J. Hart, founder and now Chairman of the Board. Mr. Hart was enjoined against the Electronic Medical Foundation on March 15, 1954, from distributing 13 electrical devices charged as misbranded with false claims for the diagnosis and treatment of hundreds of diseases and conditions. In 1961 he was prosecuted for violating the injunction, entered a plea of "no contest" and was fined $500

V. EARL IRONS, Chairman of the Board of Governors (1963). Mr. Irons was then a food supplement distributor who served a one-year prison sentence in 1957 for Misbranding Vit-Ra-Tox, a vitamin mixture sold by house-to-house agents. His conviction by the Federal Court at Boston was upheld by the Court of Appeals on April 24, 1957.

ROYAL LEE, deceased Director, member of the Board of Governors and one of the founders of the Federation, was a non-practicing dentist at Milwaukee who was twice convicted for violating the Federal Food and Drug law. On April 1962, he was given a one-year suspended prison sentance and put on probation for three years by the Federal District Court at Milwaukee. His firm, Wilmarth Products Company, was fined $7,000. A court order prohibited them continuing to ship 115 special dietary products misbranded by false claims for the treatment of more than 500 diseases and conditions.

ROY F. PAXTON, Director (term ending 1963) was twice convicted as the promoter of "Millrue", a worthless cancer remedy. Mr. Paxton was convicted the second time in February 1963 by the Federal District Court at Springfield, Illinois. He was fined $2,500 and served a three-year prison sentence. The corporation, Millpax, Inc., was fined $1,000.

ANDREW G. ROSENBERGER, listed as "Nutrition Chairman" and a featured speaker at NHF national conventions. Mr. Rosenberger, representing the firm "Nutrition Food Centers," at Cambridge, Massachusetts, was convicted of misbranding dietary food products. On June 19, 1962, Andrew Rosenberger and his brother Henry, were each fined $5,000 and the corporation was fined $10,000 by the Federal District Court at Boston. Each of the Rosenbergers received a six-month suspended prison sentence and was put on probation for two years. The sentences were upheld by the Court of Appeals.

The Washington representative of the Federation continues to be Clinton R. Miller, Vice President. Before coming to Washington, Mr. Miller was the proprietor of the Clinton Wheat Shop at Bountiful, Utah. One of his products, Dried Swiss Whey, was seized on charges that it was misbranded as a treatment for intestinal disorders.

The aims and purposes of the National Health Federation are shown by its monthly publication, NATIONAL HEALTH FEDERATION BULLETIN, a pocket-size magazine puslished at San Francisco with Fred J. Hart listed as "Managing Editor."

RECENT DEVELOPMENTS

On April 9, 1971, Kurt W. Donsbach, currently Vice President of NHF pleaded guilty to practicing medicine without a license on charges brought by the State of California. According to the State records, the case culminated a five-month investigation by the Fraud Section of the State Bureau of Food and Drug Inspections.

Undercover agents of the California State Bureau of Food and Drug Inspections made repeated visits to Donsbach's "Nature's Way Health Food Store" in Garden Grove, California. They reported business "very good", usually with about 15 persons waiting to see "the doctor". Donsbach represented himself as a chiropractor, a naturopath, and a "Bachelor of Therapeutic Science." Investigation disclosed he is not licensed as a chiropractor in California, and the State does not recognize the other credentials. His driver's license identified him as an M.D.

The case resume' states that the California agents found that Donsbach was receiving "patients" in his "consulting room" and prescribing organic vitamins, minerals, etc. for disorders ranging from spastic colons to menopause and from serious heart aliments to breast cancer.

A woman agent was told by Donsbach on several occasions that her "breast cancer" could be controlled if she followed his advice and adhered to a strict diet with vitamins, minerals, and a herbal tea called "chipparral."

Another woman agent was told that her "emphysema" and "heart condition" would be helped 100 percent by following a regimen of vitamins, minerals and herbs.

A man agent was instructed to take cabbage tablets daily to cure "stomach ulcer."

The cost of Donsbach's treatment to the woman agent with "breast cancer" would have been approximately $60 per month. With this as a yardstick for ten patients daily, and a five-day week, the California authorities estimated a gross income to Donsbach of around $2 million a year.

Donsbach was fined $750 plus $2,000 costs of investigation, and placed on probation for two years. Additionally, he consented to stop all "nutritional consultation" in the State of California.

Aside from his "health food" store, Kurt W. Donsbach is president of Nutrapro Labs, Inc., of Garden Grove, California. The firm's stationery indicates it deals in proteins, vitamins, stock formula, private labeling, custom formulation, contract development, market research, and unusual cosmetics.

The NHF continues to advocate and defend ill-founded and unsupported theories and practices, even for the treatment of serious disease conditions such as those described above, under the guise of the "right to freedom of choice" in health matters. The NHF contends that only those products and procedures with are intrinsically injurious should be legally restricted. This philosophy, of course, exposes innocent members of the public to worthless products, false hopes, and a return to the long discarded philosophy--"let the buyer beware!"

Such a philosophy fails to recognize the danger of reliance on unproven or ineffective agents in the treatment of serious disease which can be just as dangerous to the patient as the use of intrinsically injurious substances. One example of this NHF position is the continued advocacy in their association journal of the "right" of persons to obtain cancer remedies which are illegal in the United States because their merits, even for research purposes, have not been established.

NHF maintains that there is a right to sell food and other articles for their presumed health benefits, whether or not there is any scientific evidence to support the claims to promote them. A good example will be found in the November 1972 issue of the NATIONAL HEALTH FEDERATION BULLETIN. This issue contains an article entitled "How to Survive in a Poisoned World," by Paavo O. Airola, an Arizona naturopath. The article exaggerates the effects of air and water pollution and then prescribes approximately a dozen "health foods" and vitamins and minerals as effective antidotes. Scientifically, the material is nonsense. This type of literature also provides unethical or misguided publicity on such products with sales promotion material which exploits widespread fears and misconceptions.

Currently, NHF is carrying on a lobbying campaign in Congress against FDA's regulations which update obsolete (1941) rules on the labelling of special dietary foods. Under the laws as passed by Congress in 1938, the label for a food for special dietary uses must include "such information concerning its vitamins, minerals, and other dietary properties" as the regulation prescribes as "necessary in order to fully inform purchasers as to its value for such uses." The law also authorizes FDA to establish standards of quality and identity for food, including food supplements. The NHF's expressed philosophy is wholly contrary to the intent of Congress in enacting these laws. Further, their exaggerated views concerning the value of many vitamins and minerals and many other substances are not supported by recognized nutrition and medical authorities both inside and outside Government.

Directly related to the National Health Federation campaign against FDA's dietary food regulations is a massive campaign for legislation which would exempt "health food", vitamins, minerals, etc. from being proven safe and effective by their sponsors when they are offered for the treatment of diseases. Present law offers full consumer protection by requiring that articles intended to treat disease conditions must be proven safe and effective BEFORE they can be placed on the market. Legislation being advocated by NHF would substantially weaken this protection which has been part of our law since 1938. The NHF bill (H.R. 643) would bring about this rollback in consumer protection by permitting the marketing of articles used in treating diseases or conditions without any assurance that they are safe and effective. The burden would be shifted to the Government to detect and remove dangerous products after they have been marketed (i.e. locking the barn door after the horse is stolen). In the meantime, of course, the public is exposed to such dangerous untested and ineffective products. Thus, a loophole would be opened for a return of the famous "patent medicine" style of promotion with "food supplements" taking the role of the "snake oil" remedies of bygone times; good for everything.

The NHF sponsored legislation would also reverse requirements of present law regarding proof of safety of food additives. In addition, present law deems a food to be adulterated if it contains a substance which "may be" injurious to health; yet the NHF bill would permit protective action only when a product is intrinsically injurious to health. Here again, this legislation would inappropriately shift the burden to the Government rather than the manufacturer who should bear this responsibility when he undertakes to market a product. We believe most consumers would not want to lose this protection against potential hazards.

According to the U. S. Postal Service, paid subscriptions to the NHF Bulletin (sworn statement filed August 18, 1972) totaled 18,173. Membership, however, is estimated to be about 10,000.

We, of course, are concerned about the effects of this campaign on the uniformed consumer. We will continue to monitor the inquiries received. The Department's formal bill report on this legislation has issued and, at least, members of Congress now have more detailed information on the impact of this bill.

John T. Walden

Gerald F. Meyer

Emery W. Thurston, NHF director, was convicted and sentenced July 24, 1973, [illegible] prescribing and selling the unapproved new drug Laetrile to an agent of the [illegible] of Food and Drug, California State Department of Health, who represented [illegible] Thurston that she had uterine cancer.

The affidavit of the agent is attached. (Not reproduced)

The defendant was fined $500 and assessed $125 (Peace Officer Training [illegible]ment). The fine was suspended and the defendant placed on probation [illegible] 24 months on condition that he not sell or promote the sale of Laetrile [illegible] cancer, and not engage in the practice of medicine without a license.

Court Cases

Over the years the legality of fluoridation has been tested repeatedly. Courts in over one-half of the States have heard fluoridation cases, and the constitutionality of fluoridation has been upheld by the Supreme Court in over a dozen States. In addition, at least eight times cases have been taken to the United States Supreme Court, and to date, no final decision has been unfavorable toward fluoridation regardless of the charges presented.

A summary of both domestic and foreign fluoridation litigation through 1966 is contained in the attached publication, "Fluoridation: The Courts and the Opposition," Clark, Robert E. and Sophy, Michael M.

The following highlights of five cases that were heard over the last few years have been included to exemplify the continuing effort by the opposition to combat fluoridation through the courts:

1. Aitkenhead vs. Borough of West View

Plaintiffs filed action to enjoin the defendant borough and water authority from continuing to fluoridate the public water supply. It was the contention of the plaintiffs that the addition of fluoride at 1 ppm was a menace to their health and that of the public because a link between fluoridated drinking water and cancer had been established by a new epidemiological study authored by Drs. Dean Burk and John Yiamouyiannis.

Judge Flaherty, Court of Common Pleas of Allegheny County, Pennsylvania, issued a preliminary injunction on November 16, 1978, which prohibited the addition of fluoride to the water supply treated at the West View Water Authority's Neville Island facility. This prohibition was to remain in effect until the court held a final hearing on the matter or until the matter was submitted to, considered by, or dealt with by the Pennsylvania Department of Environmental Resources, taking into account the evidence previously heard by Judge Flaherty.

The defendants (West View Water Authority) immediately appealed Judge Flaherty's preliminary decree of November 16, 1978, to the Commonwealth Court. Under the Pennsylvania Rules, an appeal to the Commonwealth Court operated as an automatic stay of the injunction pending the appeal. Judge Flaherty subsequently reinstated the injunction, but the Commonwealth Court superseded that action by Judge Flaherty and reinstated the automatic supersedeas. Therefore, from and after the November 29 order from the Commonwealth Court, no injunction was in effect.

After a full review of the evidence, the Department of Environmental Resources refused to give its permission to the water authority to

discontinue fluoridation of the water. It was this order of January 10, 1979, which led to the subsequent order of the Commonwealth Court on February 21, 1979, which dismissed the appeal from the preliminary injunction. This Commonwealth Court ruling held that the Department of Environmental Resources' decision was one of the conditions which would dissolve Judge Flaherty's preliminary injunction by his own terms. The Commonwealth Court did at this time order Judge Flaherty to determine whether or not he had jurisdiction in equity before he proceeded to any final hearing on the matter. On May 25, 1979, Judge Flaherty entered an order sustaining his jurisdiction in equity. The West View Water Authority appealed this finding to the Commonwealth Court. At present, both the plaintiffs and defendants are now engaged in appeals to higher courts regarding the jurisdictional issue of whether or not the Court of Common Pleas properly had jurisdiction in the West View water case.

In summary, Judge Flaherty's original opinion has not been judicially distributed, but it remains without effect. The West View Water Authority has never discontinued fluoridation at anytime throughout the litigation. The merits of this case - of whether or not fluoridation of public water is dangerous and may cause cancer - have not been heard nor will they be until the jurisdictional issue is resolved.

L. Yiamouyiannis vs. Schneiderman

The plaintiff filed this action to recover damages for defamation regarding statements to the news media following the entering of a preliminary injunction by the Pennsylvania Court on November 6, 1978. Purportedly, the defendant stated that the Burk-Yiamouyiannis study failed to adjust for age, race, sex, and geographic factors. The plaintiff contended that he did make said adjustments and the fact that he did was known to the defendant at the time of his statements to the media. Also, the plaintiff charged that the defendant spoke with willful and reckless disregard for the truth and that he spoke with "personal spite" and "ill will" and with malice. On February 5, 1980, Judge Penn, United States District Court for the District of Columbia, denied the plaintiff's but granted the defendant's motion for a summary judgment and dismissed the case with prejudice.

3. Yiamouyiannis vs. Consumer Reports

Plaintiff filed an 8 million dollar libel suit charging that he had been defamed by Consumer Union's two-part report on fluoridation. This report criticized Dr. Yiamouyiannis' claims that fluoridation causes cancer as being baseless and misleading. On May 30, 1975, Judge Owen, United States District Court for the Southern District of New York, granted a summary judgment in favor of Consumer Union against Dr. Yiamouyiannis. Judge Owen further stated in his opinion that "the suggestion is strong that the plaintiff's objective in bringing this action is to use this court to discourage the publication of opposing views." Subsequently, this case was appealed and the summary judgment issued by Judge Owen was upheld in the U.S. Court of Appeals, 2nd Circuit.

4. Ford vs. City of New York

Plaintiffs filed a class action contending that fluoridated water is a public and private nuisance; that fluoride in water constitutes "refuse"; that fluoridation is an unconstitutional deprivation of life; and the decision to continue to fluoridate the city's water supply is arbitrary and capricious because fluoridated water is poisonous, carcinogenic, and allergenic. On November 27, Judge [illegible] Supreme Court, New York County, dismissed this complaint.

5. City of Brainerd vs. State of Minnesota

A series of suits, appeals, and counter-claims have been filed by the city of Brainerd from 1973 through 1979. The culmination of this litigation, which included appeals to the Minnesota Supreme Court and the United States Supreme Court, ended in February 1980, when the city of Brainerd complied with the court order by fluoridating their water supply in accordance with Minnesota Stat. S 144.145. It should be further noted that the State of Minnesota invoked an 18-month moratorium on the need to comply with the State Fluoridation Law and convened a Governor's Commission to study the health effects regarding fluoridation. This Commission, which retained Dr. Yiamouyiannis as a consultant and examined the same body of evidence presented in Judge Flaherty's court, reached the following conclusion: that "the claims that fluoride is allergenic, mutagenic, or carcinogenic are not supported by the preponderance of available scientific data."

The Safe Water Foundation

Dear Friend:

This is a personal appeal to have you attend the National Health and Safe Water Foundation Health Expo 80. For anyone at all concerned about the fight for health rights, attendance at this convention is mandatory.

This is a crucial time. While national legislation is pending on both the fluoridation and Laetrile issues, and amidst one of the most important fluoridation cases now in progress in Illinois, renegades bent on using the National Health Federation for their own promotion and personal gain have refused to honor the demands of the NHF Board of Governors: (1) to reinstate Marshall McNott and myself (approved by the Board of Governors by a vote of 14-1), (2) to dissolve the Executive Committee (by a vote of 13-2), and (3) to dismiss Clinton Miller (by a vote of 13-4) and have illegally withheld funds to fight the major health rights battles.

Unless the Board of Governors exerts its authority to stop the present raping of the National Health Federation by Clinton Miller, Curt Donsbach, Kirkpatrick Dilling, and Betty Lee Morales, the NHF will be lost.

No matter what the result, a determination will be made at the Columbus Health Expo 80 Convention as to whether or not an interim organization will be set up to handle the health rights fight until the NHF can put its act together and, in the event that this does not occur, tentative provisions will be made to establish a permanent organization to take over the areas that the NHF has abandoned.

We're going all out. Won't you? Please attend.

Sincerely,

John Yiamouyiannis, Ph.D.
6439 Taggart Road
Delaware, Ohio 43015

P.S. The lineup of top speakers alone makes Health Expo 80 a must!

At this time when a substantial part of the support to fight fluoridation has been precipitously and illegally cut off, I urge you to help see us through this difficult period with a generous donation.

Enclosed is my donation in support of the Illinois court case.

___ $10 ___ $100 ___ $1000 ___ $_____

Name_____Street_____

City_____State_____Zip_____

National Antifluoridation Congres

NEWSLETTER

Volume II Number 3 April, 1980

FLUORIDATION IN THE UNITED STATES

*Attempts by the Center for Disease Control (CDC) to fluorid- date cities and towns around the United States using federa tax dollars as an incentive has met with opposition, not only in Washington, D.C., but also at the grass roots level as can be seen by the following results of the April primari

*Residents of Abilene, Kansas defeated fluoridation by a vote of 1329 to 626.

*Residents of Athens, Texas defeated fluoridation by a vote of 675 to 396.

*Residents of Augusta, Kansas defeated fluoridation by a vote of 1317 to 545.

*Residents of Humboldt, Kansas defeated fluoridation by a vote of 403 to 304.

*Residents of Show Low, Arizona defeated fluoridation by a vote of 433 to 65.

*Residents of Wamego, Kansas defeated fluoridation by a vote of 597 to 349.

*Residents of Winfield, Kansas defeated fluoridation by a vote of 1984 to 903.

*CDC's request for $9.5 million to promote fluoridation may also have suffered a serious setback when CDC admitted, in response to questions from Labor-HEW Appropriations Subcommittee Member Sylvio Conte, U. S. Representative from Massachusetts, that:

(1) They were unable to provide a single laboratory study showing that fluoride at 1 ppm was effective in reducing tooth decay.

(2) "There has never been a blind study in the human population" showing a reduction in tooth decay. Note: A blind study is one of the minimum requirements for obtaining the unbiased data necessary for an objective study.

(3) They were unable to provide a single unbiased study which indicated "beyond any reasonable doubt that fluoridation (is) . . . safe and not harmful to the people."

*In further testimony before the House Subcommittee on Labor-HEW Appropriations, Dr. Yiamouyiannis (Dr. Y) pointed out that contrary to claims by CDC's Dr. Millar, "the Flaherty Decision has to this day not been overturned by anyone."

He addressed CDC Director William Foege's statement that for every dollar spent on fluoridation of public water supplies, $50 would be saved by pointing out that Dr. Foege was unable to provide a study showing that this or any reduction in dental costs occurs in any town, city, or other geographical area. Dr. Y cited ADA statistics which showed from 1958 to 1970, dental costs of the 10 most fluoridated states increased 237% compared to an increase of 214% in the 10 least fluoridated states.

*After Dr. Y cited his letter from the British Ministry of Health regarding acknowledgement that Dr. Y's cancer studies simultaneously adjusted for age, sex, and race, CDC withdrew from its testimony the claim that Dr. Y's studies had not made such a correction.

*Richard Hunter, a waterworks employee in Cincinnati, Ohio, claims that fluoride exceeded the levels set by state law on September 6 and 9, 1979 and created a health hazard in the drinking water. After Hunter went to the U.S.E.P.A. charging that the plant had violated the law, he was fired. On April 24, he appealed his firing to the Cincinnati Civil Service Commission.

*The Supreme Court has handed Americans a powerful, new weapon to defend themselves against civil rights abuses at the local level. The court has warned city and county governments that they can be held financially accountable in the courts for any policies that violate the constitutional rights of their citizens. Until now, local governments could avoid damage suits by simply arguing that officials charged with violations were acting in "good faith" in carrying out official policy. This applies to cities and counties imposing mandatory fluoridation, especially in areas such as Annapolis.

*On April 14, the Illinois Court Case to stop fluoridation statewide began. Original predictions were that the case would last 3-4 weeks. However, it has become evident within the first week that the State's attorney is trying to drag the case out.

BITING DOWN

*(On March 20, 1980, the Levittown Tribune published the following statement).

> Like it or not, 26 years ago the Levittown Tribune aided in a campaign to bring fluoride additives to our drinking water. Under Tribune sponsorship, petitions were circulated and apparently enough signatures were gathered to make the Town of Hempstead add the chemical as a dental preservative measure. Levittown and Carle Place are the only independent water supplies in Nassau County that have elected to accept fluorides, despite the long-standing controversy about their nutritional value and their side effects. Among these most vocal against fluoride is our neighbor Joy Grand. She reminded us that, in part, the Tribune was responsible for the fluoridation drive in 1953

and 1954. Despite the fact that there are 17,000 homes in Levittown, only 2,600 signatures brought in the fluoride under a carefully contrived campaign backed by the aluminum industry and endorsed by the American Dental Association. Since that time some very disturbing evidence has cropped up in the case against fluoridation. We do not know how solid this is, but we feel that you, the reader and the recipient of the chemical, should be the judge. Not the Levittown Tribune. So for the next few weeks, Joy Grand is going to have her full say about the issue. And, of course, we welcome rebuttals. And at the end of the series, we are going to ask you, our readers, to indicate whether or not you want fluoride to remain in your drinking water. After all, it took only a fraction of our residents to bring fluoride to Levittown at what the Water Commissioner calls "great expense." It should take an equal number of signatures to turn off the valve forever.

(We commend the Levittown Tribune for being open-minded and honest enough to change their position regarding fluoridation. We hope that their courageous action will serve as an example to other newspapers whose second thoughts on fluoridation may have been chilled by peer pressure and set aside because of dogmatic positions they had taken in the past.)

INTERNATIONAL NEWS

*In a letter dated 24 March 1980 from G. K. Matthew, Britain's Principal Medical Officer (Britain's counterpart of the U. S. Surgeon General) to Dr. Y, he writes: "At your recent meeting with Dr. Gerard Vaughn /Britain's Minister of Health/ and Sir George Young /Britain's Deputy Minister of Health/, I was unable to thank you for the various papers which you sent under cover of your letter of 6 February 1980 and, in one case, subsequently. Sir Emmanuel Kaye particularly asked that I should nevertheless write to place the receipt of these papers on the record. I am glad to do so and to confirm, as Sir Emmanuel particularly asked, that this unpublished material shows that you have carried out analyses of the twenty city data /on fluoridation and cancer/ which simultaneously take account of age, sex, and race, in the compositions of the populations of these cities." (emphasis added).

*The following is an excerpt of a communication from P. Clavell Blount, chairman of the National Anti-Fluoridation Campaign, England: "In his informative Newsletter received today (April 8), Dr. John Yiamouyiannis says that 83 (British) M.Ps have already signed in opposition to fluoridation. When Dr. Yiamouyiannis visited England early in March, 83 M.Ps had by then signed an Early Day Anti-Fluoridation Motion tabled last July by Mr. Ivan Lawrence, M.P. But the total number of M.Ps who had signed in opposition to fluoridation with the National Anti-Fluoridation Campaign had exceeded 83 several years ago - even before Mr. Lawrence had changed from pro- to anti-fluoridation. When Dr. Yiamouyiannis visited England last month the total number of anti-fluoridation M.Ps including those who had signed Mr. Lawrence's Early Day Motion was more than 150. We have sent Dr. Yiamouyiannis a list of the names of these M.Ps and hope he will make a correction in the next issue of his excellent Newsletter."

SPECIAL REPORT: THE NATIONAL HEALTH FEDERATION IN CRISIS

*On January 4, 1980, after trying unsuccessfully to eliminate, through internal efforts, certain corrupt practices going on at the National Health Federation, Dr. Y submitted his resignation as NHF Science Director. In his resignation letter, he pointed out how his efforts to stop fluoridation were being sabotaged by the Executive Director, Clinton Miller; that hundreds of thousands of dollars had been bilked from members and friends of the NHF through a mail order scheme (Viguerie) spawned by Clinton Miller (little, if any of this money ever made it to the NHF); and that Clinton Miller had tried (unsucessfully) to pressure Dr. Y into illegally claiming that funds raised for the NHF were tax-deductible (when they were not). Although Dr. Y's resignation was unanimously rejected by the Board of Governors, it was revealed that the Chairman of the Board, Kurt Donsbach, had clandestinely tried to get the Executive Committee to fire Dr. Y prior to the Board meeting for fear that he would blow the whistle on these activities during his speech at the Annual NHF Convention where he was a scheduled speaker. In their attempt to hold Dr. Y, the Board promised to terminate its dealings with Viguerie, put Clinton Miller on probation, get a Washington, D.C. lobbyist, and give Dr. Y a 60% raise for the year of 1980.

Two months later, Kurt Donsbach and other members of the Executive Committee illegally broke Dr. Y's contract with the NHF and fired him. Within three weeks Dr. Y was reinstated as Science Director by a 14-1 vote of the NHF Board, which also voted to dissolve the Executive Committee by a vote of 13-2 and to dismiss Clinton Miller by a vote of 13-4. Since that time, Kurt Donsbach and Clinton Miller, accompanied by NHF Executive Committee Member Betty Lee Morales and NHF Board Member Kirkpatrick Dilling have refused to honor the Board's mandate as well as Dr. Y's contract, and as a result funds for Dr. Y's salary and expenses in the fluoridation controversy have been cut off.

A special meeting of the NHF Board of Governors has been set for July 24-25 to settle the controversy. In the meantime, the Safe Water Foundation will have to bear the additional expenses of maintaining the effort through court cases, research, and educational projects regarding fluoridation.

It appears that this controversy has set two factions of the NHF apart. The hucksters, who have used the NHF for their own personal gain, and the consumerists, who have used the NHF in the public interest. The Safe Water Foundation certainly hopes that the consumerists win and return the National Health Federation to its stated purpose, i.e. to protect the consumer from government infringement of their health rights and to inform the consumer of health frauds whether they be perpetrated by the government in the form of fluoridation and swine flu fiascos or whether they be perpetrated by the hucksters in the form of phoney cures or phoney Ph.D.s in nutrition.

National Antifluoridation Congres

NEWSLETTER

Volume II Number 4

May, 1980

FLUORIDATION IN THE UNITED STATES

*On May 5, water fluoridation in New Bedford, Massachusetts was stopped. Last November, New Bedford voters rejected fluoridation 20,000 to 10,000; however, a small group of city residents and the Massachusetts Dental Society filed a lawsuit forcing fluoridation to continue in New Bedford until a decision was reached. On May 2, the court ruled against the dental society and ordered a halt to fluoridation according to the wishes of the residents.

*On May 20, Portland, Oregon residents rejected fluoridation by a vote of 58,000 to 50,000. Two years ago Portland residents had narrowly passed a fluoridation measure.

*On May 22, Ohio Federal Court Judge John Manos agreed to review briefs from Plaintiffs seeking to stop fluoridation and Defendants seeking to institute fluoridation. He called a status conference for September. In the meantime, Cuyahoga Falls, ordered to fluoridate by the Ohio EPA on or before March 19, 1980, will not have to fluoridate or even purchase the equipment necessary to fluoridate.

*As of this publication, the Illinois trial has dragged on for 6 weeks. On May 21, just after the Plaintiffs had rested their case, the Defendants moved to have the case dismissed. At 12:00 noon Judge Ronald Nieman called a recess and returned the following morning to rule that the burden of proof showing fluoridation was harmful had been met by the Plaintiffs and that the burden had been shifted from the Plaintiffs to the Defendants who now had to show by the testimony of their witnesses, that fluoridation is safe. We expect that the trial will end within the next 3-4 weeks.

*The Pennsylvania Supreme Court ruled that the Commonwealth Court can properly determine jurisdiction in the Aitkenhead vs. West View Water Authority case before any additional testimony is heard and before a final decision on the merits of this case is made by the trial court. We had hoped that the Pennsylvania Supreme Court would have returned the case back to the trial court for immediate hearing and final decision on the merits before the Commonwealth Court considered jurisdiction. The effect of this ruling will be to drag this case out for another 3 to 6 months.

*On May 2, Mayor Bob Powell of Monroe, Louisianna, ruled out fluoridation. Despite pressure from a local dentist, he stated that there was no need for a hearing on fluoridation since the city did not approve of the idea.

*Richard L. Hunter who was fired after accusing co-workers of putting too much fluoride in city drinking water, lost his complaint to the Cincinnati Civil Service Commission. On May 7, 1980 he filed an appeal in the Hamilton County Court with a request for a jury trial.

*The Grand Rapids (Michigan) Press reported on March 8 that "Voters here /in Pentwater, just outside of Grand Rapids/ would become a political barometer Monday on a major nationwide campaign, just as Iowa was for presidential campaigns. Pentwater voters will decide Monday whether they wish to have the village water supply fluoridated." Two days later voters turned down fluoridation as well as CDC grants to pay for the necessary equipment and training, as well as 2 years of chemical costs by a vote of 156 to 94.

*On May 15, Baldwinsville (New York) City Council turned down fluoridation 5-2. Among those testifying against fluoridation were Dr. Lennart Krook, Dr. Paul Buck, and Dr. Y.

*Rockland County, New York wins its day in court. Pressures from the Board of Health to get Rockland County to fluoridate have been set aside by a court decision to determine whether the Board's mandate to fluoridate is arbitrary and capricious by exposing the residents of the county to serious health risks. In a separate action, the city of Suffern, New York got a stay of an order from the "Health" Board to fluoridate immediately.

*From May 6 to May 13, Dr. Robert Mick and Dr. Reuben Benner of New Jersey; Mary Louise Dennis, Pauline Gulio, and Eleanor Krinsky of New York; Grace Gerencher and Manny Roth of Pennsylvania; Joseph Genko of Washington, D.C.; and Martha Bevis of Texas took time out of their lives as private citizens to inform the members of the House Subcommittee on Labor-HEW Appropriations as to the health hazards of fluoridation. According to staff members and Representatives, they had a profound impact. One staff person pointed out that the CDC was unable to answer important questions that they had raised. Another alluded to "a flood of letters". The subcommittee members and their staffs were reported to be "uncomfortable" with the conflict and afraid to challenge the U.S.P.H.S. and the A.D.A. They seem to prefer instead to lend their support on the basis of the freedom of choice or the fiscal issue.

*A computer (TRS-80 Model II) has been contributed to the Safe Water Foundation. The computer will be used to print mailing labels sorted by zip code, avoid duplication in mailing, register donations, typeset the Newsletter, and serve for storage and retrieval of scientific information as well as tabulation and calculation of scientific data. It will compute receipts of donations which will be compiled on a yearly basis and sent out with the January or February issue of the NAFC Newsletter. For those desiring individual receipts for each donation, please write on the outside of the envelop "Individual Receipt Requested."

Christian Science Committee On Publication
For Illinois
8 South Michigan Avenue · Chicago, Illinois 60603 · (Area Code 312) 372 5267

April 17, 1980

Hon. Ronald Niemann
Circuit Court Judge
Madison County, Illinois

Dear Mr. Niemann:

In the matter before the court concerning fluoridation of water in [redacted] Alton, Illinois, the Christian Science church wishes to submit the following statement for the information of the court.

As far as the Christian Science church is concerned the decision of Christian Scientists on the issue of fluoridation is one of individual conscience. The church simply does not involve itself denominationally in this controversy. Mr. George Miscott, who is a member of a local Christian Science church in Evanston, Illinois, but not of the national denomination, is, of course, free to speak from his own convictions as an individual, but he is not authorized to speak for the denomination or for Christian Scientists in general. This does nothing to change the fact that compulsory fluoridation may violate the right of the individual in his freedom of choice in the matter of personal health.

Christian Scientists approach matters of physical well being, as they do all other aspects of their lives, in the broad context of Christian religious conviction and healing. There may be those who through the years, and of many different religious persuasions, have disapproved of attempts of health authorities to impose current views about health prevention on the public. The Christian Science church, however, recognizes the greater public interest and does not take a stand that would deprive others of health care that they feel desirable and necessary.

It should, also, be strongly noted that when the issue has been decided, and by statute the public has been brought under a specific requirement, such as fluoridation or innoculation, Christian Scientists are known for their obedience to the law. The Christian Science church, therefore, does not now and has not taken a public position against fluoridation.

Sincerely yours,

Robert A. Johnson

Robert A. Johnson
Committee on Publication

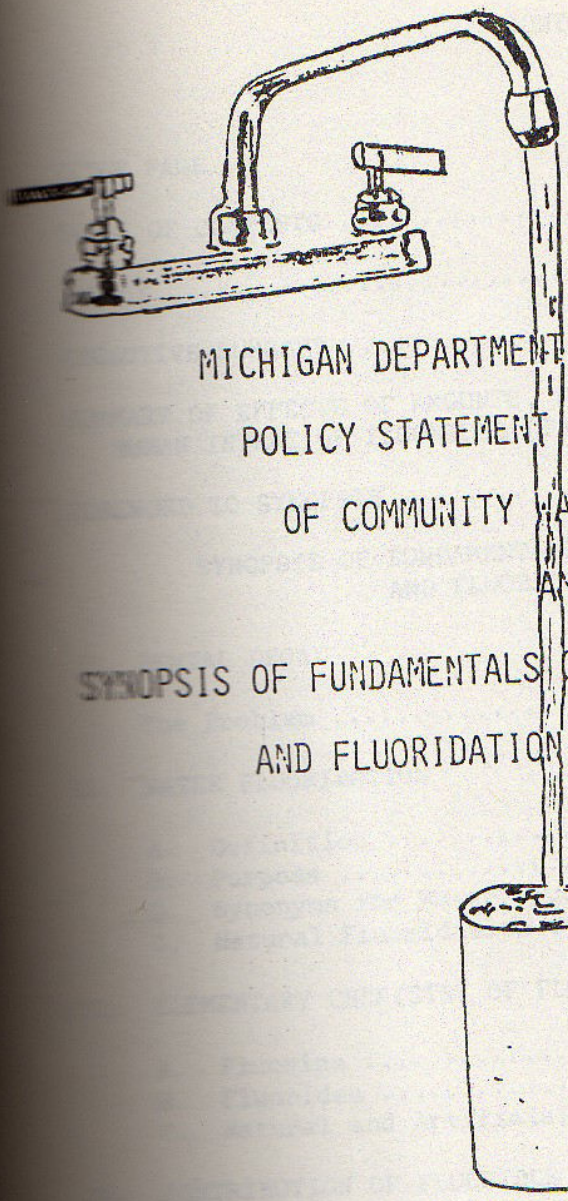
ORGANIZATIONS ENDORSING FLUORIDATION

NATIONAL

Am. Academy of Allergy
Am. Academy of Pediatrics
Am. Assoc. for Advancement of Science
Am. Assoc. of Dental Schools
Am. Assoc. of Industrial Dentists
Am. Assoc. of Public Health Dentists
Am. College of Dentists
Am. Dental Association
Am. Dental Health Soc.
Am. Dental Hygienists' Assoc.
Am. Heart Assoc.
Am. Hospital Assoc.
Am. Institute of Nutrition
American Legion
American Medical Association
American Nurses' Association
American Osteopathic Assoc.
Am. Pharmaceutical Assoc.
Am. Public Health Assoc.
Am. Public Welfare Assoc.
Am. School Health Assoc.
Am. Soc. of Dentistry for Children
Am. Veterinary Med. Assoc.
Am. Water Works Assoc.
AFL-CIO
Assoc. of Public Health Veterinarians
Canadian Dental Assoc.
Canadian Medical Assoc.
College of Am. Pathologists
Comm. on Chronic Illness
Consumers Federation of Am.
Envir. Protection Agency
Federation of Am. Societies for Experimental Biology
Federation Dentaire Internationale
Great Britain Ministry of Health
Health Insurance Assoc. of Am.
Health League of Canada
Inter-Assoc. Committee on Health
International Dental Federation
Joint Comm. on Health Problems of the Am. Med. Assoc. and the National Education Assoc.
National Commission on Community Health Services
National Congress of Parents and Teachers
National Education Association
National Health Council
Nat. Institute of Municipal Law Officers
National Research Council
Office of Civil Defense
Pan Am. Health Organization
Society of Toxicology
State and Territorial Health Officers
U.S. Department of Agriculture
U.S. Dept. of Defense - Army, Navy, Air Force
U.S. Dept. of Health, Educ., Welfare
Food and Drug Admin (RDA)
Public Health Service
U.S. Jr. Chamber of Commerce
World Health Organization
International Association of Dental Research

STATE

Michigan Academy of Pedodontics
Michigan Association of the Professions
Michigan Dental Association
Michigan Dental Hygienists' Association
Michigan Department of Public Health
Michigan State Medical Society
Visiting Nurses Association



MICHIGAN DEPARTMENT OF PUBLIC HEALTH

POLICY STATEMENT ON FLUORIDATION OF COMMUNITY WATER SUPPLIES

AND

SYNOPSIS OF FUNDAMENTALS OF RELATION OF FLUORIDES AND FLUORIDATION TO HUMAN HEALTH

PREPARED BY:

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

MAURICE S. REIZEN, M.D., DIRECTOR

CONTENTS

TITLE PAGE ..... A

TABLE OF CONTENTS A-1

POLICY A-4

EXECUTIVE SUMMARY A-5

SUMMARY OF EFFECTS OF AMOUNTS, FORM AND FREQUENCY OF HUMAN INTAKE OF FLUORIDES (TABLE) A-8

FOREWORD TO SYNOPSIS A-9

SYNOPSIS OF FUNDAMENTALS OF RELATION OF FLUORIDES AND FLUORIDATION TO HUMANS

I. DENTAL DECAY

The Problem A-10

II. WATER FLUORIDATION

A. Definition A-10
B. Purpose A-11
C. Synonyms for Water Fluoridation A-11
D. Natural Fluoridation A-11

III. ELEMENTARY CHEMISTRY OF FLUORIDES

A. Fluorine A-11
B. Fluorides A-11
C. Natural and Artificial Fluorides A-12

IV. DISTRIBUTION OF FLUORIDES IN NATURE

A. Soil A-12
B. Atmosphere A-12
C. Foods A-13
D. Water A-13

1. Surface Streams, Lakes and Oceans A-13
2. Ground Source for Drinking A-13

V. HISTORY OF FLUORIDATION

A. Early History of Fluorides and Tooth Decay A-14
B. Laboratory Analyses and Water of Naturally Fluoridated Areas A-14
C. Studies in Naturally Fluoridated Areas of the U.S.A. and World A-15

CONTENTS, Continued

V. HISTORY OF FLUORIDATION, Continued

D. Addition to Fluoride-Deficient Supplies A-15

1. Grand Rapids, Michigan A-16
2. Newburgh, New York and Brantford, Ontario A-16
3. Muskegon, Michigan A-16
4. Midland, Michigan A-17
5. Today (1979) A-17

VI. INTAKE AND BODY METABOLISM OF FLUORIDES

A. Intake of Fluorides A-17

1. Fluoride as an Essential Mineral Nutrient A-17
2. Fluoride Content of Food A-18

a) Fluoride in seafood A-18
b) Fluoride in tea A-18
c) Today's foods A-19
d) Variation in food A-20
e) Inadequacy of fluorides in foods for children A-20

3. Intake From Air A-20
4. Intake From Water A-21

B. Body Utilization of Fluorides A-21
C. Excretion of Fluorides A-21
D. Equation for Total Intake, Metabolism and Excretion .. A-23
E. Total Fluoride Intake A-23

1. Infant Foods A-23
2. Daily Total Fluoride Intake in Children A-24
3. Daily Fluoride Intake of the Adult Male in a Fluoridated Area A-24
4. Body Metabolism and Excretion in the Adult Male .. A-25

F. Summary on Intake and Metabolism of Fluorides A-25

VII. ENAMEL OPACITIES OR MOTTLING IN FLUORIDATED AND NONFLUORIDATED AREAS

A. Indistinct Mottling in Areas With One ppm of Fluorides in Drinking Water A-26
B. Noticeable Mottling in Areas With Excess Fluorides in Drinking Water A-27
C. Necessary Ages for Fluorosis of Teeth A-27
D. Nonfluoride Opacities or Mottling in Fluoridated and Nonfluoridated Areas A-28

CONTENTS, Continued

VIII. FLUORIDATED WATER, FLUORIDES AND THE HUMAN BODY

A. Teeth A-29
B. General Health A-29
C. Body Tissues and Fluids A-29
D. Pregnancy A-30
E. Birth Defects Including Mongolism A-30
F. Growth and Development A-31
G. Heart and Cardiovascular Disease A-31
H. Eyes and Ears A-31
I. Enzymes A-31
J. Kidney A-32
K. Thyroid A-32
L. Skeleton and Bones A-32
M. Rheumatism and Arthritis A-33
N. Mortality A-34
O. Cancer A-34
P. Allergy A-34
Q. Diabetes A-35

IX. BENEFITS OF FLUORIDATED WATER A-36

X. COST BENEFITS OF WATER FLUORIDATION A-36

XI. COMMUNITIES REPORTING DENTAL BENEFITS A-37

XII. COMPARISON OF OTHER METHODS OF PREVENTION OF TOOTH DECAY BY FLUORIDES (TABLE) A-39

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

POLICY STATEMENT ON FLUORIDATION OF COMMUNITY WATER SUPPLIES - 1979

(Based on Recent Synopsis of Fluorides and Fluoridation)

In 1949, the Michigan Department of Public Health issued a statement of support for the study of water fluoridation in Grand Rapids, the first community in the world to fluoridate in 1945. This statement did not recommend the addition of fluorides to public water supplies. When benefits of community fluoridation were reported one year later from Grand Rapids, water fluoridation of all public water supplies was recommended by the Michigan Department of Public Health in July, 1950. This policy was confirmed in 1952, 1953 and 1955 with each subsequent report of continued benefits of water fluoridation in Grand Rapids.

Studies in the naturally fluoridated areas established the relationship of fluoride at about one part per million in water to the reduction of tooth decay. The original study of community water fluoridation in Grand Rapids duplicated these same benefits of less tooth decay. The data in Grand Rapids have been supported by almost comparable current results in Newburgh, New York and Brantford, Ontario. Evidence of dental benefits has been found repeatedly in other communities of Michigan, the U.S.A. and throughout the world.

No adverse physiological effects from water with optimum fluoride have been confirmed in studies in naturally fluoridated areas and in early phases of community water fluoridation. A review of recent evidence of this country and the world upholds these original conclusions that there are no significant hazards from fluoridated water to humans on this continent and the environment. This therefore forms a positive consensus of opinion for water fluoridation by scientific organizations throughout the world.

In January of 1978, Governor Milliken requested the Michigan Department of Agriculture and the Michigan Department of Public Health to review the intake of fluorides in Michigan and to pay particular attention to possible health hazards of increased intake. The report to the Governor indicated that there is no reason to change the state's policy concerning the value of adjusting drinking water fluoride content to one part per million.

On the basis of the original investigations, the recent scientific evidence of the benefits, efficacy and safety of water fluoridation, and its own reviews, the Michigan Department of Public Health recommends and encourages that all local communities approve and adopt this preventive measure to correct any deficiency of fluorides in their drinking water to the optimum level. Local dental, medical and other professional societies should be included in all deliberations and their advice obtained.

Reviews of this nature are not static. The department has been and will continue to be receptive to additional scientific information regarding fluoridation from any source.

Maurice S. Reizen, M.D.
Director

EXECUTIVE SUMMARY

Tooth Decay

Tooth decay is recognized as a widespread chronic disease in man that destroys body tissues and produces pain, discomfort, fever and infection which can spread into other tissues such as the lymph glands and tonsils. Death can occur from this disease because of complications with valvular disease of the heart, especially bacterial endocarditis. Tooth decay may result in absence from school or work and increasing costs of treatment of this disease may strain a family or a community budget.

Fluorides on this Earth

Fluorides are not a recent discovery by man in a laboratory but have been present on this earth probably since its creation. Fluorides are present as inorganic compounds in rocks and soil throughout the earth's surface. Some organic fluorides occur naturally but do not have any relation to fluoridation because of their insolubility. Fluorides are present in minute amounts in nearly every food and water supply. Unfortunately these very small amounts in foods are too low for the prevention of tooth decay. Some water supplies become naturally fluoridated as the original water seeps through the rocks and soils and absorbs fluorides during this route. These waters retain sufficient amounts of the fluoride ion for the prevention of tooth decay. Natural fluorides have been present in the water supply of millions of people for generations and fluoridation adds this an identical fluoride ion to the same level in community water supplies as the concentration in the protective naturally fluoridated waters.

Definition of Water Fluoridation

Water fluoridation is the controlled adjustment of a water supply of a temperate climate to an optimum concentration of about one part of the fluoride ion in a million parts of water or 1/10,000 of one percent of fluorides in water.

Fluoridation does not affect the taste, the odor or the color of water. Hardness of the water has no relation to benefits of fluoridation. Fluoridation does not affect the use of water for any domestic or industrial purpose.

Benefits of Water Fluoridation

Children drinking water with a significant amount of fluorides since birth have about two-thirds less tooth decay than children with water with insufficient fluorides. The optimum concentration of fluorides in water in temperate zones is about 0.9 - 1.2 parts per million for these dental benefits. Some other benefits to general health are indicated through fluoridation such as better condition of the bones of the elderly population. Financial savings in dental treatment can be realized through the lesser amount of tooth decay in children of fluoridated communities.

History of Fluorides and Fluoridation

The early history of the relationship of fluorine and dental decay began in the last quarter of the 19th century. Lower amounts of tooth decay were observed along with discolored teeth (mottled enamel) in some regions of the U.S.A.

One investigator thought that the mottled enamel appeared to be caused by something in the drinking water which, in 1931, was discovered by a new laboratory analysis to be an excessive amount of fluorides in the water. At this time it was noted that trace amounts of fluoride in water might inhibit dental decay with no noticeable staining or pitting. A series of studies in naturally fluoridated communities were carried out by the U.S. Public Health Service in 1938, and a direct relationship was established between the proportion of fluorides in drinking water and the amount of tooth decay among children who drank the water since birth. Some children in South Dakota, Wisconsin and Colorado had stained teeth from too much fluoride, but this entire population also had less tooth decay than groups of children in the same states with very little fluoride in their drinking water.

These studies in the natural fluoride areas of the U.S.A. were confirmed by scientists in similar areas of other countries. It was concluded that one part per million of fluoride in water does not produce any observable mottling of teeth or any undesirable hazard to the general health of humans but does produce less tooth decay.

The next step was to see if the same benefits could be attained by increasing the concentration of fluoride-deficient water of a community water supply to a level of one part fluoride per million parts of water. In 1945, controlled studies of fluoridation began at Grand Rapids, Michigan, Newburgh, New York, and in Brantford, Ontario. The results of these studies after more than 10 years showed a uniform and constant reduction of dental decay and demonstrated that fluoridated domestic waters exert the same reduction of tooth decay as observed in naturally fluoridated areas. Fluoridation is merely the transference of a natural phenomenon to a disease control measure of widespread usefulness to man.

In 1979, there are more than 6.7 million people drinking fluoridated water in [illegible] Michigan communities; in addition, 105 million American people and a total of [illegible] million people in England, Russia, Canada, Netherlands, Chile, German Democratic Republic and other countries of this world drink fluoridated water.

Fluorides in Water

Some water supplies have too little natural fluoride, some too much, and others just the right amount. Too little fluoride in water will not reduce tooth decay, but too much fluoride (much more than two parts per million) even in a temperate climate may cause pitting and staining of the teeth in some individuals. The amount of available fluorides is dependent on the solubility of the different inorganic compounds. At the optimum concentration (about 0.7 - 1.2 parts per million in temperate climates) upwards to two-thirds of tooth decay can be prevented.

Fluorides in Food

Although fluorides are present in almost all foodstuffs in some trace amounts, food does not contain enough fluoride to prevent tooth decay in children. The intake of fluoride from food was not a primary consideration in studies in naturally fluoridated regions of the U.S.A.; the essential determination was the inverse relation of the concentration of fluorides in drinking water to the amount of tooth decay in a population. A recent review by the Michigan Department of Public Health confirmed an insignificant impact through food processing with fluoridated water. In

unfluoridated areas fluoride tablets or drops have to be used because of insufficiency of fluoride in foods for dental benefits.

Metabolism of Fluorides in the Human Body

Fluorides are rapidly excreted by the body. The amount excreted depends on the intake of fluorides and the absorption by the body--in children, proportionally more fluoride is retained by the body during tooth and bone development. As the skeletal system matures and tooth development and bone growth ceases, a higher percentage of the intake of fluorides is excreted. Only enough fluorides are used by the body of an adult to satisfy the ionic exchange between the bones and blood. The excretion of fluoride is very rapid as one-third of an oral dose can be excreted in three hours and, in 24 hours, 60 percent of the oral dose of fluorides is eliminated from the body.

History of Fluoridation

Reputable scientific organizations throughout the world support water fluoridation and recommend one part per million of fluorides in the water supply in areas of temperate climates as safe, beneficial and economical and not productive of any undesirable systemic effect in man. No significant abnormal systemic or functional effects, except for some mottling of teeth, have occurred in Americans who have used waters containing as high as eight parts per million fluorides for as long as 17 years. At one part per million no noticeable mottling occurs but marked protection against tooth decay does occur.

Detailed studies of the relation of general health to fluoridation throughout the world by scientists of many disciplines and countries have not demonstrated any effect of fluoridation on mortality rates or illness. Fluoridation has had no effect upon the prevalence and incidence of cancer, arthritis, allergies, heart disease, birth defects and diseases of bones, skin, eyes, endocrine glands, kidneys, liver, nerves, blood, lungs or digestive system. However, physicians may recommend limiting fluoride intake for patients having kidney disease so severe that they cannot excrete fluoride.

Acute poisoning by fluorides does occur when there is accidental ingestion of excessive amounts of the raw chemical. Chronic poisoning also has occurred in cases of long term chronic industrial exposure to very high levels. Several reports described skeletal changes in the tropic zones of India resembling those of the chronically exposed industrial workers. No confirmation has been presented that the amount of skeletal accumulation after ingestion of waters at about one part per million or even higher in the temperate climate of the U.S.A. has been harmful. Chronic fluorosis is not found generally in temperate climate of the world.

Alternatives to Water Fluoridation

Other methods of reducing tooth decay either by fluorides or by some other agent or agents have been suggested as alternatives to water fluoridation. On a community basis no other method has been proven to be as effective, safe, economical or practical as water fluoridation in the reduction of tooth decay.

SUMMARY OF EFFECTS OF AMOUNTS, FORM AND FREQUENCY OF HUMAN INTAKE OF FLUORIDES

Amounts of Fluorides or Concentration in Water	Form and Frequency of Intake	Effect	Safety Factor or Remarks
Less than 0.7 parts per million in water	Drinking water	No reduction in tooth decay with trace amounts Some reduction occurs up to 0.7 p.p.m. (Section V.-A.)	Supplementation of fluorides necessary through tablets or other means for the reduction of tooth decay.
0.7 - 1.2 parts per million in water	Drinking water daily during childhood from birth	Maximum reduction of tooth decay (Sections V-C & IX)	Only normal & routine ingestion of water is necessary with daily living. Optimum concentration will vary according to mean annual temperature.
About 2.5 parts per million or higher in temperate climates	Continual drinking of water daily before the ages of 8-12 years	Noticeable or objectionable dental mottling (See Sec. VII.)	Would require at least twice the normal daily intake of water fluoridated at one part per million
Eight parts per million in drinking water in the U.S.A.	Daily intake of drinking water	Nonsignificant skeletal fluorosis in 10% of adult population (Sec. VIII L.)	One would have to drink eight times the normal amount of water fluoridated at one part per million.
20-80 milligrams per day as in chronic industrial exposure	Daily intake for 15-20 years of water with very excessive amounts of fluoride or by long term chronic exposure to industrial materials and fumes	Skeletal fluorosis or Industrial fluorosis (See Section VIII L.)	Would require excessive daily intake of water with excessive amounts of fluoride for many years. Industrial exposure can occur in nonfluoridated area
250-500 milligrams	Raw chemical, instant dose (usually accidental)	Acute ill effects of nausea, vomiting and abdominal symptoms	Fluoridated water at one part per million would have to be ingested in the amount of over 60 gallons instantly. Not possible from usual food and drink
9500-9800 milligrams	Raw chemical, instant dose (usually accidental)	Acute effects leading to death	About 800 gallons or more of fluoridated water (one part per

FOREWORD

This synopsis on fluorides and fluoridation summarizes the epidemiological evidence of effects on human beings diversely functioning in many communities of this world and among environmental variations of this earth. The statements are as concise as possible from a multitude of information and from opinions of scientific organizations.

The bibliography mainly contains references pertinent to man but some reports on animals are listed for supporting information and for clarity. In the course of examination of the entire subject of the relation of fluorides and fluoridation to human beings, the scope of the scrutiny involved all facets both favorable and unfavorable. As a result, several unfavorable reports are included in the bibliography for objective consideration of the reader.

Two sections of references are presented. The first group contains reports of the past decade, 1968-78. The publications represent comparatively recent evidence. Reports previous to 1968 are listed in the second section and are included for their original contribution to this scientific subject. Although the bibliography does contain numerous references, it is only a partial listing of the available information. From 1970 to the present, approximately 3500 scientific publications about fluorides are listed in the scientific literature.

Numbers in parentheses refer to bibliography at the end of the synopsis.

SYNOPSIS OF FUNDAMENTALS OF RELATION OF FLUORIDES AND FLUORIDATION TO HUMANS

I. DENTAL DECAY

The Problem:

Tooth decay is a disease since body tissues are destroyed; loss of function, disfigurement, pain and illness result.

Dental decay can become a chronic disease and affects nearly all human beings.

Unless interrupted by treatment, dental decay progresses until teeth have to be removed, since decayed teeth are not self-repairing tissues of the body.

Untreated decay is so common that its consequences of discomfort and loss of teeth are considered inevitable.

The child or an adult with an aching, decayed tooth and/or a swollen face cannot perform satisfactorily at school or at work.

The increasing costs of dental treatment can be a heavy burden to the family pocketbook or community health budget.

Badly decayed teeth can become abscessed with the spread of infection into the soft and hard tissues, and to tonsils, lymph glands and other organs and may lead to death from bacterial endocarditis.

People with valvular diseases of the heart may suffer additional heart damage when septic teeth are removed.

(4, 11, 49, 187, 190, 249, 377)

II. WATER FLUORIDATION

A. Definition

Water fluoridation is the controlled adjustment of the water supply to a concentration of one part of the fluoride ion in a million parts of water or 1/10,000 of a percent of fluorides in water, and this adjustment must comply with legal regulations and principles of water engineering for a safe, wholesome and potable water supply.

N.B. Water fluoridation or fluoridated water as mentioned in this text will refer to drinking water at this optimum concentration of one part per million unless otherwise noted.

This level of about 0.7 - 1.2 parts per million of fluorides in water is recommended for temperate climates (Michigan). For tropical or colder climates, the concentration must be adjusted accordingly.

(49, 128, 148, 187, 190, 249, 308, 309, 310, 339, 341, 403, 409)

III. WATER FLUORIDATION, Continued

B. Purpose

The recommended level of fluorides is for the prevention of tooth decay; maximum reduction that can be expected is upwards to two-thirds of the lifetime accumulation of dental cavities.

(4, 49, 123, 187, 194)

C. Synonyms for Water Fluoridation

The process also is described as community, regulated, supplemental or artificial fluoridation.

D. Natural Fluoridation

Natural fluorides in water refer to the concentration of fluorides deposited naturally in water.

(369, 370, 371)

IV. ELEMENTARY CHEMISTRY OF FLUORIDES

A. Fluorine

Fluorine is a chemical element or atom and does not exist in nature in a free and unmixed state as it readily unites with other elements to form fluoride compounds.

Compounds are chemical combinations formed by an exchange of electrons of two or more other elements. Each element forming the chemical compound does not behave in the same manner as the original element itself.

An organic compound is a chemical combination which includes carbon in its chemical structure.

(18, 250, 321, 371)

B. Fluorides

When fluorine combines with other elements to form compounds, it becomes a fluoride.

Fluorides are usually found as inorganic salts in nature.

In water, fluoride is dissolved and separated from the other chemical elements and exists in water as a fluoride ion with its own distinct properties.

Organic fluorides have no connection to water fluoridation since the fluoride ion is not released in solution.

III. ELEMENTARY CHEMISTRY OF FLUORIDES, Continued

B. Fluorides, Continued

The only concern in the relation of water fluoridation to humans is the fluoride ion because it is the only form, with rare exceptions, that is absorbed, metabolized and circulated in the human body.

(18, 40, 250, 321, 371)

C. Natural and Artificial Fluorides

Some individuals suggest a distinction between the different fluoride compounds used in water fluoridation.

Calcium fluoride, because of its wide natural distribution, is usually designated as the natural fluoride whereas, for example, sodium fluoride is representative of fluoride compounds added to water. Other compounds commonly used in water fluoridation are: sodium silicofluoride and hydrofluosilicic acid.

Any of these compounds, when dissolved in water, will yield the same fluoride ion by ionization in water. However, sodium fluoride or the silicofluorides have a high rate of solubility and, therefore, a high rate of ionization when dissolved in water as compared to calcium fluoride with a low rate of solubility and, therefore, low rate of ionization.

The relatively low solubility of calcium fluoride in water usually makes it an uneconomical and impractical compound for use in water fluoridation.

(9, 18, 250, 252, 371, 374)

IV. DISTRIBUTION OF FLUORIDES IN NATURE

A. Soil

Fluorides occur throughout the earth's crust as calcium fluoride or fluorspar in mineral rock and ore.

(18, 163, 170, 250, 371)

B. Atmosphere

Fluorides are present in the air only in very minute amounts except during the occasional episodes of heavy industrial pollution. (This industrial pollution of air by fluorides and other substances is being corrected by combined efforts of government and industry.)

Stations of the National Air Sampling Network routinely measure fluoride concentrations in the air.

(28, 170, 204, 231, 321, 322)

III. DISTRIBUTION OF FLUORIDES IN NATURE, Continued

C. Foods

Fluoride is a common chemical present in almost all food items but in very minute amounts.

A meal free of fluorides would be difficult to prepare from plant and animal food, but the fluoride intake is low from any meal except from a diet consisting of fish and tea.

Fluoride in foods is too low and inadequate for the prevention of tooth decay in children.

The use of fertilizers in agriculture has not produced any meaningful effect upon the fluoride content of the crops.

(40, 63, 83, 135, 143, 244, 250, 257, 345, 402)

D. Water

1. SURFACE STREAMS, LAKES AND OCEANS

Rivers - less than 0.3 parts per million of fluorides, but rivers in Western Texas contain 6.4 parts per million of fluorides.

Lakes - less than 0.3 parts per million; 7.3 parts per million in lakes of North Dakota and high of 2800 parts per million in Lake Nakuru in Africa.

Oceans - 1.2 parts per million (Atlantic and Pacific).

(2, 16, 18)

2. GROUND SOURCE FOR DRINKING

The source of water in the ground is the result of surface water which in passage through rocks and soil can become naturally fluoridated by absorption of fluorides from the rocks and soil.

The natural concentration of fluorides in drinking water can be of three levels:

a) Too low - in the United States most water supplies occur with fluorides at trace amounts to somewhat less than 0.7 parts per million. At trace amounts there is no reduction of tooth decay and generally the reduction of tooth decay increases as the fluoride content rises up to 0.7 parts per million.

IV. DISTRIBUTION OF FLUORIDES IN NATURE, Continued

b) Optimum level - some waters throughout the U.S.A. and other areas with temperate climates of the world have the necessary concentration of about 0.7 to 1.2 parts per million; this concentration is effective in reducing tooth decay with no confirmed hazard to man, animal or the environment.

c) High amounts - some water supplies in the U.S. and the world have amounts which are considered too high; individuals consuming water with concentrations above 2.5 parts per million of fluorides can exhibit noticeable signs of dental mottling; high levels of fluorides have been reported in the U.S. up to 8 to 14 parts per million. In Africa, drinking waters have been analyzed at 38 and 95 parts per million. A reduction of high fluoride content of these waters is appropriate.

(4, 170, 241, 250, 289, 290, 293, 294, 295, 296, 297, 308, 309, 310, 311, 322, 403, 409)

V. HISTORY OF FLUORIDATION

A. Early History of Fluorides and Tooth Decay

Early investigators of U.S.A., Britain and Italy in the last quarter of the 19th century originated the idea of the relationship of fluorides to tooth decay.

In 1916, Doctor Frederick McKay reported a study of mottled enamel with the observation that, although some individuals of the population did exhibit teeth with stains and pitting, less tooth decay was present in these populations. He advanced the theory that this condition may be due to some substance in the water.

(160, 300, 322, 354, 355, 356, 357)

B. Laboratory Analyses and Waters of Naturally Fluoridated Areas

In the early 1930s, a laboratory method was discovered which determined that this substance in the water was fluoride. This discovery led to the fluoride analyses of drinking waters throughout the U.S.A.

These examinations of the water supplies indicated that about four million people in the U.S.A. were drinking waters with significant or excess amounts of fluorides; one community water supply contained eight parts per million, and another 14 parts per million.

(284, 295, 322, 339, 340, 341)

V. HISTORY OF FLUORIDATION, Continued

C. Studies in Naturally Fluoridated Areas of the U.S.A. and World

A series of studies by the U.S. Public Health Service in 1938, found a direct relation between the concentration of fluoride in drinking water and the amount of tooth decay in children who drank the water.

Some children in Texas, South Dakota, Illinois, Arizona, Colorado and Arkansas had spotted or stained teeth from too much fluoride in the water, but also the entire group of children in these areas had less tooth decay than other children in the same state with very little fluoride in their drinking water.

These studies in the U.S.A. have been confirmed throughout other natural fluoride areas of the world.

By comparing the concentration of fluorides in the water supply to rates of tooth decay of more than 7,000 children in 21 American cities, studies in the naturally fluoridated areas of the U.S.A. established the principle that a maximum of tooth decay can be prevented among lifelong residents of the areas where the drinking water contained about one part per million of fluorides.

No body ills or defects in these populations could be associated with lifetime ingestion of this concentration of fluoride in the water supply; at this concentration, no apparent or noticeable mottling occurred.

In areas with more than 2-3 ppm, some individuals had the white or brown spots, and, with excessive concentrations, pitting and staining.

(13, 77, 190, 289, 290, 291, 292, 293, 294, 295, 306, 329, 333, 334, 343, 346, 347, 350, 351, 352, 354, 355, 356, 357, 377, 386, 392, 393)

D. Addition to Fluoride-Deficient Supplies

Nature illustrated the dental benefits through drinking water containing the optimum natural concentration of fluorides.

Water fluoridation is man's adaptation of a natural phenomenon into a method of disease control.

Water fluoridation is a scientifically refined and regulated procedure of adding fluorides to water for a definite concentration according to the climate and waters of the region.

Natural fluoridation occurs when fluorides dissolve into water as it passes through rocks and soil.

(25, 123, 155, 187, 261, 316, 403, 409)

V. HISTORY OF FLUORIDATION, Continued

1. GRAND RAPIDS, MICHIGAN

a) Reduction in tooth decay

The next step was to determine if the same benefits could be obtained in humans by increasing the concentration of the fluoride ion in fluoride-deficient water of some communities to the optimum level of one part fluoride ion per million parts of water.

In January 1945, Grand Rapids became the first city in the world to fluoridate its water supply. The results of the Grand Rapids study after 10 years of fluoridation showed a reduction on the average of about 60 percent in the decay rate for permanent teeth in children born in Grand Rapids after fluoridation.

Studies of more than 10 years in various communities throughout the world demonstrated that fluoridated domestic water supplies exert the same preventive effects on tooth decay observed in naturally fluoridated water supplies.

(123, 187, 256, 258, 259, 260)

b) Appearance of teeth

A study in Grand Rapids in 1961-2 showed that the tooth developed during ingestion of fluoridated water has improved color and translucency for an appealing look and is formed better than a tooth developed during the ingestion of non-fluoridated water.

(18, 299, 322)

2. NEWBURGH, NEW YORK AND BRANTFORD, ONTARIO

Newburgh, New York, and Brantford, Ontario started water fluoridation soon after Grand Rapids. The results in these two cities confirmed the findings in Grand Rapids.

(138, 261, 262, 263, 264, 267, 268, 269, 279, 280, 305, 324)

3. MUSKEGON, MICHIGAN

Nonfluoridated Muskegon was chosen as a control city with Aurora, Illinois for the comparison with Grand Rapids. When dental benefits began to appear in the early reports for Grand Rapids, Muskegon decided to adopt fluoridation and initiated the process in July, 1951, just six years after Grand Rapids.

(413)

V. HISTORY OF FLUORIDATION, Continued

4. MIDLAND, MICHIGAN

Previously, the city of Midland, Michigan started water fluoridation in 1946, or one year after Grand Rapids.

(359, 402)

5. TODAY (1979)

a) Michigan

To date, 440 Michigan communities have a fluoridated water supply--353 with controlled water fluoridation and 87 with a significant amount of natural fluorides; over 6.7 million Michigan people are drinking fluoridated water and nearly 95 percent of the population on a public water supply is drinking fluoridated water; more than one million Michigan residents of 46 communities have been drinking supplementally fluoridated water for 25 years or longer.

(151)

b) U.S.A.

In this country over 105 million people in over nine thousand communities have a fluoridated water supply; about 24 million people in over 100 cities with populations of 50,000 or more, including Washington, D.C. and Chicago have had adjusted fluoridation for more than 20 years.

(226)

c) World

More than 130 million people in the world are served by a supplementally fluoridated water supply; more than 13 million in Russia, 6.5 million in Canada, five million in Australia, three million in the United Kingdom, same number in the Netherlands and in Chile, and over one million in the German Democratic Republic. In Russia, it is planned to supply fluoridated water to 31 million people in the 1970s.

(77, 159, 198, 249, 250)

VI. INTAKE AND BODY METABOLISM OF FLUORIDES

A. Intake of Fluorides

1. FLUORIDE AS AN ESSENTIAL MINERAL NUTRIENT

The essentiality of fluoride as a mineral nutrient has been confirmed in reports of recent research by the Food and Nutrition Board, National Research Council, National Academy of Sciences; and by the United States Food and Drug Administration.

(12, 24, 76, 163, 169, 190, 197, 234, 235)

VI. INTAKE AND BODY METABOLISM OF FLUORIDES, Continued

2. FLUORIDE CONTENT OF FOOD

Foods have been analyzed for fluorides and generally contain a very low amount of fluoride with exceptions such as seafood and tea, which in comparison to other foods have a high content of fluorides; white bread, cereals, cheese and chicken contain fluorides in intermediate amounts.

(91, 146, 150, 164, 170, 174, 181, 182, 250, 321)

a) Fluoride in seafood

As in humans, fluoride is deposited mainly in bones of fish.

The edible portion of fish meat contains an average of one part per million with ranges of 0.2 to 5.0 parts per million or more.

Seafood such as canned sardines contains a very high concentration when bones are included in the edible portion.

(18, 137, 164, 169, 170, 190, 250)

b) Fluoride in tea

The fluoride content of various brands of dry tea leaves ranges from 3.2 to 300 parts per million on a fresh-weight basis.

The concentration of fluoride in liquid tea or infusion is dependent upon: the type of tea, the age of the tea leaves, the amount of tea used, the volume of water used, the fluoride concentration of the water and the brewing time.

A tea of medium strength made with nonfluoridated water contains an average concentration of 0.75 to 1.00 parts per million of the fluoride ion. When tea bags are used instead of tea leaves, the fluoride concentration may be lower. If the water itself is fluoridated then the yield is approximately doubled.

It has been demonstrated that fluoride in tea is somewhat less available than fluoride in water, because the fluoride ion in tea is not as readily absorbed as the ion in water.

A reasonable estimate is that an average adult tea drinker daily ingests about one milligram of fluoride, which is well below the 20 milligrams daily intake throughout 15-20 years for any chronic effects in adults; a maximum daily dose from tea for adults is estimated at 10 milligrams which is still below any toxic dose for adults.

II. INTAKE AND BODY METABOLISM OF FLUORIDES, Continued

b) Fluoride in tea, continued

Any danger of this additional fluoride to children is very low since children drink tea to a very small extent and in a much weaker dilution.

Occasionally tea may be consumed daily instead of water.

These situations may be more typical in a country such as England than the United States.

(18, 40, 146, 169, 174, 190, 224)

c) Today's foods

The total dietary source of fluorides, exclusive of that from drinking water is reported to range from 0.3 milligrams per day in low fluoride areas to 3.4 milligrams per day in high fluoride areas in the United States. This estimate is from World Health Organization and American Medical Association sources.

Confusion has resulted concerning the amounts of fluoride in foods because of recent suggestions that there is more fluoride in food now than was originally suspected. The following considerations probably influenced this thinking: 1) better methods of laboratory analysis for determining micro-minute amounts of fluoride in food and in the entire metabolic process of fluorides; 2) more interest has been developed in recent years regarding the analyses of additional foodstuffs and dietary patterns; and 3) the processing of food with fluoridated water. It is significant to note that food has been processed with fluoridated water in communities with naturally fluoridated water supplies since the existence of these water supplies.

A 1978 report by the Michigan Departments of Public Health and Agriculture summarized the information concerning estimates of fluoride levels from food analyses and concluded that: 1) some evidence supports the contention that the background level of fluorides in food had risen slightly between the 1940s and 1960s and it is reasonable to assume this increase is because food processors began to use fluoridated water; 2) the amount of this increase is no more than approximately 0.5 mg/day - a relatively small increment as compared to the effects of water fluoridation; 3) evidence does not support an increase between 1965 and the present; and, 4) no present evidence exists for a continued increase or escalation of the level of fluoride intake from food.

(20, 37, 69, 104, 126, 146, 150, 159, 161, 170, 213, 250, 254, 286, 411)

VI. INTAKE AND BODY METABOLISM OF FLUORIDES, Continued

d) Variation in food

Food itself may present many variations because of:

a) The wide variety of foods that may be produced and processed locally or imported from another geographic region of the world with different agricultural methods and food processing.

b) Diet patterns and preparation of food in races and countries with modifications of age, socio-economics, dietary habits, occupation and seasonal occurrence of climate, temperature and humidity.

(59, 126, 135, 146, 150, 161, 170, 210, 257, 278, 342, [illegible])

e) Inadequacy of fluorides in foods for children

Fluorides are present in micro-minute amounts in many food items and the intake of fluoride from food ingested by the average American child is low. Epidemiologic investigations consistently have demonstrated that the amount of fluoride ions absorbed solely from food and other sources than water during childhood is insufficient for the prevention of tooth decay.

The original and significant studies of the effect of fluorides in water in naturally fluoridated areas of the U.S.A. considered diet and food intake among other variables such as age, sex, [illegible] and ethnic origin in the study populations. The only factor which differed in these populations was the concentration of fluorides in the water supply. These differences in the drinking water were the determining factors in the studies of benefits and any possible hazards. In nonfluoridated areas fluoride intake from sources other than water had no consequence on tooth decay. Supplements of fluoride through tablets and liquids began in nonfluoridated areas for the prevention of tooth decay because of unavailability of the fluoride ion in the drinking water and the inadequacy of the ion from other sources than water.

(57, 150, 167, 174, 190, 260, 264, 293, 296, 321)

3. INTAKE FROM AIR

Fluorides in air are absorbed through the lungs during respiration in very minute amounts.

The National Air Pollution Control Administration has data that no hazards from inhaled fluorides exist to people living in a fluoridated community.

Estimates by this agency show that a person in his daily breathing of the environmental air for 24 hours would absorb a total of no more than 1/20 of the average daily uptake of fluorides from all sources or 0.045 milligrams per day.

III. INTAKE AND BODY METABOLISM OF FLUORIDES, Continued

4. INTAKE FROM WATER

Water is the principal dietary source of fluorides for dental benefits and for body utilization in children.

The effect of fluoride intake from water depends on the concentration of fluorides in the drinking water. Original investigations in nonfluoridated areas correlated this concentration with benefits and other effects.

The human body sets its own physiological limits on the volume of water that may be ingested within a time period.

Water in the daily intake of fluids may be replaced by other liquids; this substitution of other liquids for water may decrease or increase the necessary fluoride intake.

(40, 51, 59, 167, 169, 170, 174, 194, 195, 200, 257, 321, 410)

B. Body Utilization of Fluorides

Fluoride compounds will not affect the body unless the fluoride ion is released by the compound.

Stable and inert fluoride compounds are not absorbed and are excreted rapidly by the body.

Relatively insoluble compounds such as calcium fluoride release fluoride ions very slowly and in proportionally small amounts for absorption by the body.

The absorption of the fluoride ion depends on numerous factors including the solubility of the compound, the physical form of the ingested fluoride, the frequency of ingestion, the inorganic ion environment of the fluoride, the presence or absence of food in the stomach and the organic constituents of the diet. The stability of the inert compounds of organic fluorides may be such that no fluoride ions are released or absorbed.

Inorganic fluorides naturally present in normal diets are absorbed readily to an extent of about 80 percent, but the absorption of less soluble inorganic fluorides is reduced to about 50 percent.

(40, 84, 87, 167, 181, 211, 319, 321, 330, 371)

C. Excretion of Fluorides

Upon ingestion, insoluble fluorides are not absorbed by the body but are excreted in the feces.

VI. INTAKE AND BODY METABOLISM OF FLUORIDES, Continued

C. Excretion of Fluorides, Continued

Ingested soluble fluorides pass through the walls of the stomach and small intestine into the body fluids. The body tends to maintain a constant level in the blood and body fluids and during periods of high intake this level is maintained by bone deposition and urinary excretion.

Up to 80 percent of excreted fluorides is in urine. Fecal excretion accounts for almost the rest with perspiration accounting for a very low percentage except during periods of intense activity or exposure to high temperatures.

Normal kidneys excrete fluorides rapidly and efficiently--one-third of an oral dose can be excreted within three hours, the highest rate being within the first hour; 60 percent of the fluoride intake is excreted within 24 hours. The kidneys handle fluoride almost as easily as any ion in the water.

The amount excreted depends to a great extent on the age of the individual, the degree and duration of previous exposure to fluoride and the state of skeletal saturation.

More fluoride is retained for bones and teeth during development in children while a greater proportion is excreted by adults because less fluoride is needed proportionally for bone metabolism.

In an individual who begins drinking water with fluorides and has had a very limited previous exposure to fluoride, a larger percentage of a given dose will be deposited in bone and less excreted. The amount deposited in bone will lessen and the amount excreted will increase with age as exposure at a constant level continues. Ultimately an almost steady state of skeletal balance will be reached. As long as the balanced state is maintained the urinary excretion of fluoride approximates the intake. In the balanced state the urinary concentration has been found to very closely match the fluoride level of the drinking water which makes urinalysis a reliable indicator of the level of fluoridation, particularly if 24 hour specimens are obtained.

It has been shown that the fluoride retention in bones can be a reversible process. Thus, if individuals move from a high fluoride area their urine will show higher levels than current intake for a long period of time (up to two years has been demonstrated) reflecting the skeletal loss. This reduction of fluoride in bone will continue until the equilibrium between intake and skeletal deposition is again established. The body maintains its own equilibrium.

The amounts of fluorides excreted is dependent on the fluoride intake and the amount utilized by the body.

(28, 30, 52, 53, 75, 90, 94, 105, 170, 174, 190, 210, 221, 223, 241, 286, 317, 319, 321, 322, 331, 347, 371, 391, 416, 417, 418)

III. INTAKE AND BODY METABOLISM OF FLUORIDES, Continued

B. Equation for Total Intake, Metabolism and Excretion

Total fluoride intake from all sources = amount absorbed and metabolized plus amount excreted.

Fluoride intake determines the proportional amount of fluorides metabolized and excreted.

(40, 94, 105, 170, 190, 211, 223, 240, 347, 371)

C. Total Fluoride Intake

1. INFANT FOODS

Infant formulus and baby foods will vary in fluoride content considerably depending on the food item and the fluoride content of the water used in preparation or processing. Studies of baby foods have suggested an adequate intake of fluoride from certain infant preparations for infants 0-6 months of age.

The Committee on Nutrition of the American Academy of Pediatrics and the Council on Dental Therapeutics of the American Dental Association have stated that there is no additional need for fluoride from other sources for infants of an optimally fluoridated community. In nonfluoridated communities, suitable regimens for fluoride supplements in tablets and liquids are available for infants and children. Physicians and dentists should consider the fluoride content of any infant foods and have the infant's drinking water analyzed for fluorides before prescribing fluoride tablets or drops.

Human milk has been determined to be quite low in fluoride content.

Insignificant differences of dental fluorosis were found between formula-fed children and breast-fed children in Uppsala, Sweden with a natural concentration of 1.2 parts per million of fluorides in water; it was calculated that an infant fed with dry milk diluted with water containing one part per million of fluoride would retain in bone less than 0.4 percent of the fluoride.

In Pennsylvania, 246 children, who lived in a fluoridated community and had prolonged use of the nighttime baby bottle until one and one-half years of age, showed less of the extensive tooth decay of the anterior teeth associated with baby bottle syndrome.

(3, 8, 10, 45, 57, 61, 62, 63, 89, 91, 147, 150, 201, 202, 210, 213, 245)

VI. INTAKE AND BODY METABOLISM OF FLUORIDES, Continued

2. DAILY TOTAL FLUORIDE INTAKE IN CHILDREN

Fluoride Intake of Infants and Children*

Age (Years)	Estimated fluorides from drinking fluoridated water at 1 ppm, (milligrams)		Estimated fluorides from food (milligrams)		Total estimated fluoride intake (milligrams)
1-3	ingests 0.39-0.56 mgs.	+	0.03-0.27 mgs.	=	0.42-0.83 mgs.
4-6	" 0.52-0.75 "	"	0.04-0.36 "	"	0.56-1.11 "
7-9	" 0.65-0.93 "	"	0.05-0.45 "	"	0.70-1.38 "
10-12	" 0.81-1.17 "	"	0.06-0.56 "	"	0.87-1.73 "

* These estimates are based on data of the World Health Organization as originated by McClure. A recent review of intake of fluorides in Michigan indicated the possibility of slight increases in these estimates between the 1940s and 1965. A recent survey, in four different geographical dietary regions of the United States, indicated a total daily fluoride intake of the average six-month old infant to be 0.174 - 0.554 mg/day and for the two-year old to be 0.317 - 0.554 mg/day.

Variations can be expected in other countries such as Japan, India and Chile because of climate and dietary practices.

Daily differences can occur in individuals depending on physiological needs, fluoride metabolism and the state of development of the bones and teeth.

(8, 10, 137, 150, 250, 348, 349, 377)

3. DAILY FLUORIDE INTAKE OF THE ADULT MALE IN A FLUORIDATED AREA

Estimates from the World Health Organization and American Medical Association sources have suggested the following range of the daily intake of fluoride for the American adult male.

Source	Estimated Amount
Food	0.33 - 3.40 milligrams
Fluoridated Water (3-4 pints daily)	1.00 - 1.60 milligrams
Air	no significant intake
Total Daily Intake	1.33 - 5.00 milligrams

C. INTAKE AND BODY METABOLISM OF FLUORIDES, Continued

3. DAILY FLUORIDE INTAKE OF THE ADULT MALE IN A FLUORIDATED AREA, Continued

Possible problems in studies on foods are illustrated by the differences found in two different studies of the young adult male. One study of a "market basket collections" indicated an intake by the young male adult of 2.1 - 2.3 mg/day. A more recent study of the same type of food items by the University of Minnesota in four dietary regions of the U.S.A. showed a daily intake of 0.91 - 1.72 mg. per day. The results of both studies, however, fit into the range of estimates in the table of the World Health Organization and the American Medical Association.

The report on Fluoride Intake in Michigan indicated a possible slight increase due to foods processed in fluoridated water but the increase is of no consequence.

(12, 150, 190, 193, 206, 250, 349)

4. BODY METABOLISM AND EXCRETION IN THE ADULT MALE

A U.S. male ingesting a daily total of 5.00 milligrams of fluoride would assimilate about 1.00 milligrams for body metabolism and excrete the rest - approximately 2.50 milligrams through the urine, and about 1.50 milligrams through fecal excretion and perspiration.

(12, 40, 75, 94, 105, 137 286)

E. Summary on Intake and Metabolism of Fluorides

A physiological balance exists between intake, body absorption and excretion of fluorides.

Variation in each person's eating and drinking habits, fluoride content of individual foods, and other conditions make it difficult to estimate the precise fluoride intake of any individual.

The average daily intake of fluoride only from food is inadequate for the reduction of tooth decay.

The average combined daily intake of fluorides from food and fluoridated water does not approach the acute toxic dose in an adult, nor is it enough for demonstration of chronic ill effects after daily ingestion for 15 to 20 years.

If the fluoride content of food would provide an adequate intake for children, then tooth decay would not be so highly prevalent in nonfluoridated communities. Regardless of the fluoride intake from foods or the environment, only populations in fluoridated areas exhibit significantly less tooth decay when compared with similar groups in nonfluoridated areas.

VI. INTAKE AND BODY METABOLISM OF FLUORIDES, Continued

F. Summary on Intake and Metabolism of Fluorides, Continued

Original and significant studies of the effects of fluorides in water in naturally fluoridated areas were not based primarily on food intake but rather on concentration of fluorides in water which was the fundamental determining factor of dental benefits.

Because of the universal presence of fluorides in food and water, intake of fluoride by man is inevitable and has taken place throughout the evolutionary development.

Both naturally and supplementally fluoridated water have been used with daily diets and cooking practices of the consuming public without any known severe consequences. Generally there has been a minute increase of fluorides in foods due to use of fluoridated water in food processing since the initiation of community fluoridation, but any hazards from this slight addition are improbable.

Concentration of fluorides in water should not be confused with supplements of fluoride tablets, lozenges or liquids, which are used for control of tooth decay in nonfluoridated areas.

The oral use of fluoride tablets or other forms as practiced in nonfluoridated areas for the prevention of tooth decay may require an analysis of the diet.

Fluorides in food may not be absorbed as readily as the fluoride ion in water from the gastrointestinal tract. The absorption of fluorides in food by the body is dependent upon the solubility and rate of solubility of the fluorides in the food. The absorption may range from 50-80 percent of the fluoride in the food intake. Only the absorbed fluoride has physiological significance.

VII. ENAMEL OPACITIES OR MOTTLING IN FLUORIDATED AND NONFLUORIDATED AREAS

A. Indistinct Mottling in Areas with One ppm of Fluorides in Drinking Water

The amount and severity of fluorosis can be an indicator of the amount of fluoride intake of a population.

At one part per million of fluorides in water only indistinguishable, very mild and mild forms of fluoride opacities, usually on bicuspids and molars, are present.

This type of mottling is not easily observed by the naked eye during smiling and speech and it is necessary for a trained dental dpidemiologist using a strong light to recognize these types.

VIII. ENAMEL OPACITIES OR MOTTLING IN FLUORIDATED AND NONFLUORIDATED AREAS, Continued

A. Indistinct Mottling in Areas with One ppm of Fluorides in Drinking Water, Continued

In fluoridated areas, about ten percent of the children show these milder forms of tooth opacity.

There is no structural damage, pitting or observable staining to the tooth structure.

False reports about extensive damage to the teeth of black children have been made. Black children in fluoridated areas exhibited the milder forms of mottling which was at the same level as that for other children from fluoridated areas. Some data have been reported to suggest that black children may receive a proportionally greater protection from tooth decay by fluoridation than white children in the same community.

There is no public health problem of this indistinct mottling from fluoridated water at one part per million.

(4, 5, 12, 29, 58, 63, 87, 91, 92, 105, 137, 150, 152, 153, 165, 173, 230, 264, 289, 290, 291, 294, 295, 297, 383, 394, 406)

B. Noticeable Mottling in Areas with Excess Fluorides in Drinking Water

The higher the concentration of fluorides, above the recommended amount, the higher will be the degree of fluoride mottling in a population.

Noticeable signs of mottling with distinguishable white spots may occur in about 20 percent of children at low concentrations of 2.5 parts per million or higher in U.S.A. waters.

At four parts per million about 35 percent of children will show moderate mottling with brown stain and unusual wear of enamel.

Severe forms with pitting and staining are present at concentrations of eight parts per million or above.

A higher intake of water with excessive fluorides in hot tropical climates can result in a higher proportion of the population with noticeable mottling.
(1,
26, 80, 82, 91, 92, 107, 145, 152, 153, 162, 165, 190, 199, 241, 265, 320, 327, 357, 399, 415, 416)

C. Necessary Ages for Fluorosis of Teeth

No mottling can occur after age eight years once the teeth are fully formed. There must be constant exposure to fluorides when tooth enamel is developing in the young child; no such opacities can develop during adulthood.

(4, 91, 92, 146, 322)

VII. ENAMEL OPACITIES OR MOTTLING IN FLUORIDATED AND NONFLUORIDATED AREAS

D. Nonfluoride Opacities or Mottling in Fluoridated and Nonfluoridated Areas

Some researchers express doubt that the very mild forms of mottling found in optimally fluoridated areas are symptoms of any fluoride intoxication or disease but observed that these milder forms may be a result of other conditions unrelated to fluorides.

Teeth which are mottled because of disease, general infection and fever, congenital defect, antibiotic intake or injury during childhood and not because of fluorides, can be present in individuals of both fluoridated and nonfluoridated areas.

Nearly all of these nonfluoride opacities can be noticed very easily by the eye.

(4, 26, 80, 92, 105, 137, 145, 190, 323, 373, 381, 382, 383, 385, 40[illegible])

FLUORIDATED WATER, FLUORIDES AND THE HUMAN BODY

[illegible], FUNCTION OR DISORDER	EFFECT OF FLUORIDATED WATER (One part per million)	COMMENT
Teeth Reduction of tooth decay [illegible], 29, 32, 35, [illegible], 44, 54, 58, 75, [illegible], 110, 111, 130 [illegible], 138, 139, 156 [illegible], 196, 198, 218 [illegible], 260, 264, 269	Lifetime ingestion of fluoridated water will produce a maximum reduction of two-thirds of tooth decay among children. Proportional dental benefits are provided to children who begin drinking fluoridated water sometime after infancy.	Sugar restriction and personal mouth hygiene are not as effective or practical on a community basis for the reduction of tooth decay. Improved appearance and formation of teeth have been observed in teeth with adequate fluorides.
Dental benefits to adults [illegible], 157, 159, [illegible], 192, 238, [illegible], 277, 279, [illegible], 384	Greater numbers of teenagers with decay-free teeth are being reported in studies throughout the U.S.A. and Canada. Beginning with teenagers and continuing into and through adulthood, residents of fluoridated areas show lower prevalence of tooth decay.	
General Health [illegible], 18, 41, 46, [illegible], 87, 91, 94, [illegible], 150, 155, [illegible], 230, 215, [illegible], 238, 249, [illegible], 291, 298, [illegible], 333, 337, [illegible], 350, 351,	The status of health of people in supplementally and naturally (up to 8 parts per million) fluoridated areas has been the same as for populations in nonfluoridated areas except for lesser amount of tooth decay and possibly better bone structure and less calcification of the aorta.	Three quarters of a century or more in naturally fluoridated areas and thirty years of experience in Grand Rapids, MI, Newburgh, N.Y., and Brantford, Ont. and many years of fluoridation in the thousands of fluoridated communities support this comment.
Body Tissues and Fluids Soft tissues [illegible], 56, 105, 137, [illegible], 398)	Normal soft tissues of humans do not accumulate fluorides.	Only an excessive intake with acute effects will raise this level very slightly.

VIII. FLUORIDATED WATER, FLUORIDES AND THE HUMAN BODY, Continued

HUMAN ORGAN, FUNCTION OR DISORDER	EFFECT OF FLUORIDATED WATER (One part per million)	COMMENT
2) Blood (15, 18, 26, 27, 56, 81, 105, 170, 203, 219, 220, 275, 332, 396, 397)	Blood plasma maintains a low level of fluorides by urinary excretion and by exchange with bones. Only about one-fifth of the fluoride in blood plasma is free and ionic and participates in body reactions- the remainder is bound to albumin.	Blood plasma has an average fluoride level of 0.14 - 0.[illegible] parts per million which is [illegible] elevated with drinking water four times the optimum level of one part per million. No anemia or interference with the blood-forming system occurs with fluorides at high levels.
3) Human milk (12, 60, 62, 94, 170, 201)	Mother's milk does not exceed the low concentration of 0.2 parts per million of fluoride regardless of the mother's fluoride intake.	
D. Pregnancy (18, 26, 31, 66, 74, 137, 197, 237, 282, 390, 396)	No harmful effect on mother and baby from mother's ingestion of water with 1-2 parts per million of fluorides but a reduction of decay of primary teeth of the infant does occur. No increase in stillbirth rate and neonatal mortality rate has been observed in fluoridated areas.	Chromosomal damage in mice by fluorides has been claimed but these claims have been refuted.
E. Birth Defects Including Mongolism (18, 31, 38, 46, 66, 74, 141, 165, 171, 175, 190, 237, 321)	Fluorides in water have not been correlated to any birth defects. Studies in England and the U.S. have confirmed this fact. Possible genetic dangers of fluoride in mice were suggested in a recent study but no evidence of reproductive disorders in humans using fluoridated water has been presented. In 1976, an epidemiological survey did present contrary evidence since human birth defects were no greater in fluoridated areas than in nonfluoridated areas.	One study reported a connection between fluorides and mongolism. The major fallacy in this study was the correlation of fluoride content of water of place of birth instead of place of residence of the mother during pregnancy.

FLUORIDATED WATER, FLUORIDES AND THE HUMAN BODY, Continued

[illegible], FUNCTION [illegible]	EFFECT OF FLUORIDATED WATER (One part per million)	COMMENT
Growth and Development 98, 137, 163, 177, 197, 235, 274, 333, 351, 396)	No adverse effects on growth and development have been shown on children in fluoridated Newburgh, N.Y., a fluoridated community in England, or teenagers in Holland. No unfavorable reports have been issued from any fluoridated area.	Children living in naturally fluoridated areas have enjoyed normal growth and development with less tooth decay. Exception may be some children with noticeable mottled teeth in areas with excessive levels of fluoride.
Heart and Cardiovascular Disease 74, 87, 105, 178, 236, 276, 314, 360, 396)	Continued consumption of water at one part per million of fluorides is not harmful to the heart, does not contribute to heart disease nor is the cause of increasing deaths due to heart disease. A report from high fluoride areas of the Dakotas suggests a reduction in calcification of the aorta in both sexes.	Dr. Dudley White, noted cardiologist, has stated: "Elderly persons with 'tired hearts' need have no fear with fluoridated water. It is safe for all."
Eyes & Ears 249, 333, 389, 390)	No adverse effects upon vision and hearing by one part per million fluorides in water. Indications are that hearing may be improved by fluoridated water due to favorable action upon bones of middle ear.	Fluorides are being used to treat osteoporosis of the labyrinthine capsule, a structure of the inner ear. Four thousand patients were treated with moderate doses of sodium fluoride for periods of one to eight years and over 80 percent showed favorable results
Enzymes 63, 105, 313,	At the concentration of one part per million in water, fluoride ingestion into the body has not been shown to have any influence on enzymatic activity. Enzymes are used in metabolic life processes and the absence of clinical or epidemiological evidence of harm to general health in fluoridated areas is the basic safety factor. Fluoridated water has no relation to poisoning of enzymes.	Enzymes can be inhibited by extremely high levels of fluorides. This level has to be at least 20-100 times higher than the concentration in body fluids.

VIII. FLUORIDATED WATER, FLUORIDES AND THE HUMAN BODY, Continued

HUMAN ORGAN, FUNCTION OR DISORDER	EFFECT OF FLUORIDATED WATER (One part per million)	COMMENT
J. Kidney (12, 26, 28, 30, 52, 53, 78, 90, 91, 92, 94, 137, 150, 165, 168, 214, 221, 223, 229, 240, 283, 315, 319, 333, 334, 337, 347, 350, 391, 396, 417, 418, 419)	Fluoridated water does not damage or unfavorably affect the kidneys of normal people, diabetics, or persons with any kidney trouble. No increase of deaths due to kidney disease. National Kidney Foundation has confirmed that fluoridation does not harm the kidneys. Deionization of water used for dialysis to limit the concentration of not only fluorides but also other ions has been recommended as a prevention against any accumulation in the body. Chemical, pathological, clinical and statistical studies on residents in endemic fluoride regions of the U.S.A., where the level is as high as eight parts per million, have ruled out the possibility of kidney injury through fluorides in water.	In patients with terminal [illegible] disease, clearance of all [illegible] from the body is impaired. Excretion of fluorides is [illegible] tional to fluoride intake. Toxic industrial fluoride [illegible] sure has not been characterized by kidney injury. It has never been demonstrated experimentally that kidney [illegible] can be produced by fluoride levels of less than 100 parts per million fluoride in water. A Michigan review has suggested the possibility of a rare person on optimally fluoridated water and having prolonged kidney deficiency could accumulate substantial fluoride in their bones, but no bony abnormalities in such cases have been reported.
K. Thyroid (12,26, 46, 50, 92, 137, 190, 215, 304, 313, 327, 333, 334)	No detrimental effects on the thyroid gland and its function are produced by fluoridated water. Pathological changes in the thyroid show no increased frequency in regions where the water is fluoridated either naturally or artifically nor does a specific toxicity of fluorine for the thyroid gland exist. (Statement of World Health Organization in 1970).	Fluorides do not accumulate [illegible] the thyroid. Fluorides are not antagonistic to the iodine-thyroid beneficial relationship.
L. Skeleton and Bones (6, 19, 39, 67, 68, 70, 78, 79, 85, 86, 87, 91, 92, 93, 99, 107, 108, 109, 112,	Fluoridated water may have the beneficial effect of increasing bone density to strengthen bones and decreasing the amount of osteoporosis in a population.	Fluoride combines with calcium in the bone to form a strong apatite and slow the loss of calcium.

FLUORIDATED WATER, FLUORIDES AND THE HUMAN BODY, Continued

ORGAN, FUNCTION OR DISORDER	EFFECT OF FLUORIDATED WATER (One part per million)	COMMENT
Skeleton and Bones, Continued 114, 115, 116, 118, 125, 129, 144, 162, 170, 207, 208, 215, 271, 272, 273, 287, 313, 319, 326, 333, 334, 345, 351, 352, 380, 394, 395, 418, 419)	Fluoride deposition in the bone may increase in many years without a loss of function or adverse changes in structure. After three decades of regulated fluoridation of drinking water at a level of 1.0 parts per million, no evidence has accrued of any harmful effect on bone despite increased skeletal fluoride storage through the lifetime. A study in the Dakotas with water at about four parts per million has shown that the population of this area had less osteoporosis and vertebral collapse especially among females than a comparable group in a low fluoride area. Bone fractures among young selectees of the Armed Forces were not related to fluoride levels from 0.0 to 3.8-5.1 parts per million.	Prolonged intake of water at less than four parts per million does not produce any adverse or recognizable bone changes. In the U.S., intake of water containing 8 parts per million for more than twenty years may induce bone changes but no cases of crippling fluorosis. Cases of crippling fluorosis have been found after chronic industrial exposure to fluoride for many years, mainly in other countries. Crippling fluorosis has been reported in India after ingestion of water at four parts per million or more for 10-15 years; malnutrition, questionable water supplies, excess drinking of water due to hot tropical climate and heavy manual labor may be contributing factors. Osteoporosis or reduction in the quantity of bone occurs in higher frequency among the elderly, especially the elderly white females of nonfluoridated areas, but there was diminished prevalence in women after five years of fluoridation.
Rheumatism and Arthritis 253, 298, 322, 334, 335, 375,	No excessive fluorides were found in bones of arthritic patients living in a fluoridated area. People of fluoridated Watford, England had no increased prevalence of rheumatoid arthritis, osteoarthrosis, spondylitis or disk degeneration when compared with people of a nonfluoridated community in England. Fluoridated water does not cause or aggravate disorders of the bone.	Trials are currently being conducted on treatment of bone disorders with fluorides. Arthritis was no more prevalent in Bartlett, Texas with eight parts per million of fluoride in the water than in Cameron with hardly any fluorides in the water.

VIII. FLUORIDATED WATER, FLUORIDES AND THE HUMAN BODY, Continued

HUMAN ORGAN, FUNCTION OR DISORDER	EFFECT OF FLUORIDATED WATER (One part per million)	COMMENT
N. Mortality (26, 64, 65, 78, 178, 188, 215, 236, 249, 314, 315, 325, 360, 414)	Statistically, adjusted death rates were the same for fluoridated and comparable nonfluoridated areas. A recent study of mortality rates indicated no evidence of a harmful effect including cancer attributable to fluoridated water.	Mortality from infectious [illegible] stomach disorders, cancer, cardiovascular diseases and [illegible] other diseases are the same [illegible] fluoridated and comparable [illegible] fluoridated areas.
O. Cancer (12, 18, 33, 34, 55, 73, 95, 121, 127, 165, 166, 170, 175, 178, 179, 180, 187, 188, 189, 190, 191, 225, 232, 233, 239, 248, 249, 251, 314, 315, 325, 335, 360, 387, 404)	A statistical association between cancer and fluoridation has been asserted. The Royal College of Physicians of England have asserted that there was no evidence that fluoride increases cancer mortality; the Royal Statistical Society has agreed with this statement. Furthermore, although an association may exist in such population studies this association does not establish a causal link. The National Cancer Institutes in the United States and Canada have refuted claims of any connection of cancer, cancer mortality to fluoridated water.	Fluorides in water do not [illegible] cancer in humans. Breast cancer rates were [illegible] in areas of Texas with [illegible] fluoride levels. The Oregon Supreme Court [illegible] Oregon Secretary of State's [illegible] on use of allegations of attributing cancer to fluoridation. No evidence of cancer mortality attributable to fluoridation was reported in the 1978 [illegible] 46 cities.
P. Allergy (7, 46, 74, 137, 165, 170, 190, 249, 412)	American Academy of Allergy has stated that there is no association between fluorides in water and allergy. One author has claimed an allergy to fluorides but this claim has not been confirmed.	Allergy to fluoride would be unusual since: (1) no chemical bonding of fluoride to amino acids occurs; [illegible] a large number of people drink tea; (3) a number of people [illegible] in contact with ocean water (1-1.5 parts per million of fluoride): (4) fluorides are present in nearly all foods and waters; and (5) trace amounts are present in air.

FLUORIDATED WATER, FLUORIDES AND THE HUMAN BODY, Continued

[illegible], FUNCTION [illegible]	EFFECT OF FLUORIDATED WATER (One part per million)	COMMENT
[illegible] Diabetes [illegible], 122, 313, 314, [illegible], 333, 374)	Fluorides in water do not increase diabetes or deaths due to diabetes. Fluoridated water does not produce any adverse effects to the kidneys of diabetics.	Inhabitants of Bartlett, Texas with water containing eight times the optimal amount were shown not to be liable to diabetes. No evidence of an increased incidence of diabetes was found in cryolite workers who had developed occupational fluorosis. Uncontrolled diabetes can produce excessive thirst. The adult with untreated diabetes could ingest water at eight times the recommended amount in supplementally fluoridated water with no complications. The problem here is not the fluoridated water but the uncontrolled and probably unrecognized disease state of diabetes. Diabetics urinate more than normal and may excrete a higher amount of fluoride because of the higher intake of fluids.

IX. BENEFITS OF FLUORIDATED WATER

More children can enjoy being free of tooth decay.

Children have less tooth decay - by about two-thirds. (The greatest benefits have been suggested to be among poor and black children.)

Improved appearance of teeth.

The reduction in teeth requiring extraction may result in less malocclusion in a population.

Savings in costs for dental treatment.

Less pain and discomfort from decayed teeth.

Reduction of absences from school and industry due to tooth decay and for the treatment of decayed teeth.

Fluorides in water may have a role in preventing some bone diseases and bone weaknesses associated with old age. Fluorides may also prevent the calcification of the arteries of the heart.

Considerable evidence has suggested that the strengthening effect on bone by fluoridated water may prevent bone loss and recession in the bones of the jaws; exposed root surfaces of the teeth are susceptible to dental decay and would be protected by the strengthened bone; additionally the stronger bone from the intake of fluorides in water may resist the formation of gingival pockets and periodontal disease leading to the extreme gum condition known commonly as pyorrhea.

The lesser number of dental abscesses caused by decayed teeth will decrease the hazard to valvular heart conditions.

(4, 18, 21, 49, 102, 119, 136, 158, 185, 190, 222, 238, 246, 250, 299, 318, 376, 378, 406)

X. COST/BENEFITS OF WATER FLUORIDATION

The costs of water fluoridation in a community may vary because of the natural, but insufficient, fluorides in the water, number of wells supplying water, amount of water used in the community and the size of the family and length of residence.

The estimated costs for fluoridation of a medium-sized community in Michigan is about $0.25 per person per year.

The Michigan Department of Public Health has estimated in 1978, that, for a family of two adults and one sixteen year old, the savings in dental bills would amount to $190 for the sixteen year old who has ingested fluoridated water since birth, as against an expenditure of $7 to $12 for water fluoridation; this investment in fluoridation would have a return of about twenty-fold based on minimum estimated costs of restoring or filling decayed tooth surfaces.

X. COST BENEFITS OF WATER FLUORIDATION, Continued

Community savings can be realized for costs of dental care subsidized by government funds and private third-party or prepayment insurance plans.

The World Health Organization has estimated the savings in costs of restoring and extracting teeth by analyses of programs in the United States, New Zealand, the United Kingdom, the Netherlands, Czechoslovakia and Switzerland, and established positive ratios of cost-benefits from one to 2.5 and upwards of one to 41.

The economic advantages of the following conditions are difficult to assess:

1. Less pain and discomfort from decayed teeth.

2. Reduction in individual loss of time from school or industry.

3. Lower number of malocclusions and edentulous conditions requiring extensive and expensive corrections.

4. With the additional measures of good dental hygiene, the preservation of a decay-free condition is easier.

(17, 43, 47, 48, 49, 72, 103, 131, 149, 172, 187, 265, 266)

XI. COMMUNITIES REPORTING DENTAL BENEFITS

Dental benefits have been recorded during the more than thirty years since regulated water fluoridation was implemented. Favorable reports have been received from many communities throughout the world. A partial listing would include:

Community and Period of Fluoridation at Last Report
(Figures in parentheses are references)

Michigan

Grand Rapids	17 years	(123, 256, 258, 259, 260, 299, 328, 383)
Wyandotte	8 years	(358)
Gladstone	11 years	(361)
Escanaba	11 years	(361)
Jackson	15 years	(149)
Battle Creek	15 years	(149)
Kalamazoo	15 years	(149)
Flint	10 years	(149, 218)
Midland	10 years	(402)

XI. COMMUNITIES REPORTING DENTAL BENEFITS, Continued

U.S.A.

Newburgh, N.Y.	25 years	(71, 262, 264, 267 - 268, 279, 288, 305)
Evanston, IL	14 years	(317)
Charlotte, NC	10 years	(405)
Norway, ME	5 years	(312)
Easton, PA	7 years	(317)
Antioch, CA	10 years	(381)
Rochester, NY	5 years	(270)
Red Lake Falls, MN	18 years	(110)
Silver Bay, MN	10 years	(111)
Ely, MN	10 years	(4)
Milwaukee, WI	12 years	(196)
Philadelphia, PA	20 years	(183)
Richmond, VA	20 years	(42)
Louisville, KY	10 years	(156)
Elmira, NY	6 years	(137)
Fayette, AL	11 years	(154)
New Haven, CT	7 years	(124)

World

Brantford, Ontario	25 years	(40, 280, 324)
Gold Field Region, Australia	6 years	(142)
Prince George, B.C. Canada	12 years	(249)
Baxio Guandu, Brazil	3 years	(14)
Curico, Chile	3 years	(249)
Tabor, Czechoslovakia	8 years	(106, 249)
Kuopio, Finland	4 years	(82, 249)
Kyoto, Japan	12 years	(249)
Copenhagen, Denmark	9 years	(54)
Naas, Ireland	4 years	(249)
Wroclaw, Poland	5 years	(246, 247)
Cambria, Wales	7 years	(100)
Hastings, New Zealand	16 years	(140)
Kluang, Malaysia	7 years	(75)
Tiel, Netherlands	13.5 years	(134)
Basel, Switzerland	5 years	(54, 249)
Birmingham, England	5.5 years	(23)
Santa Fe, Argentina	5 years	(14)
Tirgu-Mures, Rumania	9 years	(44)
Toronto, Canada	5 years	(222)
Canberra, Australia	10 years	(35, 36)
Girardot, Colombia	8 years	(143, 249)
Townsville, Australia	16 years	(241)
Johore Bahru, Malaysia	7 years	(75)
Norilsk, U.S.S.R.	8 years	(77)
Karl-Marx-Stadt, East Germany	10 years	(130)
Brno, Czechoslovakia	6 years	(77)

	ADMINISTRATION	PERCENT REDUCTION OF TOOTH DECAY	REMARKS
Community Water Fluoridation	By drinking water	55-70% of lifetime tooth decay in children with benefits extending to adulthood.	Best method available rated on ease, safety, efficacy, and economy.
School Water Fluoridation	By drinking water but only during school hours. Level of fluorides is much higher than community fluoridation because of limited intake of school water during school hours.	About 40% reduction of tooth decay in school children.	Restricted to children attending school; requirements are the same as for community fluoridation; requires constant supervision. Two-thirds as effective in reducing tooth decay as community water fluoridation.
Fluoride Tablets or Drops	Daily ingestion of one milligram of fluoride from birth to age 8 years.	20-40% reduction.	Dependent on daily administration by the children under close supervision by parents at home for at least 8 years; 2/3 as effective as community fluoridation.
Professional Application of Fluoride	Professional application of fluoride solution in clinic or dental office.	30-40% reduction of future tooth decay after application.	Requires professional personnel; about 40% as effective as community fluoridation.
Mouthrinse, Home Use	Daily use of fluoride rinse solution.	20-50% reduction of tooth decay after start of rinsing.	Requires constant supervision of child; 1/3 as effective as community fluoridation.
Mouthrinse School Program	Daily or weekly rinsing.	Same as home use.	More effective than unsupervised rinsing; requires school person to assume responsibility.
Fluoride Dentifrice	Daily use with tooth brushing.	15-25% of future increase of tooth decay after initiating use.	Requires self-discipline for daily habitual use. Less than ¼ as effective as water fluoridation.

(4, 10, 57, 77, 88, 91, 96, 97, 141 , 174, 212, 216, 217, 407, 408)

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A-64

JAMES V. BARONE, D.D.S.
PRESIDENT

May 26, 1978

Maurice S. Reizen, M.D.
Director
Michigan Department of
Public Health
3500 N. Logan
Lansing, MI 48909

Dear Doctor Reizen:

The working draft of the Policy Statement of Fluoridation of Water Supplies-1977 has been considered by the Michigan Dental Association. As you know the Association does not have scientific expertise on its staff to evaluate the statement critically from a technical viewpoint. For that purpose the Association would have called on the School of Public Health, University of Michigan and the School of Dentistry at the University of Detroit for assistance. I understand that you have already requested a review by both of those schools and it would be redundant for this Association to repeat their conclusions. Assuming those educational institutions have validated the synopsis scientifically, the Association agrees with the conclusion that the adjustment of the fluoride content of water supplies is an effective and completely safe means of substantially reducing tooth decay. Statistics indicate that persons born and growing up in an area with the proper fluoride content in the water supply will have 60% less decay throughout their lifetime than if that same water supply were deficient in fluoride.

The Michigan Dental Association is not aware of any documented case of harm to any individual in this country resulting from the controlled fluoridation of water supplies. The fact that persons may enjoy a more comfortable life because of better dental health resulting from this relatively simple public health procedure, should convince government officials of the need to extend this benefit to as many persons as possible.

The Michigan Dental Association commends the Department for its very thorough study and offers its assistance in its continuing effort to expand this public health measure.

Sincerely,

James V Barone D.D.S.

James V. Barone, D.D.S.
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JVB/ty

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Office of the Dean

April 13, 1978

Dr. Maurice S. Reizen
Director Michigan Department of Public Health
P.O. Box 30035
3500 N. Logan St.
Lansing, Michigan 48909

Dear Doctor Reizen:

Recently, I had the pleasure of reviewing a document entitled "Synopsis of Fluorides and Fluoridation" prepared by the Dental Division of the Michigan Department of Public Health. Dr. Donald Forrester, Chairman of the Department of Pediatric Dentistry, this School, also reviewed the article. We found it a comprehensive survey of the use, reliability, and effectiveness of fluorides in the control of dental caries.

Both Dr. Forrester and I have had an amount of experience in research evaluation and as it relates particularly to fluorides. From this vantage point, we feel that the long history of proven success with fluorides, the many studies attesting to the safety of fluorides in controlled use, water fluoridation must continue as a public health measure for the control of dental caries.

Children brought up in fluoridated communities no longer appear in dental offices with rampant caries to start life as dental cripples.

The article referred to above thoroughly documents these facts.

Sincerely,

James W. Smudski, D.D.S., Ph.D.
Dean

JWS/tms

The University of Michigan
SCHOOL OF DENTISTRY
ANN ARBOR, MICHIGAN

Office of the Dean

May 26, 1978

Maurice S. Reizen, M.D.
Director, Michigan Department
of Public Health
3500 N. Logan
Lansing, Mi 48909

Dear Dr. Reizen:

On behalf of The University of Michigan School of Dentistry I wish to commend you and your staff for what has obviously been a monumental effort in compiling the report, Synopsis of Fluorides and Fluoridation. It is a comprehensive work which supports the safety and efficacy of optimally fluoridated water in the prevention of dental decay. The document gives continued cause for the faculty of this School to reaffirm its support for the fluoridation of drinking water as an effective and safe anticaries measure.

In this new age of preventive dentistry, it is important to remember that fluoridation is the basic measure in prevention. It requires no dependence on individual effort and after 30 years of successful experience it is unquestionably effective. In addition, recent studies on the economic benefits have proven that in communities with fluoridated water children's dental bills are lower. Not only do parents save, but taxpayers save as well when children are eligible for dental care under publicly funded programs such as medicaid.

It is frustrating that despite 30 years of successful experience with fluoridation the claims of its antagonists remain much the same. Their most recent allegations have attempted to link fluoridation with cancer. Documented evidence from the National Cancer Institute has demonstrated that there is no correlation. Further proof that fluoridation of water supplies produces no harmful effects, including cancer, is contained in a study by David Erickson, D.D.S., Ph.D., reported in the May, 1978 issue of The New England Journal of Medicine. This study

compares the mortality rates in 24 cities with fluoridated and 22 with non-fluoridated water supplies for the years 1969-71.

Other claims of the anti-fluordationists have taken on ecological overtones. They contend that fluoridation is yet another form of pollution and that the total intake of fluoride is dangerous. These allegations are particularly ironic in view of the fact that fluoridation is, perhaps, the most natural of all scientific measures. Very simply, it is a copy of nature.

Again, I wish to compliment you and the appropriate members of your staff for compiling such an exhaustive report on fluorides and fluoridation. Continued study of this important subject area is essential, and it is the hope of the faculty of this School and myself that your department will be provided the fiscal support to maintain its position of leadership.

Thank you for the opportunity to review the document and the policy statement.

Sincerely yours,

William R. Mann

William R. Mann
Dean

WRM/ia

The University of Michigan

SCHOOL OF PUBLIC HEALTH

109 SOUTH OBSERVATORY STREET
ANN ARBOR, MICHIGAN 48109

OFFICE OF THE DEAN

February 28, 1978

Maurice S. Reizen, M.D.
Director
Michigan Department of
Public Health
3500 N. Logan
Lansing, MI 48909

Dear Dr. Reizen:

I have reviewed with great interest the document produced by the Michigan Department of Public Health entitled Synopsis of Fluorides and Fluoridation. It is a pleasure for me, on behalf of the University of Michigan School of Public Health, to endorse this document and its contents and to urge its dissemination to all parties in Michigan interested in the issue of water fluoridation.

The document constitutes the most thorough recent review of fluoridation available. It is thoroughly scholarly and includes 373 references related to all facets of fluorides and fluoridation. It is well organized and provides ready access to any aspect of the fluoride question. It deals with all reactions to fluoride, beneficial and adverse. It gives careful attention to problems of dosage and specific toxicity in overdosage, and most important of all, gives attention to the important public health issues involved.

Fluoridation is perhaps our best documented mode of disease prevention. From casual epidemiologic investigation through comparative studies of communities, through controlled clinical trials, our knowledge of the effect of fluoride at optimum dosage in drinking water has grown. There can no longer be any doubt that at the level of one part per million, water fluoride is an important and dependable public health ally in the war against dental disease. A wide range of safety between therapeutic and toxic dose exists. The addition of fluoride at optimum concentration to water supplies is demonstrably cost effective. This method is or should be readily available and accessible to all of Michigan's population, at least those served by municipal water supplies. As a public health measure, there is no substitute for the fluoridation of drinking water. Everyone muse use water and, therefore, everyone has access to the benefit of water fluoridation. Above all, our younger children require the protection afforded by this important public health measure.

The State of Michigan has long been a nation's leader in public health programming. The State Health Department and Public Health Laboratories are leaders among the 50 states. It is important to note Michigan's

role in gathering information concerning fluoridation of public water supplies, evaluation of such fluoridation, and dissemination of the information to the population. Grand Rapids was the pioneer city in teaching us the benefits of this preventive measure. More recently, Michigan has produced a public health code, now under review by the legislature, which will again place this State in the forefront of health protection of all its citizens.

Again, it is a pleasure for me to endorse, on behalf of the University of Michigan School of Public Health, this superb document on fluoridation. Please extend my congratulations to your responsible staff members for a thorough and scholarly piece of work in the public interest.

Sincerely,

Richard D. Remington

Richard D. Remington, PH.D.
Dean

WORLD HEALTH ORGANIZATION
ORGANISATION MONDIALE DE LA SANTÉ

A22/P&B/7

29 May 1969

TWENTY-SECOND WORLD HEALTH ASSEMBLY

Provisional agenda item 2.7

FLUORIDATION AND DENTAL HEALTH

Report by the Director-General

INTRODUCTION

During the forty-third session of the Executive Board, questions were raised on the position and activities of WHO concerning the fluoridation of community water supplies. The Executive Board adopted the following resolution (EB43.R10):[87*]

"Considering that reports from several countries indicate that great advantages to dental health accrue as the result of water fluoridation; and

Recognizing the value of the support of WHO in securing fluoridation of all supplies of drinking water which require it,

REQUESTS the Director-General to study this question and report to the Twenty-second World Health Assembly."

This report, in the preparation of which invaluable assistance was given by the International Dental Federation, is, accordingly, a brief review of available information on the subject. No attempt has been made to provide a comprehensive bibliography, which would include several thousands of known publications, relating to fluorides and dental health. However, references to major publications on this subject from several countries are listed in Annex V.

1. DENTAL CARIES AS A WORLD-HEALTH PROBLEM

Dental caries is one of man's most prevalent chronic diseases, affecting people of all ages in all countries. Nearly 100 per cent. prevalence in large groups of population is reported from many countries throughout the world, especially in Europe and North America. Even where a prevalence of dental caries is recorded as low, notably in parts of Africa, Asia and Pacific Islands, it is usual to find 40-60 per cent. of the population affected. A sharp increase in caries incidence and prevalence is reported regularly in developing urban areas. Only in very rare situations, involving small groups of people, does caries prevalence remain at low levels.

Dental caries predominantly affects children and adolescents. In areas of high prevalence, children's teeth may be attacked at two years of age when the deciduous teeth are completing their eruption. Great Britain has reported an average of four carious teeth per child at the age of three years[41] and a recent report from Norway shows that only one child in 1000 is free of dental caries by 15 years, and only one person in a thousand by 21 years.[68]

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* Numbers denote the references in Annex V.

Epidemiological studies on the prevalence of dental caries have been conducted in many population groups and these provide an impressive amount of factual data on the high and widespread prevalence of this disease. Currently, WHO is promoting standardization of dental survey methods and organizing co-ordinated dental epidemiological studies on a world-wide scale to complete the information and maintain adequate surveillance of the problem.

The most characteristic feature of dental caries, different from the majority of other human ailments is that once started it does not cease to progress and never heals naturally. Every tooth affected by caries requires specific treatment performed by qualified personnel using rather sophisticated and costly technical equipment. If not treated, carious lesions inevitably progress to a painful stage of pulp involvement and later on to total destruction and loss of teeth.

The initial dental damage due to caries may also cause many hazards to general health. Loss of teeth affects masticatory function which reflects on the whole digestive system. Infection from decayed teeth, spreading throughout the organism, may lead to acute and chronic septic conditions, inflammation of lymphatic nodes, tonsils and other organs of the body.

The large number of cases and the frequency of the attack rates of dental caries impose a great burden on existing dental services in every country. The work of repairing the lesions produced exceeds any dental manpower capacity or economic resources that can reasonably be allocated for dental care, even in countries with highly developed health systems.

In the United States of America, with more than 100 000 dentists, less than 40 per cent of the population obtain dental treatment each year. It was estimated, in 1962, that to treat the existing backlog of dental needs, the main share of which consists of dental caries and its consequences, would have cost US$ 15 billion, or approximately US$ 80 per person, as compared with US$ 2.4 billion, or US$ 12 per person, actually spent on dental care.[63]

In the USSR, a recent study of dental needs of the population in several cities has resulted in an estimation of an optimal dentist to population ratio of 9.5 to 10 000 or about one dentist for 1000 people, which is more than 2.5 times higher than existing dental manpower in urban public health services.[17]

In Sweden, one of the most successful countries in their child dental health programme, dental manpower ratios as high as one dentist to 900 children have not been sufficient for total care required.[84]

In New Zealand, a nation-wide dental treatment programme has allocated one school dental nurse for every 500 children.[66] Similar manpower ratios are not available in the great majority of countries where dentist to population ratios vary from one to 2000-3000 to one dentist to several hundreds of thousand or even millions of people. The 500 000 dentists in the world today do not represent sufficient manpower to treat the billions of dental caries that produce the major part of all dental needs in children and adults throughout the world.

It becomes clear that with all the urgency of developing national dental care programmes, enlarged networks of dental services and radical increases in the training of professional and auxiliary dental personnel, these measures will not provide, in the foreseeable future, a solution to the problems which arise in connexion with the growing prevalence of dental caries and its hazards to human health. It is therefore generally agreed that, alongside these measures, preventive methods must be developed and promoted to decrease the very high level of dental caries.

Research activities on the causes of dental caries are developing in many countries. As yet, however, only limited success has been obtained in some areas of the problem. The means of controlling the etiological factors of dental caries remain very limited and have mostly concerned laboratory experiments on animals.

Some very interesting scientific approaches to the problem include the regulation of diet through restriction of carbohydrate intake, promotion of oral hygiene techniques, and recently proposed application of phosphates, anticaries enzymes and vaccines. These methods are, however, not yet practical for mass prevention against dental caries in large populations.

The only well-tested and effective preventive method in current use which has resulted in a substantial decrease in the rate of dental caries is controlled application of fluorides.

2. FLUORIDES AND DENTAL CARIES

The first observations on the relation between fluorides and dental health date back to the last quarter of the Nineteenth Century. In the 1930s reports appeared in the literature on the connexion between fluoride content in drinking-water and dental enamel formation in several parts of the world.

The studies performed by Dean[26] and others in the United States of America later in that decade confirmed the inverse relationship between fluoride levels in drinking-water and the prevalence of dental caries. Further investigations were performed throughout the world including studies in Argentina, Canada, England, Greece, Hungary, India, Kenya, Norway, Sweden, Switzerland, Turkey, South Africa and the USSR.[27] These studies showed that the dental caries experience of populations in areas with water containing fluoride in concentrations of approximately one part per million (1 ppm) and higher, was much lower than in regions with lesser or only trace amounts of fluoride in the water. After this relationship was established, proposals were made to test the feasibility of using, by means of water fluoridation, controlled levels of fluoride for the prevention of dental caries.

Water fluoridation may be defined as the controlled addition of fluoride compounds to community water supplies, aimed at adjusting the fluorine content of drinking-water to a level sufficient for effective prevention of dental caries and in compliance with criteria governing the provision of a safe water supply. Fluoride is a normal component of human and animal tissues, mostly deposited in bones and teeth. It occurs naturally in varying amounts in all water supplies and in most foods. Some water supplies have optimal or excessive amounts but most have sub-optimal or only trace amounts of the element.

The first controlled fluoridation of community water supplies was started in 1945-1946 in four cities in the United States of America and Canada, where the content of fluoride in water was adjusted to the level of 1.0-1.2 ppm. Detailed dental examinations were carried out on children before fluoridation and were repeated in subsequent years. These surveys enabled dental caries experience in fluoridated areas to be compared with that in control areas. Reports of results after 10 years of controlled fluoridation in these four cities have shown a uniform decrease of approximately 60 per cent. in the prevalence of dental caries in permanent teeth of children who had used fluoridated water since birth as compared with children of the same ages in non-fluoridated areas.[8,11,20,49]

These results were of such significance that other water fluoridation programmes were initiated in the United States of America and in many other countries.[12,54] Special councils, commissions and groups have prepared reviews and reports, recommending water fluoridation as a public health measure in several countries, e.g. Australia,[13] Canada,[23] Netherlands,[65] New Zealand,[67] Norway,[68] South Africa,[76] Sweden,[81] United Kingdom of Great Britain and Northern Ireland,[40] the United States of America,[82] and the USSR.[72] Now fluoridation programmes are reported in 32 countries and territories, serving approximately 110 million people residing in over 4600 communities, as illustrated in the table in Annex I.

3. EFFECTS OF WATER FLUORIDATION

3.1 Dental health

Fluoridation does not eradicate dental caries but substantially reduces its prevalence and incidence. Best results are seen in children who have consumed fluoridated water since birth, as they generally have less than half the number of dental cavities than they would otherwise have had. Epidemiological studies conducted in Great Britain, Hungary, and the United States of America, also tend to illustrate the protective dental effects of fluoridation in adult life-time residents of areas with naturally-fluoridated water.[1,32,71]

Statistics concerning the reduction in the prevalence and incidence of dental caries after fluoridation are difficult to compare and summarize in a uniform manner due to a general lack of standardization in reporting. Many studies were conducted at varying lengths of time using different age-groups and methods of examination. However, findings have been consistent in demonstrating caries reductions of the same order as the original classical studies. These studies show that controlled fluoridation of community water supplies does prevent a large proportion of carious lesions in people living in many different parts of the world, exposed to different environmental conditions.

A synopsis of some data from published reports of results in prevention of dental caries by water fluoridation is included in Annex II.

Introduction of water fluoridation has a particular impact on professional productivity of existing dental personnel. New Zealand has had the advantage of a highly developed dental care programme for schoolchildren for over 40 years. Before fluoridation programmes began in 1953 each school dental nurse was able to provide dental care for approximately 450 children. A significant decrease in the prevalence and incidence of dental caries after 10 years of water fluoridation has now enabled one school dental nurse to care for 700, 800 or even 900 schoolchildren.[66] In recent studies in the USSR, it has been estimated that controlled water fluoridation decreased the need for dental treatment and extractions by 40 per cent. and for prosthetic restorations by 20-30 per cent.[78] In the United States of America, a study has shown that the time and cost factors for providing an incremental dental care programme for schoolchildren in a fluoridated community (Newburgh) was less than half that required for schoolchildren in a control non-fluoridated community (Kingston).[10]

3.2 General health

The effects of water fluoridation on general health have been analysed in numerous studies performed by researchers representing many different health disciplines. Well-constructed comparative studies have been conducted in areas having different natural fluoride levels in the water supplies and in those with fluoridated water. These studies have included detailed information on health conditions of people as related to the prevalence and incidence of cancer, allergies, heart diseases, mental and neurological abnormalities and the effects on skin, eyes, endocrine glands, liver and kidneys, digestive, circulatory and respiratory systems, bones, joints and oral health conditions. Results have repeatedly shown no differences in mortality or morbidity that could be attributed to fluoridation.[2,4,13,19,21,25,28,31,43,44,53,55,58,73]

There also has been a large amount of laboratory research on the physiological and metabolic effects of fluorine and its compounds. Results of these studies have produced no contra-indication to fluoridation in terms of adverse systemic, tissue or metabolic changes, including the possibility of cumulative effects. On the contrary, reports in medical literature have indicated that fluorides appear to be necessary for the development of optimal calcification in bones and may be used therapeutically in the treatment of osteoporotic conditions.[18,56,74] Because of its effect on calcification, fluorine may have a role in preventing some bone diseases and frailties associated with senility.

Among people who live in areas with excessive levels of fluorides in water (eight to 20 ppm) a high prevalence of mottled enamel (dental fluorosis) and cases of osteosclerosis have been reported. Some doubt exists, however, about the possible relationship of the latter condition to fluoride ingestion. Higher concentrations of fluoride in water may be regarded as unsafe. The safety margin between the content of fluoride in fluoridated drinking-water recommended for the prevention of dental caries and fluoride concentrations which may produce toxic effects, is so large that fluoridation, as a public health measure, should cause no concern on the grounds of safety.

The practice of fluoridation has been associated with much scientific controversy. Arguments against the widely established evidence of the safety of water fluoridation have, in general, been based on unique conditions, incomplete medical histories, or on ambiguous description of findings, erroneous analysis and interpretation of data.[13,30,31,33,77,80] On the other hand, over 20 years of careful and intensive epidemiological studies have demonstrated the safety of controlled water fluoridation as consistently as its effectiveness in the prevention of dental caries.

ENGINEERING AND ECONOMIC CONSIDERATIONS

Fluoridation of public water supplies requires an accurate maintenance of the optimal fluoride level, which may vary from 0.6 to 1.2 ppm for different geographic and climatic areas and according to seasonal changes in mean temperature and average drinking-water consumption figures. In determining the amount of adjustment needed for a given area, the level of fluoride naturally present in the water supply has to be considered.[37,38,39]

The mechanical procedures and equipment required for regulating the supply of fluoride in community water supplies are similar to those used for other water treatment measures.[37,61,64] Fluoridation has proven practical for a variety of water treatment plants with different degrees of complexity. Reliable equipment has been developed for use with different types of fluoride compounds and varying volumes of water in large metropolitan areas serving several million persons and small rural towns of less than 1000 people. The primary requirement for fluoridation of a community is the existence of a public water supply served by an efficient plant where the control of fluoride compounds is technically and economically feasible. Fluoride chemicals frequently used include sodium fluoride, sodium silicofluoride, hydrofluosilicic acid, magnesium silicofluoride and fluorspar. Deposits of fluorspar, the least expensive compound, are widely scattered on every continent.[59] As technical developments progress for refining and dissolving fluorspar, the cost of fluoridation could be reduced to one-fifth of the small <u>per capita</u> cost currently experienced. Fluoride compounds, being toxic in high concentrations, require proper handling and storage precautions by water plant personnel for both personal and public protection. Control measures in operating procedures are necessary to ensure that the optimum fluoride level is maintained with acceptable limits.[29,37,58,61,64,70]

A programme of regular inspection of equipment, analysis of water samples and record keeping is a further safeguard for the public and the methods for developing such a programme have been recommended by the WHO Study Group on International Standards of Drinking Water Quality.[7,86]

In areas where excessive amounts of natural fluoride exist, defluoridation of public water supplies is indicated. Technical methods and equipment have been developed for removing large amounts of fluoride salts from community water supplies, but these procedures are relatively expensive and thus more difficult to apply.[37,60] Recently, progress has been made in the United States of America and Argentina in developing new processes to decrease high concentrations of fluorides in water supplies. These projects are concerned with reducing costs of defluoridation through utilization of inexpensive and readily available local materials.

Expected expenses on water fluoridation programmes may be assessed according to [illegible] tion, operation and maintenance costs which will vary in different areas depending on [illegible] availability of technical equipment, fluoride compounds and number and size of operating stations serving the community water supply. Initial installation costs for equipment [illegible] to approximate the operation expenses for one year. The rough figure of 10 cents per [illegible] per year has been used as a general estimate in the United States of America.[29,64] Several countries from various regions have reported cost estimates very close to the United States of America estimate.[13,24,41,48,67,76] Other countries have experienced even lower per capita rates although relativity from country to country is hard to establish. In all cases the cost of fluoridation was much lower than the savings due to the resultant decrease in [illegible] for dental treatment. Moreover, decrease in dental caries facilitates provision of [illegible] fessional services for other dental problems, which require a great amount of extra [illegible] if anything like the ideal in dental health is to be achieved even in wealthy nations.

5. OTHER METHODS FOR SUPPLYING FLUORIDES

Many people throughout the world live in isolated rural areas, which are often supplied by individual well or spring water supplies. Fluoridation of these water sources is not generally possible, nor technically sound as a public health measure. Individual home fluoridator units have been developed, but operation, cost and efficiency of these small systems is difficult to maintain in comparison to fluoridation through public water supplies. Such measures are impractical for populations in developing countries. Experiments with fluoridation units for rural schools have been somewhat successful,[46,47,79] although further studies are indicated before this method can be universally advocated.

Other methods have been studied for providing fluorides to individuals not served by community water supplies. These include the use of topical applications of concentrated fluoride compounds, mouth-washes and toothpastes. Fluoride compounds require repeated applications by dental personnel, thus consuming much professional working time and making the method a very costly undertaking as a large-scale public measure. Results from use of fluoride mouth-washes and toothpastes have shown varying degrees of effectiveness and depend upon meticulous individual effort which is difficult to attain for whole populations at any age.

Vehicles other than water have been tested in some countries as a means for systemically supplying optimum amounts of fluoride. The use of milk, table salt, flour, tablets and vitamin preparations have been tested and have yielded results of varying degrees of effectiveness, efficiency and desirability. These methods all require effective motivation on the part of individuals and hence present the same problem as topical application in mouth-washes and toothpastes. Except for tablet administration, these vehicles present difficulties in determining the concentrations of fluorine to be used and are subject to wide variations from country to country according to dietary patterns. Nevertheless, continued investigations are warranted into efficient methods of providing adequate fluorine for populations living in areas where water fluoridation is not possible.

At present, the superiority of water fluoridation over other methods is abundantly clear both for populations which have a long history of high prevalence of dental caries and, particularly, for developing countries now experiencing a caries "explosion", associated with dietary change in urban developments. In the latter situation, the fact that urban proliferations, usually, are the first to have reticulated public water supplies associates well with the rapidly increasing need for caries prevention in such communities.

POSITION OF PROFESSIONAL ORGANIZATIONS

Many national and international health organizations have adopted official policy statements as a result of detailed investigations on the effectiveness, safety and economic aspects of water fluoridation. Over 60 professional organizations have recommended that water fluoridation be considered and implemented wherever feasible in communities with adequate technical facilities.[48,54] The International Dental Federation whose membership consists of national dental associations from 59 countries, adopted a resolution in 1964 stating that "fluoridation of public water supplies be commended to all public authorities as the most effective public health measure presently available for reducing safely and economically the incidence of dental caries"[34] (Annex IV).

WHO ACTIVITIES RELATED TO WATER FLUORIDATION

WHO has been interested in the development of water fluoridation programmes for some time. In 1957 an Expert Committee on Water Fluoridation concluded that controlled fluoridation of drinking-water is a practical and effective public health measure.[85] A WHO monograph on "Fluorides and Human Health", which contains contributions by 28 scientists from 11 different countries, with reviews on the ingestion, absorption, distribution and excretion of fluorides in man, is in press. This monograph contains a review of research findings on the systemic effects of small amounts of fluorides.[2] A synopsis of excerpts from reports of WHO expert committees, study groups and seminars and from resolutions by WHO regional committees is included for reference in Annex III.

ANNEX I

REPORTED WATER FLUORIDATION PROGRAMMES

Country or territory	Year first project started	Number of communities reported to have fluoridation programmes	Population served by fluoridated water	
Americas				
Brazil	1953	86	1 500 000	*
Canada	1945	313	6 063 000	*
Chile	1953	64	3 300 000	*
Colombia	1953	6	2 401 000	*
El Salvador	1956	1	1 380 000	*
Mexico	1960	5	1 750 000	*
Panama	1950	8	510 215	*
Paraguay	1959	1	135 000	*
Puerto Rico	1953	59	1 808 000	*
United States of America	1945	3 827	71 916 000	*
Venezuela	1952	22	60 000	*
Europe				
Belgium	1956	1	10 000	**
Czechoslovakia	1958	30	1 000 000	*
Federal Republic of Germany	1952	1	6 000	**
Finland	1959	1	60 000	*
Ireland	1964	44	1 180 000	*
Netherlands	1953	15	3 000 000	*
Roumania	-	1	70 000	**
Sweden	1952	2	130 000	*
Switzerland	1960	3	250 000	*
United Kingdom of Great Britain & Northern Ireland	1955	15	2 250 000	*
USSR	1960	24	-	
Eastern Mediterranean				
Kuwait	-	-	-	*
Western Pacific				
Australia	1956	23	3 452 100	*
Hong Kong	1961	11	3 570 000	*
Japan	1952	-	-	
Malaysia	-	6	3 000 000	**
New Zealand	1953	29	1 205 233	**
Papua - New Guinea	1966	1	38 000	*
Ryukyu Islands	-	2	740 000	*
Sarawak	-	12	180 000	*
Singapore	1958	-	-	*

* Information from WHO Regional Offices and countries.

** Information from International Dental Federation (1968).

Other figures are from sources listed in the references 37, 45, 50, 62, 83.

ANNEX II

EXAMPLES OF DENTAL EFFECTS OF WATER FLUORIDATION AS REPORTED IN SEVERAL COUNTRIES

BRAZIL

After three years of fluoridation in Baxio Guandu, reduction in decayed, missing, filled (DMF) permanent teeth for seven year old children was 21.1 per cent.; for eight year olds 18.2 per cent.[24]

CANADA

After 10 years of fluoridation in Brantford, Ontario, a 53.9 per cent. reduction in DMF teeth was experienced in children six to 16 years of age as compared with prefluoridation data from the same city. After 17-1/2 years, a continuing reduction in dental caries experience was found in 16-17 year olds in Brantford. In Prince George, British Colombia, after 12 years of fluoridation, 71.5 per cent. of children six to eight years old were caries-free as compared to 48.1 per cent. before fluoridation.[22,49,51]

CHILE

After the first three years of fluoridation in Curico, reductions in DMF teeth were 48 per cent. for three to four year old children and 25 per cent. for five year olds. The proportion of children three to five years without any dental caries rose from 8.6 to 37.0 per cent.[3,24]

COLOMBIA

Before fluoridation in Girardot in 1953, dental examinations on 4000 children revealed that 69.4 per cent. of first permanent molars were decayed. In 1956, this prevalence was reported to have been reduced to 42.2 per cent.[24]

CZECHOSLOVAKIA

After six years of fluoridation in Tabor, a reduction in dental caries of 74 per cent. was found in deciduous and permanent teeth of children who drank fluoridated water since birth.[35,52,72]

FINLAND

In Kuopio after four years of fluoridation, it has been reported that nearly three times as many children were without decay.[5]

JAPAN

Results from Kyoto after 12 years of fluoridation at 0.6 ppm showed a 40 per cent. reduction in dental caries for seven to eight year old children as compared with data from a control area.[62]

IRELAND

An interim study on the Naas (fluoridated) and Athy (control) project, after four years, showed a 28 per cent. decrease in decayed teeth, with 39 per cent. reduction in decayed tooth surfaces for seven to 10 year old children.[69]

A22/P&B/7
Annex II

NETHERLANDS

In Tiel, after six and a half years of fluoridation 67 per cent. less carious lesions were found on proximal tooth surfaces of 10 year old children. After eight and a half years a reduction of 62 per cent. was found in pit and fissure cavities in seven year olds. After 10-1/2 years, a 78 per cent. reduction was found in dental caries on proximal tooth surfaces of 12 year olds. After 11-1/2 years, 11 year old children experienced 55 per cent. less DMF teeth than children in the control town of Culemborg.[14,15,16,35]

NEW ZEALAND

In Hastings after 10 years of fluoridation, 10 year old children had approximately 55 per cent. less carious lesions as compared with prefluoridation data in the same town.[37]

PUERTO RICO

Reductions in prevalence of dental caries in fluoridated areas after 10 years ranged from 66 per cent. for six year olds to 31 per cent. for 15 year olds.[6]

SWITZERLAND

After five years fluoridation in Basel, the number of DMF teeth was reduced at each age from seven to 15 years, the greatest reduction being 60 per cent. for seven year old children who used fluoridated water from two years of age.[42]

UNITED KINGDOM OF GREAT BRITAIN AND NORTHERN IRELAND

Results from the first three trial studies after five years of fluoridation showed a decrease in the average number of decayed, missing and filled teeth for three year olds of 66 per cent; four year olds, 57 per cent.; five year olds, 50 per cent. Number of children free from dental caries at three years of age had risen from 32-60 per cent. and at four years of age from 22-42 per cent. After eight years of fluoridation in Anglesey among children aged eight years, dental caries experience in first permanent molars was reduced by nearly 40 per cent., while in the control area it remained virtually unchanged.[35,36,41]

UNITED STATES OF AMERICA

Observations after 10 years of fluoridation in Grand Rapids, Michigan showed a reduction in caries experience for deciduous teeth of 54 per cent. for six year olds, and for permanent teeth an average of 60 per cent. for children born since fluoridation was started in 1945. After 15 years, the prevalence of dental caries was 50-63 per cent. less in 12-14 year olds; 48-50 per cent. less in 15-16 year old adolescents. The final 10-year report from Newburgh, New York showed a 58 per cent. reduction in DMF teeth for continuous-resident children six to nine years old. A 14-year post-fluoridation study in Evanston, Illinois showed similar results to the study in Grand Rapids, Michigan.[8,9,11,20]

UNION OF SOVIET SOCIALIST REPUBLICS

Results of water fluoridation in Norilsk after seven years, indicated a 43 per cent. decrease in dental caries for seven year olds; a 33 per cent. decrease for eight year olds.[72,75]

ANNEX III

EXCERPTS FROM REPORTS OF WHO EXPERT COMMITTEES, STUDY GROUPS AND SEMINARS AND FROM RESOLUTIONS BY WHO REGIONAL COMMITTEES

MEETINGS

I. WHO Report on the Dental Health Seminar, Wellington, New Zealand, 4-21 May 1954 (Un-numbered document, WPRO, 1954)

Participants: 37. From the Western Pacific Region: Australia, China, Fiji, Hong Kong, Japan, Korea, Malaysia, New Zealand, North Borneo, Philippines, Sarawak, Territory of Papua and New Guinea, and Viet-Nam.

From the South-East Asia Region: Burma, Ceylon, India, Indonesia and Thailand.

From the Eastern Mediterranean Region: United Arab Republic and Iran.

Conclusions:

9. "The presence of the fluoride ion in communal water supplies in the proportion of approximately 1 ppm is associated with a lowered incidence of dental caries. The adjustment of the fluoride ion content of the communal water supplies to an optimal level is a safe and effective public health measure.

10. In those countries where dental caries is prevalent; fluoridation of water supplies should be undertaken."

II. Dental Health Services for Children
Report of the Study Group organized by the WHO Regional Office for Europe, Brussels, 3-7 February 1958
(Un-numbered document, EURO, 1958)

Participants: 20. From the following countries: Belgium, Bulgaria, Denmark, Finland, France, Ireland, Italy, Netherlands, Norway, Sweden, Switzerland, United Kingdom of Great Britain and Northern Ireland, United States of America, USSR and Yugoslavia.

FLUORIDATION

The WHO Expert Committee on Water Fluoridation, in its report, concluded that there was abundant positive evidence to support the belief that this method of prevention rendered the teeth much more resistant to dental caries. Moreover, there was no available scientific evidence of any harmful systemic effects. This method was considered to be practicable for inclusion in public health practice.

The Group has taken note of the above Report and is satisfied that it may properly advise planners of dental health programmes to include fluoridation of water supplies in those areas where the existing waters are deficient in fluoride and where the nature of the water system is such as to permit its adoption."

III. Report of a WHO Expert Committee on Dental Health: Water Fluoridation (Technical Report Series No. 146, Geneva, 1958)

Participants: 7. From the following countries: Brazil, India, Sweden, Switzerland, United Kingdom of Great Britain and Northern Ireland, and United States of America.

A22/P&B/7
Annex III

Conclusions:

1. Drinking-water containing about 1 ppm fluoride has a marked caries-pre[illegible] action. Maximum benefits are conferred if such water is consumed th[illegible] life.

2. There is no evidence that water containing this concentration of fluoride impairs the general health.

3. Controlled fluoridation of drinking-water is a practicable and effective [illegible] health measure.

Summary:

. . .

17. No other vehicles or techniques for the prophylactic application of fluor[illegible] can at present replace the fluoridation of drinking-water as a public health measure.

IV. Dental Health Services for Children
Report on a Seminar organized by the WHO Regional Office for Europe, Goteborg, 20-27 April 1960 (Document EURO 151.2)

Participants: 42. From the following countries: Albania, Austria, Belgium, Bulgaria, Czechoslovakia, Denmark, Finland, France, Federal Republic of Germany, Greece, Iceland, Ireland, Luxembourg, Morocco, Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, Turkey, United Kingdom of Great Britain and Northern Ireland, USSR and Yugoslavia.

Conclusions:

9. "Full attention should be given to the proved effect of water fluoridation [illegible] a caries preventing measure."

V. Report of a WHO Expert Committee on Dental Health: Organization of Dental Public Health Services (Technical Report Series No. 298, Geneva, 1965)

Participants: 8. From the following countries: Brazil, Czechoslovakia, Malaysia, Scotland, Sweden, Switzerland, United States of America, and USSR

Summary and conclusions:

4. "Public dental health programmes usually include educational, preventive and treatment services. Because of the universal prevalence of dental diseases and the enormous unmet dental needs throughout the world, and in almost every country, it is recommended that preventive services be given a high priority in such programmes and that the application of proven methods of prevention be encouraged.

"The importance of preventive activities in a dental public health programme has already been emphasized. These should be developed to the fullest extent that available knowledge permits. Where the problem is essentially dental caries, the nature and the use of fluorides should be widely publicized, particularly their use in the form of water fluoridation, but also in alternative forms when suitable water supplies are not available."

Special Considerations for the Development of Dental Public Health Services in Newly Independent Countries.

In view of the general inadequacy of resources and the magnitude of the needs, preventive measures assume added importance. All proven methods should, if possible, be adopted. The addition of fluorides to the water supplies, if they exist, is the most practical, but other possibilities should also be considered."

REGIONAL COMMITTEES

II. Pan American Health Organization, XV Meeting (Directing Council) and WHO, XVI Meeting (Regional Committee), Mexico, D.F., August - September 1964
Resolution XXIII (Official document PAHO 58, p. 77)

RESOLUTION XXIII
FLUORIDATION OF PUBLIC WATER SUPPLIES

The Directing Council,

Having considered the report of the Director on the fluoridation of public water supplies (Document CD 15/29);

Considering that dental problems cannot be solved or dental disorders brought under control with the available professional resources and that the relative shortage of dental resources will become more pronounced as the population of Latin America increases;

Considering that the fluoridation of public water supplies is an effective means of preventing dental caries;

and

Bearing in mind that, in order to hasten the extension of water fluoridation to areas that are not yet benefiting from this measure, there must be close collaboration and co-ordination between dentists and sanitary engineers,

Resolves:

1. To take note of the report of the Director on the fluoridation of public water supplies (Document CD 15/29) and to endorse the policy outlined in it.

2. To note with satisfaction the terms of the recommendation on fluoridation adopted by the IX Pan American Congress of Sanitary Engineering, organized by the Inter-American Association of Sanitary Engineering (AIDIS) and held in Bogota, Colombia, in June 1964.

3. To suggest to national authorities having responsibility to provide public water supplies that they take the necessary steps to begin fluoridation in water systems which have not yet adopted that measure.

4. To recommend that the Director continue his efforts to obtain the funds needed to implement the proposed programme."

III. WHO Regional Committee for Europe, 15th Session, Istanbul, 1965
(Document EUR/RC15/R6)

CHILD DENTAL HEALTH IN EUROPE

The Regional Committee for Europe,

Having studied the document submitted by the Regional Director;

Recognizing that dental disease in the children of the European Region is a major problem,

EXPRESSES the need for:

... A more rapid development of water fluoridation where practicable or, failing this, other methods of administration of fluorine, as a caries preventive measure."

ANNEX IV

International Dental Federation

FLUORIDATION RESOLUTION

Adopted by the General Assembly, at the 52nd Annual Session,
San Francisco, California, United States of America, 7-14 November 1964

Whereas, dental caries is a disease of major proportion throughout the world, causing pain, disfigurement and impairment to health; and

Whereas, the scientific evidence supporting the safety, effectiveness and practicality of fluoridating public water supplies in order to reduce the incidence of dental caries has been considered and accepted by an Expert Committee convened by the World Health Organization, by governments, and by scientific and professional organizations throughout the world, and

Whereas, continuing study and observation over the past thirty years have established fluoridation of communal water supplies as the most efficacious and inexpensive means for preventing dental caries and for improving dental health throughout life, be it therefore

Resolved, the fluoridation of public water supplies be commended to all public authorities as the most effective public health measure presently available for reducing safely and economically the incidence of dental caries.

ANNEX V

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WHY DOES THE MICHIGAN DEPARTMENT OF PUBLIC HEALTH PROMOTE WATER FLUORIDATION?*

MAURICE S. REIZEN, M.D., DIRECTOR
MICHIGAN DEPARTMENT OF PUBLIC HEALTH

I have been invited by your capable, persistent, and spunky secretary to discuss today the question, "Why does the Michigan Department of Public Health promote water fluoridation?" During my discourse I hope to share with you the perspective that water fluoridation is just one of the many phases of a health program designed to meet the legal responsibilities as demanded of the Michigan Department of Public Health by legislation, regulation, and expediency.

You are well aware that water fluoridation has been the subject of a variety of attacks and support in the past many years. The process has been propelled from the scientific field, through public debate in the townhalls and into the political arena, through the judicial process in courts and through the legislative channels of our state government. While water fluoridation has been going through all these experiences, the basic scientific fundamentals and reasons for the procedure may have been forgotten.

In answering the question at hand, I would beg your indulgence as I present some basic definitions and explanations of public health, a brief description of the Department, and a discussion of tooth decay and its effect upon the health of the public.

Public health is the art and science of <u>preventing</u> disease, (I stress the word preventing), prolonging life and promoting physical and mental efficiency through organized community effort. The key words in this definition are in the last phrase, <u>through organized community effort</u>. Public health activity may be directed to the population of the entire community, both professional and lay. All people are considered and included in public health practice, the acutely and chronically ill, as well as healthy individuals who may be either resistant or susceptible to disease.

Prevention against disease by individualized attention to each person in a group falls within the preventive sector of medicine but is often time-consuming and costly. Protection for as many people as possible by an organized community effort is a more practical and economical approach for public health professionals.

*Presented at annual meeting of the Michigan Pure Water Council April 22, 1976.

The Michigan Department of Public Health is described in the law as the state agency responsible for ". . . general supervision of the interests of the health and life of the people of this state . . ." This responsibility lies primarily in the prevention of disease and to preserve and promote a healthy life for the citizens of Michigan.

The Public Health Department is composed of professional people with specific training and specialized experience in their discipline. Many of our staff have a master's or a doctor's degree. Add to this personnel the professional resources available to the Department from other state agencies, the universities, and the private professional sector, Michigan is fortunate to have such a talented army in the constant battle against disease and illness.

As State Health Director, broad powers of supervision and control of public water supplies in the state has been bestowed by statute to me and thus our Division of Water Supply of the Bureau of Environmental Health. A statutory requirement is delivery of safe, wholesome, and potable water.

The surveillance of water is from its natural source, whether it is a well, a river, or a lake, through complex water conditioning procedures and the delivery system. The training, examination, and certification of water work operators are a part of our function. An acceptable water supply depends on treatment and removal of suspended solids and precipitation of deleterious compounds in solution for removal of these substances. Acceptable standards for taste and odor have to be met. A standard of performance is indicated for any procedure of water conditioning. The public is usually unaware of these many processes in the preparation of the water flowing from their faucet.

All chemicals, whether they are present in the source of the water or added to water during the treatment process are taken for granted and the public simply expects and demands delivery of a safe, wholesome, and potable tap water.

Let us discuss tooth decay. Dental decay is a disease which destroys human tissues, specifically tooth enamel. A person with a rotten tooth is not a healthy individual. Decayed teeth may lead to disability and deformity. An aching tooth and a swollen face demolish the sense of mental, social, and physical well being. The consequences of tooth decay can deter an individual from gainful pursuit or effective performance in earning a living.

Dental care is one of the greatest needs of children examined in Operation Head Start, and dental disease was the leading cause of draft rejection in World War II. Studies and surveys reveal as much as 98 percent of the population in nonfluoridated areas can be affected by the disease. One out of every three people over 45 years of age have lost all their natural teeth due to the ravages of dental diseases. The illness, pain, discomfort, and disabling effects of dental disease is one of the leading causes of absenteeism in school and industry. Dental decay is not self-limiting and, if unchecked, the disease progresses to a degree that extreme surgical removal of the infected tissues or tooth becomes necessary with resultant disability and deformity. The replacement of one's own teeth for proper function, esthetics and well being requires considerable effort, expertise and money.

The financial burden for restoring or replacing decayed teeth is stunning. Cost for dental care for less than thirty thousand four to six year old children enrolled in the Head Start Program exceeded over six hundred thousand dollars in one year. The Michigan Delta Dental Plan, one of several private third party dental insurance programs, has reported an annual expenditure for dental care of more than $66 million dollars for approximately 1.1 million individual claims. The Dental Section of the Bureau of Health Care Administration of the Michigan Department of Public Health has an annual budget of 24 million dollars for dental care of approximately two hundred thousand people covered by Medicaid. Since our agency is supported by tax funds, any effort to lessen the expenditure of public money because of tooth decay is justified, and demanded today by the tax-paying public.

Tooth decay is of public health concern because: (1) the disease can affect the whole population; (2) of its effect upon the health, welfare, and economic life of the general public; (3) its treatment by private and public funds is costly; (4) there is a simple community solution to reduce the prevalence of this disease and its ravages; and, (5) this mode of prevention has not been applied universally in the state population areas.

The best public health practice of preventing this dental disease is water fluoridation - a safe, effective, and economical public health measure. Other methods of prevention have shown limited success. Nutrition counseling with emphasis on low sugar intake, education about oral hygiene procedures (toothbrushing and flossing), and systemic or topical application of fluorides do not reduce the amount of tooth decay in the general population as effectively, economically, and easily as water fluoridation although they are important adjuncts to good dental hygiene.

Now we are getting to the crux of the subject of today's discussion. I must remind you that I am discussing water fluoridation. Water fluoridation merely is supplementing the fluoride content of water at its source to bring the amount of fluoride to <u>a desirable, safe, and effective level</u>. This level is recommended at approximately one part of the fluoride ion to a million parts of water. I will keep the discussion pertinent to this procedure and concentration of fluoride as established by this definition and I would ask you keep this definition in mind.

I must repeat that the desirable and recommended concentration is approximately one part of the fluoride ion in one million parts of water. This minimal amount of fluorides does <u>not</u> destroy but improves the quality of drinking water. The fluoride ion, unjustly has been declared guilty of much trauma and injury to human life equal to that by arsenic and old lace, or the illegal use of drugs, or the guns, cannons, and bombs of the past two world wars.

The fluoride ion is not a scientific diabolic invention in the laboratory that has been inflicted by man upon this world and its environment. The fluoride ion is a chemical element that occurs in the natural environment of man - in soil, vegetation, and water. Fluoride is found in varied amounts

in nearly all regions of the entire world. Nearly all food items contain some fluoride. To totally avoid intake of fluorides in foods, you literally would have to starve to death. There is not enough consistent fluoride in food, however, to do the effective job of reducing tooth decay as does the safe and recommended amount of fluoride in water.

The metabolism of the fluoride ion in the human body has been studied extensively throughout the world including the Soviet Union. Researchers in the western and eastern countries by their own studies have exonerated fluoridated water from any wrongdoing or crimes against the health of their societies.

I have described previously the responsibility of the Department for complex water conditioning procedures to produce a safe, wholesome, and potable water supply. The supplementation of drinking water with the recommended amount of fluorides undergoes the same diligent monitoring and standards as all other water conditioning procedures. There is constant monitoring of the water supply during fluoridation until its delivery of water to the Michigan homes. The water operators are trained and supervised in this procedure. Fluoridated water has to be delivered as a safe, wholesome, and potable supply - the same as nonfluoridated water. Drinking water of optimum quality should have the prescribed amount of fluoride in its content.

Water is the universal solvent. In its passage through the atmosphere, and above and below the surface of the world, it will gather desirable and undesirable substances. The problem in the preparation of natural waters for drinking is the elimination of the many physical and chemical impurities which readily may be absorbed by water. "Pure" water is never found in nature. Modern scientific technology and instrumentation is revealing trace amounts of numerous substances in water, many of which previously were not known to be in water because they could not be detected. "Water purification" may be an idealistic misnomer because safe drinking water without a trace amount of some substance may be a practical impossibility.

It can be agreed that there are many complex procedures which water undergoes to become a safe, wholesome, and potable water supply. Yet, the use of one more relatively simple procedure or compound in the water works plant arouses cries of conspiracy with communists, or with capitalists, "mass medication" or "poisoning", infringement upon human rights, government dictatorship, malfeasance of public office, personal ridicule or questioning of one's honesty.

The supplementation of water supplies with fluorides has been accused of being responsible for many, if not all, physical ills. These ills may range from headaches and a hangnail down through the body to flat feet or ingrown toenails. Water fluoridation has been blamed for conception out of wedlock. In California, voters were told fluoridation leads to impotence but, in New Jersey, the charge was nymphomania. I present the latter instance to show you how inconsistent and illogical the situation has become.

Recently, there have been attempts to link the dread disease, cancer, with the intake of fluoridated water. The National Health Federation has charged that: "Fluoridation of water supplies has increased the risk of cancer." The National Cancer Institute has refuted this claim, and I quote Dr. James Peters of the National Cancer Institute Division of Cancer Cause and Prevention: "Their (National Health Federation) statements contain an oversimplified analysis of the data selected and ignore many important geographic, environmental, demographic, and cultural factors that are known to have a relationship to cancer occurrence and death from cancer." Dr. Peters added: "The National Cancer Institute has reviewed all of the statements and statistical presentations submitted or made available by the National Health Federation and had found nothing to support their assumptions and allegations with respect to a causal relationship between cancer mortality rates and fluoridated water supplies."

In the early 1950's claims were made in the booklet of the Fluoridation Educational Society, "The Truth about Water Fluoridation." These claims attempted by misuse of the Grand Rapids death rates from cancer to help support the claim that fluoridation of the public water in that city "tends to speed up the cancer process and thereby produces earlier deaths in cancer patients."

The data from Grand Rapids itself did refute the above erroneous interpretation of statistical data. More than eight years experience with fluoridation at the time of these claims has shown a decrease in the death rates from cancer in Grand Rapids, whereas during this same period there has been an increase in the United States. A longer lifespan and improved means of detecting the disease accounted for this situation. It is emphasized that data of a few years concerning a single disease in a single community are not a reliable index; that care must be exercised in utilizing morbidity and mortality rates; and disease data should be evaluated only by a trained and experienced specialist in epidemiology.

Investigations of any possible relation between fluoridated water and cancer were made in Wales, England, New Zealand, Holland, Japan, and these United States. The conclusion of these epidemiological studies was that no correlation between fluoridated water and cancer existed.

Heart disease has not been overlooked in the objections to water fluoridation. The National Heart and Lung Institute of the National Institutes of Health has refuted the claims released by the Citizens' Action Program for Safe Wisconsin Water, Inc. The conclusion of the National Heart and Lung Institute, after review of the data, was that there is no evidence of any relationship between the intake of fluoridated water and heart disease mortality in Wisconsin or elsewhere. In cities with populations over ten thousand that were studied, mortality rates in fluoridated communities were no higher than in those without fluoridated water.

In Grand Rapids, vital records presented no evidence of unfavorable trends in heart disease or general mortality.

A few communities have defeated or discontinued fluoridation in the past years. A defeat or discontinuance has never been attributed to any scientifically documented adverse effects on health. Saginaw, Bay City, and Tecumseh, Michigan have discontinued water fluoridation at one time but now the citizens of these Michigan cities are having the benefits of fluoridation.

Ingestion of communal water containing an optimum amount of fluoride from birth until the calcification of permanent teeth is recognized as the best means of reducing the prevalence of tooth decay. Not only is a more resistent tooth developed, but also a better appearing tooth is formed. The support of fluoridation by the scientific world has been a result of voluminous scientific proof in the archives of scientific literature. Investigations of the health effects of drinking water with the optimum amount of fluoride have been through in areas where the water supply contains a natural amount and in areas such as Grand Rapids where fluorides are supplemented to a desirable concentration. Grand Rapids was the first city in the world to fluoridate its water supply and this procedure has been exerting its beneficial effects for more than thirty years in this Michigan community. There are other cities in Michigan where fluoridation has been operating for approximately 25 years. (Muskegon, for instance, originally was the control city for Grand Rapids, but grew impatient for the dental benefits and fluoridated in 1950.) Jackson, Battle Creek, Kalamazoo, Midland, Marquette, Wyandotte, Mount Clemens, Benton Harbor, Ann Arbor, Ludington, Bay City, Muskegon Heights, Traverse City, South Haven, Grand Haven, Highland Park, and other communities all have had about a quarter century of experience in water fluoridation. If I were to enumerate the Michigan communities which have had fluoridated water for at least ten years, I would miss my next appointment and all of us would miss lunch. There are now more than 400 communities supplying fluoridated water to over six million people in Michigan. With all the experience of water fluoridation in these cities, the general health in these fluoridated communities is satisfactory and, at least, corresponds to the level of health in nonfluoridated areas except in one condition. That exception is a noticeable reduction in tooth decay. Physicians of these communities will attest to the general well being of the public. No one can go into the streets of these cities and proclaim with justification that illness is prevalent in the area because of fluoridation.

The Michigan Department of Public Health, which I remind you again is responsible for the protection of the health of the Michigan population, constantly has been surveying these fluoridated communities in the same manner as it has the rest of the state for signs of illness. The Department participated in the first studies in Grand Rapids and has conducted special studies in other cities such as Flint, Jackson, Battle Creek, Kalamazoo, Wyandotte, Escanaba, and Bark River. At this moment there are preparations for a dental survey to assess the dental benefits after ten years of water fluoridation in Flint. Our experience and studies in this state and the confirming evidence from many parts of this country and the world simply enforce the recommendation and promotion of supplemental fluoridation of all water supplies deficient in this essential nutrient.

These reasons are the basis of community water fluoridation in Michigan, but the decision to fluoridate has not been a passive and arbitrary one solely by your state health department. The Public Health Advisory Council, appointed by the Governor to advise the State Health Director, has asked that fluoridation be promoted. The University of Michigan, long a leader in research in tooth decay and its prevention, endorses water fluoridation. Other Michigan Universities, the overwhelming majority of recognized Michigan professional societies and associations, and lay and voluntary organizations are supporting water fluoridation.

Water fluoridation has proven to be an economical activity. Estimates of its costs have been made at about 15-25 cents per person per year. What has been the savings in costs for dental care for individuals lucky enough to be born and raised in a fluoridated community?

At the cost of a candy bar per person per year, the financial benefits are great. The Michigan Department of Public Health has estimated, for a family of two adults and one sixteen year old, the cost of water fluoridation for the sixteen years of life of the child would be $7.00 to $12.00. The saving in dental bills would amount in sixteen years to nearly $190. Thus, the return for the family's investment would be about twenty fold. A family of four, two adults, and two teenagers, would have a return of more than forty fold. These estimates are based on minimum costs for primary restorative dental care and does not include the more expensive care by a dental specialist.

Where can a family invest their money more wisely and get such a large return for their investment? Remember, there are other than these financial considerations - the savings in pain, discomfort, illness, disability and deformity, savings in time and costs of travel to the dental treatment center or office, and the loss of time and earnings keeping dental appointments for treatment of the condition.

The Michigan Department of Public Health wants valid evidence of illness anywhere. The only request is that such evidence have a basis in fact and can be validated scientifically.

In final summary, the Michigan Department of Public Health is promoting a practical organized community effort, water fluoridation, to reduce a public health problem, tooth decay. At the same time, the general activity of the Department is concerned with the total health of the entire Michigan population. A primary function in this general activity is the provision of a safe, wholesome, and potable public water supply to the citizens of the State of Michigan, whether the water is fluoridated or not fluoridated. We would recommend the fluoridated supply. It is in the interest of the health of people in Michigan.

STUDIES OF FLUORIDATION'S EFFECTIVENESS - A BIBLIOGRAPHY

Recent Studies

Community	Date of Report & Publication	% Reduction	Population Group
Newcastle and Northumberland	Brit Dent J. 1977	57-67%	Urban & Rural
New Haven, Conn.	Conn. Health Bul. 1979	54.5%	10 yr olds
Toronto, Ont.	Dept of Pub Health 1978	60%	13 yr olds
Flint, Jackson, Battle Creek & Kalamazoo	MI Dept of Pub Health 1976	62-65.6%	7-9 yr olds
Perth, West. Australia	Austral. Dent J. 1978	60%	10 yr olds
Birmingham & Salford, England	Brit. Dent J. 1979	54%	
Winona, Minnesota	Northwest Dent. 1977	57.1%	6-12 yr olds

Following is a partial list of the many studies completed in both the United States and abroad which substantiate the effectiveness of fluoridation in reducing the incidence of dental caries. (For additional reference see MDPH Synopsis)

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SUGGESTED OUTLINE FOR SPEAKERS

NATURE'S WAY TO PREVENT TOOTH DECAY

Introduction

Describe tooth decay in general terms. Emphasize it is a disease which produces pain and discomfort, and possibly general illness and infection. Oral disease starts at a young age and affects almost every person. Avoid boring, statistical data.

Personalize the subject for listeners by asking them to think about their family's dental bills and the condition of their own mouth--jagged edges of cavities, fillings, missing teeth, dentures and bridges.

Mention the costs of dental disease:

1. Tooth decay and its consequences can force absences from work and school.

2. Physical disfigurement can cause psychological or emotional problems.

3. Treatment can become expensive for families and the community.

The most effective, safe and practical way to prevent dental decay is water fluoridation.

I. Definition:

Water fluoridation is the controlled adjustment of a water supply to the concentration of one part fluoride ion in a million parts of water, or 1/10,000 of one percent of fluoride in water.

A. Fluoride is a natural element on earth.

1. It is found in varying amounts in soil, rocks, plants, air and water.

2. It was not invented in a laboratory but has been on earth since its creation.

B. Fluorides at the optimum concentration (1 ppm) in water result in a meaningful reduction of tooth decay and produce no hazard to the human body or the environment.

1. When there is too little fluoride the result is no harm and no benefit.

2. When there is too much fluoride, noticeable mottling may result. This occurs at 5-8 times more than the recommended amount, but will not be seen at the recommended concentration of 1 ppm.

II. History*

A. Natural Fluoridation

1. Dr. Frederick McKay discovered that people who had Colorade Brown Stain also had an absence of tooth decay.

* See *Synopsis of Fundamentals of Relation of Fluorides and Fluoridation to Human Health*, pp. 14-17.

A. Natural Fluoridation, Continued

2. He finally attributed this condition to a substance naturally occurring in the drinking water. In 1931, using newly developed technics, this natural substance was discovered to be fluoride.

3. Further studies in naturally fluoridated areas showed a direct relationship between the proportion of fluoride in the drinking water and the amount of tooth decay in children who were lifelong residents of the region.

4. On the basis of medical and dental health studies in naturally fluoridated areas it was determined that at the level of about one part per million there was a meaningful reduction in tooth decay with no danger to the human body or the environment, and no noticeable mottling would occur.

B. Supplemental or Regulated Fluoridation by Man - A Copy of Nature

1. On the basis of all the studies in naturally fluoridated areas the idea of controlling fluoride levels to the optimum amount was introduced as it was developed by the design of nature.

   a) In the 1940's Grand Rapids, Michigan, Newburgh, New York, Evanston, Illinois and Brantford, Ontario adjusted the fluoride content in their water supplies to one part per million.

   b) After 15 years of study, children living in these cities had 50-70 percent less decayed, missing and filled teeth than children living in nonfluoridated cities.

2. These classic studies have been repeated in the state of Michigan, throughout the U.S. and the world and have shown similar results.

3. Local action regarding fluoridation, such as rulings by the City Council or referenda, should be discussed in terms of the individual community's response to the scientific evidence available from studies.

4. Endorsements (see page 147)

   a. Local
   b. State
   c. National

III. Additional Intakes of Fluorides (pp. 17-26 in Synopsis...)

A. Fluoride is an essential mineral nutrient and is found in low amounts in most foods, in the air and in sea water.

B. Although fluorides are taken into the body by other vehicles, they are in such minute amounts that they neither harm the body nor prevent tooth decay.

III. Additional Intakes of Fluorides, Continued

C. The average combined daily intake of fluorides does not approach acute toxic dose in children or adults, nor is it enough to demonstrate chronic ill effects after daily ingestion for 15 to 20 years.

D. Studies in naturally fluoridated areas indicate that in addition to the intake through foods and air, fluoridated water at one part per million fluorides is necessary for dental benefits.

IV. Fluoridation's Effect on General Health

A. Fluoridation, both natural and supplemental, has not been shown to affect cancer, heart disease, arthritis, allergies, birth defects and diseases of eyes, skin, endocrine glands, kidneys, liver, nerves, blood, bones, lungs or digestive system in studies done throughout the world.

B. Acute poisoning by fluorides can occur when excessive amounts of the raw chemical powder is ingested. Chronic poisoning also has occurred in workers who have experienced long-term chronic industrial exposure to very high levels of fluoride.

* Emphasize there is no relation between acute or chronic poisonings and fluoridated water.

C. Often the range of complaints from rashes to headaches and dizziness is due to the power of suggestion. Many people lodge complaints about "symptoms" from fluoridation even before fluoride is added to their water supply.

V. Engineering Safeguards

A. Waterworks personnel must take a course and pass a certifying examination.

B. Waterworks operators are responsible for:

1) Daily testing (chemical analysis) of water and periodic reports sent to Michigan Department of Public Health.

2) Monthly sample to State Lab.

3) Surveillance and monitoring of reports by water engineers for under or overfeed.

VI. Legal and Religious Considerations

A. The legal validity of water fluoridation has been thoroughly tested in U.S. Courts and has been invariably confirmed.

B. The Michigan Supreme Court ruled that fluoridation was to promote public health and was not in violation of any state or constitutional law.

VI. Legal and Religious Considerations, Continued

C. The American Civil Liberties Union policy is that fluoridation does not constitute an unconstitutional invasion of a person's beliefs, religious or otherwise, and, therefore, does not violate principles of civil liberties.

D. The Christian Science Church's position on fluoridation is one of individual conscience. It recognizes the greater public interest and does not take a stand that would deprive others of health care that they feel desirable and necessary.

VII. Benefits from Fluoridation

A. The reduction in tooth decay with a lifetime ingestion of fluoridated water is up to two-thirds less than with nonfluoridated water.

B. Perhaps less tangible, but not unimportant, are the reduction of unnecessary toothaches, less pain and discomfort from bad teeth, and the relief of distress and anxiety over dental treatment.

C. The economic benefits are substantial.

1. The amount and severity of dental decay is reduced; therefore, the total cost of dental care can be lowered by 50 percent.

2. Dental insurance companies adjust their rates to group experience. Insurance premiums can be lower in fluoridated communities because the amount and type of treatment rendered is less expensive. Therefore, either more services can be added to dental benefits or the cost of the premium could be reduced for members of the community.

3. Tax-supported dental programs, such as Medicaid, get similar reductions in costs in fluoridated areas. More children can be treated for the amount of money spent, which is a more efficient use of the taxpayers' money.

VIII. Safety of Fluoridation

A. The safety of fluoridation has been proven repeatedly in numerous studies.

1. Medical investigations of large groups of long-time residents in naturally fluoridated areas with up to eight parts per million or more have been made.

2. Clinical analysis of tissues, x-ray surveys for bone changes and post mortem examinations have been conducted.

3. Research using animals has been done in laboratories.

4. The findings from these studies have provided consistent evidence that, in addition to all food and other sources of fluorides, humans may ingest fluoride in the water up to eight times greater than the recommended amount of one ppm without any adverse effect other than some persons exhibiting mottled enamel, and still acquire the benefits of better dental health.

SUMMARY HINTS FOR SPEAKERS

ACCENTUATE POSITIVES AND ELIMINATE NEGATIVES

Positives

Emphasize the amount of fluoride in fluoridated water is one part fluoride in a million parts of water, and keep the focus of the discussion on the optimal (1 ppm) concentration of fluoride.

Fluoridated water at one part per million is never poisonous, nor have confirmed ill effects resulted from drinking fluoridated water. Ingestion of massive amounts of any chemical, such as sodium chloride (salt) or sodium fluoride, can be harmful.

Emphasize the reduction in tooth decay, pain, discomfort, missing teeth, and anxiety over appearance in adults, teenagers, and children.

Keep statements about the merits of fluoridation positive without exaggerating. Examples:

(a) Fluoridation is the addition of fluoride to water deficient in this mineral. It is supplementing or fortifying water with an essential nutrient.

(b) Fluoridation builds stronger teeth more resistant to tooth decay; teeth developed with fluorides are more attractive in appearance and have better structure.

(c) Fluoridation is man's copy, improvement, or imitation of nature.

(d) Benefits and safety of fluoridation are based on studies by leading health authorities in the U.S. and throughout the world.

(e) Fluoridation is recognized as a preventive health measure by all reputable scientific and professional organizations throughout the world.

Negatives

Avoid technical terms such as "dental caries"; instead, use tooth decay or rotten teeth.

Avoid the term "dose" which implies medicine or treatment; use amount or intake of fluorides.

Avoid the word "artificial"; when referring to fluoridation use supplemental, controlled, or regulated addition of fluoride to water.

Avoid "treatment" or "therapeutics" when referring to dental care, restoration or filling of teeth, or water processing (rather than water treatment).

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NOTE: Speakers are encouraged to be familiar with the contents of such references as:

Synopsis of Fundamentals of Relation of Fluorides and Fluoridation to Human Health (See Appendix A)

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