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Fluoridation's Benefits Not Limited to Health: Some Observations, Some Predictions

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THE University of Illinois College of Dentistry presently is in the early stages of a study on the impact of community water fluoridation on dental practice. We do not have sufficient data as yet to present statistically valid interpretations of the differences in dental practice in fluoridated and fluoride-deficient communities, which accounts for the title of this paper.

Previous studies which have reported on the economic impact of fluoridation have been based primarily on DMF surveys of child populations, and projected evaluations of the significance of the "M" and "F" components of the surveys. One significant study was done in Gainesville, Florida, in which a cohort of children was followed for five years, and their needs for dental care observed (1). Our study concentrates solely on the office of the private dental practitioner and on what he records on his patient record cards. Our interest is in him and on the nature of his practice.

With the passage of time and the gradual acceptance by the public of fluoridation's beneficial impact on health, water fluoridation is now being viewed from broader social and economic vantage points. We know that water fluoridation prevents about 65 per cent of all carious lesions from occurring, assuming optimal exposure to fluoride during the tooth formative years. There is also reason to believe that those carious lesions which do occur, following ingestion of fluoridated water from birth, are different from cavities occurring in the

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absence of fluoride intake. Fluoride compounds combined with the apatite structure of enamel and dentin make teeth less soluble to the acid end products of the carious process; therefore, it seems logical to assume that caries progresses at a slower rate in teeth which have benefited from fluoridation than in those which have not.

If that caries which does occur is thereby delayed, because of increased host resistance, the end product of dental caries, pulp exposure, is less likely to occur, and fewer of the teeth which are attacked by caries are likely to be lost. It is not uncommon, in fluoride-deficient communities, for neglected first permanent molars to be lost by age eight or nine. Such is hardly ever the case in fluoridated communities (2). Even if neglected, they tend to resist caries for longer periods of time, bringing about certain obvious benefits. First, children tend to be older when urgent dental treatment becomes necessary (if it becomes necessary at all). Because they are older, they approach the dental experience with a greater degree of maturity and are better prepared emotionally to accept pain and some of the discomforts of dental treatment. The few years difference between the child in urgent need of care in fluoridated and fluoride-deficient communities could be marked enough to have a significant effect on the child's initial reaction to dental treatment.

Let me emphasize that these observations are hypotheses—that we do not as yet have documented evidence that the average child seeking dental care in fluoridated communities is significantly older than his counterpart in fluoride-deficient communities; but there is good reason to feel that such is the case. Numerous articles in the dental literature also bear out the facts that patients who have drunk fluoridated water since birth have less malocclusion and better dental health generally than patients from similar socioeconomic backgrounds who have been brought up on fluoride-deficient water.

A comprehensive review of the literature on the impact of water fluoridation on dental practice indicates that some other noticeable changes seem to be taking place in dental practice as a result of fluoridation (3):

1. the reduction in caries seems, to a limited extent, to be counterbalancing the inadequacy of dental manpower;
2. dentistry is gradually undergoing a transition from a profession preoccupied with an unending demand for dental repair to a more satisfactory concern for comprehensive oral health service;

3. the shift away from major attention to caries is leading to greater attention to periodontal treatment and interceptive orthodontics.

Undoubtedly the greatest effect of water fluoridation is on the practice of dentistry for children. Pedodontists from fluoridated communities all over the United States have indicated that profound changes have taken place in their practices since the advent of fluoridation (4). It is well established that fluoride intake changes the nature of the carious process, that different tooth surfaces are affected, and that, in concert with topical fluoride applications, caries arrestment is more likely to take place. Generally speaking, pedodontists in fluoridated areas indicate satisfaction with an obvious trend away from "emergency dentistry" and toward a greater emphasis on preventive orthodontics and tooth guidance.

Supervisors of pedodontic clinics in dental schools located in fluoride areas have expressed some concern for the dearth of patients. Such dental schools are apparently finding it necessary to alter their teaching approach to children's dentistry, since rampant caries and the need for pedodontic endodontics has greatly diminished. Practitioners, in general, do not seem concerned about a decrease in numbers of child patients, but school clinics will apparently have to resolve the problem and find ways of attracting new families to dental schools for dental care. The great backlog of dental disease, the tremendous number of patients to be seen, and the inadequacy of dental manpower will certainly prevent any striking decrease of dental patient load in the foreseeable future, but there may be a lag for a period of time until those portions of the population who otherwise would not receive care are encouraged to seek it. It would seem that as government programs for dental care for children gather momentum, that the patient load will increase well beyond our ability to cope with it, irrespective of the impact of fluoridation. We would hope that a day will come in the foreseeable future where fluoridation plus an increase in manpower would bring a resolution of the dental disease problem within reach of the profession.

Pedodontics is apparently beginning to benefit much in the same way as pediatric medicine did from the decrease in infectious diseases of children a few decades ago. Pedodontists are finding it possible, therefore, to spend considerably more time, in fluoridated communities, on prevention and maintenance, and to spend less time with each patient and treat more children in the same amount of time.

Our surveys of pedodontic practice have shown that the preventive approach to dental treatment goes well beyond the passive acceptance by the practitioner of water fluoridation. Most pedodontists supplement systemic fluoride consumption with topical fluoride applications, as well as an organized program of dental health education, instruction in oral hygiene, and a periodic recall system, including prophylaxis and at least bite-wing radiographs.

ECONOMIC ADVANTAGES OF FLUORIDATION

The economic advantages of fluoridation have been reported frequently in recent years (5). We now have good reason to believe that not only does the public benefit financially, but that the practicing dentist also tends to benefit. For reasons not yet clear to us, dentists who practice in fluoridated communities tend to have higher incomes than dentists in fluoride-deficient, but otherwise comparable, communities. Our data have begun to reveal evidence that larger numbers of patients, each needing less care, are seen by dentists in fluoridated communities.

Not only is there justification for expecting less direct costs accruable from a decrease in dental caries in fluoridated communities, but there is good reason to expect less malocclusion and less periodontal disease which might otherwise have occurred as an indirect result of decreased caries and tooth loss, with resultant lower dental costs.

There is already good evidence in the literature that fluoridation makes a marked impact on costs of dental care, at least with children. The Gainesville study, referred to earlier (1), was based on regular clinical maintenance care of a particular school population. The fluoride level of the Gainesville community water had been controlled at a level of 0.8 ppm since 1949. The study was started in 1954 and completed in 1959. It was done to determine the dental needs of first through sixth graders in a community having the benefits of water fluoridation. The services were completed in four series. In the first series, which took 17 months, an average of 1,270 children were completely treated per dentist year. By the fourth series the ratio had increased to one and half times as many children treated. An increase of nearly 60 per cent was shown in the third series when each dentist treated 2,000 children per dentist year. Also, during the first two series a child averaged 45 minutes of treatment time; in the last two series this had been reduced to 30 minutes. In the first series,

with 4,000 children under treatment, 9,000 permanent teeth were restored, one in 30 requiring pulp therapy. During the second treatment series, with approximately the same number of children, only 4,050 permanent teeth required restoration. This was less than half as many as in the first series. Since the dentists had more time available, they were able to treat 5,000 primary teeth as well. The third treatment series had nearly a thousand more children, but the number of permanent teeth filled was only 3,237, and only one in 60 required pulp therapy. In the fourth series about 4,000 children participated. Extractions and pulp therapy were reduced to a minimum in both the third and fourth series. The Gainesville study tells a very important story about the ongoing impact of water fluoridation on the practice of dentistry for children. We still have a great deal to learn about the long-range effect on adult dental practice.

Almost 65 per cent of New Mexico's population is served by community water supplies having almost optimal or excessive fluoride content. Only 8 per cent of the population served by community water supplies is not drinking at least an optimal amount of fluoride. Striffler estimated that for every three dentists needed in New Mexico, another area with the same size population, fluoride-deficient, would need four dentists (6). Our preliminary data on comparison of dentist:population ratio in comparable fluoridated and fluoride-deficient communities has not, at least to this date, corroborated this observation.

As was shown by the continually decreasing services necessary in each consecutive series in the Gainesville study, with each dentist being able to treat more children in each consecutive series, the cost per capita for dental care decreases with each year of fluoridation. Each dentist is also able to treat more patients. In New Britain, Connecticut, a survey conducted ten years after the start of fluoridation showed a reduction in the ratio of decayed to filled teeth and the number of missing teeth (7). In 1951, the ratio of filled to unfilled teeth among the 12 and 13 year olds was one to one. In 1961 it had decreased to nearly three to one. In 1951 the average child in New Britain, six to 16 years old, had six and one half DMF teeth. In 1961 this had dropped to three and one half, a reduction of 44.5 per cent. The economic implications of these facts are readily apparent.

One potential benefit from fluoridation can be reduced premiums

for prepayment dental plans. A New York City dental prepayment plan urged fluoridation of the city's water supply in 1963 as a benefit to dental insurance costs (8). "As fluoridation's beneficial effects become apparent it will enable group dental health insurance to cut premiums or increase benefits. . . . With fluoridation we will pay for fewer fillings and extractions, especially among children," said one of the administrators of the plan. He continued, "It is no exaggeration to say that a large number of New York children may with regular care preserve their permanent teeth for life. Prepayment health insurance can increase its allowances for expensive replacements so desperately needed by so many who have already lost teeth, or reduce the premiums it charges."

In respect to the relationship between fluoridation and dental health insurance, Young and Pelton observed (9), "A community prepayment program to provide dental health care for children seems to offer attractive possibilities for improving oral health conditions and contributing to the satisfactions of dental practice. Experience has shown that the basic problem involving voluntary health insurance programs is to offer services that the people desire at a premium they are willing to pay. The premium rate is particularly important in dental prepayment because the fear of unpredictable catastrophic expenditures for dental health care is largely absent." Analysis of data derived from dental examinations in Nampa and Coeur D'Alene, Idaho, indicated a considerable reduction in treatment costs, thereby indicating the possibilities of a decrease in premium rates in a community such as Nampa where the drinking water contains an optimal amount of fluoride.

PREDICTIONS

Dental practice is changing dramatically. One of the major reasons for this is the growing impact of water fluoridation on the nature of dental practice. It is inevitable that anything which eliminates so much of the major disease problem with which dentists spend the bulk of their practicing hours must make a marked imprint on practice.

As fluoridation affects more and more people and more and more dentists, dentists will see less of the ravages of dental caries. Restorative dentistry will occupy less of their total practicing time. The

emphasis on restoration and repair will shift to a greater emphasis on diagnosis, prevention, and maintenance. Dentists will do less exodontics, and there will be a decreased need for endodontics as well. More attention will be given to periodontics and maintenance of the health of the supporting structures of the mouth.

The specialty of pedodontics will gradually change. Pedodontists will concentrate more on prevention and interceptive orthodontics than on reparative dental procedures. It would seem that, over the long run, oral surgery will be the most profoundly affected specialty of dentistry, and that there will be a gradual decrease in the need for oral surgeons, since the bulk of the oral surgeon's time is spent removing the ravages of dental caries.*

The practice of dentistry will probably undergo highly desirable changes. The dentist should have opportunities in the future to spend more of his working hours on the more scientifically-based aspects of practice, and less on the purely mechanical. Since prevention will play a more prominent role, he will find it necessary to utilize his knowledge of basic science more frequently than at present.

All these changes will make a marked impact on dental education. It seems inevitable that the emphasis on restorative dentistry in dental education will slowly be replaced, at least in part, by increasing attention to oral medicine, periodontics, pedodontics, orthodontics, preventive dentistry, and public health. While water fluoridation, alone, can hardly stimulate such changes, present indications are that it will play a major role in doing so, along with the other social, scientific, and economic changes taking place in society.

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* A nationwide survey of oral surgeons, conducted since the presentation of this paper April, 1966, indicates that oral surgeons practicing in long term fluoridated communities (and who practiced in those same communities for an adequate period pre-fluoridation) have noticed no marked impact of fluoridation on their practices. If anything, the great majority of them feel that they are busier. A few indicated that they seem to have less call for the use of general anesthesia, and a significant number noted that fewer children seem to need their services. This survey will be published elsewhere in greater detail.

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