

FLUORIDES



TEETH

Division of Oral Hygiene

*State Board of Health
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FLUORIDES AND TEETH

Division of Oral Hygiene
North Carolina State Board of Health

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Early History



In the current interest and concern about fluoridation, the addition of fluorides to municipal water supplies, we should not forget the dramatic history of the discoveries and developments on which this preventive measure is based.

This particular story begins almost fifty years ago with the desire and determination of a young dentist to do something about a condition that was disfiguring the teeth of his patients. In 1908 Dr. Frederick S. McKay and his colleagues in Colorado Springs set themselves the task of finding the cause and cure of the "Brown Stain" occurring in the teeth of 80 per cent of the children and young adults of their town. In examining the teeth and talking to the children they noted that the teeth of those who had moved into the community after the age of ten were not affected.

Dr. McKay extended his investigations to the surrounding countryside and small communities, travelling by horse and buggy and asking the people what they ate and where they got their water. He found many other similarly afflicted

communities but he also found one community that did not have "Colorado Brown Stain." Of great significance was the fact that this was the only one of these towns that did not get its water from the Pike's Peak watershed. Later, in a mining community, the condition was found to be extremely serious. This town used water from a deep mine.

Dr. McKay had called in Dr. G. V. Black to help in the investigations. It gradually became apparent to them, from their own studies and from reports received from others who had become interested, that the condition was related to the water supply. Dr. Black gave the name, mottled enamel, to the condition. The first article on mottled enamel in dental literature was published in 1916 in "Dental Cosmos" under the joint authorship of Dr. McKay and Dr. Black.

Conclusive evidence of the validity of the water hypothesis was furnished between 1916 and 1931 by experiences with changing water supplies in several communities. Britton, South Dakota, changed from shallow surface wells to deep drilled wells with the result that all of the younger children had mottled tooth enamel while the teeth of the older children were not affected. After a similar experience in Oakley, Idaho, where the water source was changed from surface wells to water piped from warm springs, a second change was made and the mottling was ended.

At Bauxite, Arkansas, with the establishment of a deep well system mottling appeared. The wells were sealed off and water from the Saline River was used. Ten years later Dr. McKay and Dr. H. Trendley Dean of the United States Public Health Service examined the children's teeth and found the teeth of those born since the change from the well to river water free of mottling. They also noted, however, that the teeth of these children were more subject to decay than were the mottled teeth. This new and important observation led to a new field of investigation.

The study at Bauxite also led to finding that it was the high fluorine content of water that caused mottled enamel. This discovery was made by H. V. Churchill, chief chemist of the Aluminum Company of America, and was announced by him January 20, 1931. He found the fluoride content of the deep well at Bauxite to be 14 parts per million and was the first to suggest the possible correlation between fluorides in the water and mottled enamel. Waters from other affected communities were analyzed and found to contain fluorine.

Dentists and chemists then became engrossed and engaged in studies and experiments to determine the amount of fluorine which would inhibit decay without causing mottled enamel and in devising methods for regulating the fluorine content of drinking water. As late as 1935 there was more emphasis on reducing the fluorine content of water to prevent dental fluorosis





than there was on adding fluorides to municipal water supplies to prevent dental caries.

In our own State in the early thirties, Dr. Dean and the writer visited communities where the children's teeth showed mottling. In Windsor, where the condition was prevalent in a mild form, the artesian well water was found to contain excessive amounts of fluorine. These wells were sealed off and a new source of water substituted.

In brief, then, the first three steps in discovering the relationship of fluorides in drinking water to dental health have been:

1. The association of the prevalence of mottled enamel with the water ingested during the period of tooth formation.
2. The isolation of fluorine as the constituent of water that causes mottled enamel.
3. The observation that mild dental fluorosis was accompanied by low dental caries prevalence.

Natural and Controlled

The discovery that the presence of small amounts of fluorides in water reduced the occurrence of dental decay without causing any mottling led to studies and experiments which resulted in the acceptance of fluoridated water as a means of reducing the incidence of tooth decay. By making studies in many communities using water with varying amounts of fluorides the scientists arrived at the conclusion that approximately one part per million (1PPM), varying slightly according to climatic and other factors, was a safe and effective fluoride content for drinking water.

All of the studies and experiments thus far had been made with naturally fluoridated water supplies. The logical sequence of events was for the suggestion to be made that fluorides might be added to water supplies which were deficient in this element in order to reduce the incidence of dental caries. With the fact well established that 1 PPM was beneficial to dental health two questions remained to be answered. They were:

1. Did the use of fluoridated water have a harmful effect on any other part of the body?
2. Would results from drinking water to which fluorides were added be the same as from drinking water with naturally borne fluorides?

For finding the answer to the first question nature had already provided a laboratory

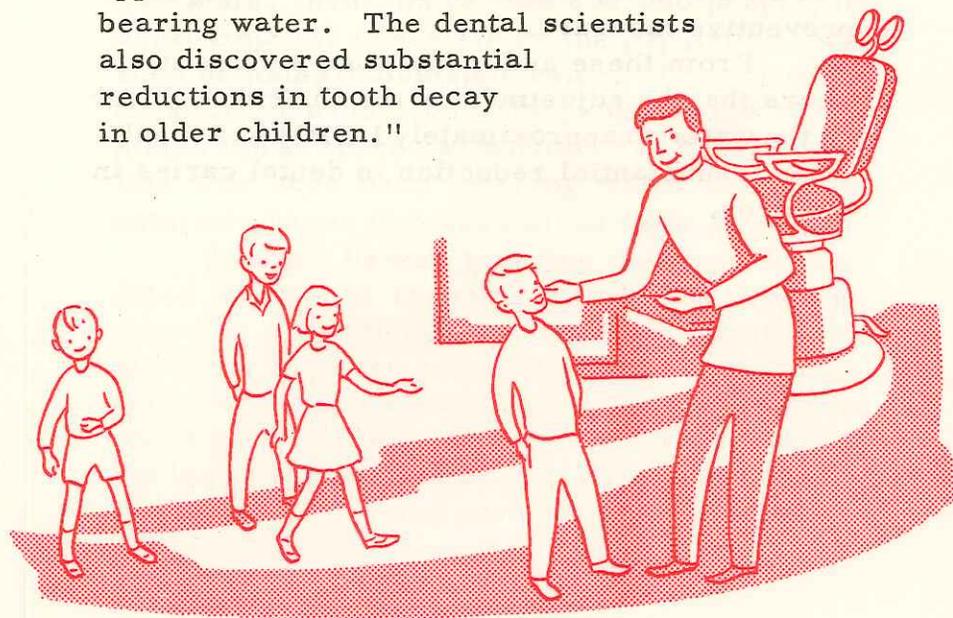
with over 3,000,000 guinea pigs - the areas where the drinking water contained fluorides from the desirable concentration up to five and ten times that amount and the people who had been drinking this water. From exhaustive studies in these areas, to determine the prevalence of diseases or diseased conditions of body organs and structures, there is no evidence that prolonged ingestion of water containing even more than the recommended 1 PPM of fluorine has, in any case, produced any harmful effects.

In 1945 studies were begun to find the answer to the second question, that is, to determine whether or not controlled fluoridation would give the same benefits as natural fluoridation. The experience in Grand Rapids, Michigan, has answered this question in the affirmative. Today, six year old children in Grand Rapids have 66 percent fewer cavities than their teen age brothers and sisters had at the same age. The following is a brief account of this experiment.

"To determine the effect of adding fluoride to water supplies, research workers of the Public Health Service got together nine years ago with officials of the University of Michigan and the Michigan State Department of Health. They selected Grand Rapids, an industrial city of nearly 200,000, as the place for their study. The city fathers there agreed to cooperate, and on January 25, 1945, Grand Rapids became the first city in the world to add fluoride to its water supply.

"Before fluoridation and every year since, dentists have examined the teeth of Grand Rapids children and, for comparison, have made similar examinations in near-by Muskegon, Michigan, and also in Aurora, Illinois. They chose Muskegon because it is similar to Grand Rapids in climate and geography, and gets its water from the same fluoride-free Lake Michigan. Aurora was selected because its water supply contains about the same amount of natural fluoride that Grand Rapids is adding to its water. In 1945, Aurora children had about two-thirds less tooth decay than Grand Rapids children had before fluoridation.

"By 1952, tots six-years old and younger drinking the fluoridated water of Grand Rapids from birth had the same low decay rates as their opposites in Aurora with its natural fluoride bearing water. The dental scientists also discovered substantial reductions in tooth decay in older children."



A similar test has been in progress in Newburgh and Kingston, neighboring towns in New York State. Beginning in May, 1945, sodium fluoride has been added to the water supply of Newburgh, bringing the content to 1.2 PPM, while the Kingston water supply has been left free of fluorine. Dental examinations of children up to 12 years of age were begun in 1944 and have been made every year since. Each successive examination has shown a decrease in decay in Newburgh and a constancy in the decay rates in Kingston.

Many other cities have obtained practically the same results by adding fluorides to their water supplies. Among the earliest of these are Sheboygan, Wisconsin; Lewiston, Idaho; Marshall, Texas; and Brantford, Ontario. Charlotte was the first city in North Carolina to adopt this preventive measure.

From these and many other studies it appears that the adjustment of the fluoride content of the water to approximately 1 PPM has resulted in a substantial reduction in dental caries in children.

Present Status

The current state of fluoridation cannot be termed the status quo, in the popular use of that term, for it is constantly changing. Fluoridation is a going concern with each week, even each day, showing more and more evidence in its favor and phenomenal gains in its acceptance as a preventive measure. From figures released July 1, 1954, we find that in the Nation 17,601,658 people in 981 communities are drinking fluoridated water. The figures for North Carolina show that fluoridation is in operation in 20 municipalities serving 513,620 people and that it has been approved in several more towns with a combined population of over 100,000. In our own State, then, more than 600,000 people, or approximately one-sixth of the population, will soon be using fluoridated water. These figures do not include the 3,000,000 people in the United States and an appreciable number in North Carolina who have been drinking water containing naturally borne fluorides all of their lives.

It might be well to define the term, fluoridated water. It is water to which a small amount of a fluoride salt, a natural constituent of water, has been added in order to supply the deficiency and bring the content to a certain level which has been found to be beneficial in reducing the incidence of tooth decay. The generally accepted amount is one part per million. This is



such an infinitesimal amount that a person drinking 8 glasses of water a day for 16 years will consume only an ounce of the fluoride salt.

We believe that the fact that many water supplies are deficient in this natural element is to be accounted for through soil erosion. The fluoride salts which are added to water are the same ones which occur naturally. It will be seen then, that fluoridation is a matter of nutrition and not medication. Adding fluorides to water is comparable to fortifying flour, that is, returning to refined flour the minerals and vitamins which were taken out during the milling processes.

We have cited a few of the many pilot studies in fluoridation. There are now, as there have been for years, many groups of physicians, dentists, biochemists, and other scientists devoting much time and thought to this field of research. The average citizen, or even dentist, may not have the time or the training in research techniques to read and evaluate the voluminous reports of the various studies, experiments, and tests in order to decide for or against fluoridation. As in many other matters pertaining to health we must rely on authoritative sources for information and advice. Of course, we should be certain that our sources are authoritative.

Fluoridation has the backing of an impressive array of scientific organizations. Among them are the following groups with the dates of endorsement.

State and Territorial Dental Health Directors,
June, 1950

American Assn. Public Health Dentists,
October, 1950

American Dental Association,
November, 1950

State and Territorial Health Officers,
November, 1950

American Public Health Association,
November, 1950

United States Public Health Service,
April, 1951

North Carolina Dental Society,
May, 1951

National Research Council,
November, 1951

American Medical Association,
December, 1951

The unqualified endorsement of these societies and associations should assure even the most faint hearted and cautious that fluoridation is a safe and effective public health measure. North Carolina communities were not "the first by whom the new was tried." We hope they will not be "the last to lay the old aside."

A Community Responsibility

As typical of the recommendations of the several groups, we quote the one adopted by the State and Territorial Dental Health Directors.

"Resolved, That the State and Territorial Dental Health Directors recommend the fluoridation of public water supplies for the partial control of dental caries, where the local dental and medical professions have approved this program and where the community can meet and maintain the standards required by the State health authority."

This brings us to the procedure to be followed by a community wishing to join the ranks of the 981 cities and towns now adding fluorides to their water supplies. First of all, it should be understood that fluoridation is always initiated locally. It is never imposed on a commu-

nity by a state or federal agency. However, there are certain safeguards which have been included by the North Carolina State Board of Health in its policy which approves and recommends fluoridation. These requirements, in short, are: (1) that the measure must be endorsed by the local dental and medical societies, by the local Board of Health, and by the municipal governing body; and (2) that the procedure for adding fluorides to the water supply must comply with standards established by the State Board of Health.

The first move toward fluoridation in a community may be made by any local group, such as a civic club or a parent-teacher association. Information and assistance may be secured from the local dental society and health department, as well as from the State Board of Health and the State Dental Society. Of course, a preliminary step is to determine the natural fluoride content of the water supply to find whether or not the addition of a fluoride compound is indicated.

A matter of interest is the cost of fluoridation. This is effectively answered in the title of a booklet by the Public Health Service, "Better Health for 5 to 14 cents a year through Fluoridated Water." This represents the per capita cost of the equipment, amortized over a 20 year period, and the yearly supply of the fluoride compound. The three compounds generally used are sodium fluoride, silicofluoride, or sodium silicofluoride.

In conclusion, two reminders are in order. For the first we quote a paragraph from the above mentioned publication.

"To gain the full benefits of fluoridated water, children must drink it during the period their teeth are forming, or from birth to about age 8. Children who are older at the time fluoridation is started receive some protection against dental decay but not as much as the younger children. The protection obtained by children continues throughout life."

For the second reminder, we call attention to the phrase in the resolution by the State and Territorial Dental Health Directors, "for the partial control of dental caries." The fluoridation of water supplies is not a "cure-all." It does not prevent all tooth decay and there is no evidence that it will retard dental decay that has already started.

"Visit your dentist" is still the most important dental health rule. Regular dental care is essential to good dental health.



This material appeared in a series of articles by Ernest A. Branch, D. D. S., Director of the Division of Oral Hygiene of the North Carolina State Board of Health. The articles were published in the Sunday editions of the leading daily newspapers of the State and in many of the weekly papers.

