

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

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ADULTS BENEFIT FROM FLUORIDES

Dental surveys in communities with fluoridated water supplies have proved that the dental health benefits gained in early life can last a lifetime.

Fluoride has been classified as a mineral nutrient essential to optimal health because of its demonstrated importance to the development of healthy teeth. Ongoing medical research suggests that fluorides may also be effective in the prevention and treatment of degenerative bone diseases that are common among older people.

The attached bibliography and reprints document the dental health benefits accruing to adults in fluoridated communities and present some of the evidence for the medically supervised use of larger amounts of fluorides in maintaining the general health of adults.

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4 Enclosures

Annotated Bibliography on Adult Benefits from Fluorides--DDH  
Fluoride and Mineral Metabolism--D. M. Hegsted, Ph. D.  
Effects of Water Having Naturally Occurring Fluoride on Dental  
Health of Young Adults--Harold R. Englander, D.D.S., M.P.H.;  
Rudolph de Palma, D.D.S.; and Robert G. Kesel, D.D.S., M.S.  
Effects of Naturally Fluoridated Water on Dental Caries in Adults--  
Harold R. Englander, D.D.S., and Donald A. Wallace, Ph. D.

## ANNOTATED BIBLIOGRAPHY ON ADULT BENEFITS FROM FLUORIDES

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  $2\frac{1}{2}$  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 Auroral 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., Likins, 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 ever 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 considered 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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