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Community Water Fluoridation

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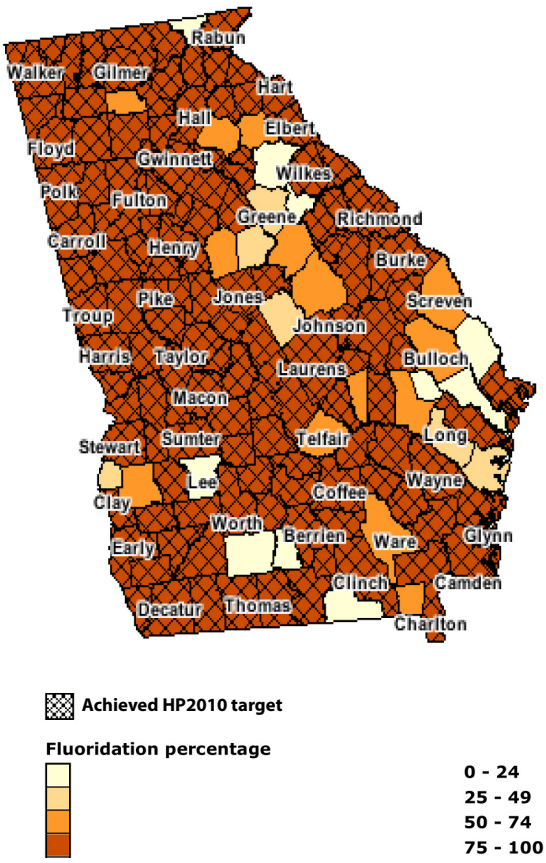
INTRODUCTION

Communities fluoridate their water supply as a cost-effective public health measure to help prevent cavities. Community water fluoridation adjusts the fluoride occurring naturally in water to a level that helps prevent cavities for the surrounding population. Fluoride is an element found at varying levels in all diets. In addition to fluoridated water, other sources of fluoride include foods and beverages produced in areas with fluoridated water, toothpaste, fluoride-containing mouth rinses, dental treatment products, and dietary supplements. Efforts to quantify fluoride intake have proven difficult due to the variable fluoride content within products as well as variation in amounts consumed.

Currently, the U.S. Public Health Service recommends an optimal concentration of fluoride in drinking water be 0.7 to 1.2 mg/L (milligram per liter or part per million) fluoride to yield an average of 1 mg per day of consumed fluoride for protective dental benefits.[i] However, The Department of Health and Human Services recently proposed changing the optimal concentration of fluoride from a range of 0.7 to 1.2 mg/L to a static amount of 0.7 mg/L. The reduced level would provide the best balance of protection from dental caries while limiting the risk of dental fluorosis.[ii] This will have minimal implications for Georgia since the state fluoridates at the static amount of 0.8 mg/L currently.

Georgia's community water fluoridation (CWF) program began in 1951 with the fluoridating of the City of Athens water system. A fluoridation law was passed by the Georgia legislature in 1973 (Georgia Code, O.C.G.A. § 12-5-175) and mandates adding fluoride to all incorporated community water systems serving more than 25 citizens. Exemption to fluoridation can be made by a community referendum. Water samples are tested monthly by the Georgia Public Health Laboratory to ensure optimal levels of fluoride. As of 2008, about 96 percent of Georgia's public water was kept at optimal fluoride levels compared to 64 percent nationally.[iii] Georgia exceeds the Healthy People 2020 goal for this measure of 75 percent.

FIGURE 1: PERCENTAGE OF COUNTY PUBLIC WATER SYSTEM POPULATION RECEIVING FLUORIDATED WATER, 2006



Source: Centers for Disease Control and Prevention. Oral Health Maps, 2006; http://apps.nccd.cdc.gov/gisdoh/waterfluor.aspx. Accessed online, November 1, 2010.

BACKGROUND

Fluoride prevents tooth decay internally and on the surface of the teeth. Systemic fluoride acts on internal and external tooth surfaces while topical application of fluoride has been shown to decrease the potency of the microorganisms in dental plaque bacteria. Systemic fluoride is provided by fluoridated public water supplies, dietary supplements, foods, and beverages. Sources of topical fluorides include fluoride-containing toothpastes, mouth rinses, and gels.[iv]

Dental caries, also known as tooth decay or cavities, are a health problem with impacts on the medical, functional, nutritional, and psychological status of people in all age groups. The prevalence of dental caries is 41 percent in children aged 2-11, increasing to more than 68 percent in adolescents, aged 16-19.[v]
The Health Care Financing Administration estimates five percent of the total health care expenditures (or $34 billion dollars) in the U.S. annually is spent on dental services of which 13.2 percent (or $4.5 billion) is used for filling cavities.[vi]

BENEFITS

Numerous reports document exposure to fluoridated water supplies during adolescence results in reduced tooth decay.[vii] Additional studies have documented an increased rate of caries following withdrawal of fluoride from drinking water.[viii]

However, comparable decreases in caries have also been observed in communities in non-fluoridated areas. An explanation of this can be attributed to the "halo" or diffusion effect. Non-fluoridated communities benefit from goods such as processed foods and beverage produced in fluoridated communities. Due to this "halo" effect, community water fluoridation reduces dental decay from 18-40 percent. Suggested reasons for this include greater use of fluoride-containing dental care products, reductions in the consumption of refined sugar, better access to and utilization of dental health services, improvements in oral hygiene and increased awareness of dental health.[ix]

In addition to the benefits to children, water fluoridation has also been found to have beneficial effects for adults as well. Older adults may experience similar or higher levels of new decay as school children. Findings show water fluoridation contributes to a 27 percent reduction in tooth decay in adults.[x]

Several factors may be influencing the decrease in tooth decay prevalence. These include improved access to dental care, enhanced knowledge of dental hygiene, expanded use of fluoride-containing dental care products and increased exposure to fluoride through foods and beverages. Overall, the evidence indicates fluoride is beneficial to dental health.

OPPOSITION TO COMMUNITY WATER FLOURIDATION

There are groups within the United States and the world –anti-fluoridation groups– who oppose community water fluoridation. These groups are very passionate and committed to their cause. With a strong presence on the web and social media, they have been successful in creating doubt in the minds of many citizens, elected officials, and policymakers about the effectiveness of community water fluoridation. However, many of their claims are simply not supported by scientific evidence or the research has been distorted or misrepresented to convey a message different than the original, intended message.

Anti-fluoridation groups have recently used several current events to further their position. The 2006 National Research Council report, *Fluoride in Drinking Water*, is often cited by anti-fluoridation groups evidencing water fluoridation is harmful. However, this report focused on the regulation of communities that have naturally occurring fluoride in their water. The report did not contain recommendations for community water fluoridation of drinking water.

Similarly, anti-fluoridation groups often cite the announcement made in 2006 by the American Dental Association (ADA) instituting an interim policy advising parents and caregivers using infant formula needing reconstitution to consider using bottled water with no or low levels of fluoride (<0.3ppm). However, in 2010, the ADA released a statement in support of water fluoridation after research published in *The Journal of the American Dental Association* affirmed "children can continue using fluoridated water and fluoride toothpaste because it has been proven to prevent tooth decay." The study showed substantial consumption of fluoride increases the chance of mild dental fluorosis, but "mild fluorosis does not negatively affect dental health or quality of life."[xi]

Anti-fluoridation groups also claim several conditions can be attributed to community water fluoridation, but there is little or no credible evidence to support these claims. In fact, for most of the following arguments, there are systematic scientific reviews and research disproving their claims:

> ***Cancer:*** Anti-fluoridation groups cite a study claiming to have found more cancer in selected fluoridated cities when compared to selected non-fluoridated cities. However, most studies have not found significant increases in cancer mortality or site-specific cancer incidence. The National Research Council affirms "the weight of evidence from more than 50 epidemiological studies in different populations and at different times has failed to demonstrate an association between fluoridation and increased cancer risk in humans."[xii]

Bone Fractures: Although some early ecologic studies suggested an association between hip fractures and water fluoridation, evidence to date suggests fluoride has no effect on hip fractures.[xiii] Additionally, there was a systematic review conducted in 2000 by the University of York that concluded "the best available evidence on the association of water fluoridation and bone fractures shows no association."[xiv]

Renal Disease: A 1993 report by the National Research Council reported the threshold renal fluoride toxicity in animals is 50 mg/L. However, there are no published studies that show fluoride ingestion at this concentration level can affect the kidney.[xv]

Immunological Effects: There are a few animal studies that suggest fluoride has a negative effect on the immune system. However, these studies utilized excessively high doses of fluoride and questionable study methods. No association has been shown in humans at fluoridation levels used in community water fluoridation.[xvi]

Low IQ in Children: Studies in China reported lower IQ associated with the intake of naturally occurring fluoride; however, these studies have questionable study designs. Studies in Mexico and the US suggest fluoridation has no correlation with IQ.[xvii]

Reproductive Health: At levels used for fluoridation, there is no effect on reproductive health. Animal studies using much higher doses of fluoride (100 – 500 mg/L) showed adverse effects on reproduction. The National Research Council confirms "ingestion of fluoride at current concentrations should have no adverse effects on human reproduction."[xviii]

Other popular claims used by anti-flouridation groups are that there is an association between water fluoridation and Down's Syndrome, AIDS, and Alzheimer's disease. However, no credible scientific information links water fluoridation with any of these conditions.

DENTAL FLUOROSIS

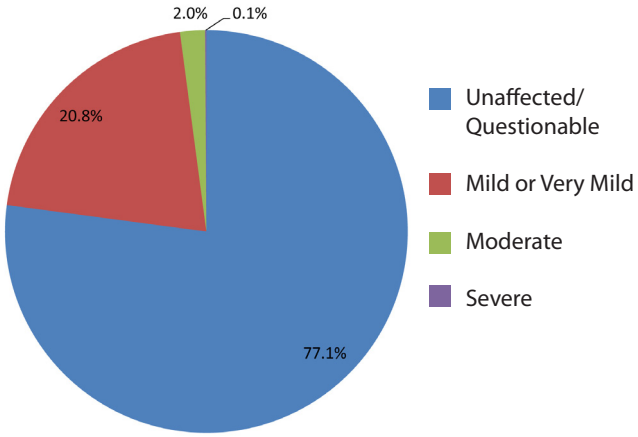
Another argument used by anti-fluoridation groups to oppose water fluoridation is its link to dental fluorosis. Dental fluorosis refers to changes in the appearance of tooth enamel caused by long-term ingestion of fluoride during the time teeth are forming. Dental fluorosis occurs when children with developing teeth consume fluoride; therefore, teeth that have erupted are not at risk. Only children aged eight years and younger may develop dental fluorosis because this is when permanent teeth are developing under the gums.[xix] However, chronic exposures to higher levels of fluoride may result in dental fluorosis. In addition, the discoloration associated with dental fluorosis could have several other causes such as childhood trauma and antibiotics.

FIGURE 2: COMPARISON OF MILD DECAY AND MILD FLUOROSIS

MILD DECAY **MILD FLUOROSIS**

The total consumption of fluoride among children (i.e. fluoridated water, fluoride supplements, and ingested fluoride toothpaste) can increase the risk of dental fluorosis. The findings in two national surveys of cases of dental fluorosis show the vast percentage of cases to be very mild to mild. In a study completed by the National Health and Nutrition Examination Survey (NHANES) from 1999-2004, approximately 23 percent of persons aged 6-49 had some form of mild dental fluorosis while more than 90 percent of persons aged 6-49 have had a dental cavity in at least one permanent tooth.[xx] Approximately two percent had moderate dental fluorosis and less than one percent had severe dental fluorosis.[xxi]

FIGURE 3: PERCENT OF DENTAL FLUOROSIS AMONG PERSONS AGES 6-49, UNITED STATES, 1994-2004



Source: National Center for Health Statistics Data Brief, No.53, November 2010

Aside from maintaining optimal levels of fluoride in water, communities can reduce dental fluorosis in their childhood population by educating parents and health professionals about ways to reduce fluoride consumption in this population. The smaller size and weight of infants requires they receive an even lower dosage of fluoride. Breastfeeding and using ready-to-feed formula were also recommended as steps to limit fluoride ingestion. Lastly, using non-fluoridated toothpaste and reducing other exposure to topical fluoride rinses can also reduce fluoride ingestion in younger children.

CONCLUSION

Water fluoridation – endorsed by the American Dental Association, US Public Health Service, American Medical Association, and the World Health Organization – is a safe, economical, and effective measure to prevent dental caries. CDC has identified water fluoridation as one of the ten great public health achievements of the 20th century

Community water fluoridation prevents cavities and saves money, both for families and the state health care system. Economic analyses find, of larger communities of more than 20,000 persons, every dollar invested in this preventive measure saves about $38 in the costs of dental treatment. Community water fluoridation also reduces the disparities in dental caries among those of lower socioeconomic status.[xxii]

To minimize the risk of ingestion of topical fluoride agents, health professionals should remind parents to supervise their children when using products containing fluoride. Specifically, parents should ensure:

- Children use only a smear of toothpaste
- Avoid inadvertent swallowing of toothpaste
- Advice is sought from a dentist or physician for children under two before using fluoride toothpaste
- Extra strength toothpaste is not used by children

Dental caries represent a health problem with impacts on the medical, functional, nutritional, and psychological status of patients. Fluoridation of public water supplies is a safe, economical, and effective measure to prevent dental caries.

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