COMMENTARY

Why I Continue to Support Community Water Fluoridation

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In 1997 the journal *Perspectives in Biology and Medicine* published an article by John Colquhoun entitled "Why I changed my mind about water fluoridation" (1). Colquhoun had served as the principal dental officer for the city of Auckland, New Zealand, in the 1970s and early 1980s. At that time, he was an advocate for community water fluoridation and accepted findings that the procedure is safe and effective in reducing the prevalence of dental caries. After his retirement, however, he became an outspoken critic of community water fluoridation and expressed his views frequently for about 15 years, until he died in 1999.

Perspectives in Biology and Medicine is a reputable, peer-reviewed journal published by the University of Chicago Press and sponsored by the university. It has a paid circulation of about 2,500. The National Institutes of Health Library subscribes to the journal. The journal has both an advisory board and a lengthy editorial board. Dentists or dental scientists are not included on the editorial or advisory boards. Nearly all of the articles in the journal seem to be opinion pieces and are not data based. Editorial policy states that the journal serves as a vehicle for articles that convey new ideas or stimulate original thought in the biological and medical sciences. The editorial policy also states that the journal encourages the submission of interpretive essays that develop scientific ideas not fully tested.

Colquhoun's paper has received a lot of attention. Opponents of water fluoridation have quoted Colquhoun's position widely during debates and on the Internet. Because Colquhoun was a public health dentist, his paper seems to have some credibility as well among some proponents of water fluoridation and scientists not familiar with the issues.

Dr. Ernest Newbrun and I were each asked by the American Dental Association to critique Colquhoun's paper. Subsequently, we combined our responses into a paper that was published in the same journal in which Colquhoun's paper had been published (2). Because few dental health personnel are likely to read *Perspectives in Biology and Medicine*, I have prepared this commentary for the *Journal of Public Health Dentistry*. Most of the contents have been taken from my response to the ADA, but some excerpts have been extracted from the published response to Colquhoun's paper by Newbrun and Horowitz (2). I am indebted to Dr. Newbrun for his thoughts on several issues.

One of Colquhoun's arguments in his paper is that the prevalence of dental caries in New Zealand has declined in the last 30 years or so, both in nonfluoridated and fluoridated areas, and, therefore, the decline has little or nothing to do with community water fluoridation (1). Colquhoun bases much of his arguments on data derived from treatment records of children seen in public clinics. These children were examined and treated mostly by dental nurses, untrained in epidemiologic survey methods. The examiners were not standardized in their interpretation of diagnostic criteria, nor did they calibrate their examining techniques. Each is likely to have had his or her own criteria for what constituted a cavity and which teeth required restorative care. In addition, New Zealand had used dental nurses for many years to deliver restorative care to schoolchildren. At about the time of the surveys Colquhoun refers to, a change in diagnostic and treatment philosophy was occurring worldwide because of the realization that early caries lesions could remineralize, and that unnecessary restorative treatment was being provided. This realization led not only to fewer fillings being placed, but also to conservative changes in diagnostic criteria for caries in surveys. These changes may have been particularly pronounced in New Zealand, where at about that time dental nurses began to deliver caries-preventive services and

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In 1988 I participated with Colquhoun in a four-day debate at a Symposium on the Benefits/Hazards of Community Water Fluoridation in Porto Alegre, Brazil. He and several others with antifluoridation views were sponsored by a group of water engineers who were opposed to the implementation of fluoridation in the Brazilian State of Rio Grande de Sul. Several researchers or public health officials and I were sponsored by dentists in the area who believed in the benefits and advantages of community water fluoridation for their areas. I am not sure whether either side won the debate. However, I found John Colquhoun's presentations and comments during the symposium to contain half-truths, biased interpretations of the literature, and falsifications.

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not solely to place fillings, their previous and traditional job responsibility. It is not possible to determine the effects of these changes on measuring caries prevalence in fluoridated or nonfluoridated areas of New Zealand; however, it precludes drawing valid conclusions from treatment records, upon which Colquhoun relies for many of his assertions.

Colquhoun tries to make the point repeatedly that dental caries prevalence has dropped considerably in nonfluoridated areas of New Zealand (1). It has dropped in many other countries of the world as well during the past 20 years or so. He briefly mentions the dilution effects in measuring the effectiveness of water fluoridation from the widespread use of fluoride-containing products, primarily fluoride dentifrices in nonfluoridated areas; yet he barely acknowledges the well-known diffusion effect of community fluoridation wherein persons in nonfluoridated communities benefit from consuming products processed in fluoridated communities. New Zealand, with widespread community fluoridation particularly in larger cities where foods and beverages tend to be processed, undoubtedly experiences a profound diffusion effect from water fluoridation.

[Colquhoun's] suggestion that American epidemiologists, researchers, and public health officials continue to recommend community water fluoridation (despite their knowing deep down that it is ineffective and dangerous) to save their jobs, reputations, and the embarrassment of having to say they were wrong, lacks credibility.

The majority of references that Colquhoun uses in his paper either to discredit the effectiveness of water fluoridation or to document its dangers were published in the journal *Fluoride* (1). A quick count shows 13 references from *Fluoride*. This journal has a long history of publishing articles critical of the use of fluorides, particularly community water fluoridation. Until his death, Colquhoun was the editor of *Fluoride* and treasurer of its publisher, the International Society for Fluoride Research.

Some of his references cite papers by Dr. John Yiamouyiannis, a vocal opponent of community water fluoridation (3,4). One of Yiamouyiannis' papers claims that a difference did not exist in dental caries prevalence in 1986–87 between US children who lived in fluoridated or nonfluoridated communities, as determined by examinations of schoolchildren in a national survey conducted by the National Institute of Dental Research (NIDR) of the NIH. Yiamouyiannis based his claim on his own analysis of the NIDR data, which failed to use accurate life-time residence histories of the children. Yiamouyiannis has repeatedly obtained data from government sources and then analyzed them to show damaging effects from community water fluoridation. His spurious analysis—based on crude mortality data unadjusted for age, sex, or race, showing that persons in fluoridated communities die from cancer more than do persons in nonfluoridated communities (4)—has been fully discredited by the National Cancer Institute of NIH (5). Colquhoun's use of reports by Yiamouyiannis only weakens his premises.

In his paper, Colquhoun speculates on the reasons (other than the use of fluorides) that the prevalence of dental caries has declined in New Zealand and other countries (1). Although he states that he doesn't know the answer for sure, some of his reasoning is highly questionable. According to Colquhoun, a rise in living standards accompanied by a tremendous increase in the consumption of fruits and vegetables, the introduction of household refrigerators, and a large increase in cheese consumption have contributed to the decline. He seems to ignore the findings of dozens of studies showing that primitive populations with poor nutrition were largely free of dental caries until processed foods and confections were introduced, which led to deterioration of their oral health (6). His reasoning, which largely ignores refined carbohydrates and fluoride, is strange and faulty.

Dietary control, particularly the restriction of sugary goods, is not a practical public health method for caries prevention. No controlled studies have demonstrated that caries is a result of calcium deficiency, nor is tooth decay a problem of some vague "general nutritional" inadequacy, as Colquhoun asserts (1). The relation of dietary sugar to dental caries has been amply documented (6). In most countries, the dental caries prevalence of children did not change much before World War II. Beginning around 1940, dental caries declined in several European countries and Japan because of wartime rationing of sugar (7,8). When rationing ended after the war, dental caries climbed to previous levels. Not until after water fluoridation was introduced in 1945 and other fluoride-containing products became widely available did dental decay begin a steady decline in the United States, a decline that continues to this day, despite rising national sugar consumption (9).

Other alleged criticisms that Colquhoun tries to make, as have several other opponents of fluoridation, are that there has never been a blind study or evaluation of community water fluoridation and that communities for the evaluation of the effects of fluoridation have not been selected randomly. It is extremely difficult to conduct a completely blind, long-term study of community water fluoridation. Opponents have used this argument repeatedly to allege that differences in the hundreds of studies that show beneficial effects of community water fluoridation are totally a result of bias on the part of proponents of water fluoridation (1,10,11). It is unlikely that many epidemiologists from around the world all would have had the same degree of bias to measure consistently about 50 to 65 percent reductions in dental caries in the early studies of community water fluoridation. In fact, a few investigators have managed to conduct blind evaluations of fluoridation in which children were transported from fluoridated and unfluoridated communities to a neutral site for examinations without informing the examiners of the home of the children or in which radiographs were examined blindly (12-14). Colquhoun ignores these studies (1).

With respect to randomness in se-

lecting communities with and without fluoridation, Colquhoun and some other opponents are unequivocally unwilling to accept the validity of any of the hundreds of studies on the effectiveness of community water fluoridation because the communities had not been selected randomly (1,10,11). In other words, they are willing to accept as valid only studies in which a randomly selected community would fluoridate its water (whether it wanted to or not) and be paired with a randomly selected control community. The purity of random selection sounds great, but it is unfeasible when it comes to selecting sites for the implementation and evaluation of water fluoridation.

Contrary to Colquhoun's claim, most of the world has not rejected fluoridation. Water fluoridation is practiced in scores of countries; further, in many countries, including his own, more than half of the population consumes fluoridated drinking water. In many countries without water fluoridation, salt fluoridation has been implemented in recent years, e.g., France, Germany, Mexico, and Costa Rica. Colquhoun implies incorrectly that many countries do not have water fluoridation because they are concerned about the dangers of fluoride. The recent worldwide growth of salt fluoridation belies his implication.

Colquhoun's statement that fluoridation is practiced only in America and in countries under strong American influence is patently absurd. Are Singapore, Hong Kong, Chile, Switzerland, and New Zealand likely to be influenced by dictates from the United States? His suggestion that American epidemiologists, researchers, and public health officials continue to recommend community water fluoridation (despite their knowing deep down that it is ineffective and dangerous) to save their jobs, reputations, and the embarrassment of having to say they were wrong, lacks credibility. How many proponents would be willing to harm their own children by continuing to promote the addition of a harmful substance into the drinking water merely to save their jobs or keep from being embarrassed? One also should question the motivations of some of the opponents of fluoridation. Colquhoun made a second "career" as an opponent of fluoridation. Others have their own agendas for notoriety and money, in some cases by being on "the other side" of the issue.

Colquhoun devotes considerable space in his article to alleging that the fluoridation of community water supplies is harmful to persons who consume the water. Claims that fluoride is harmful have been reviewed amply by international, national, state, and local authorities (15-19). The committees or commissions that prepared these reports included independent, eminent experts in a variety of fields, such as medicine, epidemiology, pathology, pharmacology, and toxicology, as well as other scientists and water engineers. The conclusions have been remarkably similar, namely: that the benefits of water fluoridation far outweigh any potential health risks. *Consumer Reports* magazine has aptly summarized the situation: "The simple truth is that there is no 'scientific controversy' over the safety of fluoridation. The practice is safe, economical, and beneficial. The survival of this fake controversy represents, in our opinion, one of the major triumphs of quackery over science in our generation" (20).

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The opponents of fluoridation are a heterogeneous group and cannot easily be categorized by any single characteristic. Among their numbers are right-wing extremists, misguided environmentalists ("Greens"), chiropractors, persons concerned about the costs of fluoridation, food faddists, and antiscience "naturalists." Other opponents have emerged, including the self-proclaimed "neutrals," who try to portray an image of dispassionate open-mindedness, but clearly have accepted the opposition's arguments irrespective of whether they have been adequately tested and answered. Others have been described as "born-again antifluoridationists," who previously accepted the mainstream belief in the benefits of fluoridation, but have finally seen the truth. Clearly, Colquhoun falls into this latter category. However, it is important to recognize that simply by claiming to be a former advocate and now clearly being a dedicated opponent of fluoridation in no way validates Colquhoun's judgment nor excuses his distortion of the literature.

Opponents of water fluoridation, including Colquhoun, have drawn attention to studies that report an association between fluoridated water supplies and hip and other bone fractures. Actually, findings have been mixed: some studies have shown a decreased risk, others an increased risk, and still others no association. For summaries, see Gordon and Corbin (15) and Hillier et al. (16). So, the collective data are equivocal. Responsible proponents of water fluoridation do not claim a protective effect of drinking fluoridated water against bone fractures.

In 1991 the National Institutes of Health sponsored a workshop to examine historic and contemporary research on fluoride exposure and bone health in humans. The summary and recommendations of this workshop merit quoting: "Taken together, the results of these six contemporary studies fail to establish an adequate basis for making firm conclusions relating fluoride levels in drinking water to hip fracture and bone health. In general, the results yielded relatively small clinical impacts and/or weak statistical power. There is no basis for altering current public health policy [for community water fluoridation]" (15). An expert committee of the World Health Organization came to the same conclusion, stating: "With respect to hip fracture and bone health, there is no scientific evidence for altering current public health policy on the use of fluorides for caries prevention" (17).

Colquhoun refers to a study that he claims reported a fluoride-related incidence of a rare bone cancer, called osteosarcoma, in young male rats (21). The actual conclusions of this study were: "NaF did not alter the incidence of preneoplastic and neoplastic lesions

at any site in rats of either sex." Subsequently, an ad hoc subcommittee was appointed by the United States Public Health Service to review not only animal studies, but also human studies on the relationship of cancer and fluoride exposure. It concluded that: "Optimal fluoridation of the drinking water does not pose a detectable cancer risk to humans as evidenced by extensive human epidemiological data" (18). Furthermore, it concluded that "animal studies fail to establish an association between fluoride and cancer" (18).

Expert epidemiologists and scientists at the National Cancer Institute of the NIH have also responded to the charge that fluoride causes cancer. They write (5,22):

> Opponents to fluoridation have spent enormous amounts of time attempting to link adverse effects with fluoridation. Given enough attempts, someone should be able to link some condition with fluoridation in some group using some methodology. Responding to each such attempt would seem less useful than periodic reviews of all the evidence by qualified panels of experts that can assess the quality of the work and the resultant weight of the evidence. The last such review dealing with cancer issues reached the same conclusion as those preceding it, that optimal fluoridation of the drinking water does not pose a detectable cancer risk to humans as evidenced by extensive human epidemiological data.

Colquhoun and other antifluoridationists assert that some countries have "banned" fluoridation for health or safety reasons. This assertion is a great distortion of the truth, inasmuch as the actual reasons that some countries have not adopted water fluoridation have been for political, legal, or technological reasons. The Swedish parliament repealed the Water Fluoridation Act in 1971, although its Social Insurance Committee had given a favorable report on fluoridation. The government's political action was not supported by Sweden's leading health experts (23). Kuopio, Finland, stopped fluoridation in 1992, even though an expert committee consisting of professors from the University of Kuopio had concluded that there was not any medical, toxicological, or ethical reason for stopping fluoridation (24). Fluoridation of water in Tiel, the Netherlands, was stopped in 1973 on a legal basis, not for considerations of safety.

Opponents of fluoridation like nothing more than to have public debates on the radio, television, or in the press because it makes fluoridation seem like a "controversial" issue and gives them free publicity. In such debates with an equal number of speakers for and against fluoridation, it appears as if the health science community is evenly divided on this issue. In fact, the overwhelming majority, probably well over 95 percent, of scientists, physicians, dentists, nurses, veterinarians, and pubic health professionals fully support community water fluoridation. Moreover, according to a recent Gallup poll, 70 percent of the American public believes community water should be fluoridated, 18 percent is opposed and 12 percent has no opinion (25). The proportion of the public favoring fluoridation in such surveys has changed very little over the years, with 60–75 percent perceiving it as desirable since 1952.

I first became a proponent of community water fluoridation about 45 years ago when I was a dental student at the University of Michigan, where faculty professors Phillip Jay and Kenneth Easlick described the attributes and benefits of the procedure. Since that time my support for community water fluoridation has not diminished because I have seen first-hand the beneficial effects to oral and total health that are produced by consuming drinking water with optimal concentrations of fluoride. Certainly, I have not changed my mind about the safety and effectiveness of water fluoridation.

Fluoridation is the least expensive way to reduce tooth decay. It is eminently safe. Fluoridation benefits children and adults and the benefits continue for a lifetime if consumption continues. It reduces the cost of dental care. Fluoridation is the fairest way for everyone in a community to benefit; it is socially equitable. Because fluoridation does not require an individual effort or direct action by those who will benefit from the procedure, it has the attributes of an ideal public health method.

Fluoridation has the endorsement of hundreds of professional organizations and eminent scientists. An example comes from Dr. David Satcher, current assistant secretary for health and surgeon general of the United States. In a recent letter, Dr. Satcher says the following (26):

> Fluoridation remains an ideal public health measure based on the scientific evidence of its safety and effectiveness in preventing dental decay and its impressive cost effectiveness. Further, one of my highest priorities as Surgeon General is reducing disparities in health that persist among our various populations. Fluoridation holds great potential to contribute toward elimination of these disparities. I am pleased to join previous Surgeons General in acknowledging the continuing public health role for community water fluoridation in enhancing oral health protection for Americans.

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