THE ETHICS OF WATER FLUORIDATION

The ethics of water fluoridation are scrutinized by Mark Diesendorf in this issue of *Fluoride*.[1]

As scientific evidence about the effects of water fluoridation has increased, the ethical issues involved have needed to be re-examined. In 1957, a New Zealand Commission of Inquiry was able to allay ethical concerns about water fluoridation as a public health measure by finding that it was not merely beneficial but also safe, and that no harmful effects on health would follow the fluoridation of water supplies.[2] Resistance to fluoridation was seen to be influenced by anxiety lest the process be dangerous. It was accepted that nobody would desire to implement a dangerous or ineffective process. They found that the fluoridation of public water supplies was effective in preventing dental decay and involved no risk to health or otherwise. They found there was no danger, that the process was a valuable one, and that the benefits of fluoride could be made available in an effective way only by utilizing public water services. In 1994, this simple view was no longer acceptable.[3] While benefits involving a 20 to 40% reduction in dental decay with water fluoridation were seen to remain, the possibility of adverse health effects could no longer be ruled out. A small increased risk of hip fracture was seen to be possible and an increased risk of osteosarcoma could not be excluded. However when the benefits and risks of water fluoridation were compared, the great majority of public health workers were seen to favour fluoridation. The principles of beneficence (doing good) and health equity were seen to outweigh the principles of nonmaleficence (not harming) and respect for autonomy. The balance of benefits and risks was seen as dynamic and open to change if new information arose showing for example a reduction in beneficence or increased maleficence.

Diesendorf notes that the balancing of the benefits and risks is inseparably linked to the assessment of what the benefits and risks are seen to be. If the view is taken that the risks are questionable and the benefits substantial it can be asked: is it right to impose questionable risks on a tiny minority in order to confer substantial benefits on the majority? When a question of this nature is asked it is relatively easy to find in favour of fluoridation. However, Diesendorf finds that the scientific evidence does not support the opinion that the risks are only questionable and the benefits are substantial. Each of these areas has been the subject of extensive debate.

Diesendorf's view that the benefit from water fluoridation on dental caries is probably small has been examined[3] and found less convincing than the view of Newbrun[4] that fluoridation produces a mean 30% reduction in caries in the permanent teeth of children. However, these reviews have not addressed the finding by Yiamouyiannis[5] of no difference in the levels of tooth decay in schoolchildren, using the DMFT index, between fluoridated and nonfluoridated communities in the USA. The current status of the scientific evidence on the benefit of fluoride in drinking water appears to be that it is difficult to demonstrate a clear cut and substantial effect.

Diesendorf observes that the adverse effect of dental fluorosis can be viewed as either a cosmetic effect or as evidence of damage by fluoride to the enamel-forming cells, the ameloblasts. The association of hip fractures with fluoridation is seen as being more serious with a fatality rate of about 25%. The epidemiological studies

showing an association between hip fractures and higher water fluoride levels have now received further support from a study by Jacqmin-Gadda, Commenges and Dartigues in France.[6] They found that persons aged 65 years or older living in areas with 0.11-1.83 mg/L had 86% more hip fractures than those living in areas with 0.05-0.11 mg/L. After adjusting for the risk factors of age, sex, Quetelet index (weight in kg/height in m^2), smoking status and sporting activity, the study found the suggestion of a deleterious effect of fluoride in drinking water on the risk of hip fractures, even at moderate levels of fluoride.

Thus Diesendorf sees the question, about whether it is right to impose questionable risks on a tiny minority in order to confer substantial benefits on the majority, as being inconsistent with the scientific evidence and so is poorly posed. It is this question, however, that appears to have been answered when it is reported that most health professionals have put significant weight on the benefits of the prevention of dental caries and more serious illnesses, as opposed to a possible small increase in hip fractures and probably very little or no significant adverse cosmetic impact from dental fluorosis.[3] A more appropriate question is seen to be whether it is right for society to impose risks on some people for the possibility of conferring minor benefits or convenience on the same or other people?

In understanding the cariostatic mechanisms of fluoride, emphasis has been given to topical effects.[7] Previously debate had ranged between whether fluoride was an indispensable trace element in the diet or a food.[2] Fluoride has been seen as a nutrient and fluoridation as a process of food fortification.[2] Diesendorf finds the evidence suggests that fluoridated drinking water has negligible systemic benefit and may at best have a small topical effect. He thus finds it would be misleading to describe fluoride as an essential nutrient, and suggests that the only "justification" for putting fluoride in drinking water is that the small fraction of children who do not brush their teeth with fluoride toothpaste or would not use fluoride mouthrinses might miss out on a possibly small topical benefit. Thus the question of whether it is right to deprive people, especially low-income earners, of a valuable nutrient or preventive medication is seen not to conform with the realities of the physiological role of fluoride.

In contrast, well-posed ethical questions are seen to be: "Is mass medication, which is difficult or expensive to avoid, wrong?" and "Is mass medication with an uncontrolled dose wrong?" It had previously been argued that fluoridation was not "mass medication" because it was analogous to food fortification.[2] Whether fluoridation involves medication or not appears to depend on the definition used of medicine, and whether it includes the prevention of disease as well as treatment. Diesendorf notes the incongruity between the usual medical situation, where the dose is prescribed, and the situation with fluoridation, where the dose ingested can vary widely depending on the level of fluid intake.

Diesendorf notes that there is some evidence that fluoridated water may be a causal factor in genetic damage, cancer and damage to the immune system, but makes the assessment that further evidence is required before such relationships can be said to be firmly established. The Subcommittee on Health Effects of Ingested

Fluoride of the National Science Council (USA) similarly found inconsistencies in the fluoride toxicity data and gaps in knowledge.[8] After noting the evidence for a dose-related increase in the incidence of osteosarcoma in male rats given fluoride in their drinking water, they recommended further research into the area of carcinogenicity, along with those of fluoride intake, dental fluorosis, and bone strength and fractures.

Diesendorf observes that chronic poisoning, allergic reactions, and hypersensitivity with fluoridated water, fluoride supplements and fluoride toothpaste have been reported by Waldbott, Burgstahler and McKinney.[9] The National Research Council report[8] suggests that these findings should be disregarded because of insufficient clinical and laboratory evidence of intolerance, and the lack of evidence of immunologically mediated reactions. Diesendorf notes that whether executive statements of professional bodies are genuine scientific refutations is subject to debate. An alternative view finding support for the occurrence of hypersensitivity or intolerance can be given.[10] The existence of a syndrome of chronic fluoride toxicity with multiple systemic manifestations was established by Roholm.[11] Waldbott has described treating close to 500 patients with the chronic fluoride toxicity syndrome,[9] and it is similarly debatable whether or not it is appropriate for this experience to be disregarded because it is insufficient evidence of intolerance to fluorides as used in the fluoridation of community water. In addition to noting temporal associations between symptoms and exposure to fluoride, Waldbott confirmed the role of fluoride in the illnesses with single and double-blind testing in some patients.[12]

Waldbott, through his experience, formed the view that fluoridation posed a great dilemma, in which the choice was faced of whether or not to adopt water fluoridation with the authoritative promise of better dental health but with the possibility also of detrimental adverse effects.[9] His own conclusion was that the dental benefits of fluoridation were illusory and had the substantial cost of many suffering the perplexing illness of chronic fluoride toxicity.[9] He considered that time always sided with the truth and it was only a matter of time before mistaken views were exposed and discarded. He considered that true knowledge had the potential to alleviate the suffering of people, and that when the severity of the problems of chronic fluoride toxicity were recognized by medical practitioners, and laws mandating truly safe drinking water were sincerely enforced, the health of many people would dramatically improve. Together with Professors Gordonoff, Benagiano and Fiorentini, he helped organize a successful international conference on fluoride which was held in Bern, Switzerland, in 1962. As a result, the International Society for Fluoride Research (ISFR) was founded.

Although there will not be a universal acceptance of Diesendorf's assessment of the current status of scientific research on fluoride, I consider it has been offered in the spirit of seeking the truth for which the ISFR was established.

Diesendorf leaves the ethical judgements on the questions posed up to the reader. His emphasis has been on refining the ethical questions that need to be asked so that they accurately reflect current understanding of the risks and benefits of fluoride. His view is that the ethical questions cannot be easily transformed into scientific and

technical ones that can be answered glibly by dentists and medical practitioners. The clarity of his dissection of the issues will aid the resolution of the great dilemma posed by fluoridation.

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Bruce Spittle

ANNOUNCEMENTS

THE XXIst CONFERENCE OF THE INTERNATIONAL SOCIETY FOR FLUORIDE RESEARCH WILL BE HELD IN HUNGARY IN AUGUST 1996. Inquiries to:

Dr Miklós Bély,
Department of Morphology,
National Institute of Rheumatology,
PO Box 54, H-1525 Budapest 114,
Hungary.

THE ADDRESS OF THE EDITORIAL OFFICE OF *FLUORIDE* HAS BEEN CHANGED TO:

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