

A Summary of an Enquiry by the Royal College of Physicians into Water Fluoridation

The value of the enquiry into water fluoridation carried out by the Royal College of Physicians is that it constitutes a major UK review by an eminent and highly responsible independent medical authority. During the deliberations a total of 359 publications was studied, evaluated and discussed. The published Report¹ gives full references to these publications. The Committee of Enquiry consisted of 14 eminent specialists in the fields of general medicine, paediatrics, community medicine, toxicology, epidemiology and genetics under the Chairmanship of the then RCP President, Sir Cyril Clarke. Meeting over a period of 18 months, the Committee studied a mass of published data and certain work then unpublished to which it had access. Oral evidence was taken from leading members of organisations opposed to fluoridation and the literature published by these bodies was examined in detail. This summary is not intended to replace a direct study of this important Report.

FLUORIDE AND DENTAL DECAY

The Report traced the history of the relationship between fluorides and dental decay including the early evidence provided by English studies. It was observed as far back as 1933 that children living in Maldon, Essex, had less decay than children living elsewhere. The associated factor was fluoride in the drinking water. During the Second World War it was noted that children who were evacuated from South Shields to the safer area of Westmorland had remarkably good teeth –much better than those of local children. Dr Weaver who was medically and dentally qualified, and a senior medical officer with the Ministry of Education investigated.

He found that the water supply to South Shields naturally contained 1.4 parts per million (ppm) of fluoride. He continued with further studies of dental health in the North East of England and confirmed the American findings of a relationship between fluoride in drinking water and a diminished amount of dental decay. The association between two factors is not necessarily one of cause and effect: proof of a cause and effect relationship depended on a human experiment in which fluorides are added to drinking water.

Such an experiment was commenced in Grand Rapids, USA, in 1945, and was followed by several others a little time later. After 6 years it was established beyond doubt that a cause and effect relationship existed. The British Government sent a Mission to the USA and Canada in the early 1950s. It reported back to the UK Government and suggested that demonstration studies be carried out. These studies commenced in 1955 in Kilmarnock, in Anglesey and in Watford. After 11 years these studies were completed and the findings agreed with those of the American studies. Considering all these studies and others that had been carried out in New Zealand, the USSR and in other parts of Europe, the Royal College of Physicians concluded:

“It has been repeatedly established that both children and adults in communities that consume 1mg fluoride per litre of water (i.e. 1ppm) over the years of tooth formation (up to age 14 years) have a substantially lower prevalence of dental caries.”

OBJECTIONS TO FLUORIDATION

Objections to fluoridation were listed as follows: it is dangerous, unnecessary, uneconomic or of negligible benefit, or that even if safe and beneficial it is unethical.

Fluoridation is dangerous

The Committee gave a list of disorders claimed to be attributable to water fluoridation ranging from the trivial, such as flatulence, to the more serious, such as congenital malformations, heart disease and cancer. It was pointed out that most of the listed disorders were reported by two persons- Waldbott & Spira- who in their extensive writings claimed that all kinds of allergic reactions could be attributable to fluorides in drinking water. Those making these claims of health hazard often overlooked the difference between inorganic and organic fluorides or between fluoride in drinking water at 1ppm and the concentrations used in certain test tube or animal experiments. Whereas it has often been said in criticism that fluoride added to drinking water differs from that naturally present, the Committee stated that due to ionization of all fluoride salts there is no difference in absorption from soft water as opposed to hard water. Another criticism they considered was that the volume of water consumed by individuals cannot be controlled. This was answered by pointing out that the purpose of fluoridation is not to administer a specific dose to each person but to replicate the beneficial effects as observed in communities that receive water with fluoride naturally present at 1ppm.

Fluoridation is unnecessary

The suggestion that fluoridation is unnecessary because there are other equally effective methods of preventing dental decay was dismissed. The daily administration of fluoride supplements (by tablets, drops or milk) has the disadvantage of relying on strict adherence to a regimen by children and parents which from experience cannot be maintained. The application of fluoride solutions or gels to teeth in the dental surgery is time-consuming and hence expensive. Reference was made to a study in Askov, Minnesota in which a dental health education programme was sustained for ten years: it involved toothbrushing twice per day in the classroom, the provision of free toothbrushes and toothpaste for home use, the application of topical fluorides and continuous effort to control excessive intake of sweets. The authors of the Askov experiment concluded after ten years, that the dental health study cost fifty times as much as water fluoridation would have cost, and was less than half as effective as fluoridation had proved to be in comparable communities.

Fluoridation is uneconomic

After discussing this kind of objection the Committee stated: "*All the indications are that even apart from the obvious social benefits, fluoridation would produce appreciable savings in the overall cost of the dental service.*" Whereas only a small proportion of water is drunk "... *the low cost of fluoride and the inadequacy of alternative methods of providing this on a community basis, fluoridation is economic.*"

Fluoridation is of negligible benefit

This accusation is often linked with the charge that fluoridation merely delays the onset of dental decay for a few years. The Committee stated the evidence indicates that fluoridation gives substantial and continuous protection throughout a life span indicating true prevention and not a delay in the onset of dental decay.

Fluoridation is an unwarranted compulsory measure

Opponents of water fluoridation admitted to the Committee that they accepted the addition of substances such as copper sulphate, chlorine, alum and calcium as warrantable. The Committee could not accept that the distinction between these substances and fluoride formed a basis for

considering fluoridation as unwarrantable. Reversing the ethical argument the Committee stated its concern with the propriety of withholding a procedure if safe and of benefit. In conclusion the Committee stated “...caries is not a trivial disease but one that is responsible for a great deal of morbidity and for an appreciable number of deaths from dental anaesthesia and from bacterial endocarditis.”

PHYSIOLOGY AND TOXICOLOGY OF FLUORIDE

Physiology

The Committee began by referring to the ubiquitous nature of fluoride in the earth's crust, in drinking water, in certain foods and hence in animal and human tissue - also in sea water at a level of 0.8 to 1.4ppm. It was estimated that the normal daily intake of fluoride (from food, water and tea) in an adult ranged from 1.26- 7.70mgs: in a community with drinking waters fluoridated at 1ppm, the daily intake ranged from 2.70 -12.20mgs.

Fluoride is absorbed in the alimentary tract and of that which is excreted, 80 per cent is in urine, 10 per cent in faeces and the rest in sweat. Only extremely small quantities are found in saliva, in tears and human milk. That fluoride which is retained is found in bones and teeth. It is quite normal for bone levels to reach 1,000ppm, and in a fluoridated community (at 1ppm in drinking water) it reaches a level of about 2,500ppm.

Fluoride enters teeth during development and after eruption. The normal fluoride content of enamel on eruption doubles throughout life and that in dentine trebles. During pregnancy the placenta acts as a barrier to fluoride and hence very little enters the foetus. Human and cows' milk contain only very small quantities of fluoride which are unrelated to intake.

Reference was made to the belief of the Food & Nutrition Board of the National Research Council (USA), of the Food & Drug Administration (USA) and of the World Health Organisation that fluoride is a trace element essential for animal life.

Acute Toxicity

The median lethal dose (MLD) of sodium fluoride is estimated to be between 4-5 grammes (or 2-2.5g fluoride). The Committee stated “*It would clearly be impossible for water containing 1ppm to cause any lethal effects since it would be necessary to drink, over a short period, 1,000 litres (220 gallons) to receive even 1 gramme of fluoride.*”

Chronic Toxicity

After considering all the evidence the Committee stated:

“There is no evidence ... that either condition (i.e. skeletal or dental fluorosis) can be produced by fluoride at a concentration of 1ppm irrespective of whether the water is soft or hard.”

DENTAL MOTTLING

The Committee concluded: “*There is no evidence that in a temperate climate water containing fluoride at a concentration of 1ppm is associated with an increased prevalence of dental mottling.*”

SKELETAL EFFECTS

The skeletal effect of chronic fluoride toxicity is skeletal fluorosis. This is a condition in which increased bone is formed and ligaments around joints calcify. This condition has been found in people who drink water providing 20 -80mg fluoride per day over many years, and in those in industry with high fluoride quantities in the atmosphere. The Committee concluded *“There is no evidence that the prevalence of any musculo-skeletal disorder is increased in areas with fluoride at a concentration of 1ppm in the drinking water.”*

Osteoporosis

There is a condition of bone called osteoporosis which as its name implies is one in which bone becomes porous and more prone to fracture. This condition normally commences in mid life and progresses as age advances. One form of therapy for this condition, when acute, is the prescribing of large daily doses of sodium fluoride. The Committee recorded: *“Certain evidence suggests that osteoporosis and its complications are less prevalent in high-fluoride areas but it may be noted that some of this evidence refers to levels in excess of 1ppm.”*

Special Cases

There has been a suggestion that because fluoride is mostly excreted by the kidneys, in renal failure there could be an increased deposition of fluoride in bone. The Committee considered all the evidence and concluded: *“No symptomatic cases have been reported of skeletal fluorosis in dialysis patients who have been dialysed with water containing 1ppm F.”* *“In any case”,* the Committee continued, *“the increasing use of deionisers (to remove other ions considered to be potentially dangerous) obviates any possible danger.”*

CONGENITAL MALFORMATIONS

Mongolism (Down’s Syndrome)

In the late 1950s and early 1960s an American called Rapaport suggested that fluorides caused Mongolism. The methods of his study were severely criticised at the time and his findings were not accepted by his medical colleagues. However, his work stimulated many other enquiries, all of which refuted his claim.

Other congenital malformations

The Committee concluded that there was no evidence to indicate that fluoridated drinking water at 1ppm increased the incidence of congenital malformations of any kind.

CANCER

The Committee published its report in 1976 and considered all the evidence available up to 1975. This evidence was considerable. The conclusion reached was:

“There is no evidence that fluoride increases the incidence of, or mortality from cancer in any organ.”

(Since 1976 so-called evidence of a fluoridation-cancer link has been submitted principally by two American authors, but all this evidence has subsequently been completely refuted by a Working

Party under the chairmanship of Professor Knox in 1985. A summary of the Knox Report has been published by the British Fluoridation Society².)

OTHER CONDITIONS

Allergy

The Committee considered once again the many allergic reactions said to be induced by fluoride. Apart from the fact that these claims could not be confirmed by workers other than Waldbott, the evidence which mostly swayed the Committee was that of the American Academy of Allergy who was asked by the US Public Health Services to evaluate available clinical reports of the main types of alleged allergic response. The Academy reported back that there was no evidence of allergy or intolerance to fluorides as used in the fluoridation of community water supplies.

Thyroid

The distributions of endemic goitre and dental fluorosis were once thought to be similar and hence fluoride was thought to be a causative factor. The Committee considered the evidence and concluded: “...*there is no evidence that fluoride is responsible for any disorder of the thyroid.*”

Other Endocrine Disorders

In the Second World War a person called Dr Spira asked 1,099 military personnel with mottled teeth to fill in a questionnaire asking if they suffered from constipation, boils, heat rashes, loose shrivelled skin, loss of hair and brittle nails. On the basis of the proportion reporting, these symptoms were attributed to parathyroid disorders caused by fluoride as indicated by mottled teeth. For several reasons this was a fantastic and completely unjustified leap of deduction. In the first place there was no attempt to justify the relating of dental mottling with dental fluorosis and in the second place no analyses of a similar kind were made of persons not possessing dental mottling. More adequate studies have revealed no relationship between fluoridation and parathyroid disorders, or any other endocrine disorder.

Cardiovascular disorders

The Committee stated: “*There is no epidemiological evidence to support the suggestion that fluoride increases the prevalence of arteriosclerosis.*”

Optic neuritis

The suggestion that optic neuritis could be attributed to fluoride began from a single case in 1964 when a 56-year-old man developed this condition six weeks following sodium fluoride therapy (60mg daily) for severe spinal osteoporosis, and about six months following parathyroidectomy. Since that time, although sodium fluoride therapy has been used widely in the treatment of both osteoporosis and Paget's disease there has been no evidence of optic nerve damage which has been specifically looked for.

Miscellaneous disorders

The association of two factors is not necessarily a cause and effect relationship. For fluoridation to cause a specific disorder, this would need to be observed consistently in every fluoridated

community. Occasionally purely by chance a particular disorder may have an increased prevalence in one fluoridated community but not in others. Many of the disorders claimed by opponents of fluoridation are often based on these odd occurrences which cannot be repeatedly observed. The Committee concluded: *“There is no evidence that allergies, thyroid disorders or any of the conditions referred to can be caused by 1ppm fluoride in drinking water.”*

FLUORIDATION IN PERSPECTIVE

The Committee listed fluoridation schemes throughout the world and discussed the size and quality of universal support. On the question of the environmental aspects of fluoridation there was no evidence that pollution of any kind would occur.

CONCLUSIONS

“There is now an enormous body of information bearing on the subject of fluoride and health which amply justifies the following conclusions:

- 1. Fluoride in water added or naturally present at a level of approximately 1ppm over the years of tooth formation reduces dental decay throughout life.*
- 2. There is no evidence that the consumption of water containing approximately 1ppm of fluoride in a temperate climate is associated with any harmful effects, irrespective of the hardness of the water.*
- 3. In comparison with fluoridation, systemic fluoride supplements such as tablets, drops and fluoridated salt have not been shown to be as effective on a community basis.*
- 4. There is no evidence that fluoridation has any harmful effects.”*

RECOMMENDATION OF THE COLLEGE

“The College recommends fluoridation of water supplies in the United Kingdom where the fluoride level is appreciably below 1ppm.”

COMMENTS OF THE BRITISH FLUORIDATION SOCIETY

Those empowered with the decision of fluoridation are requested to consider the weight of the authoritative conclusions made by the Royal College of Physicians.

References

1. Royal College of Physicians (1976): *Fluoride Teeth and Health* Pitman Medical. London. ISBN O 272 79373 6.
2. Knox EG (1985): *Fluoridation of water and cancer: a review of the epidemiological evidence.* HMSO, London.