

## **A summary of the Knox Report and how it refutes the alleged fluoridation-cancer link**

In 1980 the Department of Health and Social Security commissioned a Working Party with the remit of assessing all published evidence on the alleged linkage between human cancer and fluoridation. Members of the Working Party were individually eminent authorities in epidemiology, cancer research, pathology, statistics and water treatment.

The Working Party published its 116 page Report on 14 January 1985. In the Preface, Dr E. D. Acheson, Chief Medical Officer at the DHSS, stated:

*“The wealth of evidence which has been gathered during this period (i.e. of 40 years experience of water fluoridation) including that presented in this report, justifies the conclusion that fluoridation is a safe and effective method of reducing dental decay”.*

In order to assist the many decision-makers and students of water fluoridation, the British Fluoridation Society has prepared this short summary. It is not intended to replace a direct study of this very important and definitive document.

### **THE BOGEY OF CANCER**

There will be few people in the UK who have not heard the whisper or the loud remark “They say it causes cancer”. The identity of ‘it’ is water fluoridation. The identity of ‘they’ is either not revealed or is not known, but there is a nuance that they are really those in the know. Unwittingly the press may have added credence to the whispers by publishing articles boldly headlined ‘Fluoridation and Cancer: Shock Report’, or by publishing letters from some people claiming special new knowledge from an ‘impeccable’ source. It is regrettable that such tactics have had some success in causing unnecessary public concern. Because of this the UK Department of Health and Social Security felt it desirable to commission a Working Party to make an objective, extensive and definitive enquiry into the charge that water fluoridation causes cancer.

### **WORKING PARTY TERMS OF REFERENCE**

The Working Party was initially chaired by Professor Alderson - Professor of Epidemiology, Institute of Cancer Research, University of London, and latterly by Professor Knox -Professor of Social Medicine, University of Birmingham. Members of the Working Party included nine eminent authorities in epidemiology, cancer research and water treatment. The remit of the Working Party was “ ..to appraise the published and otherwise available data and conclusions on cancer incidence and mortality amongst populations where drinking water is either artificially fluoridated or contains high levels of fluoride from natural sources”.

They were asked to submit their Report in a form which could be understood clearly by lay persons and this they did. The Report was published on 14 January 1985. Their investigation involved an assessment of all that had been published on this subject in the scientific journals or appearing in law reports, and in proceedings of all official enquiries. Additional information was sought of and received from some of the authors of the studies. Certain members of the Working Party were commissioned to carry out a series of checks on, and even full re-analyses of, some of the most important data and results.

The total number of scientific papers and documents which were assessed was 110. In addition, consideration was given to the several reports of enquiries made or specially commissioned by official scientific bodies or by Governments. A full bibliography of all these reference points is included in the Report.

## ANALYSING CANCER STATISTICS

Whereas the Report is written in a style for lay people to understand, the appraisal of cancer statistics can be complex and the necessary statistical analyses are the province of those expert in this field. There is however an underlying principle which even those of us without expertise can understand.

The crude death rate (the CDR is the number of cancer deaths per 100,000 population) in one of our seaside towns is very high. To the unaware this seaside town appears to be a very unhealthy place in which to live. But then every year a large number of persons retire to this seaside town and hence the population is weighted with older people. Understandably the CDR in this town is higher than would exist in one with a larger proportion of young people. To ascertain whether the seaside town in question is really an unhealthy place in which to live, statisticians and epidemiologists have to take into consideration the distribution of age. This is particularly necessary when studying cancer deaths because cancer deaths are most frequent after the age of 65 years. When adjustment is made for age, statisticians calculate a Standardized Mortality Ratio (SMR): when this is done for our seaside town, it is found that it is in fact a most salubrious place in which to live. See Table 1.

	<b>CDR</b>	<b>SMR</b>
Birmingham (fluoridated 1964)	280.8	213.0
Bournemouth (non-fluoridated)	414.7	181.9
Bootle (non-fluoridated)	288.3	271.5

*Source:* Mrs Paula Cook-Mozaffari. University of Oxford

The pertinence of this simple explanation to the claimed fluoridation-cancer link is quite clear. The Working Party, although not giving such a simple homily, stresses the difference between the CDR and the SMR because this type of adjustment constitutes an essential ingredient in their analyses and in their subsequent conclusions.

## REVIEW OF TRENDS IN THE UK

In the UK several analyses of death from cancer in fluoridated and non-fluoridated communities have been made since 1944 but none has demonstrated any cause for public concern. In the minds of some, however, the alarm bells began to ring in 1972 when two Americans (Schatz & Schatz), having first intimated their own belief that fluorine is a carcinogen, stated “...our analysis of official health statistics from Birmingham England show that the death rates from leukaemia and from all other types of cancer were greater from 1965-69 (five years following fluoridation in 1964) than from 1958-64 (five years before fluoridation).” Strangely this statement was made without accompanying data or analyses.

The ringing of these alarm bells was sustained by Brady (1977), who commented on the “marked rise” in cancer deaths after the commencement of water fluoridation in Birmingham in 1964. Her graphical presentation was of Crude Death Rates: it caused her to say “...while this graph does not

*prove that fluoridation was responsible for all the higher cancer death rates, it gives cause for concern.”* At this stage an American called Burk came into the picture. He also examined the CDR for Birmingham. In 1980 he claimed that following fluoridation in 1964, *“Birmingham showed the greatest increase in CDR for cancer of any large city in the world.”* This claim was refuted by Cook-Mozaffari & Doll in 1981. Comparing similar data with those of the seven largest cities in England and Wales they stated that even using the CDR there was nothing exceptional about Birmingham. But more important than this the CDR is quite inadequate to truly distinguish genuine changes in the rate from changes due to differential ageing of the population.

Analyses of the corrected data by independent statisticians completely refuted the conclusion of Schatz & Schatz, of Brady and of Burk. Using the SMRs for fluoridated Birmingham and Solihull there was a smaller increase (5.9%) in cancer deaths between the two five-year periods (before and after fluoridation) than occurred in neighbouring non-fluoridated communities (9.1% ). All these considerations led the Working Party to state that the papers of Schatz & Schatz, of Brady and of Burk *“...cannot be regarded as showing any association between fluoridation and mortality from cancer.”* They were particularly critical of Burk. His *“...only attempt at standardization for age was inadequate. Even his conclusions that an abrupt and sustained increase in CDRs occurred in Birmingham following fluoridation is untenable, depending as it did on an unacceptable selection of data which most favoured his hypothesis and on his failure to make comparisons with other areas.”*

Reference was also made to the studies carried out in Anglesey where the water has been fluoridated since 1955. Whereas there was an increase in cancer mortality between the pre-fluoridation years 1949-53 and the post-fluoridation years 1959-63, there was a decrease of 8 per cent between the 1959-63 rate and the 1969-73 rate over which period the water supply was still fluoridated. These two sets of evidence, together with other evidence from naturally fluoridated UK communities, were stated by the Working Party to *“..provide substantial reassurance concerning the safety of fluoridation in respect of cancer. All statements to the contrary were based on errors”.*

## **REVIEW OF TRENDS IN THE USA**

The first town in the USA to fluoridate its water supply was Grand Rapids and this was in 1945. The responsible city fathers had been satisfied that the evidence from naturally fluoridated communities indicated there to be no health hazard. Studies made in subsequent years gave no cause for alarm even about cancer . In fact the suggested fluoridation-cancer link received no particular prominence in the USA until a few months prior to a referendum being held in Los Angeles in 1975. In January of that year, the National Health Federation, a private organisation based in California and one which had pronounced its opposition to fluoridation, distributed two handouts claiming that cancer death rates were higher in fluoridated than in non-fluoridated American cities. The author of these handouts was a biochemist called Yiamouyannis who eight months earlier had been appointed Science Director of the Federation. There then followed a spate of handouts by the National Health Federation, articles in its own Bulletin and in a publication called *Let's Live*. Yiamouyannis was joined as co-author by Burk who had retired from a senior position with the US National Cancer Institute. The contention of Yiamouyannis & Burk was based on statistics of cancer mortality for selected US counties averaged for the period 1950-69: these statistics published by the US National Cancer Institute in 1974 allowed comparison between places but not between times.

Whereas the National Cancer Institute fundamentally disagreed with the conclusion of Yiamouyannis & Burk, they were undeterred and continued their claim by shifting their attention to another set of data and another form of study around which the controversy has largely turned ever since. These alternative data were the official year-b.y-year statistics for the total number of cancer deaths in large American cities. The new form of study was what is called a 'time trend analysis'. From the total set of data, Yiamouyannis & Burk selected ten fluoridated cities and ten non-fluoridated cities, and on that basis concluded that fluoridation increases cancer deaths. Once more the National Cancer Institute quickly responded by emphatically denying the validity of the Yiamouyannis & Burk conclusions.

Within a short period, three groups of independent scientists - two British and one American - reanalysed the data and concurred with the National Cancer Institute: the claimed fluoridation-cancer link could not be sustained.

### **REJECTION OF THE YIAMOUYANNIS-BURK ANALYTICAL METHODS**

The Yiamouyannis-Burk claim depends on their assertion that their own methods of analysis are to be preferred to the standard methods universally used by epidemiologists and medical statisticians. The DHSS Working Party gave considerable attention to this assertion and rejected it for the following reasons:

1. A major weakness in the method used by the two Americans is their failure to make comparisons between cancer death rates in different populations as far as possible with regard to the demographic structure of the populations that were compared - in other words to compare like with like as far as possible.
2. They made many mistakes and inconsistencies in the handling of data, examples of which are given in the Report.
3. They failed to conduct acceptable tests of statistical significance.

### **CONCLUSIONS AND REFUTATION OF CANCER LINK**

The Working Party concluded that "*The time-trend studies of Yiamouyannis & Burk are so seriously flawed that their conclusion of a linkage between increases in cancer mortality and the introduction of fluoridation is untenable. For more valid analyses it is necessary to look to studies of the same general type that have been undertaken by other workers.*"

Full consideration was given to the extensive work of other scientists not only in the UK and the USA but from other countries. From this, the Working Party concluded that "*No consistent evidence of hazard has been found either in terms of cancer in general or in terms of cancer at any number of specific sites. ...*" in communities where the water has been fluoridated to a level of one part per million fluoride or in those where it occurs naturally sometimes at a much higher level.

### **COMMENTS OF THE BRITISH FLUORIDATION SOCIETY**

The Knox Working Party, in its exhaustive enquiries and analyses has accurately pinpointed the origins of the claimed fluoridation-cancer link and with equal accuracy has demonstrated this link to be false.

It is to be hoped that this complete demolition of the spectre created by Yiamouyannis and Burk will remove public apprehension on this issue once and for all.

The verdict is very similar to that given by Lord Jauncey in the Strathclyde Fluoridation legal case. Reference to the British Fluoridation Society summary of the case: *Comments on the case Mrs Catherine McColl v Strathclyde Regional Council*, will complement the reading of this summary of the Knox Working Party.

## **References**

Knox EG (1985):*Fluoridation of water and cancer: a review of the epidemiological evidence*. HMSO, London.

Lord Jauncey (1983):*Opinion of Lord Jauncey in causa Mrs Catherine McColl (A.P) against Strathclyde Regional Council*. The Court of Session, Edinburgh.