

Other (non-dental) health impacts of Water Fluoridation

Some 370 million people worldwide, including six million in England and 200 million (70 per cent of the population) in the United States, have an artificially fluoridated water supply and there is over 50 years experience of the measure in the UK and 70 years internationally. Routine monitoring of health in these areas has not revealed any health problems associated with water fluoridation.

It is always worth bearing in mind that concerns over water fluoridation equally apply to fluoride naturally present; if fluoride at 1ppm poses a health concern then this has implications for a number of public and private water supplies that have similar or higher levels of fluoride present and would require a revision of WHO guidance and UK laws covering water quality.

PHE is required by law to monitor and report on the effects of water fluoridation schemes on the health of people living in the areas covered. The summary of the impact of fluoridation on non-dental health outcomes from their most recent report (2014) is included below. There is no evidence of any harm to health, though there was some evidence of improved rates of kidney stones and bladder cancer in fluoridated areas.

Summary of non-dental health effects of water fluoridation

[Water Fluoridation: Health monitoring report for England 2014](#)

Health condition	Evidence
Hip fractures	There was no evidence of a difference in the rate of hip fractures between fluoridated and non-fluoridated areas.
Kidney stones	There was evidence that the rate of kidney stones was lower in fluoridated areas than non-fluoridated areas.
All-cause mortality	While there was some evidence that the rate of deaths from all recorded causes was lower in fluoridated areas than non-fluoridated areas, the size of the effect was small.
Down's syndrome	There was no evidence of a difference in the rate of Down's syndrome in fluoridated and non-fluoridated areas.
Bladder cancer	There was evidence that the rate of bladder cancer was lower in fluoridated areas than non-fluoridated areas.
Osteosarcoma (a form of bone cancer) among under 25-year olds	There was no evidence of a difference in the rate of osteosarcoma between fluoridated and non-fluoridated areas.
Osteosarcoma (a form of bone cancer) among people aged 50 and over	There was no evidence of a difference in the rate of osteosarcoma between fluoridated and non-fluoridated areas.
All cancer	There was no evidence of a difference in the rate for all types of cancer between fluoridated and non-fluoridated areas.

Please note, this document will be updated as and when we receive more feedback on this particular topic.

On both sides of the fluoridation debate you have to look at the quality of scientific evidence. There is an accepted 'evidence hierarchy' from meta-analyses at the top of the quality scale, to anecdotes and opinions at the very bottom of reliability.

Causal links of fluoridation to adverse health outcomes have not been found in any of the large scale meta-analyses, the most scientifically rigorous research methodology.

Associations between variables may be used to provide 'evidence' but without eliminating confounding variables it cannot be said reliably that one variable can be definitively linked with another. It is from this type of report, on apparent associations, that many concerns about fluoride have originated:

Cancer

Studies and literature reviews by expert groups over the last 30 years consistently agree that the available evidence does not indicate that fluoride in drinking water causes cancer.

Relevant publications include:

[Critical review of any new evidence on the hazard profile, health effects, and human exposure to fluoride and the fluoridating agents of drinking water, EC Scientific Committee on Health and Environmental Risks \(SCHER 2011\).](#)

[NHMRC Public Statement: Efficacy and Safety of Fluoridation, Australian NHMRC review \(2007\)](#)

(Additionally the findings of a 2016 draft update of this review, as yet unpublished, do not change the position from 2007)

[Tolerable Upper Intake Level of Fluoride, European Food Safety Authority \(EFSA\) \(2005\)](#)

[Environmental health criteria for Fluorides, World Health Organization International Programme on Chemical Safety \(IPCS 2002\)](#)

[Water Fluoridation and Health, MRC Working Party report \(2002\)](#)

In addition to finding no association between water fluoridation and cancer deaths, the report stated, "Furthermore, studies of cancer rates in relation to variations in naturally occurring fluoride levels provide information on lifetime exposure and the absence of any detectable adverse effects of fluoride in these studies provides a high level of reassurance concerning safety."

[A Systematic Review of Public Water Fluoridation \(2000\)](#)

The 'York review' concluded that, "Overall, from the research evidence presented, no association was detected between water fluoridation and mortality from any cancer, or from bone or thyroid cancers specifically."

A US study (Fluoridation of drinking water and subsequent cancer incidence and mortality by Hoover et al., 1991) which looked at cancer death rates generally and the specific risk of bone joint cancers found that, "up to 35 years of fluoridation did not increase the risk of death from cancer for either men or women compared with the risk in the 35 years before fluoridation, or compared with populations in non-fluoridated areas" and "the risk of bone and joint cancers is no different in fluoridated areas compared with non-fluoridated areas."

[International Agency for Research on Cancer \(IARC 1987\)](#)

Please note, this document will be updated as and when we receive more feedback on this particular topic.

[Fluoridation of Water and Cancer: An epidemiological review of the evidence \(1985\)](#)

This report of the expert working party established by the Department of Health, led by Professor George Knox from the University of Birmingham, reviewed 110 published papers and reanalysed some of the most important data. The report concluded: "We have found nothing in any of the major classes of epidemiological evidence which could lead us to conclude that either fluoride occurring naturally in water, or fluoride added to water supplies, is capable of inducing cancer, or of increasing the mortality from cancer. This statement applies both to cancer as a whole, and to cancer at a large number of specific sites. In this we concur with the great majority of scientific investigators and commentators in this field."

Osteosarcoma

Major studies conducted recently in Ireland, the United States and the UK have found no evidence that water fluoridation is associated with osteosarcoma (a type of bone cancer). Public Health England's own health monitoring report, published in 2014, found no difference in osteosarcoma rates between fluoridated and non-fluoridated areas.

a. Results of Irish study on Osteosarcoma

In April 2011 the results of an Irish study of osteosarcoma and fluoridation were published.

[Drinking water fluoridation and osteosarcoma incidence on the island of Ireland](#)

Data relating to cases of osteosarcoma between 1994 and 2006 in the mainly fluoridated Irish Republic and entirely non-fluoridated Northern Ireland were used to calculate age-specific incidence rates. No significant differences were observed between fluoridated and non-fluoridated areas in either age-specific or age-standardised incidence rates of osteosarcoma. The study authors concluded: "The results of this study do not support the hypothesis that osteosarcoma incidence in the island of Ireland is significantly related to public water fluoridation."

b. Results of US study on bone fluoride and osteosarcoma

In July 2011 a team of US researchers published the results of a study they had carried out to determine whether bone fluoride levels are higher in individuals with osteosarcoma.

[An Assessment of Bone Fluoride and Osteosarcoma](#)

Samples of bone taken from patients with osteosarcoma were compared for their fluoride content with samples taken from other patients with types of tumours that had never previously been linked in the scientific literature with exposure to fluoride.

The researchers said that if chronic fluoride intake was a risk factor for osteosarcoma, it would be reasonable to expect that cases would have significantly higher bone fluoride concentrations than individuals not affected by osteosarcoma. However, the study found no association between the disease and fluoride levels in bone.

c. Results of UK study on Osteosarcoma and Ewing sarcoma

A study published in 2014 which analysed around 4,200 cases of two forms of bone cancer (Osteosarcoma and Ewing's sarcoma) diagnosed in 0-49 year olds in Britain between 1980 and 2005.

[Is fluoride a risk factor for bone cancer?](#)

The researchers found no link between these cancers and the level of fluoride in drinking water. No link was identified when they analysed data from the whole of the 25 year period and individuals within all the age groups, or when they confined their analysis to individuals born before 1970, between 1970 and 1979, or from 1980 onwards. Nor was any link identified when data analysis was confined to the 0 to 9 year age band or any other five year band up to and including 40-49.

Please note, this document will be updated as and when we receive more feedback on this particular topic.

The consensus of the scientific community continues to support the conclusion that the incidence of cancer is unrelated to the introduction and duration of water fluoridation.

Thyroid Gland

There is some evidence from animal studies for effects of fluoride on the thyroid at relatively high doses. However, the evidence is inconsistent and other studies have shown no effects on the thyroid (European Food Safety Authority (EFSA) 2005, EU Commission's Scientific Committee on Health and Environmental Risks (SCHER) 2011).

Some human epidemiological studies have reported effects on the thyroid at relatively high levels of fluoride exposure, which are not representative of levels of exposure in the UK population. These studies have important limitations, however, such as inadequate assessment of fluoride exposure and adjustment for confounding factors (e.g. iodine deficiency and nutritional status) (EFSA 2005, SCHER 2011 and US National Research Council 2006).

In 2015 S Peckham et al published an ecological study in which the authors reported an association between the risk of being diagnosed with hypothyroidism and levels of fluoride in water. The paper was widely reported and the Journal of Epidemiology & Community Health issued a press release at the time of publication. The Journal subsequently published two separate critiques alongside the original research article.

[Are fluoride levels in drinking water associated with hypothyroidism prevalence in England? A large observational study of GP practice data and fluoride levels in drinking water](#)

The second commentary by Newton et al expresses concern with the methods and analysis used, and described a re-analysis of the data, which identified a potential error in the paper.

[Water fluoridation and hypothyroidism: results of this study need much more cautious interpretation](#)

A further critique was published in the British Dental Journal by Dr M Foley.

[Fluoridation and hypothyroidism – a commentary on Peckham et al](#)

“Peckham et al. fail to understand the limitations of a poorly conducted ecological trial, and the paper contains serious biases and flaws. Literature reviews have been highly selective and critical analysis of that literature has been poor. The authors show a disturbing tendency to focus on a small number of poor quality studies that reinforce their own views, while ignoring contradictory evidence from much stronger studies and reviews. Peckham et al. should have heeded the adage 'correlation is not causation' before coming to a conclusion at odds with a large body of reputable evidence from around the world. In my opinion, the paper's conclusions can and should be dismissed.”

Ecological studies have a number of limitations; for instance ecological studies measure the prevalence of disease at the population or group level rather than the individual level, which can result in critical information at the individual level being lost in the process of aggregating data at the group level. In addition, a single ecological study cannot identify causality.

The British Thyroid Association states that the two main causes of hypothyroidism in the UK are autoimmunity and as a side effect of treatment for an overactive thyroid or for thyroid cancer, and thyroid clinicians have not changed their advice since the Peckham paper was published.

Overall, evaluations by expert authoritative organisations considering the available evidence do not consider that fluoride at the levels permitted in UK drinking water will cause adverse

Please note, this document will be updated as and when we receive more feedback on this particular topic.

effects on the thyroid (e.g. University of York review 2000, Medical Research Council 2002, EFSA 2005, SCHER 2011).

Brain effects / IQ

In 2012 Anna Choi from the Harvard School of Public Health published a meta-study suggesting that fluoride may lower the IQ in children in rural China living in areas with highly naturally fluoridated water (11ppm).

[Developmental Fluoride Neurotoxicity: A Systematic Review and Meta-Analysis](#)

The review included studies with important limitations (e.g. no information on whether IQ assessment was adequately conducted; insufficient adjustment for confounding factors (e.g. socioeconomic status, education, dietary deficiency etc.); insufficient information on exposure to fluoride from other sources; and no assessment of co-exposure to other substances such as lead or arsenic) and looked at naturally occurring fluoride levels that were generally much higher than those found in areas served by water fluoridation schemes in the UK, the United States and other countries.

A follow up by the authors stated “These results do not allow us to make any judgment regarding possible levels of risk at levels of exposure typical for water fluoridation in the US.” However this study is frequently cited as “evidence” for a link between water fluoridation and neurotoxicity.

There is only limited evidence for the neurotoxicity of fluoride in experimental animals and only following levels of exposure much higher than the amount of fluoride humans are exposed to in drinking water. Other animal studies have not shown neurological effects (SCHER 2011).

Evaluations by various experts groups do not suggest that neurotoxicity is likely to occur following exposure to fluoride concentrations present in the UK Public water supply (e.g. University of York 2000, Medical Research Council 2002, World Health Organization 2004, International Programme on Chemical Safety 2002, European Food Safety Authority 2005 and the European Commission’s Scientific Committee on Health and Environmental Risks 2011.)

So, while any substance can cause toxic effects if consumed at high enough concentrations or in high enough amounts, the overall available evidence does not support the conclusion that fluoride at the levels permitted in UK drinking water causes a neurotoxic effect.

Other health impacts

Other health impacts from water fluoridation, for which no credible evidence has been found in support of the concerns include:

- Raised lead concentrations on the blood
- ‘Unexplained modern diseases’ such as endocrine system disruption and an underlying cause of obesity.

Further work is ongoing to assess the evidence for health impacts of water fluoridation to address questions about hip fractures, bone damage and other issues.