

Health outcomes raised in recent authoritative review

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50. A number of authoritative reviews have been conducted in recent years, with the US National Toxicology Program (NTP) and European Food Safety Authority (EFSA) publishing their evaluations in 2024 and 2025 respectively.

51. The US NTP undertook a systematic review of fluoride exposure and neurodevelopment and cognition. This concluded that with moderate confidence that fluoride exposures above the World Health Organization drinking water quality guideline of 1.5 mg/L, which is the same as the UK regulatory limit, were associated with lower IQ in children. Further studies were needed to understand potential for IQ effects at lower levels of exposure (NTP, 2024).

52. EFSA evaluated the evidence for potential adverse health effects from oral sources of fluoride. Its review concluded that drinking water concentrations of

fluoride above 1.5 mg/L were associated with adverse effects on the developing brain. Evidence of effects below 1.5 mg/L were not sufficiently consistent. The EFSA review also identified that drinking water concentrations above 1.5 mg/L were associated with possible adverse effects on thyroid function and bone mineralisation. For adults and children over 8 years old, the drinking water concentration of 1.5 mg/L was used as a basis for the Upper Level for these age groups (EFSA, 2025).

53. For younger children (less than 8 years old), EFSA considered that dental fluorosis was the most sensitive effect (EFSA, 2025). The next section provides more information on dental fluorosis.

Dental fluorosis

54. Dental fluorosis is a cosmetic condition caused by excessive fluoride exposure during tooth development. It appears as white flecks, lines, or patches on the teeth. The impact of milder forms of fluorosis on measured quality of life (using the Oral Health Related Quality of Life scale) is certainly less than that of tooth decay and may be non-existent or even positive (Do and Spencer, 2007; Chankanka et al, 2010).

55. Severe cases (with brown staining or pitting) are rare and more often found in countries with high naturally occurring fluoride levels.

56. The time of potential risk for aesthetic concern is during calcification of crowns of maxillary incisors. This is complete by age of 36 months. Excess fluoride will not cause fluorosis once teeth have developed.

57. Dental fluorosis can also occur in the absence of water fluoridation, through ingestion of other sources of fluoride during tooth formation, particularly toothpaste and other fluoride supplements.

58. A study reporting on fluorosis prevalence and severity in England was commissioned to inform the 2018 health monitoring report. It found that 10.3% of children in fluoridated areas (Newcastle, Birmingham) had prevalence of fluorosis that may be of aesthetic concern, compared to 2.2% in areas not fluoridated (Liverpool, Manchester) (Pretty et al, 2016). However, there was no difference between children and young people surveyed in fluoridated and non-fluoridated cities when asked about their opinion on the appearance of their teeth, taking into account concerns which have resulted from any cause e.g., poor alignment, decay, trauma or fluorosis. Further research in adults in England has suggested that the aesthetic impact of fluorosis diminishes with age (Macey et al, 2018).