

Health effects of fluoridation on IQ are unproven

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Bruce Spittle recommends¹ a new review of health effects of community water fluoridation (CWF) because of new findings published in three recent papers. Two of these use data from Canada where CWF is used and are more relevant than the studies from areas of endemic fluorosis previously used to argue against CWF. However, these new studies have problems and a critical review of them is necessary.

Spittle ignores the finding of the two Canadian studies²⁻³ that fluoridation has no effect on child IQ, confirming the results reported by Broadbent et al⁴ for New Zealand. All three of these studies reported differences of less than two IQ points in both directions. This lack of difference was not discussed by the Canadian authors but has been discussed in critiques of one of these studies.⁵

Despite this, some commentators use the new studies as evidence of harm from CWF because they report negative relationships between child IQ, or other cognitive measures, with indicators of fluoride exposure such as urinary fluoride, drinking water fluoride and estimated fluoride dietary intake. The reported relations are in all cases weak, explaining little of the variance of cognitive facts, and often not statistically significant. Attempts to consider the influence of confounders or other risk modifying factors are limited.⁵⁻⁶ There are also methodological weaknesses related to limitations in measurement of fluoride exposure and the suitability of the cognitive measures used for young children.⁵⁻⁶

Spittle¹ confuses the results reported by Till et al,² related to breastfed and formula-fed babies with those of Green et al,³ which compared prenatal maternal urinary fluoride with child IQ. He claims a decrease in the 8.8 IQ points in the children who have been formula-fed for every 1mg/L increase in water fluoride concentration.

But this was not statistically significant when confounders were included or when outliers removed. Till et al used several different cognitive measures including performance (PIQ) and verbal (VIQ), which are subtests of full-scale IQ (FSIQ). There was a statistically significant relationship for PIQ, but not VIQ or FSIQ. The use of such subtests is questionable⁷ but seems to have led to some confusion.

The studies Spittle refers to are exploratory, using existing data bases rather than experiments specifically designed to answer the relevant questions. Reported relationships may support preconceived beliefs but it is easy to ignore important confounders or risk-modifying factors. For example, the positive relationship of ADHD prevalence with the extent of fluoridation in the US reported by Malin and Till⁸ disappeared when geographic factors were included.⁹

R-squared values indicate that the relationships reported in the studies Spittle mentions explain only a few percent of the variance of cognitive measures. The standard errors of all the regressions are large compared with the coefficients determined for the relationships. Where figures illustrating these relationships are published, they show a higher degree of scattering of data points.

Multiple measures for both cognitive factors and of fluoride exposure are used producing many relationships. Only four of the 10 relationships reported by Green et al were statistically significant ($p < 0.5$). Similarly, only three of the 12 relationships reported by Till et al were statistically significant. There is a danger that reported relationships could be misleading—as the proverb says, “If you torture your data long enough, they will tell you whatever you want to hear”.¹⁰

Any new review of health risks of CWF would have to include consideration of all

relevant recent studies as well as those selected by Spittle. For example, a Swedish study¹¹ found that low fluoride exposure similar to levels found with CWF had no effect on people's IQ and a Spanish study¹² using mother child pairs similar to that of Green et al found a positive effect of prenatal maternal fluoride on child IQ.

Finally, extrapolating from data in studies from areas of endemic fluorosis as Spittle does to estimate a possible benchmark threshold dose for the effect of fluoride exposure on child IQ can be misleading. Those relationships refer to situations which include excessively large fluoride exposures, but the same relationships often prove to be

non-significant when only data for fluoride exposures relevant to CWF are statistically analysed. It is not unusual for beneficial micro elements to have toxic effects at excessive concentrations and health problems in areas of endemic fluorosis are well known.

The few studies mentioned by Spittle have the advantage of using fluoride exposures relevant to CWF, but they have serious weaknesses. There are also other relevant studies he does not mention and there will no doubt be more in future. A new review concentrating on only the few studies like those he has selected would be inappropriate.

Competing interests:

Nil.

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