2-17-2025

I am concerned about the misuse and misinterpretation of data on fluoride excretion in urine recorded either by 24 hour collection or by spot samples.

For example, Taylor (2024) states in the Discussion on page E8:

> Studies using individual-level exposures were assessed in the regression slopes meta-analysis, which included 13 studies with urinary fluoride measures, a more precise exposure assessment measure than group-level exposures. Unlike drinking water levels, individual-level urinary fluoride concentrations include all ingested fluoride and are considered a valid estimate of total fluoride exposure.[106,107]

This is clear misuse of reference 106 (Villa 2010), a paper for which I was co-author. Taylor's paper clearly says 'individual-level exposures'; contrary to Villa's conclusions. Villa states:

> Regarding the use of the results for predicting TDFI [total daily fluoride intake], figures 1-4 indicate that, although R^2 values were high, the sample 95% PI band associated with the regression lines does not allow the use of DUFE [daily urinary fluoride excretion] as a precise estimator of either TDFI or DFR [daily fluoride retention] on an individual basis.

This conclusion was stated clearly in the review by Rugg-Gunn (2011):

> Plots of daily urinary fluoride excretion against total daily fluoride intake suggest that daily urinary fluoride excretion is suitable for predicting fluoride intake for groups of people, but not for individuals.

The above remarks related to 24 hour collections of urine. The use of spot samples (a urine collection at one time point) has been common in recent studies, such as those examining fluoride and IQ. Spot samples are imperfect predictors of 24h urinary fluoride excretion, let alone daily fluoride intake, as pointed out by Aylward (2015):

> Because of substantial within- and between-individual variation in urinary flow and creatinine excretion rates, as well as the rapid urinary elimination pharmacokinetics of fluoride, concentrations of fluoride in individual spot samples may vary substantially even when underlying exposures rates are consistent and within the exposure guidance values. For this reason, we recommend that the BE [biomonitoring equivalent] values derived here be applied to the evaluation of central tendency estimates for populations, rather than to the evaluation of individual spot sample concentrations.

Thus, spot samples of urine are an even poorer predictor of fluoride take than 24 hour urinary excretion and unsuitable for predicting fluoride intake of individuals. You will appreciate, that studies relating fluoride intake and IQ rely on measurements of fluoride intake of individuals.

Taylor K. et al. *Fluoride exposure and children's IQ scores: a systematic review and meta-analysis.* JAMA Pediatrics. Doi:10.1001/jamapediatrics.2024.5542

Villa A. et al. *Relationship between fluoride intake, urinary fluoride excretion and fluoride retention in children and adults: an analysis of available date.* Caries Research 2010; 44: 60-68

Rugg-Gunn A, Villa A, Buzalaf M. *Contemporary biological markers of exposure to fluoride.* Monographs Oral Science 2011; 22: 37-51

Aylward LL. Et al. *Biomonitoring equivalents for interpretation of urinary fluoride.* Regulatory Toxicology and Pharmacology 2015; 72: 158-167

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