

T for target organ, timing, and SDU fluoride exposure (tea)



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Background

Fluoride is a developmental neurotoxicant

Systemic fluoride uptake can cause cognitive deficits during early development. Drinking-water and tea are the main sources of fluoride intake.



Vulnerable early development

Target organ

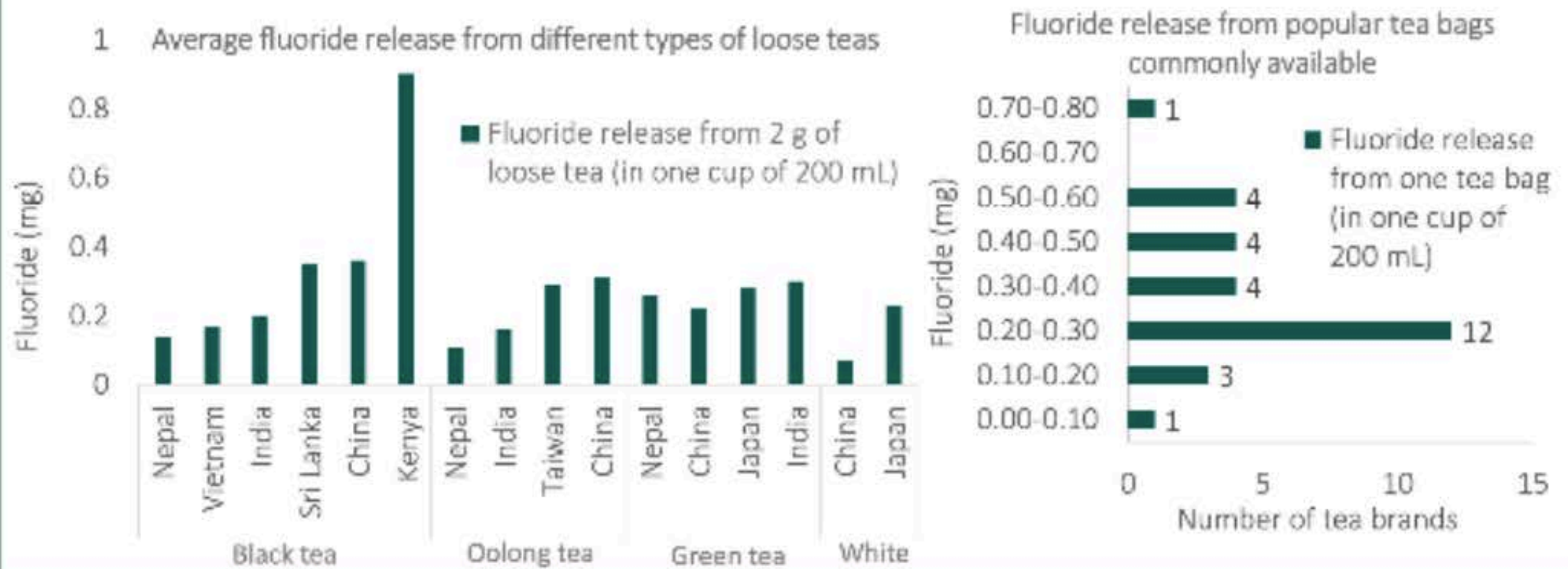
Brain



Methods

- Tea infusions were made with *deionized* water from 29 brand teas and 57 loose teas available on the market (2g/200mL/cup).
- Fluoride concentrations were analyzed using a fluoride-selective electrode.

Findings



Estimated daily fluoride intake from tea (% of exposure limit for children and adults)

Exposure limit	Age group	Daily exposure to fluoride from tea drinking		
		1 cup (200 mL) (0.14 - 0.90 mg/day)	2.5 cups (500 mL) (0.35 - 2.25 mg/day)	5 cups (1000 mL) (0.70 - 4.50 mg/day)
% of Acceptable Daily Intake ¹	Children 1 -3 years (14.2 kg)	40 - 255 %	99 - 635 %	198 - 1270 %
% of BMDL ²	Adults (>18 years) (60 kg)	9 - 66 %	24 - 150%	50 - 300%
	Adults (>18 years) (60 kg)	70 - 450%	175 - 1125%	350 - 2250%

¹ADI of 0.25 mg/day (children); 1.5 mg/ day (adults) derived from a NOAEL of 2.5 mg/kg bw/day

²BenchMark Dose Level of 0.2 mg/day (adults)

Conclusions

- Fluoride concentrations vary by **tea** type and country of origin, highest in **black tea**
- One cup of **tea** (200 mL) can exceed ADI or BMDL, especially for early development
- Disclosing information on fluoride concentrations (e.g., on **tea** package labels) would help consumers to choose wisely



32nd Annual Conference of the International Society for Environmental Epidemiology

Advancing Environmental Health in a Changing World



ABSTRACT E-BOOK

Theme: **Water quality**

P-1271

T for target organ, timing, and fluoride exposure

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Background: The brain is a main target organ for fluoride toxicity during early development. Based on recent epidemiological evidence, an approximate benchmark dose has been calculated for pregnant women at about 0.2 mg/L in water (or urine). This means that current limits for water-fluoride are too high, but tea has been suggested as an additional exposure source. **Methods:** Popular brands of teabags and loose tea were purchased in supermarkets and specialty shops in Denmark. Tea infusions were prepared in a standardized way (1 teabag or 2 g of loose tea per 200 mL cup) in deionized water, and the fluoride concentration was measured by ion-specific electrode. **Results:** Fluoride releases varied substantially. Teabags showed rather uniform and relatively high fluoride concentrations, mostly between 1 and 2.5 mg/L. Green tea and oolong tea showed results between 0.5 and 2 mg/L, and white teas were mostly lower. The concentrations in fruit/herb teas seemed to depend on the content of black tea. Some types of black tea exceeded 4 mg/L. The highest results were obtained for teas from Kenya, the lowest for Nepalese teas. The results suggest that a single cup of tea may well contribute an intake of at least 0.2 mg of fluoride (in addition to the water-fluoride concentration), thereby likely increasing the exposure above the estimated benchmark dose. **Conclusions:** Tea consumption is a main challenge in fluoride exposure assessment. In addition to limiting fluoride concentrations in potable water and in bottled water, information on fluoride concentrations in tea should be made available to allow consumers to choose wisely.