Optimization of recipes to improve nutritional intake and reduce metal(loid) exposure among Inuit women in Nunavik

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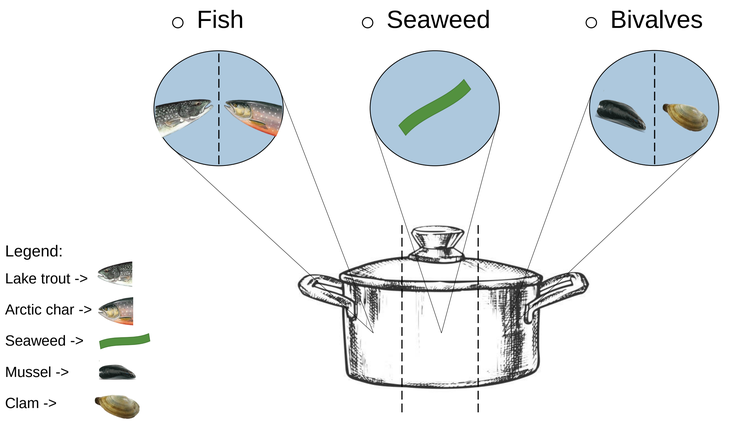
1 CONTEXT

- The traditional Inuit diet is a central part of their culture and contributes significantly to food security and nutrient intake in the communities.
- Despite the important concentrations of nutrients in traditional foods, certain **pregnant Inuit women suffer from deficiencies in Fe and Ca.**
- **A broth recipe made with a whole fish, or a fish head is recommended** for pregnant and breastfeeding women because it's said to help the baby's growth during pregnancy and to help with breastfeeding.
- During a consultation in 2019, **concerns about the concentrations of metal(oid)s in the broths** made from large lake trout (*Salvelinus namaycush*) (*manarsuk*) or Arctic char (*Salvelinus alpinus*) had been raised to the Nunavik Regional Board of Health and Social Services (NRBHSS) and Inuit colleagues
- Therefore, it was suggested that the **contaminants (Hg, As, Cd) and nutrients (K, Ca, Mg, Fe, Zn, Se)** in the constituents of the broths **be measured.**

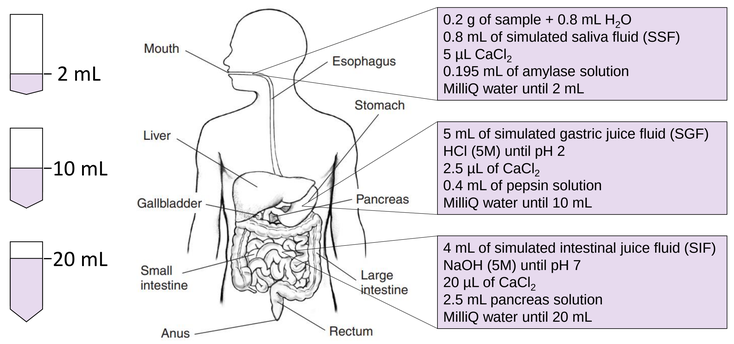
2 OBJECTIVE

Optimizing a traditional fish-based broth recipe to improve nutrient intake by adding foods likely to be rich in Fe and Ca such as brown algae (*Alaria esculenta*) or bivalves (blue mussels (*Mytilus edulis*) and clams (*Mya truncate*)) all while **minimizing exposure to contaminants**.

3 COOKING METHOD



BIOACCESSIBILITY METHOD

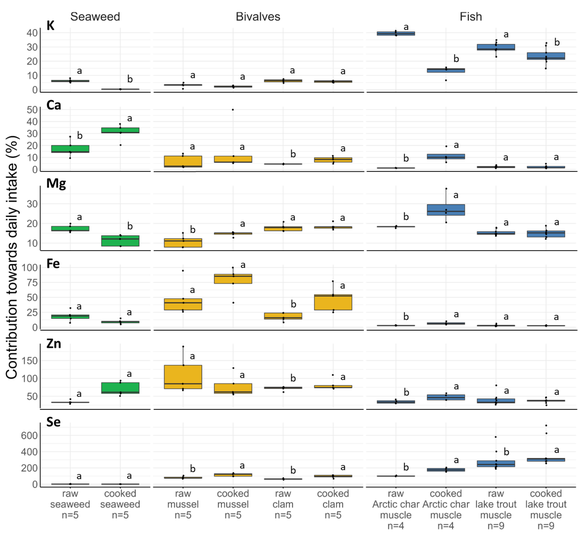


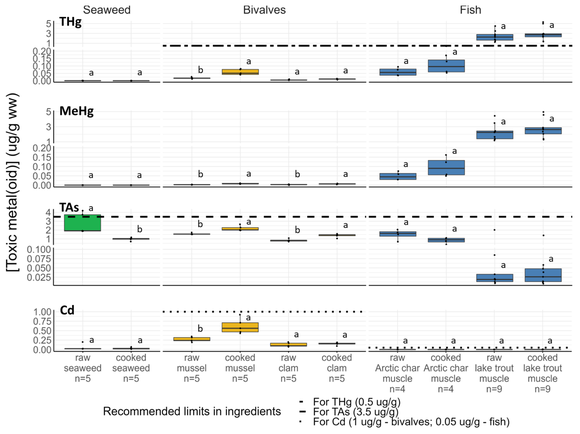
ANALYSES

- All tissues were lyophilized, and broth were preserved with 2% of conc. HNO_3 or HCl (for Hg/MeHg analysis)
- Hg analysis were performed on a DMA and MeHg analysis were done on CVAFS
- Other metals (K, Ca, Mg, Fe, Zn, Se, As (speciation), Cd) analysis were performed with an ICPMS/MS

Controls included blanks and reference materials (DORM-4, TORT-3, SMR-3232)

4 RESULTS AND DISCUSSION





*Calculation for % contribution: ((100 g (seaweed and bivalves) or 250 g (fish) or 250 mL (broth) * [mineral mg/g])/daily qty required mg) * 100
Daily quantity (qty) required for pregnant women: 60 mg Se, 4900 mg K, 350 mg Mg, 27 mg Fe, 1000 mg Ca

- Exposure to MeHg during pregnancy had been associated with developmental issue in the baby[1].

→ **MeHg exposure is low** when consuming seaweed and mussel. But Arctic char and clams as well since THg concentrations are low.

- Not all As species are considered toxic. AsB are not known to be toxic, and toxicity is currently being evaluated for As-Sug and AsL[2-4].

→ Even when concentrations go above recommended limit, **main forms are AsB in fish and As-Sug and AsL in seaweed and bivalves.**

- Broth contribution was less than 10% overall for nutrients and only TAs (mainly AsB for fish and As-Sug and AsL for seaweed and bivalves) transferred to the broth

→ **No harmful forms found in high concentrations in broths.**

- Bioaccessibility test performed on seaweed and bivalves showed that between 25-50% of THg, between 40% (seaweed) and 100% (bivalves) of TAs and 100% of Cd were released into the digestive juice.

→ THg (less than 50% as MeHg) and Cd concentrations were low for seaweed and bivalves and As is mainly As-Sug and AsL, so **exposure remains low when ingesting these ingredients.**

5 CONCLUSION

An optimal recipe would be made with a fish other than large lake trout, and seaweed and bivalves will be added and consumed whole to obtain the nutritional contribution of these ingredients.

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