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**Bone as a biomarker of mercury exposure in prehistoric arctic human populations: initial method validation using animal models**

Abstract:

Marine mammals are dietary staples among many indigenous peoples of the Arctic, but these foods sometimes contain high levels of mercury, a toxic heavy metal that can cause nerve and brain damage. Because mercury can be released into the environment by both industrial and natural processes, prehistoric marine mammal consumers may have been exposed to this toxicant, but little is known about preindustrial mercury levels. This research examined the potential for using the mercury concentration of archaeological bone as a biomarker of mercury exposure. Two requirements of valid biomarkers of exposure were explored: 1) measurement accuracy (trueness and precision) and 2) correspondence with the extent of exposure.

Measurement accuracy was evaluated using repeated determinations of mercury concentration in a sample of modern seal bones. Correspondence with exposure was examined by comparing bone mercury concentration to controlled exposure level in laboratory rats, and to the stable nitrogen isotope ratio ( $\delta^{15}\text{N}$ ) (a proxy measure of exposure) in prehistoric seals from Thule-period archaeological sites in Alaska. Results show that mercury measurements have acceptable accuracy and that bone mercury is strongly related to exposure. These promising results suggest that, with further validation on human subjects, bone mercury may provide a reliable archive of mercury exposure in preindustrial archaeological populations.