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MASTER THESIS PROJECT

Exploring 4000 Years of Mercury Variation in the Antlers of Svalbard Reindeer in the High Arctic

SARIA SATO BAJRACHARYA

Norwegian University of Science and Technology,
Trondheim, Norway

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Universidad del País Vasco Euskal Herriko Unibertsitatea
université de BORDEAUX
UNIVERSITÉ DE PAU ET DES PAYS DE L'ADOUR
LIÈGE université
NTNU Norwegian University of Science and Technology
U.PORTO

ABSTRACT

Despite its remote location, the Arctic receives substantial amounts of mercury (Hg) from lower latitudes via atmospheric and oceanic transport. With anthropogenic Hg emissions and climate change altering the global cycle of Hg, it is important to understand how different ecosystems and biota respond to these changes. In this study, temporal patterns of Hg concentrations spanning over 4000 years in the antlers of the high Arctic Svalbard reindeer (*Rangifer tarandus platyrhynchus*) were investigated. The mean (±SE) antler Hg concentration (5.29 ± 0.46 ng/g) was generally low compared to other tissues of reindeer and terrestrial Arctic wildlife. Antler Hg concentrations were higher pre-1650 Anno Domini (AD) (between 300-4000 'Before Present' (BP)) as compared to post-1650 AD (300 BP to present). Thus, no influence of the drastic increase in Hg levels caused by anthropogenic activities was reflected in the antlers from the post-1650 AD period. Additionally, no linear trend was observed in the antler Hg concentrations before 1650 AD, although increased Hg concentrations corresponded to warmer climate periods in Svalbard. It was therefore suggested that climatic and weather variability may have influenced the patterns of terrestrial Hg bioaccumulation. Mercury concentration was two times higher in the inner and porous trabecular layer than in the outer and compact cortical layer. Higher trabecular Hg concentrations in ancient antlers may suggest the likelihood of diagenetic intrusion of Hg and the need to assess this possible source of contamination prior to using ancient antlers as natural archives of pollutant exposure in future studies. This study not only reports the first-ever measurement of Hg in the antlers of high Arctic wild reindeer but also provides novel Hg data spanning a millennia-scale timeframe in the Arctic terrestrial environment. Collectively, it offers insight into the temporal patterns and potential drivers of Hg variations, which contributes to a better understanding of past and future Hg levels.