Año: 2022

Título artículo: Factors influencing lead, mercury and other trace element exposure in birds from metal mining areas

Revista, volumen, páginas: Environmental Research 212, 113575

Autores: Maciej Durkalec, Monica Martinez-Haro*, Agnieszka Nawrocka, Jennifer Pareja-Carrera, Judit E.G. Smits, Rafael Mateo

* Instituto Regional de Investigation y Desarrollo Agroalimentario y Forestal de Castilla La Mancha (IRIAF), CIAG del Chaparrillo, Ctra. de Porzuna s/n, 13071, Ciudad Real, Spain

RESUMEN: Non-ferrous metal mining is considered one of the largest sources of toxic metal released to the environment and may threaten ecosystems, notably biota. We explored how birds that inhabit non-ferrous metal mining sites are exposed to mercury, lead, and other trace elements by analyzing their feathers and verifying which factors may influence element concentrations in feathers. We sampled a total of 168 birds, representing 26 species, with different feeding habits and migration patterns in a non-polluted reference site and two historical metal mining areas: Almadén, which is considered one of the most heavily mercury-contaminated sites worldwide, and the Sierra Madrona mountains where lead has been mined since ancient times. The quantification of aluminum (Al), arsenic (As), barium (Ba), beryllium (Be), cadmium (Cd), cobalt (Co), chromium (Cr), copper (Cu), iron (Fe), mercury (Hg), magnesium (Mg), manganese (Mn), molybdenum (Mo), nickel (Ni), lead (Pb), selenium (Se), thorium (Th), thallium (Tl), uranium (U), vanadium (V) and zinc (Zn) was performed by inductively coupled plasma mass spectrometry (ICP-MS). Feather analysis revealed contamination by Hg and Pb, in Almadén and Sierra Madrona, respectively. We found that granivorous birds had the lowest feather Hg levels compared to those found in omnivorous, insectivorous, and piscivorous species, whereas feather Pb was about twice as high in granivores and omnivores, than in insectivorous and piscivorous birds. We also found differences among study sites in 13 elements and confirmed the influence of feather age, migratory patterns of the birds, and external deposition of elements, on metal concentrations in the feathers. Our results highlight that despite the cessation of metal mining in the study areas, local avifauna are being exposed to Hg and Pb from abandoned mines and old tailings sites, indicating that appropriate measures are needed to protect biota from overexposure to these toxic metals.

Funding sources
This research was co-financed by the regional plan for research (project ref. PPII-2014-028) from the Junta de Comunidades de Castilla-La Mancha (JCCM) and the Internal Research Fund of the National Veterinary Research Institute in Puławy

Enlace al artículo completo: https://doi.org/10.1016/j.envres.2022.113575

Ctra. Toledo - Albacete, s/n
13700 Tomelloso, Ciudad Real
Tel: 926 50 80 60
e-mail: secretaria_iriaf@jccm.es
iriaf.castillalamancha.es
www.castillalamancha.es