

Oral Communication 10

Hedgehogs (*Erinaceus europaeus*) as bioindicators of heavy metal(loid) pollution

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Abstract

Background: Heavy metal(loid)s pollution is a One Health concern [1]. Hedgehogs (*Erinaceus europaeus*) are promising candidates for biomonitoring programs, due to their habits, abundance, distribution and resilience [2]. **Objective:** This work aims to evaluate heavy metal(loid)s pollution, using *E. europaeus* as a bioindicator. **Methods:** Necropsies of 46 hedgehogs from three distinct rescue centres (CERVAS, LxCRAS and RIAS) were performed. Provenance and clinical data (when available) were recorded. Sex and age group were estimated. Liver, kidney and external spines (2-10 grams) were collected and stored under -20°C. Internal organs were completely freeze-dried for two days at -56°C (LaboGene CoolSafe®) and stored frozen until further analysis. Spines were washed in an ultrasound machine (Sonorex RK 106®) and dried overnight in an oven (55°C). Acid digestion was performed in a digestion plate (DigiPrep-MS®) and metal(loid)s concentrations (As, Cd, Cr, Cu, and Pb) were determined with ICP-MS. Liver and kidney were also collected for histopathology routine examination. **Results:** High levels of Cu were found in the kidney (24.74±21.05 mg kg⁻¹ dry weight [dw]) and liver (35.66 ± 19.65 mg kg⁻¹ dw), with some animals passing 100 mg kg⁻¹ dw, which is a high value for insectivores [3]. Significant correlations have been found between spines and liver and between spines and kidney, for Co (p<0.001, in both organs) and Pb (p=0.020 and p=0.019), suggesting spines as a non-invasive sample to access internal metal(loid) concentrations. Biliary hyperplasia was the most frequent lesion observed (36%) - Animals presenting biliary hyperplasia show higher levels of metal(loid)s, with a significant difference for Cd (p=0.007) and Co (p=0.019). **Conclusions:** Further research, including different locations and organs, is mandatory to comprehend the real impact of metal(loid)s pollution in different Portuguese locations, under a One Health perspective.

Keywords: trace elements; hedgehog; environmental contamination; One Health

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References

1. Ding, C.; Chen, J.; Zhu, F.; Chai, L.; Lin, Z.; Zhang, K.; Shi, Y. Biological Toxicity of Heavy Metal(Loid)s in Natural Environments: From Microbes to Humans. *Front. Environ. Sci.* **2022**; *10*:920957;
2. Jota Baptista, C.; Seixas, F.; Gonzalo-Orden, J.M.; Oliveira, P.A. Can the European hedgehog (*Erinaceus europaeus*) be a sentinel for One Health concerns? *Biologics.* **2021**; *1(1)*, 61-69;
3. D'Havé, H.; Scheirs, J.; Mubiana, V.K.; Verhagen, R.; Blust, R.; de Coen, W. Non-Destructive Pollution Exposure Assessment in the European Hedgehog (*Erinaceus Europaeus*): II. Hair and Spines as Indicators of Endogenous Metal and As Concentrations, *Env. Pollution* **2006**; *142(3)*:438-48.



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