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Monitoring cobalt presence in the hair of young individuals from Alcalá de Henares, Spain: effect of age and sex.

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INTRODUCTION

Cobalt (Co) is increasingly used in green technology development. Recently, our group has detected Co in 73 out of 97 adolescents' scalp-hair monitored (Peña-Fernández et al., 2022)**, who have born and residing in Alcalá de Henares (Spain; Fig. 1), suggesting some exposure.**

We studied its presence in young children owing to their greatest susceptibility.

MATERIAL AND METHODS

- **Hair** was collected from **120 children (6 to 9-years-old; 70 females)** born and residing in Alcalá (Spring 2001).
- Co was monitored in **97 topsoil samples** randomly sampled from different urban parks across the city after appropriate mineral digestion (Peña-Fernández et al., 2014).
- ICP-MS (Schuhmacher et al., 1993).
- Data was processed using statistical methods applied to censored data available in the 'NADA' statistical package.
- Non-carcinogenic risks to Co were also characterised.

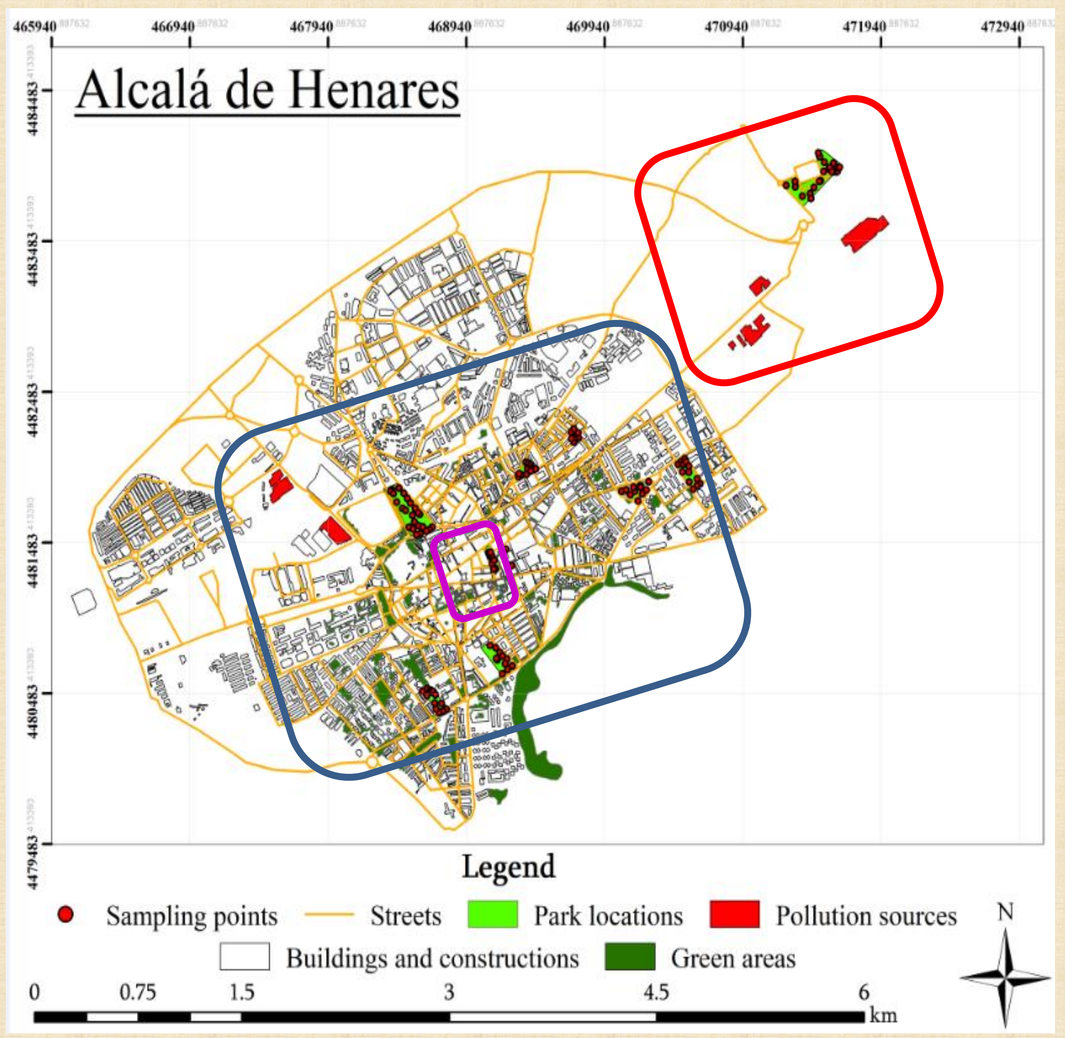

Fig 1. Study area. Topsoil samples were randomly sampled in different urban parks, industrial and garden areas in Alcalá de Henares.

RESULTS AND DISCUSSION

- ✓ **Data was processed using NADA statistical package owing to the level of censored values (26.05%; LoD=0.0034 µg/g), which was similar to the percentage observed in adolescents' hair (24.73%).**
- ✓ **Levels were slightly higher in children's hair [data presented as median and range, in µg/g: 0.0062 (0.0036-0.0437) vs. 0.0036 (0.0016-0.0817)], suggesting a minor dependency of detoxification at young ages.**
- ✓ **This effect has been reported in a study carried out with individuals living in the city of Madrid and in a village in the NE; thus, significant higher levels of Co were detected in children's hair (aged 6-10 years) *versus* teenagers' hair aged 11-15 years (0.0172 vs. 0.0141 µg/g).**
- ✓ **Similarly to the observed in the adolescent cohort, Co shown sex-dependency in children's hair, being significantly higher in female participants [*p*-value=0.00087; median and range, in µg/g: 0.0074 (0.0037-0.0437) vs. 0.0047 (0.0036-0.0157)], which is also in agreement with the observed with individuals living in Madrid.**
- ✓ **Co was non-detected in only one topsoil samples [median and percentiles in mg/kg: 1.577 (1.092, 2.584)]** (Peña-Fernández et al., 2022)**.**
- ✓ **Non-carcinogenic risks derived from the ingestion/inhalation/dermal contact to Co in soils and resuspended soils in Alcalá were negligible** (Peña-Fernández et al., 2022)**.**

CONCLUSIONS

Results suggest some exposure to Co, which would be mostly from dietary sources as Co has been little detected in Alcalá de Henares' environment. Tentative reference values for Co, *i.e.* the 95% confidence interval of the 95th population percentile (CI-PP95), are proposed for girls (0.0199-0.0356) and boys (0.0083-0.0144), as age and sex shown to affect the levels of Co in human hair. These ranges could be used to detect children living in the same city exposed to Co.

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