

## Fingerprinting the impact of chronic metal exposure on humans through gallstones

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Metals are metabolized and eliminated from the human body through bile and urine. Therefore, gallstones which develop from the precipitating bile components represent a long-term sink for metals. The impact of chronic metal exposure derived from naturally enriched soil and bedrock and from extensive mining activity on humans from two environmentally contrasting populations in SW Spain was evaluated through exhaustive mineralogical and chemical characterization of gallstone samples. Various techniques were used including bulk XRD and FTIR,  $\mu$ -ATR-FTIR, ESEM-EDS, dissolution ICP-MS, and LA-ICP-MS.

Based on the phase composition, gallstones were classified into (pure, mixed, and composite) cholesterol stones, pigment stones, and carbonate stones [1]. This study highlights the higher tendency of developing pigment stones as well as a higher accumulation of metals in especially composite cholesterol and pigment stones among the patients in the study group under chronic metal exposure in comparison to the control group (Fig. 1). The metallic precipitates in these calculi are mainly composed of Cu, Fe, Ni and Zn with a variety of minor components [1]. Possible exposure routes include contaminated soils, sulfide-rich bedrock, and dust in the air, as well as abundant consumption of local water and locally produced food products.

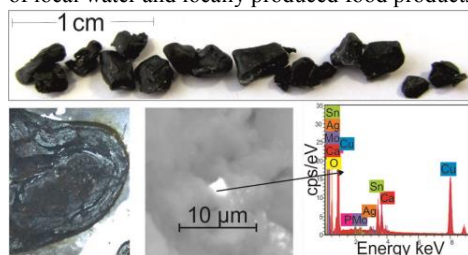


Fig. 1. Pigment stones from study group.

[1] Parviainen et al. (2016) *Sci. Total Environ.* **573**, 433-443.