GRAZING OF EQUUS CABALLUS (THE HORSE/PONY) IN THE GOLDFIELDS REGION OF VICTORIA, AUSTRALIA: DOES ELEVATED METALS IN THE SOIL TRANSLATE TO ELEVATED BODY BURDEN IN THE ANIMAL?

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The Goldfields region of Victoria, Australia has naturally elevated metalloid levels that have been further concentrated by mining activities. Values up to 3,490mg/kg As are recoded in the Ballarat region with 3.1mg/kg recorded as water soluble. The area has been extensively mined for gold (more than 13.2 million ounces extracted), but in recent times has been a site of significant growth and urban development. Materials from past mining activities are distributed throughout the regional city of Ballarat and, at its periphery, grazing of horses is common practice and consistent with the rural lifestyle that draws people to the region.

A cross-sectional and statistically selective study targeting the horse and their grazing field was devised to investigate metalloid bioavalability and uptake. Using human toenail material as a model, we analysed hoof horn material (n=65) and collected 45 soil samples (including mine waste and tailings material) from the fields. The outermost hoof material was discarded and extensive washing was required before digestion and analysis vie ICPMS and ICP-OES.

Mine waste material from horse paddocks ranged in arsenic value of from 0.4-4320mg/kg. Soil material ranged from 0.5-59.6 mg/kg arsenic and hoof horn arsenic concentration ranged from 0.2 to 1.6mg/kg with all samples presenting detectable arsenic. Other elements associated naturally with gold mining activities and materials are similarly elevated.

The presence of arsenic and other metals in hoof horn support the premise that metals are bioavailable to the horse. Statistical results show a weak but statistically significant correlation (p = 0.013) between arsenic concentration in soils and hoof horn. Limited base line data for hoof horn material is available but if comparison to human models is valid, it is postulated that the levels detected are significant.

Keywords: Equus caballus, hoof horn, arsenic