

## ENVIRONMENTAL COBALT AND HEALTH

MARIA NIKKARINEN<sup>1\*</sup>, ANNE KOUSA<sup>1</sup>, SARI MAKKONEN<sup>2</sup>, AURI KOIVUHUHTA<sup>2</sup>, ANNE-MARJA NERG<sup>2</sup>

<sup>1</sup>*Geological Survey of Finland, Kuopio, 70211, Finland*

<sup>2</sup>*Department of Environmental Science, University of Eastern Finland, Kuopio, Kuopio, 70211, Finland*  
*maria.nikkarinen@gtk.fi*

Cobalt, like other metals, is unevenly distributed in the natural environment. Cobalt is an essential trace element for humans and animals and an integral part of vitamin B12. However, when too much cobalt is taken into the human body, harmful health effects can occur. Severe Co contamination of soil is relatively uncommon but mining, smelting and industrial processing may all cause Co contamination.

Cobalt is one of the hi-tech-metals that EU has listed as critical metal, which refers commodities that are highly important to industry and society, and whose availability is subject to risk and uncertainty. The possible increase in mining and processing of Co makes it important to highlight studies on the geochemical circulation of Co and its distribution in the food chain. Soil contamination and remediation requirements must be assessed if the concentration of Co in soil exceeds the threshold value of 20 mg/kg, according to the Government Decree on the Assessment of Soil Contamination and Remediation Needs in Finland.

In Finland Co has been mined and produced in some polymetallic sulfide mines. However, there have been few investigations performed under field conditions on the availability and transfer of Co in the soil-plant system in the mining environment. In this study we investigated Co concentrations in the topmost soil (humus layer) and in wild edible mushrooms in the Luikonlahti Cu-Zn-Co mining district in eastern Finland. The soil contamination threshold value for Co was exceeded in the humus layer for the distance of about 500 m around the concentrating mill area. The total concentration of Co in humus ranged from 2.55 to 133 mg/kg. Available fraction of Co (ammonium acetate extraction) ranged from 0.68 to 23.3 mg/kg. The Co concentration in wild mushrooms depended greatly on taxa. Concentrations of Co in *Boletus edulis* grown in the studied mining area ranged from < 0.05 to 2,6 mg/kg with a median value of 0.87 mg/kg dry weight. In our previous study *Boletus edulis* grown in non-polluted collection sites Co ranged from 0.05 to 0.15 with a median of 0.08 mg/kg. The daily intake for Co considered safe according to legal standards is 1.4 mg/day. Rough calculation reveals that one kilogram of fresh *Boletus edulis* grown in the studied mining area would contain c. 18% of the given daily limit for Co.

Keywords: cobalt, environment of mine