Biomonitoring of heavy metals using *Usnea antarctica* lichens (extended abstract)

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Lichens as biomonitors

As a remote and isolated continent, Antarctica is often considered as a last great wilderness. Despite the fact that the continent is naturally protected against entry of lower latitude air and water masses, and human activities are very scarce, Antarctica is no longer an untouched environment. During last decades, many studies revealed a presence of man-made contaminants in various compartments of polar ecosystems.

Among the other biotic and abiotic materials, lichens are exceptional for their ability to capture and accumulate atmospheric pollutants. As biological accumulators they present an effective biomonitors of airborne metals. Due to their resistance to harsh conditions, lichens are widespread across all continents. Fruticose lichen *Usnea antarctica* has been repeatedly used for environmental monitoring in different parts of the Antarctica.

Unlike higher plants, lichens have neither roots nor a well developed cuticle. Due to their slow growth rate, lichens act as integrators of air pollutant patterns over long time scales. Their chemical composition reflects the composition of elements in the atmosphere (in gaseous, dissolved and particulate state) because their mineral nutrition has predominantly an atmospheric origin. Several processes are involved in acquiring both nutrients and contaminants by lichens. These processes include wet deposition and occult precipitations, direct gaseous uptake from the atmosphere and trapping of mineral particles via sedimentation and impaction.

Analysis of Usnea antarctica lichens from James Ross Island, Antarctica

Present study was designed to investigate the contents of selected heavy metals in the *Usnea antarctica* lichens from James Ross Island (JRI), Antarctica. Samples were collected during a Czech antarctic expedition to Johann Gregor Mendel station. The lichens were sampled in several areas in the northern part of JRI.

Fig. 1. *Usnea antarctica* lichen, James Ross Island.

In the laboratory, the lichens were washed thoroughly in order to remove dust and any unwanted particles and then were dried. Afterwards, lichens were homogenised in a ball mill and introduced into the solution in teflon vessels of microwave digestion system (Milestone 1200 MLS). Contents of selected heavy metals (cadmium, lead and mercury) were determined by means of atomic absorption spectrometry using Solar 939 spectrometer (Cambridge, UK) and single-purpose mercury analyzer AMA-254 (Altec, Czech Republic). The trueness of the methods was proven by measurement of the certified reference material.

The preliminary results revealed information about levels, variability and distribution patterns of cadmium, lead and mercury in lichens from the northern part of JRI. Whereas the contents of cadmium and lead were similar to those already reported for *Usnea antarctica* in the other studies from the Antarctica, the contents of mercury in certain locations were significantly higher. Although the mercury contents varied considerably among the sampling locations, some of them belonged between the highest ever reported.

A knowledge of current levels of heavy metals is essential for monitoring of increasing pollutant burden of the Antarctic environment.

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