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Analyzing the Effects of Treating Human Lung Cell Tissue with a Low-Level Chronic Metal Mixture

In 1983, Butte, Montana was designated a Superfund site due to the impact of over a century of mining activity. A recent study was conducted analyzing the accumulation of 36 elements in the hair and 11 elements in the blood of Butte residents as opposed to a control population, as well as an analysis of the soil and air of the Butte area. Elevated levels of several metals, including Cu, Mn, and As, were found in the hair, blood, soil, and air. The focus of this study was on the elevated metals in the air, arsenic and manganese. Previous studies have shown that elevated levels of metals, such as Pb, As, and Mn, can evoke serious health effects such as neurodegenerative diseases and cancers. In order to investigate the toxicity of airborne metal ions on Butte residents, this study replicated the environmental exposure of the airborne metals found in the human study, and evaluated the biological response of normal lung cells. To do this, human lung cell tissue (BEAS-2B) was treated with a low-level chronic metal mixture of either $NaAsO_2$, $MnCl_2{\cdot}4H_2O$, or a mixture of the two metals. Following metal exposure, the cell cultures were assessed with XTT cell viability assays measuring cell viability based on mitochondrial respiration and gene array plates measuring genetic changes. The results of these tests are expected to provide preliminary knowledge regarding the health impacts of low-level chronic metal exposure effects on human lung cells.