

## **A Grand Challenge for Technology Development for Heavy Metal Detection**

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### **Abstract**

In his recent 2013 book, “Only One Chance: How Environmental Pollution Impairs Brain Development --- and How to Protect the Brains of the Next Generation,” Philippe Grandjean lists 213 industrial chemicals known to cause brain toxicity and damage in humans. The list is organized by Metals, Inorganic Compounds, Organic Solvents & Substances and Pesticides. He argues persuasively that fetal exposure to these substances (e.g., Pb, Cd, Hg etc.) may interfere with normal brain development and leads to subtle and not so subtle degradation of mental function depending on dose and timing. Adult exposure is also damaging. This talk will be focused on heavy metal toxicity and detection, specifically addressing the need to detect the simultaneous presence of several heavy metals in individuals residing in remote areas. It is well accepted that exposure to heavy metals can result in neurological impairment, kidney damage, autoimmunity diseases, joint diseases, and nervous system damage. Since most heavy metals are colorless and odorless, the chances of being unwittingly exposed are high. There are a number of standard chemical analysis techniques that can be used to detect the presence of heavy metals in both the environment and in biological samples, but all of these require sending the samples to well-equipped laboratories for analysis. There is a need for a device that is at once portable, low-cost, fast-acting, low-power and sensitive to the presence of multiple heavy metals. Several new technologies are emerging that suggest that such an instrument is imminent. Since some heavy metals - such as Cobalt, Copper, Iron, Manganese, Molybdenum, Vanadium, Strontium, and Zinc - are essential to health in trace amounts, such a device might be able to demonstrate a lack of these essential elements as well. Recently, the IUPESM’s Health Technology Task Group began organizing a Workshop on Heavy Metal Toxicity and Detection in Lima, Peru to explicitly address this important problem by “describing advances in technology and screening methodologies that will bridge the gap between research and affordable practice.” Peru is one of a number of emerging nations with a pronounced heavy metal toxicity problem. A partnership of the IUPESM (IFMBE and IOMP), the Pontifical Catholic University of Peru, and the Peruvian National Institute of Health has developed to address this important issue. It is hoped that this will lead to projects under the “Future Earth” and “Urban Health” programs of the International Council of Science (ICSU).