

The IAEA's Role

Over the last 20 years, the IAEA has operated 32 projects in 51 countries dealing with various aspects of heavy metal pollution and the effects on humans and the environment. There are now eight projects ongoing in 25 countries.

In Kenya and seven other African countries for example, the Agency is training scientists to better use nuclear techniques to assess contamination of the marine environment around the continent.

And in Argentina, the IAEA is involved in conservation and management of natural resources by finding the source of methyl-mercury and identifying the main bio-accumulation pathways in significant lakes of Nahuel Huapi National Park.

The Agency contributes to the study of elements such as arsenic, cadmium, chromium, cobalt, copper, lead, manganese, mercury, nickel, tin, titanium and zinc in a variety of ways. For some Member States the IAEA provides testing equipment and training for scientists. For others, the Agency's reference materials are basic tools in quality control when new soil, plant and water samples are tested.

Testing for lead and other heavy metals in the environment and in the human body involves using the complementary techniques of neutron activation analysis (NAA), anodic stripping voltametry (ASV) and total reflection x-ray fluorescence (TXRF). The assay methods are used to determine the heavy metal composition of soils, food, water, body tissue and blood.

With NAA the material to be studied is exposed to neutrons in the core of the reactor. This causes nuclear transformations of elements in the sample, followed by radioactive decay. Each element forms radioactive nuclides which emit radiation of characteristic energy, like a "gamma fingerprint". In this way many elements, including heavy metals, can be identified and measured in the sample at the same time.

For XRF, instead of using neutrons to excite the elements in the sample, X-rays are used. Each element then de-excites by the emission of a characteristic X-ray. However, unlike NAA the samples do not remain radioactive after the process is complete.

In Jamaica, the IAEA provided a TXRF unit which is used for XRF analysis, as well as high-purity germanium photon detectors (a.k.a. gamma ray detectors) which detect the different "gamma fingerprints" being emitted by the samples under analysis.