# Micro Trace Minerals Laboratory News:
## Radioactivity

The term “radioactivity” is used to describe the spontaneous emission of a stream of particles in nuclear decay, a process in which an unstable atomic nucleus loses energy by emitting ionizing particles or radiation. Unstable (radioactive) nuclei will decay to different nuclei, emitting three types of ionizing radiations called alpha, beta and gamma which are capable to ionize materials.

In medicine, radioactive substances are used as tracers for diagnosis and treatment of cancerous cells. Similarly, these radioactive substances are used to produce nuclear weapons. Among the worst negative aspect of nuclear energy are nuclear disasters (Chernobyl, Fukushima).

Radioactivity can occur both naturally and through human intervention.

1. **Natural radioactivity:**
   Nuclear reactions which occur spontaneously are natural phenomena. They occur from natural radioactive elements such as uranium (Uranium-238) and the thorium (Thorium-232). Radioactivity testing in food does not concern itself with these isotopes.
2. **Artificially induced radioactivity:**
   An example is neutron activation, where a neutron fired into a nucleus causes nuclear fission. Neutron activation is the underlying principle of boron-neutron capture therapy for certain brain cancers, and is the basic concept behind the atomic bomb and nuclear weapons. Artificial radioactivity is produced in nuclear reactors. These induced radionuclides have varying half-lifes, which determine how long the fallout components can be detected in our environment.

**Example: Uranium**
Natural uranium (U-238) contains approximately 0.7% of the isotope U-235, and rich sources of this ore are found in the western United States, Canada, Australia, South Africa, the former Soviet Union and Zaire. To make nuclear-usable uranium, U-238 is enriched. Reactors use enriched uranium (3-5% of U-235) as fuel while weapons use more highly enriched uranium (up to 90% of U-235).

Among the decay products of U-235 are the artificial radionuclides Krypton-92, Barium-141, Strontium-90, Ruthenium-106, Iodine-131, Cesium-134 and Cesium-137.

Our newly installed gamma spectrometer is capable to provide evidence of radioactive contamination in food products. It allows the quantitative detection and verification of these radionuclides.

| Radio nuclide | Appr. Half-life | Detectable after |
|---|---|---|
| **Iodine-131** | 8 days | acute fallout |
| **Cesium-134** | 2 years | acute and recent fallout |
| **Cesium-137** | 30 years | acute, recent and fallout several years ago |

From our experience we recommend that food from Eastern European countries (Chernobyl) should be randomly monitored. We assume that the Fukushima nuclear disaster causes radioactive contamination of water, soil and food of certain areas.

We need 1kg of food or soil, or 1ltr of water for testing. Ask for pricing.