Detection and tracing of the medical radioisotope iodine-131 in the Canberra environment

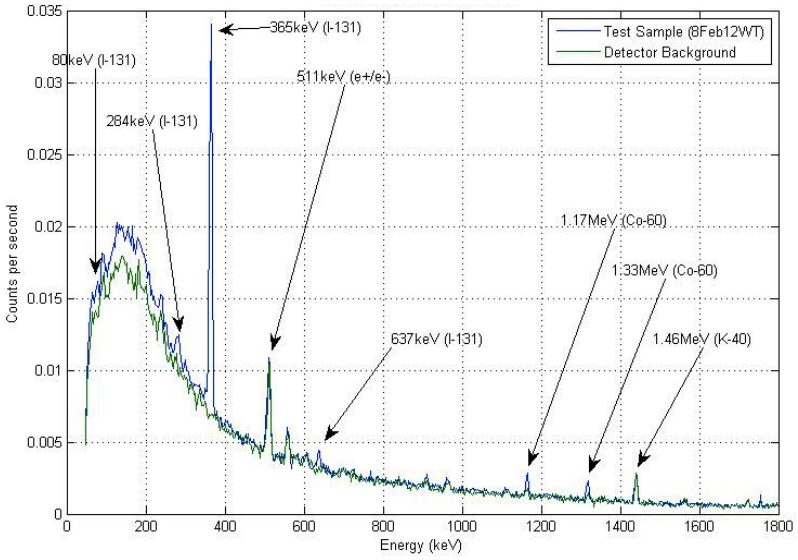
Nathan Gilfillan and Heiko Timmers

School of Physical, Environmental and Mathematical Sciences,

The University of New South Wales in Canberra, ACT 2602, Australia

Radioactive isotopes are used in a number of diagnostic and therapeutic medical procedures. Iodine-131 ($t_{1/2}$ = 8 days), for example, is applied in the treatment of thyroid conditions. Typically for therapy the radioisotope is administered to patients at activities of several GBq. Following excretion with a biological half-life of 14 hours, some of this activity passes through the sewage system into the natural environment. It has been shown that Iodine-131 can occur, for example near the outflow from sewage treatment, at activities significantly above that of typical natural background radioisotopes. Since medical use may be expected to increase in future, the understanding of the radioecology of iodine-131 and the exposure of the public to this artificial radiation are important. Furthermore, because of its straightforward identification via the characteristic 365 keV gamma-ray line, iodine-131 may be used as a tracer of sewage dilution in aquatic systems.

Water and algae sample have been collected at locations on the Murrumbidgee and Molonglo river systems in Canberra. Gamma-ray spectroscopy has been performed using a lead-shielded, high-purity coaxial germanium detector. Some measurements give clear signatures of the characteristic Iodine-131 lines and indicate the expected 8-day radioactive half-life (see Figure). This appears to be the first study of this kind for the Canberra environment. The activity calibration of the measurements is in progress.



A systematic, chronological measurement campaign at relevant locations around Canberra is planned. The feasibility of complementing the spectroscopic results using accelerator mass spectrometry (AMS) at the 14UD Pelletron accelerator is being explored.