

In vivo Prompt Gamma Activation Analysis Facility for Total Body Nitrogen and cadmium

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Abstract

Prompt Neutron Activation Analysis (PGNAA) is a technique that could have medical applications, like determination of body's contents of protein and heavy metals *in vivo*. The *in vivo* PGNAA facility, contains a neutron source (Cf-252) with safety device, a compartment for animal irradiation, and a gamma rays detecting system based on the NaI(Tl) detector with an analytical software. The prompt gamma rays were emitted after 10^{-15} s of the interaction, so they don't produce radioactive waste, and have a characteristics energy for each element, i.e. a strong peak at 2.24 MeV is observed for H.

The facility has been used with laboratory mice. Water-filled phantom placed in the neutron beam was used to system calibration. Three study groups of 5 mice each one were selected and were feed with a different diet and the total body nitrogen (TBN) of the mice was monitored with the facility. The diet produced a different TBN for each group. Some mice drank diluted water with Cl_2Cd , so the presence of Cd was detected in the mouse. The minimum Cd concentration that the system can detect was 20 ppm.

The total dose (neutron and gamma dose was measured from TLDs and simulated by MNCP-4B in the sample compartment during the irradiation time (5 minutes) is less than 2.5 mSv. This total dose is low than the dose from other analytical radiological techniques (25 a 50 mSv).

KEYWORDS: PGNAA, total body nitrogen, elemental analysis

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