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Instrumental Neutron Activation Analysis for the Determination of Gold Nanoparticles in Mice Tissues

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Gold nanoparticles (GNPs) have been utilized in high technology applications such as organic photovoltaics, sensory probes, therapeutic agents, drug delivery in biological and medical applications, electronic conductors and catalysis. GNPs for use as molecular imaging probes and their biodistribution in safety reason have been studied, widely and intensively. The objective of this study was to evaluate the capability of neutron activation analysis (NAA) method to determine GNPs in mice tissues and biological samples. 10 nm GNPs were instilled into a mouse and eleven tissue and biological samples such as blood, bone, brain, gonad, heart, intestine, kidney, liver, lung, spleen and stomach were prepared for NAA. The prepared sample was irradiated for 10 minutes with thermal neutrons using the Pneumatic Transfer System (PTS) at the HANARO research reactor in the Korea Atomic Energy Research Institute (KAERI). Acquisition of the gamma-ray spectrum was carried out using a high purity Ge detector coupled to DSPECPLUS. Intravenously administered GNPs were detected only in the liver and spleen samples. On the contrary, orally administered GNPs were detected in the stomach and intestine samples. High amount of Na in the samples hampered the detection of GNPs and minimum detection limit for GNPs in these samples was approximately 0.01 mg/kg.

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