

**Title:** Uptake and clearance analysis of Technetium(99m) labelled iron oxide nanoparticles in a rabbit brain

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**Abstract:** Nanoparticles as solid colloidal particles are extensively studied and used as anticancer drug delivery agents because of their physical properties. This current research aims to prepare water base suspension of uncoated iron oxide nanoparticles and their biodistribution study to different organs, especially the brain, by using a single photon emission computed tomography gamma camera. The water-based suspension of iron oxide nanoparticles was synthesised by a reformed version of the co-precipitation method and labelled with Tc99m for intravenous injection. The nanoparticles were injected without surface modification. X-ray diffraction (XRD), energy dispersive spectrometry (EDS) and transmission electron microscope (TEM) techniques were used for characterisation. Peaks of XRD and EDS indicate that the particles are magnetite and exist in aqueous suspension. The average diameter of iron oxide nanoparticles without any surface coating determined by TEM is 10 nm. These particles are capable of evading the reticuloendothelial system and can cross the blood-brain barrier in the rabbit. The labelling efficiency of iron oxide nanoparticles labelled with Tc99m is 85%, which is good for the biodistribution study. The sufficient amount of iron oxide nanoparticles concentration in the brain as compared with the surrounding soft tissues and their long blood retention time indicates that the water-based suspension of iron oxide nanoparticles may be an option for drug delivery into the brain.