Detection system of magnetic nanoparticles in biological tissues by Magnetoencephalography

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ABSTRACT

Magnetic nanoparticles are useful for a wide range of applications from data storage to medical imaging. Their unique features (controllable size in the nanoscale range, possibility to be coated with biological molecules, response to the application of a magnetic field...) make the development of a variety of medical applications possible, both for diagnosis and therapy (1-3). On the other hand Magnetoencephalography (MEG) is a non-invasive functional imaging technique that enables the description of the temporal and spatial patterns of brain activity in resting conditions or related to different basic cognitive processes, by detecting the weak magnetic fields generated by currents in the neurons (4,5). The detection of the weak magnetic fields depends on gradiometer detection coils coupled to a superconducting quantum interference device (SQUID). However, MEG systems are not currently being used for the detection of MNPs in biological tissues.

A system to newly detect Magnetic Nanoparticles (MNPs) in the brain and in biological tissues will be described. The method uses a commercial Magnetoencephalograph (MEG) and opens new possibilities to extend the use of MEG systems to new applications for both diagnosis and therapy of medical diseases, different from its common use in neurological diagnosis. To test the validity of the system, in this work, we will show its ability to detect MNPs in biological tissues and their possible use in diagnosis of cerebral brain microinjuries.

RESULTS

Liver Tissue

BRAIN TISSUE

BALLISTIC TISSUE

SAMPLES

MNP (in solution) injected in caudal vein

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REFERENCES