AD02

Application of Fluorescent Magnetic Nanoparticles in Bonghan System Study

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In vivo fluorescence imaging method of Bonghan duct (BHD) [1] by using magnetic nanoparticles was developed. First, the BHD inside lymphatic vessels of rats were visualized by injecting fluorescent magnetic particles into the lumbar node of lymphs, and by applying magnetic fields on the lymph vessels to be investigated [2]. The nanoparticles were preferentially absorbed by the BHD than the lymph vessels, and thus made the BHD visible under a fluorescent microscope. The specimen of the BHD was analyzed with a confocal laser scanning microscopes and transmission electron microscopes to show the distribution of the nanoparticles in the BHD.

The same magnetic nanoparticles were used to visualize a novel acupuncture muscle channel in the skin muscle layer of rat [3]. It showed completely different morphology from blood or lymph vessels and nerves. The magnetic nanoparticles could be useful for magnetic delivery of drugs through the acupuncture muscle channels.

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AD03

Detection of Magnetic Nanoparticles by Magnetic Self-Assembly of Superparamagnetic Microbeads for Biosensing

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Biosensing protocols based on the detection of magnetically labeled biomolecules are promising as a means of providing fast, inexpensive tool for medical diagnosis [1]. However, in spite of the successful use of magnetoresistive (GMR, Hall effect) sensors for the detection of superparamagnetic beads having diameters of several hundreds of nanometers, there are increasing demands for analysis of small numbers of magnetic labels with diameters in the 20 to 150nm range—namely, labels with dimensions similar to that of the biomolecules being analyzed. However, the detection of small quantities of sub-100nm magnetic beads, over large surface areas will prove to be extremely challenging due to the intrinsic noise and design limitations of GMR-type sensors. Here, we describe experiments on the possibility of exploiting magnetic self-assembly of superparamagnetic particles for rapid and highly sensitive detection of magnetically labeled biomolecule targets with diameters of less than 150nm. Our self-assembly based biorecognition protocol was used to detect the presence of only a few ~130nm diameter superparamagnetic 'targets' immobilized over millimeter sized areas, by optically monitoring the 'capture' of easily visible, micrometer sized superparamagnetic beads by the nanometer target-beads, via magnetically induced self-assembly. Fig. 1 shows the self-assembly (capture) of 2.8 micrometer beads by 130nm 'targets' immobilized on oxide surfaces.

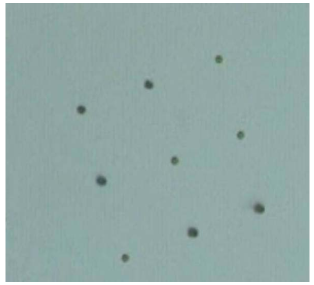

Fig. 1. Optical micrograph of 2.8 micrometer superparamagnetic beads captured by self-assembly onto the 130nm diameter target nanobeads. The arrays are 30 μm apart.

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