MAGNETIC GLYCONANOPARTICLES (MGNPs): PREPARATION, CHARACTERIZATION AND MRI APPLICATIONS.

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Magnetic nanoparticles have attracted attention because of their current and potential usefulness as contrast agents for magnetic resonance imaging (MRI) or colloidal mediators for cancer magnetic hyperthermia. Our laboratory has developed a new technology (Glyconanotechnology) for tailoring - in a simple and versatile way - biofunctionalized gold nanoclusters (glyconanoparticles, GPNs) with multivalent carbohydrate display and globular shape.[1,2] The GNPs complement other currently available multivalent systems incorporating carbohydrates and present some advantages, such as: 1) easy preparation and purification; 2) exceptionally small core size; 3) high polyvalence with control over ligands number and nanoparticle size; 4) high water solubility; 5) long term storage stability and resistance to enzyme degradation; and 6) absence of cytotoxicity. Furthermore this glyconanotechnology also allows the manipulation of the metallic core to obtain GNPs with semiconductor[3] and magnetic properties.[4]

The Glyconanotechnology used here allows the preparation of MGNPs with exceptionally small cores and singular properties with a great variety of applications in Glycobiology, Material Sciences and Molecular Biotechnology. This technology may also complement the current gene oriented Nanobiotechnology.

We present here the preparation and characterization of different carbohydrate biofunctionalized gold-iron (Au/Fe) GNPs. They have been prepared in aqueous solution in a single step. Depending on the coating sugar, size variations of MGNPs goes from 1.2 to 2 nm and at this nanosize they are superparamagnetic. This system (MGNPs) has potential applications in biomedical field, such as hyperthermia therapy or magnetic resonance imaging (MRI) and even in the design of high-density magnetic storage media. Despite of their low iron content (0.5-2%), they really act as contrast agent at high concentration. The biomedical MRI application in the diagnosis of brain cancer of these MGNPs is demonstrated by *in vivo* experiments. These preliminary results show how the MGNPs are capable of crossing the Blood Brain Barrier (BBB) and how they can be visualized by MRI (**Fig.1**).

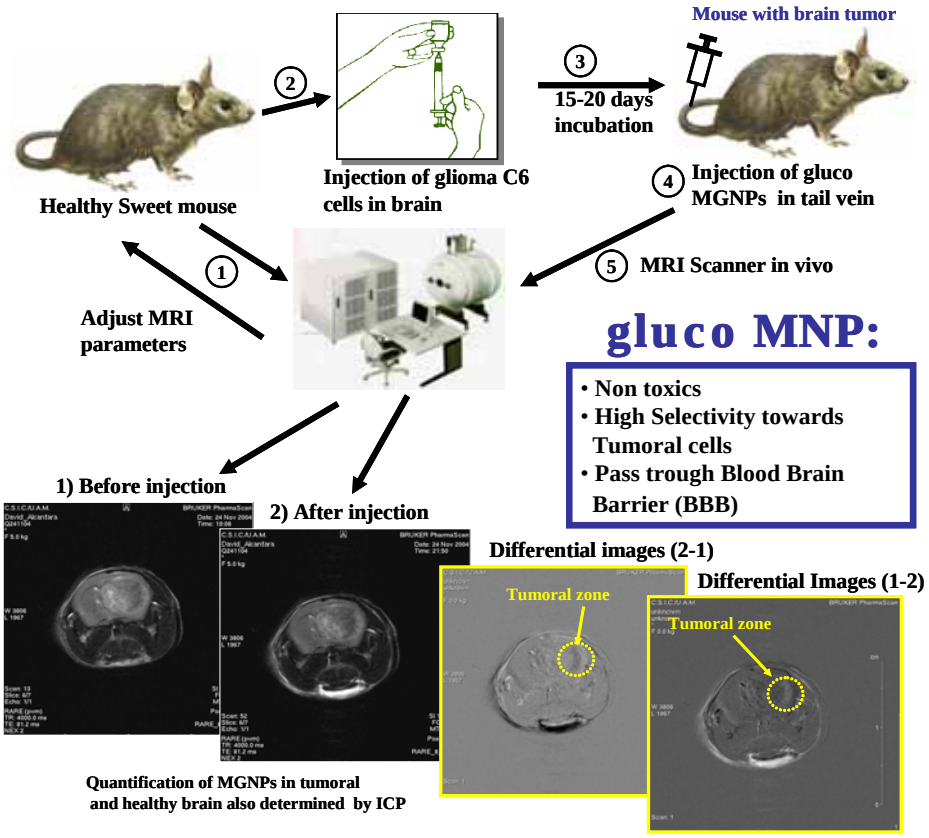

Fig.1: *In vivo experiments of MGNPs as contrast agents*

Ref.;

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4. P. Crespo *et al*., *Physical Review Letters* **2004**, 98**,** 087204-1