Controlling Ferrofluids Permeabilities to Cross an in Vitro Blood-Brain Barrier Model*

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Consisting of tight junctions that lie between endothelial cells in the CNS, the blood-brain barrier keeps most of the microorganisms and molecules from passing into the cerebrospinal fluid and hence maintains the microenvironment and protects the brain from toxins that are circulating in the blood. Unfortunately, limited by current technologies, delivering therapeutic agents or image molecules into the brain is also blocked by these highly selective tight junctions [1]. In the present study, an in vitro blood-brain barrier model was developed using an immortalized mouse brain endothelial cell line (b.End3 cells). Confirmation of the blood-brain barrier model was completed by examining the permeability of FITC-Dextran at increasing exposure times up to 96 hours in serum-free medium and comparing such values with values from the literature [2]. After such confirmation, the permeability of five novel ferrofluid (FF) nanoparticle samples, GGB (ferrofluid synthesized using glycine, glutamic acid and BSA), GGC (glycine, glutamic acid and collagen), GGP (glycine, glutamic acid and PVA), BPC (BSA, PEG and collagen) and CPB (collagen, PVA and BSA) [3], was determined using this blood-brain barrier model. All the five FF samples were characterized by zeta potential to determine their charge as well as TEM and dynamic light scattering for determining their hydrodynamic diameter. Results showed that FF coated with collagen passed more easily through the blood-brain barrier than FF coated with glycine and glutamic acid based on an increase of 4.5% in permeability. Through such experiments, magnetic nanomaterials (such as FF) suitable for MRI use which are less permeable to the blood brain barrier to avoid neural tissue toxicity and magnetic nanomaterials suitable for brain drug delivery since they were more permeable to the blood-brain barrier were identified[4].

* This study is supervised by Prof.Thomas Webster, Department of Chemical Engineering, Northeastern University

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