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The Effect of Magnetic Fields on the Capture of Magnetic Nanoparticles[1] CHELSEA FUJINAKA, Milwaukee School of Engineering, CHRIS BRAZEL, RHYTHM SHAH, The University of Alabama — It is hypothesized that magnetic nanoparticles may be used in active targeting cancer treatment by localizing the particles in the area of the tumor. To test this hypothesis static and electromagnetic fields were applied to a flow system, and UV-VIS spectroscopy was used to calculate the percentage of particles captured. Uncoated Maghemite nanopowder and FluidMAG-PAD (Chemicell) nanoparticles coated with polyacrylamide were used. Dynamic light scattering was used to look at particles size with and without proteins. Proteins caused the uncoated particles to aggregate. The static field captured approximately 15% of the maghemite nanoparticles in water in a flowing at 0.1 mL/s when using two neodymium magnets laid lengthwise along 2 mm inner diameter tubing. The electromagnetic field pulled the uncoated particles out of the dispersion, but did not capture any in one place. The FluidMAG-PAD particles could not be pulled out of solution by the static field or the electromagnetic field. In order to effectively treat cancer, nanoparticles with a coating would have to be used to avoid opsonization and aggregation within the blood stream; however they cannot be so well dispersed as to not be affected by the magnetic field. The uncoated particles exhibited the capture desired, but do not interact well with proteins. A stronger magnetic field may allow the same capture of the coated particles, but it may also be important to look for a dispersion of nanoparticles not quite as well dispersed as the FluidMAG-PAD.

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