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Effects of AC/DC magnetic fields, frequency, and nanoparticle aspect ratio on cellular transfection of gene vectors KRIS FORD, LAMAR MAIR, MIKE FISHER, MD. ROWSHON ALAM, RUDOLPH JULIANO, RICHARD SUPERFINE, University of North Carolina at Chapel Hill, NSRG/PHARMACOLOGY COLLABORATION — In order to make non-viral gene delivery a useful tool in the study and treatment of genetic disorders, it is imperative that these methodologies be further refined to yield optimal results. Transfection of magnetic nanoparticles and nanorods are used as non-viral gene vectors to transfect HeLa EGFP-654 cells that stably express a mutated enhanced green fluorescent protein (EGFP) gene. We deliver antisense oligonucleotides to these cells designed to correct the aberrant splicing caused by the mutation in the EGFP gene. We also transfect human bronchial endothelial cells and immortalized WI-38 lung cells with pEGFP-N1 vectors. To achieve this we bind the genes to magnetic nanoparticles and nanorods and introduce magnetic fields to effect transfection. We wish to examine the effects of magnetic fields on the transfection of these particles and the benefits of using alternating (AC) magnetic fields in improving transfection rates over direct (DC) magnetic fields. We specifically look at the frequency dependence of the AC field and particle aspect ratio as it pertains to influencing transfection rate. We posit that the increase in angular momentum brought about by the AC field and the high aspect ratio of the nanorod particles, is vital to generating the force needed to move the particle through the cell membrane.

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