Applied Bacterial Biomineralization: Increasing Magnetosome Formation within Magnetospirillum magneticum through Genetic Recombination of Genes Essential to Magnetosome Formation and Mutation Mediated by UV Radiation

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The magnetite crystals produced within Magnetospirillum magneticum's (AMB-1) are nearly perfect in their geometry as opposed to lab generated magnetite which has a large amount of structural impurities. The aim of this research project is to increase the quantity of magnetic organelles (magnetosomes) within Magnetospirillum magneticum (AMB-1) species. My hypothesis was if the AMB-1 is genetically recombined with genes essential to the formation of magnetosomes or is mutated through UV radiation, then magnetosome formation will increase. This hypothesis was supported for the use of the UV radiation, but was conclusive while the genetic recombination portion was unable to be fully tested with the mamB gene. The UV radiation results indicated an increase in response to the presence of a strong magnet, but the large standard error within the control's first minute of movement towards the magnet creates a necessity for further testing. The mamB gene was unable to be fully transferred to the species of E.Coli (WM3064), which would have then conjugated the plasmid into AMB-1, as the plasmid seemed to proliferate with a low copy number within the cells. The transference of the gene could be accomplished through a re-attempt at the ligation of the mamB insert into the pAK22 vector. The error within the control's response to the neodymium magnet could be mitigated through a more definite assay utilizing equipment such as an electron microscope to more directly measure the quantity of magnetosomes within the cells. This bacterial magnetite can be used to develop new treatments for cancer, new biological assays, or even transform our technologies within the bio-mechanical fields.

Awards Won:

Fourth Award of $500