Reprogramming Hair Follicle Stem Cells into Cardiomyocytes

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Damage to the heart muscle has long been considered irreparable and an indicator of future heart failure. When damaged, the heart forms a scar-like tissue that develops over regions of damaged myocardium. Ideally, when repairing cardiac tissue, scar formation should be avoided or the formed scar tissue should be replaced with functioning cardiac muscle tissue. To address this problem, functional cardiomyocytes can be injected directly into the scarred area. Although cardiomyocytes can be isolated from the patient's tissue, the process is invasive, requires major surgery and further injures the donor site. Instead, stem cells can be differentiated into cardiomyocytes and injected into the scarred area. One easily accessible source of stem cells is the hair follicle. Hair follicle stem cells (hfSCs), have been successfully reverse engineered into induced pluripotent stem cells (iPSCs). Studies indicate that iPSCs reprogrammed from bone marrow stem cells can differentiate into cardiomyocytes. Thus, the purpose of this study is to determine if iPSCs derived from hfSCs can be successfully differentiated into cardiomyocytes. In order to conduct this study, hFSCs were isolated and cultured from the hair follicle and directed towards iPSCs by forcing the hFSCs to express factors through the use of a plasmid vector. The iPSCs were then cultured and further differentiated into cardiomyocytes. hFSCs, iPSCs, and cardiomyocytes were characterized using cellular morphology and RT-PCR.

Awards Won:
Fourth Award of $500