Enhancing Human Embryonic Kidney Cell Regeneration Through Transducing Exogenous Ambystoma Mexicanum Pax-7 DNA

Brownrigg, Matthew (School: Central Bucks High School East)

The Ambystoma Mexicanum, axolotl, posits regenerative capabilities which are highly coveted in Animalia: recent studies have sequenced the axolotl's genome and have elucidated a vital protein to its regeneration, the Pax7 gene. Although humans also express the Pax7 gene, denoted as hPax7, the axolotl's unique sequence, rPax7, introduces its aptitude for muscle regeneration. The introduction of the rPax7 gene into the human genome may provide a gene therapy for muscular dystrophy, overhauling muscle tissue regeneration as well as advancing bioengineering. Last research year, the experiment introduced a synthesized rPax7 gene into non-Pax7 expressing Human Embryonic Kidney Cells, HEK-293, as well as a synthesized human Pax7 gene, HEK-hPax7, for control measures. This research year is testing the capabilities HEK-293 expressing rPax7, HEK-rPax7, and HEK-hPax7 through various procedures. Western blots have confirmed the Pax7 protein expression within transduced HEK-rPax7 and HEK-hPax7 cells. Cell viability assays have confirmed a 42.1% increase in HEK-rPax7, and a 28.5% increase in HEK-hPax7 cell proliferation compared to non-expressing HEK-293. Clonogenicity assays have found slight differences in colony structures, however there is no discernable change in advantaging growth. Apoptosis inhibition assays have revealed that HEK-rPax7 can inhibit cell death and regenerate 43.3% more than HEK-hPax7. Immunofluorescence DAPI staining has shown localization of protein functions within the nucleus of HEK-hPax7 and HEK-hPax7. These results reveal rPax7 to have strong proliferative and regenerative factors when introduced into the cellular level. The rPax7 pseudo virus has been prepared for the next phase of research: live systems testing with mice.