Defining the Role of VEGF-B Signaling in Cardioprotection and Regeneration

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This project aimed to focus on identifying VEGF-B's specific roles in cell survival and apoptosis, as well as its role in-vivo in cardiomyocyte regeneration within the zebrafish heart. The functions of VEGF-B are activated through binding with receptors such as NRP-1, and this project also aimed to explain what functions of VEGF-B are controlled by NRP-1. Treatment with cobalt chloride on H9C2 cardiomyocytes was performed to simulate ischemic injury on cardiomyocytes, and recombinant VEGF-B treatment was administered. Western blot analysis was conducted to assess biomarkers of cell survival and apoptosis, and MTS assay was done to analyze cell viability within different treatment groups. Microscopy was performed to analyze the proliferative biomarker Ki67 in zebrafish, and the apoptosis biomarker Annexin V in cardiomyocytes. It was found that VEGF-B treatment promotes cardiomyocyte survival in ischemic cardiomyocytes, as supported by increased cell survival in MTS assay and upregulation of proliferative proteins such as YAP-1 & T-Akt detected by western blot, whereas cobalt chloride leads to increased toxicity. VEGF-B treatment suppresses apoptosis in ischemic cardiomyocytes, as seen in expression levels of apoptotic cells in Annexin V staining, as well as downregulation of apoptotic proteins such as BAX detected by western blot. In zebrafish, myocardial infarction stimulated regeneration of cardiomyocytes in heart tissue, given the high concentration of KI67-stained cells in images from heart tissue staining in the MI groups NRP-1 was suggested to a role in VEGF-B's effects on cell proliferation, and on cobalt-chloride mediated apoptosis in cardiomyocytes, but further investigation must be performed to validate these results.

Awards Won: