2007
STE Dean's Award of Excellence in Undergraduate Research

The Oxygen Regulatory Protein Hypoxia-Inducible Factor-1a and Germ Cell Apoptosis in Response to Testicular Ischemia and Torsion Injury

Jonathan K. R. McNamara

Monmouth University
Biology Department

Faculty Mentor: Dr. Michael A. Palladino

Hypoxia-inducible factor-1 (HIF-1) is the major transcription factor involved in adaptive responses to hypoxia in many tissues. Testicular torsion is a hypoxic condition that produces tissue ischemia in the testis that can lead to germ cell death via apoptosis resulting in impaired fertility or infertility. Our working hypothesis is that HIF-1a plays essential roles in regulating cell death and cell survival signaling pathways in the testis following testicular torsion injury. We hypothesize that HIF-1α may serve proapoptotic and/or antiapoptotic roles in response to hypoxia following torsion of the rat testis. The purpose of this study was to investigate which cell types express HIF-1α in the testis, and to determine if HIF-1α co-localizes in apoptotic cells in the ischemic testis. Surgically induced testicular ischemia was achieved by 720^{o} torsion ranging from 1-6h followed by variable times of reperfusion. Immunohistochemistry demonstrated that HIF-1α is localized to Leydig cells under both normoxic and hypoxic conditions. *In situ* apoptosis using a TUNEL assay showed that apoptosis occurred exclusively in germ cells. In conclusion, these results support the hypothesis that HIF-1α is not involved in germ cell apoptosis but may serve important antiapoptotic roles to protect Leydig cells from the effects of hypoxia following testicular torsion.

Effect of MAP Kinase Phosphatase Regulation on Contact Inhibition

Michael Slisz and Emy Rothenberger

Monmouth University
Biology Department

Faculty Mentor: Dr. Dorothy Hutter

Previous results have indicated that, upon contact inhibition in normal fibroblasts, there are increased levels of MAP kinase phosphatase-1 (MKP-1), MKP-2, and MKP-3 proteins, and a decrease in phosphorylated extracellular signal-regulated kinase (ERK) and p38. Fibrosarcoma cells, which are cancerous cells, no not show contact inhibition, and do not have variations of the levels of active MAP kinases or MKPs. These results suggest that there is a relationship between cell growth, and MAP kinase/MKP activity. It is not known, however, if the variationsin the levels of MAP kinase and MKPs are a cause or effect of contact inhibition. It is hypothesized that the over-expression of MKPs in normal and cancerous cells will cause a decrease in cell growth. Similarly, it is expected that over expression of phosphatase-resistant MAP kinases will allow normal fibroblasts to overcome contact inhibition. Altering the levels of MKPs or MAP kinases should show direct effects on growth and signaling in cells. Cells were transfected with a vector to over express MKP-a and western blot analysis was used to confirm the expression of the exogenous protein. MTT assays were used to measure the effect of the transfected contstructs on the growth of cultures, and the over-expression of MKP-1 was found to decrease proliferation.