Hypoxia Inducible Factor-1 in the Sea Cucumber Holothuria glaberrima

Ortiz-Quintana, Carlos (School: Escuela Secundaria Especializada en Ciencias, Matematicas y Tecnologia)

One of the most striking cases of regeneration occurs in the sea cucumber Holothuria glaberrima. This species is able to regenerate most of its internal organs after a process of evisceration, including its digestive and hemal systems (García-Arrarás, 1998). Such ability provides a perfect model to study the mechanisms behind regeneration. Recent studies suggest that the transcription factor hypoxia inducible factor-1 (HIF-1), is an important protein involved in regeneration. In fact, it has been linked to tumorigenesis, stem cell biology, immunity, inflammation, cell differentiation, anaerobic glycolysis, angiogenesis, erythropoiesis and fibroblast proliferation (Haber-Katz, 2017). Thus, the objective of the research is to see if HIF-1 can be found in H. glaberrima and whether it might have a role in intestinal regeneration. Three methods were used: Bioinformatics analysis, RT-PCR, and Immunocytochemistry. We have now identified an HIF-1 mRNA sequence in our H. glaberrima databank. The sequence codes for an 850 amino acid putative protein that shows 43% identity and 62% similarity to human HIF in the first 500 amino acids. The RT-PCR demonstrates concrete evidence for the existence of HIF-1 in the genome of the sea cucumber. On the other hand, immunocytochemical studies using an anti-HIF antibody shows HIF-1 labeling in the various intestinal tissues, and specifically in cells of the submucosa and muscle layers. It was determined that there is a major cell percent of small size cells than large cells. Further studies identified the presence of HIF-1 in the regenerating intestine which in fact coincides with Meso1 labeling (García-Arrarás, 2011).

Awards Won: