

EXECUTIVE SUMMARY

The genome of an animal contains all the instructions required for its self-construction. The genetic program for this feat is encoded to a great extent in the instructions that make each gene to be expressed only in a particular location. For example, endoderm genes carry associated information that makes them function only in the gut, and nowhere else. This requires special genes, regulatory genes, which control gene expression. The nature of the process is complex because regulatory genes are controlled by other regulatory genes in a network of multiple regulatory interactions. The embryo of my choice greatly facilitates the study of these fuzzy networks because it is quite simple when compared to those of directly developing terrestrial organisms. In this project I will apply and develop the biotechnological tools needed to resolve the specific gene regulatory architecture controlling the relatively simple embryogenesis of a marine segmented annelid worm. Currently, the final tool needed to reveal the draft map of these gene regulatory circuits is specific gene disruption. This will be obtained by applying specific gene disruption methods already established in other organisms. These gene disruptions will easily generate the equivalent of a genetic mutant, and their outcome will be monitored by their effects in other genes, i.e., those regulated by the disrupted gene. First, the technology will be tested and optimized with two regulatory genes, and then it will expand to as many other regulatory genes as possible. The long term repercussions of this study are broad for biotechnology because gene regulation affects almost any biological process, including those with economical value.