Title:	Understanding the role of chromobox containing family of polycomb group in zebrafish retina regeneration & Exploring the role of associated skin microbiome in vertebrate tissue regeneration
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Abstract:	Certain injuries or amputations in humans leads to irreparable loss of body organs which cannot be cured with the help of the current scientific knowledge of mankind. Unlike mammals, certain lower vertebrates such as zebrafishes and salamander species are able to regrow amputated appendages, as well as an injured brain, retina, spinal cord, heart, and other tissues. This regeneration capacity is attributed to the ability of certain tissue-specific stem cells present in these vertebrates to dedifferentiate in response to amputation or injury and undergo proliferation leading to tissue repair. If humans could somehow mimic the tissue repair and regeneration process exhibited by lower vertebrates such as zebrafishes and Mexican axolotls, it would become the ultimate cure for innumerable disorders and loss of functions. This study is essentially divided into two parts. The first project aims at understanding the role of chromobox-containing family of Polycomb group proteins (PcG) in proliferation and differentiation of Müller glial cells during zebrafish retina regeneration. Unlike mammals, Müller glial cells in zebrafish respond to retinal injury by undergoing genetic reprogramming, transforming themselves into Müller glial derived progenitor cells. These Müller glial progenitor cells then undergo inter- kinetic nuclear migration and asymmetric cell division and differentiate into different retinal cells to replace the ablated neurons, and restore the retinal architecture. Epigenetic factors play an indispensable role towards regulating these proliferating and differentiating events in the reprogramming cells. PcG are epigenetic repressors and are involved in many biological processes. In this study we found that inhibition of Cbx proteins causes retarded development and ocular coloboma like phenotype in zebrafish embryos and a decrease in the proliferating cells in a regenerating retina. The Cbx proteins were also found to be involved in the regulation of underlying molecular pathways of retina regeneration. The second project aims at studying the role of associated microbiome in tissue regeneration in vertebrate systems such as Axolotl (Ambystoma mexicanum) and zebrafish. The microbiome is the genetic material of all the microbes - bacteria, fungi, protozoa and viruses - that live on and inside the body. A number of studies are being conducted around the world to understand the role of microbiome in essential life processes. Through this project, I aim to comprehend how the associated microbiome affects the underlying molecular pathways of tissue regeneration in vertebrate systems. In this study, we found that reduced skin microbiome led to a slower rate of blastemal formation and reduced proliferating cells in zebrafish caudal fin and in axolotl tail as compared to their respective controls. Additionally, the relative abundance of different bacterial species is changing in experimental samples as compared to controls and also during the course of regeneration. Hence, this study tries to unravel some key factors contributing towards tissue regeneration in lower vertebrate systems.
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