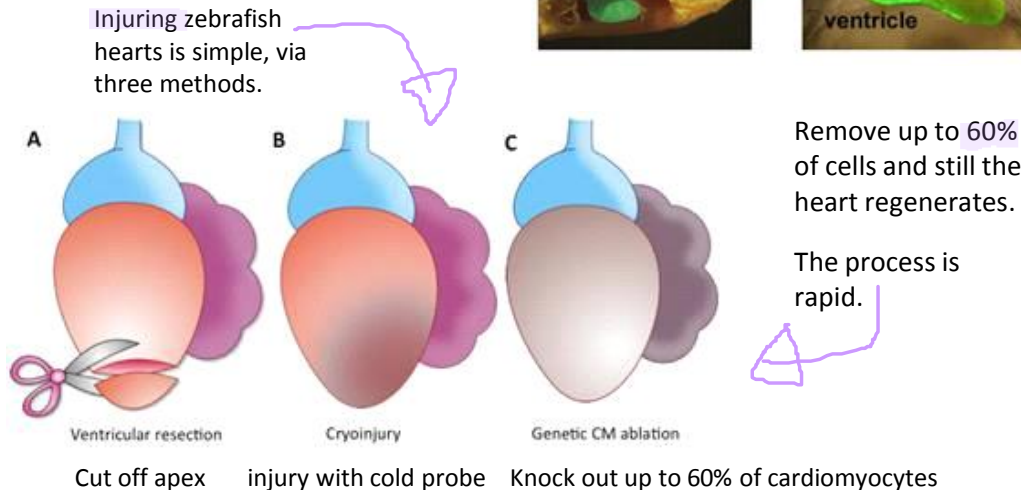
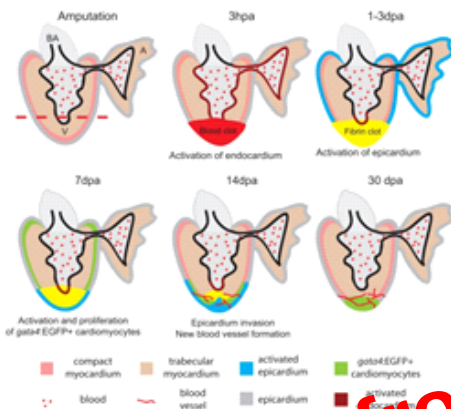
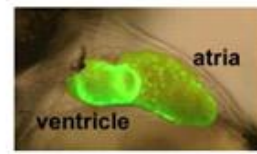
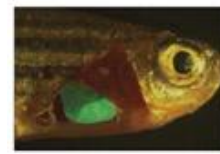


Zebrafish Heart Regeneration



Zebrafish have a simple 2 chamber heart. However the tissues are the same as the human. There is no pulmonary circulation. Positioned close to the head.



The zebrafish heart is structural similar to ours, with the same three layers of epicardium, myocardium and endocardium. The process of regeneration involves these three layers as well:

- A blood clot forms at the apex where the damage is (all three tissues have been damaged), activating the endocardium.
- A fibrin clot is important for regeneration and activates the epicardium.
- The activation and proliferation of GATA4+ cardiomyocytes is promoted by endocardial production of retinoic acid.
- The epicardium invades and promotes angiogenesis through production of growth factors.
- Within roughly 30 days, you can no longer see the damage.
- Progenitor cells are the major source for regenerating myocardium.

Look at the difference between these cells in zebrafish and humans!

Compared to zebrafish, human cardiomyocytes do not proliferate well. Although mammalian epicardium produces growth factors and the endocardium produces retinoic acid which encourages cardiomyocyte proliferation, mammals don't have GATA4+ cardiomyocytes. Maybe there is a way to switch this on in humans? Mouse cardiomyocytes found to express this during embryonic development.

Zebrafish cardiomyocytes are MONONUCLEATE . Mammalian embryonic/early postnatal hearts are mononucleate too; however mammal adult hearts only have same pools of these cells.

Studies show that, cardiomyocyte dedifferentiation, which is typically characterized by a reduction of sarcomere structures and expression of developmental marker genes, appears to be the dominant mechanism for heart regeneration in zebrafish.

This dedifferentiation phenotype is reminiscent of those seen in embryonic mammalian cardiomyocytes! Revert our cells back?? Find signalling pathways.

The neonatal mouse heart has been shown to possess robust regenerative capacity during a short window of time after birth. This capacity diminishes within a week, which seems to coincide with binucleation and loss of proliferative capacity of cardiomyocytes.

Acute myocardial infarction causes necrotic muscle and cardiac scar which is non-contractile. Cardiac SC and progenitor cells are very rare and transplants have had varying degrees of success. Other therapies are needed for treatment, and by looking at the mechanisms in species that naturally regenerate this could provide valuable insights for better treatments.

Retina Regeneration in Zebrafish

Loss of retinal cells is one of the key problems with aging

