Axolotl Limb Regeneration

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***Abstract*—Researchers have been studying how certain vertebrates can regenerate limbs for many decades. An important subject being studied is the Aloxotl Salamander.**

I. Introduction

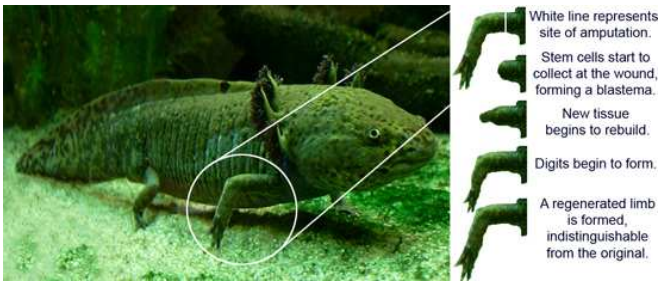
Scientists have been amazed at the regenerative properties of the Aloxotl Salamander which is capable of regenerating limbs, tails, eyes and even parts of the spinal cord and brain. By understanding the process that these salamanders regenerate these body parts, researchers may be able to replicate the phenomenon in humans to help aid amputee patients. The reason for using the axolotl salamander as the main subject for this research is due to the fact that, out of the many animals with regenerative properties, the axolotl is the closest to humans. If this were to occur, this method could completely replace the area of prosthetics.

II. Methods

Presently scientists have been testing the regenerative properties of these salamanders in two primary methods. The first method is simply amputating a limb of the salamander and observing the natural regeneration. Another method being used is to create a wound in an area of the body, cut a nerve close to that area, and take a contralateral skin graft from a limb to cover the wound. This method has had the outcome of producing an extra limb.

III. Results

The results of these experiments have shown that this regeneration occurs by dermal fibroblasts migrating to the wounded area forming an apical epidermal cap which prevents scarring in the area. A blasthema then appears in this area which is a mass of cells which are capable of growth and regeneration. At first it was thought that the cells of the blasthema in Axolotl were undifferentiated pluripotent cells but it is now thought that these blasthema may have cells that remember the structure of the appendage that was lost. Once this blasthema forms, pattern formation genes that were present at embryonic development are activated and start to form the limb as it was formed in the embryo. The foot of the appendage is formed first followed by the rest of the limb and the muscles, nerves and vessels develop with it.



IV. Discussion

Eventually scientists should be able to determine exactly how the regeneration process works in these animals. Once this happens, the next step is to determine how to mimic the environments of this regeneration. At the moment, the hardest part in achieving this is figuring out how to overcome the natural scarring that occurs in humans. If this technology were to eventually become available, it could help many individuals with missing limbs and could replace the field of limb prosthetics.

Some ethical problems arise from this study as well. One problem is the fact of producing these animals solely for experimental use and forcing them to endure the experiments. Another problem could arise as well once this technology is available to humans and that is the problem of giving humans the ability of another animal which some people could see as going against the will of nature and evolution.

References

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