Signaling Network Interactions Controlling Mouse and Salamander Limb Regeneration

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MURI news report: http://tulane.edu/research/discovery/story-limb-regeneration.cfm

Objective

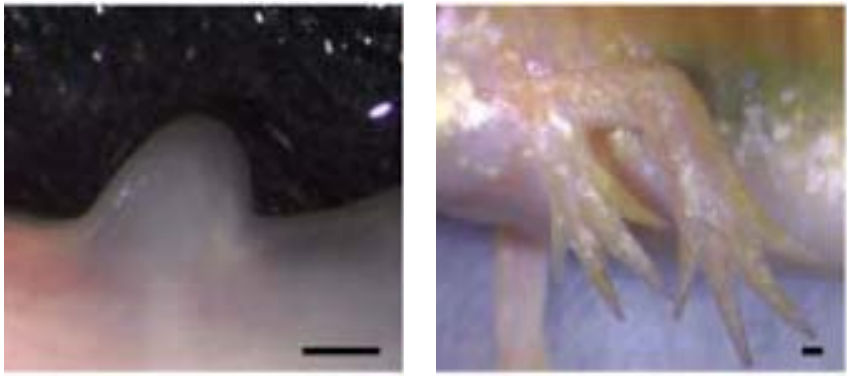
- Identify and characterize signaling pathways within mouse and salamander systems that control limb regeneration
- Based on these results, develop therapeutics to initiate regeneration in mice, and eventually humans

Approach

- Using microarray (entire genome) analysis, identify gene networks responsible for salamander limb regeneration
- Apply this data to identify homologous genes and signaling pathways for inducing limb regeneration in mice

Technical Success

- Developed working models of regeneration at the cellular level
- Initiated regeneration blastema (*i.e.*, mass of cells that do not yet have defined function and can differentiate later into various tissues) in mice



Limb regeneration in mice: investigators used data from studies of salamander regeneration to induce limb regeneration in mice, beginning with a blastema (left) and ultimately a new limb (right)

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Application

- Humans possess the genes required for regeneration, and do in fact regenerate successfully in utero, however these pathways are turned off in adults, and it is not currently known what these pathways are and how to turn them on when needed
- Identifying, understanding, and being able to manipulate these genetic networks would enable the repair and regeneration of lost or damaged limbs or organs in injured soldiers
- Healing of injured soldiers could be shifted from healing with scars to healing without scars

Potential Payoff

- More rapid healing
- Healing of injuries that are currently untreatable (loss of limbs, eyes, ears, vital organs
- Reduced scar tissue formation
- Warfighters becoming fully functional again after significant injuries
- Better than prosthetics