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# Ovary regeneration in salamanders could provide solutions to human infertility

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Axolotl salamanders are extremely resilient, but very little research has been done on their incredible ability to regenerate internal organs and eggs—also called oocytes. In a study published in the journal *Stem Cells*, Northeastern University biology professor James Monaghan and his team have discovered that these salamanders not only have the capability of re-growing limbs, they can also regenerate their ovaries and produce eggs throughout their lifespan. "When we remove a large portion of the ovary, it activates many endogenous stem cells to repair the organ," said Monaghan, whose graduate student Piril Erler, and research technician Alexandra Sweeney, performed the study. "These salamanders can repair after injury, continue to make large amounts of eggs, and continue to have a hyper-prolific female reproductive system. It's pretty incredible."

Examining the axolotl salamander's ability to regenerate ovaries after a traumatic injury and continue to produce nearly 2,000 eggs a year could lead to the development of regenerative medicines aimed at treating infertility in humans. "We found most of the genes that are expressed in human development and in human ovarian stem cells are also expressed in these salamander ovarian stem cells," said Monaghan.

Monaghan's lab now plans on targeting the signals that stimulate regeneration in the salamander, translating those signals into different models, such as mice, and then eventually looking at the human implications of this research. "If we understand the signals that are inducing the injury response, then that can be recapitulated," said Monaghan. "We start in mice and then move up. Identifying the signals

is the key element."

The axolotl salamander is unique because they can regenerate new follicles and supporting cells. In a previous study, Monaghan's lab identified a factor secreted by nerves in the salamander that is essential for the regrowth of limbs—a discovery that debunked a century-old belief that nerves don't play a factor in regeneration. But while many scientists appreciate the axolotl's incredible ability to rebuild itself, not much research has explored organ regeneration in these amphibians.

Monaghan and his lab began comparing the regenerative ability of each organ one at a time, starting with the ovary, then moving to the lungs and heart, all of which have shown to have a significant regenerative response. "If we can identify a blueprint for regeneration that is shared across multiple regenerating organs, and even the across regenerating animals, I feel these lessons can be utilized for human good. It's really an exciting time in regenerative biology."

**More information:** Piril Erler et al, Regulation of Injury-Induced Ovarian Regeneration by Activation of Oogonial Stem Cells, *STEM CELLS* (2016). DOI: 10.1002/stem.2504

Provided by Northeastern University