Role of the mitochondrial unfolded protein response (UPRmt) in spinal cord injury in Xenopus laevis

Poster

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Spinal cord injurie (SCI) is a permanent affliction resulting in partial or complete paralysis. Some organisms, such as Xenopus laevis, exhibit regenerative capabilities during larval stages, losing this ability after metamorphosis. This makes X. laevis an ideal model to study the cellular and molecular mechanisms underlying successful regeneration and to test their potential efficacy under non-regenerative conditions.

Mitochondria play an active role in regulating Neural Stem Progenitor Cell proliferation and differentiation. Moreover, SCI induces excitotoxicity and generation of reactive oxygen species (ROS), affecting mitochondrial function. We have observed that, in regenerative stages of Xenopus laevis, mitochondria exhibit an adaptive response that restores homeostasis. In contrast, non-regenerative stages show a delayed response and an inability to recover homeostasis, ultimately leading to mitochondrial dysfunction. However, it remains unclear how mitochondrial homeostasis is achieved or whether is required for successful regeneration.

Mitochondrial unfolded protein response (UPRmt) emerges as a relevant mechanism for maintaining mitochondrial homeostasis. In response to cellular stress,

excitotoxicity, and increased ROS, this pathway activates compensatory responses that help restore balance. This raises the question: does UPRmt pathway play a role in spinal cord regeneration in the Xenopus laevis model?

To address this question, we are using western blot, immunofluorescence, fluorescent probes, and pharmacological activators to evaluate levels, localization, and activation of proteins associated with UPRmt. Our results suggest that, in non-regenerative stages of Xenopus laevis, there is a response associated with the sensors and activators of UPRmt, but not with its effector proteins, suggesting an incomplete activation of this pathway.

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