

Young Newts Regenerate Their Limbs Differently Than Adults

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photo credit: University of Tsukuba

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Unlike mammals, a group of salamanders called newts can regenerate their limbs – repeatedly and at any age. According to a new [Nature Communications](#) study, adult newts have managed to secure their remarkable regenerative abilities, but they use a different mechanism than young larval newts before metamorphosis. The researchers hope these findings will provide clues for tissue regeneration and wound repair in other species, including ours.

When a leg or tail is amputated, the newt generates a cell mass called the blastema at the stump, and from this a new, fully functional limb will eventually be regenerated – regardless of age. Not all amphibians can do this: While many tadpoles and larval salamanders can regenerate limbs, they typically lose that ability after they metamorphose into frogs and adult salamanders.

It's unclear exactly how newts manage to do this throughout their lives. Previous studies suggest that either skeletal muscle fiber cells (SMFCs) or muscle stem/progenitor cells (MPCs) contribute to new muscle in regenerated newt limbs. SMFCs make up [skeletal muscles](#) – one of three major types

of muscle in the body, together with smooth and cardiac muscles. MPCs (such as satellite cells) are predecessors that can differentiate into SMFCs.

To track these cells during limb regeneration in larval and adult newts, an international team led by University of Dayton's [Panagiotis Tsonis](#) and [Chikafumi Chiba](#) from the University of Tsukuba amputated the limbs of Japanese fire-bellied newts (*Cynops pyrrhogaster*) aged 3 months, 16 months, and 3 years or more. These newts are transgenic: They have a gene for SMFCs that fluoresces and can be turned on and off.

The team found that these newts switch the cellular mechanism for limb regeneration as they metamorphose from larvae to adults: from a stem/progenitor-based mechanism to one that's based on "[dedifferentiation](#)." That means for adult newts to regenerate their amputated limbs, SMFCs that have been recruited to the stump regress (or dedifferentiate) to a more primitive state. In contrast, larval newts don't need muscle fiber cells for regeneration; instead, they use satellite cells for new muscle.