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Whalen Abstract

Regeneration is the action of regrowth of a damaged or missing organ part from the remaining tissue. Humans and other animals cannot regenerate as well. Some parts of our bodies can repair themselves very well after injury; for example, liver and skin can regenerate when they are damaged, but other parts do not repair themselves at all. While we definitely cannot regrow a whole leg or arm, some animals can regrow or regenerate whole body parts. Vertebrates like fish and salamanders are examples of species that regenerate limbs or missing parts of their organs. If we can understand why some can regenerate and others cannot, then we can help further regenerative medicine to find ways to start tissue regeneration in the body or engineer replacement tissues.

We use zebrafish model for studying regeneration, focusing on the regeneration of the larval fin fold. When the fin fold is amputated, the expression of the neuropeptide leptin increases at the site of amputation. While the role of leptin in appendage regeneration is unknown, leptin is known to play an important role in bone remodeling. Leptin acts upstream of Cart, which is another neuropeptide expressed in the brain and peripheral tissues. From previous studies, we know that mice deficient in Cart have low bone mass because of an increase cells called osteoclasts, which resorb bone. However, increase Cart expression induces high bone mass in mice, because of a decrease in osteoclasts. We want to study the function of leptin in fin fold regeneration. To do so, we will generate fish in which the expression of leptin can be experimentally induced. We hypothesize that increased leptin expression will enhance regeneration rate, increase expression of cart, and increase expression of genes involved in bone remodeling. Furthermore, these effects will be blocked in fish that carry a genetic loss of function in cart. These studies should improve our knowledge of regeneration and bone remodeling.

Sources

Ducy, Patricia, Michael Amling, Shu Takeda, Matthias Priemel, Arndt F Schilling, Frank T Beil, Jianhe Shen, Charles Vinson, Johannes M Rueger, and Gerard Karsenty. “Leptin Inhibits Bone Formation through a Hypothalamic Relay: A Central Control of Bone Mass.” Cell 100, no. 2 (January 21, 2000): 197–207.
Singh, Manvendra K., Florent Elefteriou, and Gerard Karsenty. “Cocaine and Amphetamine-Regulated Transcript May Regulate Bone Remodeling as a Circulating Molecule.” *Endocrinology* 149, no. 8 (August 1, 2008): 3933–41.