The life cycle of a jellyfish, and a way to control it

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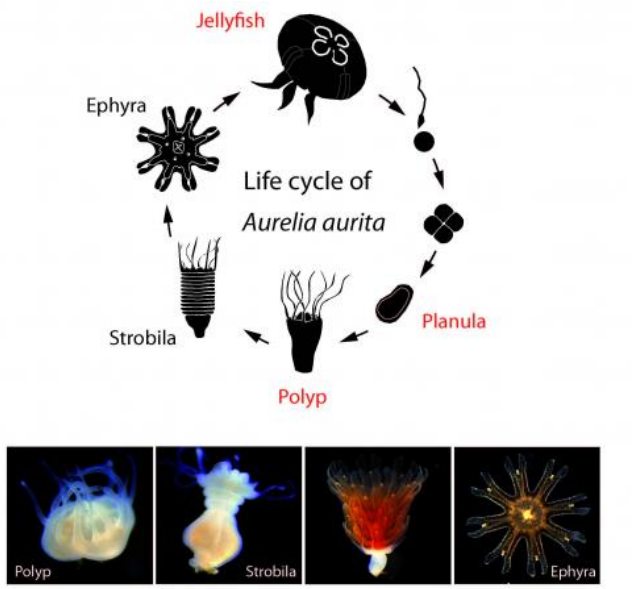

This image shows the life cycle of *Aurelia aurita*. Credit: *Current Biology*, Fuchs et al.

Those free-swimming jellyfish in the sea don't start out in that familiar medusa form, but rather start as sessile and asexual polyps. Now, researchers reporting in the Cell Press journal *Current Biology* on January 16 have discovered what triggers that transformation in the moon jellyfish (*Aurelia aurita*). The key is a novel metamorphosis hormone that accumulates during the cold winter to induce a synchronized emergence of jellyfish in the spring.

This biological understanding might offer new methods for controlling moon jellyfish blooms, which can sometimes mean trouble for fisheries and other human endeavors, the researchers say. For example, a giant swarm of moon jellies shut down a nuclear reactor in Sweden last October.

"Now we know in detail why and how *Aurelia* polyps turn into jellyfishes," says Konstantin Khalturin of the Okinawa Institute of Science and Technology. "We are also able to control polyp-to-jellyfish transition with an extremely powerful chemical inducer."

In the lab, the researchers can reliably force the polyp-to-jellyfish transition in just 48 hours; natural induction with cold temperatures alone used to take weeks.

The interest in jellyfish for Khalturin and his colleagues comes from a fascinating biological question: How do many animals develop several completely different body plans based on one genome? To find out, the authors conducted a series of experiments to uncover the molecular underpinnings of the process in *Aurelia*.

Their studies show that the *Aurelia* transition is a two-part process. The first part involves a signal common to other animals. The second depends on a novel protein, which acts as a temperature-sensitive "timer." That protein is also the precursor of the moon jellies' metamorphosis hormone.

Interestingly, Khalturin says, the hormone appears to differ in important ways amongst genetically distant strains of *Aurelia*. As a result, hormone-laden tissue taken from jellyfish in the Pacific Ocean would not turn polyps from the Baltic Sea into jellyfishes.

The researchers say the findings could in theory be used to control a population of *Aurelia* polyps in a medium-sized bay. "It is just necessary to induce their metamorphosis at the wrong period of time: the beginning of winter instead of spring," Khalturin says. Young jellyfish with nothing to eat will die, and there would be no jellyfish bloom the following summer.

Khalturin notes that similar strategies have been used for decades to fight malaria mosquitoes and caterpillar pests. However, he cautions, it will be absolutely necessary to ensure that the chemical

analog of jellyfish hormone is safe to use.

More information: *Current Biology*, Fuchs et al.: "Regulation of polyp to jellyfish transition in Aurelia aurita." dx.doi.org/10.1016/j.cub.2013.12.003

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