Genetic study of immortal jellyfish may help explain its longevity

August 30 2022, by Bob Yirka

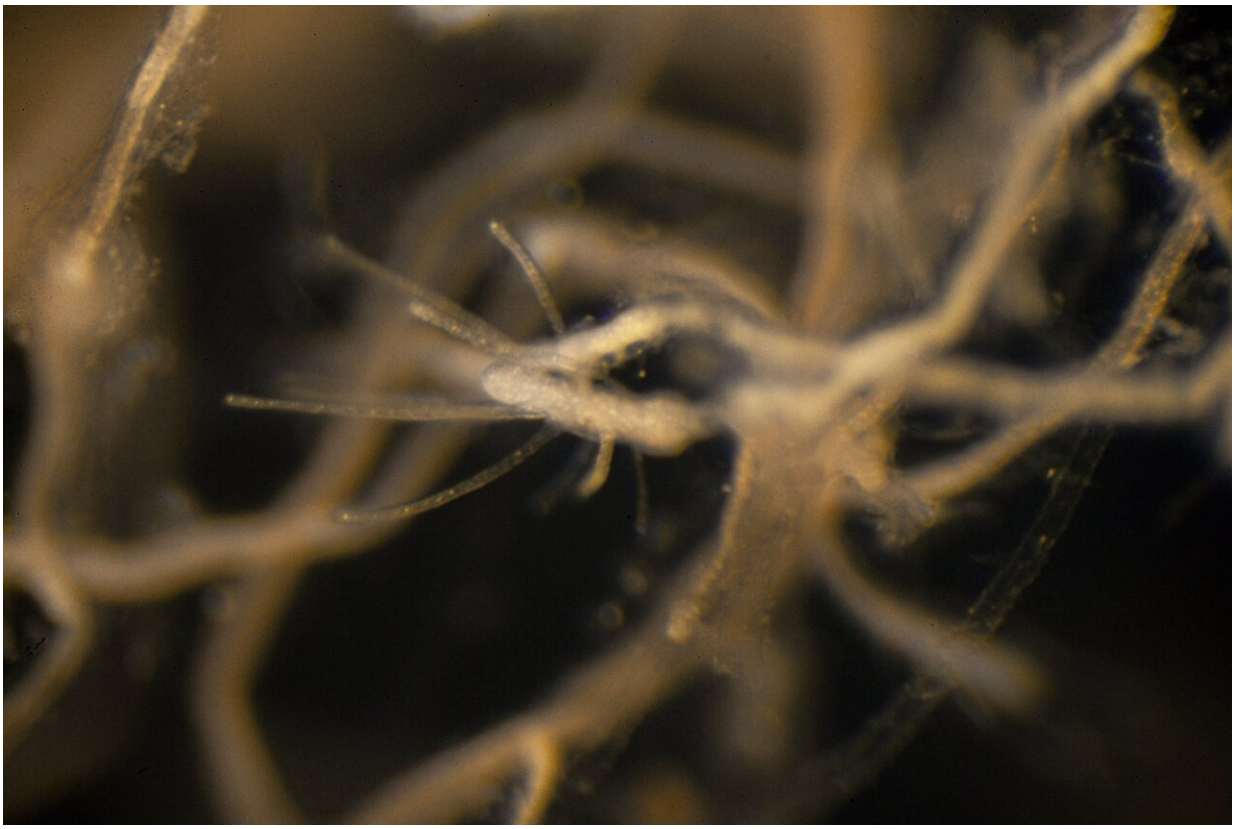
Juvenile medusae of Turritopsis dohrnii collected from polyps of Santa Caterina, Nardò, Italy. Credit: Maria Pascual-Torner

A team of researchers at Universidad de Oviedo in Spain reports

findings that could explain how the jellyfish Turritopsis dohrnii is able to live, at least in theory, forever. In their paper published in *Proceedings of the National Academy of Sciences*, the group describes sequencing the genome of the jellyfish and a close mortal relative to see if they could spot pertinent differences.

Prior research has shown that T. dohrnii begin their life as a larva drifting around in the sea. At some point, they attach themselves to the seabed and shortly thereafter begin to sprout as polyps. Next, they repeatedly clone themselves as a means of forming a colony. Once mature, the colony then begins producing mature medusas. Most other jellyfish reproduce in the same way, but their story ends there—if the colony runs into trouble, it can die. But when T. dohrnii runs into trouble, things are different. One of the medusas can morph into a cyst, similar to its original polyp, and stick itself to the bottom of the sea in a new location and restart the whole cycle. Because it reproduces via cloning, the creature never actually dies—some version of itself continues to live on, possibly indefinitely.

In this new effort, the researchers wanted to know how the jellyfish is able to recycle itself. To find out, they captured samples and conducted whole genome sequencing. Once they had the whole genome, they did the same for a very close relative of T. dohrnii, Turritopsis rubra, which is not immortal. Then they looked for the differences in the genomes that allowed one to live forever while the other perished when trouble arose.



Polyp of Turritopsis dohrnii from a colony generated by a single rejuvenated medusa. Credit: Maria Pascual-Torner

The researchers found that T. dohrnii had double the number of genes associated with gene repair and protection as T. rubra. And it also had mutations that allowed for stunting cell division and for preventing telomeres from breaking down. The researchers also noted that during the time when the jelly was metamorphosizing, some genes related to development changed back to the state when the jelly was still just a polyp.

More information: Maria Pascual-Torner et al, Comparative genomics of mortal and immortal cnidarians unveils novel keys behind rejuvenation, *Proceedings of the National Academy of Sciences* (2022).

DOI: 10.1073/pnas.2118763119