Immortal life really exists?

Marine scientists are reporting that they found an immortal life
in the ocean that is *Turritopsis nutricula*. It is a type of hydrozoa medusa
(jellyfish). In general, organisms pass through several life stages leading to sexually mature adults, and then going to involution form
at end. Thus the typical hydrozoan life cycle is that start at polyps (the hydroid) and then asexually form to medusa, and short sexual life medusa produce gamete followed by cell disintegration and death.

However, *Turritopsis nutricula* from afresh emancipated
to fully mature individuals, followed by convert back into colonial hydroids polyps (polyps to medusa to polyps). They are
thus
escaping death
and achieve a potential immortality.

‘This is the first metazoan known to revert to a clonial, juvenile morph after having achieved sexual maturity in a solitary stage.’’ Said by Dr Stefano Piraino.

They found medusa is distinguished from the polyp, which is not only different with shape and size, but also distinguished in the genomic level of the cell, which means medusa and polyp are completely different sets of somatic cells (any cell of a living organism other than the reproductive cells.).

The process that medusa transform back into polyp is called transdifferentiations that mentioned by Dr. Stefano Piraino. Transdifferentiation is defined as a directly change mature and well-differentiated somatic cells to other non-differentiated somatic cells.

They did some experiments to test transformation of medusa into polyps under several stress conditions:

1) Starvation

2) Sudden increase or reduction of water temperature

3) Reduction of salinity

4) Mechanical damage of the jellyfish bell by scissors.

Two types of medusa they reared, which are immature and maure medusa. For immature medusa, they subjected to these different stress conditions, and easily transform to polyps, but cannot transform under non-stress condition. For mature medusa, even under the best culture conditions (non-stress), they still regressed spontaneously and completely transformed to polyps.

Dr. Stefano Piraino and her colleagues deeply thought about whether this ability of transformation (medusa to polyps) presented on whole medusa or only was restricted to some of its organs and tissues. They dissected medusa into different body parts and culture them. Surprisingly, they found upper/lower half of medusa could transform back to polyps, and also tentacles, exumbrellar epidermis were all unstable and easy to transform back to polyps.

Therefore, the transformation of *T. nutricular* is considered as metamorphosis for their special Ttal feature. As mentioned before, the medusa can transform to polyps as a protection response to adverse conditions, which change one cell type to completely new cell type and reorganisation of tissues.

The research team did a comparison with other types of medusa, such as *Zanclea prolifera*, they have ability to transform medusa back to polyps but before sexual reproduction. They found among different species, only *T.nutricular* retained the ability to replicate the DNA in the dissected tissues, therefore in order to investigate the mystery of immortal life of *T.nutricular*, the regulation of life cycle reversal at the genomic level need to be well-thought-out.

The study reported by Dr. Miglietta and his colleagues, also have same contemplation. They did the experiment about immortal life of *T.nutricular*, but more relate to genetic part that compared with the genus among Turritopsis species. And they found only part of them can revert their life cycle that have unusual life history feature that uncommon within the hydrozoa.

Dr. Miglietta said ‘’it would be interesting to track their evolutionary origin using a phylogenetic hypothesis’’. This interesting and attractive feature may rise by a single event or multiple times due to a common and strong selective pressure to cause the immortal life of *T.nutricular.*

Reference:

Stefano Piraino, Ferdinando Boero, Brigitte Aeschbach & Volker Schmid, 1996, Reversing the life cycles: Medusae transforming into polyps and cell transdifferentiation in *Turritopsis nutricula* (Cnidaria, Hydrozoa) , Biological Bulletin, Vol.190, No.3, pp.302-312.