
In my ideal world....maybe 50% of 7.8 billion people would have online access to education and information and would collectively work (each contributing in their own way like mining or gamers or up to researchers and decision-makers and with a limitless supply of money) to address aging or the degeneration known as aging that leads to all chronic diseases....that's not the world we live in. Martin O'Dea in 2021, CEO Longevity Summit Dublin.

This month's theme: Planaria

Introduction

When stem cells divide for healing wounds, reproduction, or growth, they typically show signs of aging. This aging process results in stem cells losing their ability to divide, thus becoming less capable of replacing exhausted specialized cells in our tissues. A clear example of this effect is seen in human aging skin. However, planarian worms and their stem cells somehow bypass this aging process, allowing their cells to continue dividing indefinitely. One key factor in cellular aging is related to telomere length. For normal growth and function, cells in our bodies must continually divide to replace worn-out or damaged cells. Planarian worms maintain the ends of their chromosomes in adult stem cells, theoretically granting them immortality.

Planaria are capable of profound feats of regeneration fueled by a population of adult stem cells called neoblasts. These cells are capable of indefinite self-renewal that has underpinned the evolution of animals that reproduce only by fission, having disposed of the germline, and must therefore be somatically immortal and avoid the aging process. How they do this is only now starting to be understood. A study suggests that the evidence so far supports the hypothesis that the lack of aging is an emergent property of both being highly regenerative and the evolution of highly effective mechanisms for ensuring genome stability in the neoblast stem cell population

Planaria. Common genes with humans, how many?

Planaria and humans share a surprising amount of genetic material despite their differences. Approximately 80% of the genes in planaria have homologs in the human genome. This significant overlap includes genes involved in fundamental biological processes, such as those related to stem cell function and regeneration. This genetic similarity makes Planaria an important model organism for studying biological processes relevant to humans.

Scientists hope that understanding how these cells activate and differentiate could one day lead to methods for regenerating human tissues. One gene, called piwi in planaria and hiwi in humans, is expressed in both species' stem cells and is likely involved in regeneration. In planaria, piwi plays a crucial role in producing new, functional stem cells.

In humans, the hiwi gene is expressed in reproductive cells and some stem cells, such as those responsible for generating new blood cells. There is hope that studying this gene could be useful to trigger human stem cells into regenerative action.

Almost Immortal Planaria

Many people first encounter planaria, tiny flatworms with remarkable regenerative abilities, during biology class when they cut one up. Planaria, found in freshwater, marine environments, and on plants worldwide, can be sliced into hundreds of pieces, each growing into a completely new flatworm. This extraordinary ability allows planaria to reproduce asexually, effectively cloning themselves. Scientists have discovered that planaria are filled with cells akin to stem cells, which are always ready to transform into any specific type of cell needed for tissue regeneration. This capability closely mirrors that of embryonic stem cells in humans and other vertebrates, making planaria fascinating subjects for scientific study. Their simple bodies and limited tissue types make them relatively easy to research. Remarkably, the stem cell-like cells in planaria are distributed throughout their bodies in large numbers, which contributes to their incredible regenerative powers.

Planarian regeneration is notable for its dramatic extent, rapid speed, and the underlying mechanisms that enable it. Not only can each piece of a cut-up planarian regenerate into a new flatworm, but this process occurs quickly, taking just a week or two for each fragment to become a miniature version of the original worm.

During regeneration, planaria perform an impressive feat: for instance, a tail regenerating a head might lack the ability to eat, or a head without a gut can't digest food. Planaria solve this by consuming themselves—cells in the tail self-destruct to provide the energy needed for regeneration. As the head regrows, the tail shrinks to a size proportionate to the new head. Once the planarian is fully regenerated, it resumes feeding and returns to normal size. Understanding how planaria achieve this proportion adjustment during regeneration is one of the many mysteries scientists are eager to solve. When a planarian loses a part of its body, a regeneration blastema—a cluster of embryonic-like cells—forms at the wound site. These cells, rich in stem cells, can develop into various cell types needed to replace the lost body part.

Planarians do age, from the loss of fertility to a reduction in muscle mass and mobility. However, when elder planarians regenerate tissues, the newly formed parts show no signs of aging. It's as if they completely turn back the clock. Understanding and "copying" what they do could lead to ways of slowing or even reversing age-related conditions in humans.

Michael Levin Study

The study of this American developmental and synthetic biologist provides a comprehensive model connecting bioelectric signals with molecular feedback loops during early anterior-posterior (AP) axis establishment in planaria.

Bioelectric signals influence early polarity decisions in regeneration, and manipulating these signals can lead to significant anatomical outcomes, such as the formation of double-headed planaria. In other words, as strange as it seems, at least in some circumstances, bioelectric signals can create a morphology that would not exist in a "normal" environment.

Understanding the interplay between bioelectric signals and molecular pathways could lead to improved control over regeneration and morphogenesis. Given that many ion transporter modulators are already clinically approved, this research holds promise for applications in regenerative medicine.

This study underscores the importance of bioelectric signals in regeneration, a field of science largely unexplored. It is one of the many avenues for regeneration and rejuvenation of human beings. We need more scientists and more investment in all research, who could one day make possible longer and healthier lives for billions of people.

The good news of the month: An antibody extends life span in mice by 25%

The mice received a therapy against IL-11, a pro-inflammatory cytokine. This cytokine has a negative effect on the lifespan of mice and also on humans.

The scientists from London who published in Nature explain that the mice that received the antibody looked more active, and leaner, with better coat, vision and hearing, and better walking ability.

For more information

- Heales, Longevity Escape Velocity Foundation, International Longevity Alliance, Longecity, and Lifespan.io
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