# Intro:

If we had the choice, how long would we want to live?

You are made of tiny things that we call cells; they have to handle a lot of specific tasks and in order to do so, they use something we call proteins. We are not going to explain in detail how proteins work but you only need to know that it’s the “language of life”, everything happening inside you is thanks to proteins.

# What is aging?

1. Senescent cells

Your cells are made of many things, but the most important one is DNA. It is a long molecule that encodes information: 1% is for genes that are a sort of protein dictionary, they help manufacture and understand proteins. The rest is like a set of rules. If we were to use an analogy, it would be like the instruction manual of Ikea furniture: how to assemble, with how many screws, and the order of steps.

When your cells divide, they copy your chromosomes, but in doing so they lose tiny bits at the ends.

To delay this erosion, your DNA is equipped with telomeres located at the end of chromosomes. In some cases, when the telomeres are gone, cells become zombies, they refuse to die and start to build up. Not only that, but they also harm surrounding tissues and are linked to many diseases such as diabetes and kidney failure.

Scientist attempted to genetically engineer mice so that they gained the ability to get rid of senescent cells more easily. They observed that they were more active, with their heart and kidneys working better and they had less chance to develop cancer. They tend to live longer as well, 30% longer that regular mice and in better health. But we can’t do the same with all the cells of an already developed living being. Instead, we can provide senescent cells with a protein they’re underproducing that tells the cell it’s time to die.

1. NAD+

Inside of your cells, there is a bunch of complex machineries that needs maintenance. Parts of those machines needs to be destroyed, cleaned up and rebuilt, otherwise things don’t work. These machines are used to produce whatever they need but as we age those products are no longer produced in the quantities required or even not at all. We can take for example NAD+, a coenzyme that guide cells to keep themselves in a good state.

But with age we produce fewer of those, to be more precise we only have half of them at age 50 than at age 20. Some studies have linked low amounts of NAD+ with diseases like skin cancer, Alzheimer, Heart disease and multiple Sclerosis. Unfortunately, we can’t directly take pills of NAD+ since it cannot enter inside cells.

A 2016 study on mice showed that mice who received additional NAD+ were rejuvenated: They displayed an increase of the multiplication of cells of skin, brain and muscles. They were more capable of repairing their DNA and had a slightly increased life span. Anyway, it could become, with further research, one the first real anti-aging pills.

1. Stem Cells

Stem Cells are the first kind of cells that will constitute you, they have a general purpose and are not as specialized as neurons or muscles. However, their purpose is to specialize into a specific kind of cell, that is why as we age, we can see the body deteriorates. Indeed, without anything to replace what has been damaged, the body will eventually be unable to sustain itself with what it has left. Stem cells’ number decline over time and so the ability of the body to repair itself.

Scientists observed in mice that the dwelling number of stem cells in their brain could be linked to diseases. To verify this, they took stem cells in the brain of baby mice and injected it into the brain of middle-aged mice. But not in any part of the brain, rather in one of the most important parts of the brain the Hypothalamus. It is responsible for many things like reproduction, heat management, hunger or even the circadian rhythm.

Their conclusion is that stem cells allowed old cells to be reinvigorated and the effects took longer to be visible. It took 4 months to be able to distinguish between mice who received stem cells, who had brain and muscle cells that worked better with a life expectancy increased by 10%, and those untreated. We can see the same kind of effects when doing that not in the brain but in the heart: mice could exercise 20% longer and a weird consequence is that their hair grew faster.

# Can we stop or even reverse aging?

1. Examples of immortal beings

We already found in Nature living beings that display some kind of “immortality”. Let’s look at 2 of them: There’s a species of jellyfish called “Turritopsis dohrnii” that is capable of reversing its life cycle. Instead of dying, it can go back to an earlier stage of its life cycle and become a juvenile again, losing its ability to reproduce in the process. We might say that this jellyfish can revert time. But it doesn’t happen exclusively when it hit a certain age, it can be because of stress or danger.

For the second living being, we can look at “Hydra viridissima”, an aquatic living being that is the same as jellyfishes, corals and sea anemodes. It uses a simple strategy to capture food: Standing still and grab whatever passes by. But the most important trait it has is its ability to live forever. Scientists found out that this Hydra possess an overabundance of FoxO genes. We can find this gene in most animals, even in humans, but not in those quantities. Their purpose is to regulate how long cells can live.

We saw two living beings that are “immortal” but there is an issue: Those are aquatic living beings that are not the same size as us humans. In fact, they don’t go beyond centimeters and it might not be exactly what we are looking for. Afterall, being reborn doesn’t mean that you keep your memories or the knowledge accumulated, and humans are not well known to be staying in the same spot for extended periods of time.

1. Why it’s probably a bad idea

We previously saw that DNA is protected by telomeres, but we must not forget how complicated the body is. Some scientist observed how cells divide and noticed a consistent behaviour: Human cells can divide only a certain amount of time, to be precise they can only divide between 40 and 60 times before entering a senescence phase. We call this limit “Hayflick Limit”.

It should be known to you that there is something that we call “cancer”. Those cells are distinct from your body as they do not operate with or for it, instead they fight for resources and cause chaos in your body until you eventually die. Those cells are fairly subject to a lot of discussion as they are very particular. In order to avoid errors with cells division, our cells self-destroy when they reach their Hayflick Limit. Indeed, as a cell divide, its ability to repair DNA is less efficient and errors are more likely to be made, increasing the chance of the cell becoming a cancer cell.

Cancer is, according to a lot of people, something terrible. After all, it is among the deadliest conditions. However, we can look at HeLa, a cell line that is now immortal, and observe very peculiar properties. In addition of being immortal, it can reproduce for infinity, while being the same. Usually, cancer cells can’t do that. This cancer was taken from Henrietta Lacks, who suffered from a cervical cancer. It was taken without her or her family knowledge’s and without their consent, but this enable scientist to work with identical cells that can be supplied easily. This of course means that we can study a lot of things, immortality being one of them.

# But should we stop aging if we can?

1. There are benefits to it
2. But a lot of trouble as well
3. In the end it’s not right, we should focus on Healthspan

# Conclusion:

It’s too soon to know the answer, everything showed here are theoretical and studies are mostly conducted on mice, to prove something we need clinical experimentations and human trials, but it doesn’t mean it’s useless information, after all, it gives us ideas and exploration paths.

But we should remember that, although it is exciting and fills us with wonder, there’s always hidden aspects, and ending aging is no exception. Dying always was the natural order for millennia and maybe we don’t fully understand it from a biological and evolutionary perspective. In other words, we could destroy a delicate balance established by meddling with nature.

Instead of focusing on something that is far from guaranteed to be developed in our lifetime, we should focus on something about our lifetime, many people want to **become** old but nobody wants to **be** old. And it’s obvious why, the elderly is always in pain, with deteriorated senses, and with memories too hard to bear. Instead of increasing our lifespan and being captivated about a far future that will never be the way we think or plan it to be, we should focus on the present moment and in the near future. We should focus more on increasing our Healthspan instead of wrongly focus on Lifespan.

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