

# Telomeres

---

Ștefan Cobeli

April 7, 2016

## 1 MOTIVATION

When a cell divides, its DNA must be multiplied also. For that both cells have to have the DNA information. The DNA is a double helix construction of nucleotides. In the DNA replication process, some enzymes cut the bounds from the two strands of the double helix form and others completes the two separate strands with the complementary nucleotides needed for obtaining twice the same DNA .

Here occurs a problem, that is caused by the enzymes that generate the new nucleotides. They cannot go all the way to the end of a strand, and stop almost at the final.

Hence, at every DNA multiplication, there is some lose of the genetic information. Luckily, at the end of each chromosome there exists Telomeres, that prevent the disappear of the main nucleotides .

## 2 ABOUT TELOMERES

**OVERVIEW** A Telomere is a region at the end of a chromosome with a sequence of nucleotides that repeats several times. So every time the DNA is replicated, when the enzymes don't copy all the information to the end, it's not such a big problem, because the chromosome will lose a little part of a telomere, but not the main genetic information. Hence the telomeres controls the life of a cell. If the cells cannot divides anymore, the whole organism cannot survive.

Another important role of telomeres is that prevents the chromosomes to bind to each other ( DNA is sticky ).

In conclusion, the telomeres protects the ends of the chromosomes.

There exists an enzyme that preserve the length of telomeres and it's called telomerase. In human body, there is a little concentration of telomerase, in the somatic cells, but it still remains unused.

**HISTORY** Although the telomerase existence was observed since the 1930s, their impact on ageing was intuited barely in the 1970s, when Alexey Olovnikov realised that the DNA wasn't completely replicated.

In 2009 Carol Greider and Jack Szostak won the Nobel Prize in Medicine for discovering the telomerase enzyme and how it affects the telomere length.

**FUN FACTS** It is expected, that if we can synthesize telomerase, the average life expectancy will grow to 500 years .

Cancer cells contain active telomerase and make use of it very well. This fact makes them almost immortal. It is belived that drugs that make telomerase inactive, can stop cancer in it's spread and disappear completely.

All vertebrates have the same telomere composition TTAGGG and this section of nucleotides is repeated approximately 2,500 times in human body cells.

Other telomere compositions :

Higher plants have TTTAGGG ;

Insects have TTAGG .

### 3 RECREATION

#### 3.1 FRACTIONS AND INTEGRALS

- Let's write some shorthand formulas:

$$\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots = \sum_{n=1}^{\infty} \frac{1}{2^n} = 1$$

- Let's write some obvious facts:

$$\int \int \int \int \int \int \int \int \int \int dx = x^{10}$$

FUN FACTS

$$1 - 1 + 1 - 1 + 1 - \dots = \frac{1}{2}$$

Therefore:

$$1 + 2 + 3 + 4 + \dots = -\frac{1}{12}$$

•

$$\int_a^b x^n dx = \frac{x^{n+1}}{n+1}$$