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Study discovers first real indicator of longevity in mammals

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A team of researchers from the Spanish National Cancer Research Centre (CNIO), headed by CNIO Director María Blasco, has demonstrated in a pioneering study on mammals that longevity is defined at a molecular level by the length of telomeres. The work—which is published today in the online edition of the journal *Cell Reports*—opens the door to further study of these cellular components in order to calculate the rate at which cells age and thus be able to determine life expectancy for a particular organism.

Chromosomes—the cellular containers holding the genetic information in living creatures—have repetitive sequences of DNA at their extremities called telomeres. These sequences act as hoods that protect the genetic material in the face of any external agent which might damage it and compromise the function of the cells.

Several transversal population studies—measuring telomere length once over time in a large group of individuals—show a relationship between the length of the telomeres and the risk of suffering illnesses—cardiovascular disease or cancer, for example.

Until now, however, the use of telomeric measurements to predict real life expectancy in mammals had not been evaluated.

"In the transversal studies, it appears that individuals with short telomeres have a significantly increased probability of developing illnesses, including cancer. But this information is not applicable to a

specific individual", says Blasco.

To determine a real ageing prediction method, the authors of the present study have carried out longitudinal studies of telomere length in mice, in which a single individual is followed over a period of time.

After taking periodic blood samples from the same individual, from which cells were extracted for study, they found that those mice which managed to live longer were not the ones that had longer telomeres at any given age but those in which showed less telomeric shortening over time.

"The important thing is not so much the long telomeres at any given time as the tendency or the evolution of the length of the telomeres over time", says Elsa Vera, lead author of the study.

NEW OPTIONS FOR STUDYING AGEING AND ITS CAUSES

With this study, Blasco's team suggests using mice as an animal model in longitudinal studies that allow for health prognoses in humans. Blasco says that: "while telomere length in normal mice is much greater than in humans, we have found, surprisingly, that the telomere shortening rate in mice is 100 times faster than in humans, so the old dogma of normal mice not getting old due to the shortening of their telomeres is wrong".

This study further opens the possibility of studying, via the longitudinal examination of these genetic guardians, the real effect of lifestyle choices such as diet, smoking or exercise on individual ageing rates.

These studies might therefore be crucial in preventing illnesses or in developing new medicines to treat them.

More information: The rate of increase of short telomeres predicts longevity in mammals. Elsa Vera, Bruno Bernades de Jesus, Miguel Foronda, Juana M. Flores, and Maria A. Blasco. Cell Reports (2012). doi: 10.1016/j.celrep.2012.08.023