Bird DNA shows inbreeding linked to shorter lifespan

May 17 2016

Seychelles warbler. Credit: University of East Anglia

Pieces of DNA that predict lifespan are shorter in birds that are inbred - according to new research from the University of East Anglia (UEA).

The findings, published today, mean that inbreeding could be linked to a shorter lifespan.

The team also found effects that spanned generations - with the young of inbred mothers also being negatively affected.

The DNA pieces in question, known as telomeres, are found in almost all animals - including humans.

They act as protective caps at each end of a chromosome - providing protection from damaging substances.

Lead author of the research Kat Bebbington, a PhD student in UEA's School of Biological Sciences, said: "Telomeres are a bit like the hard plastic ends of a boot lace. Over time, they get broken down and become shorter because they absorb all the damage experienced during life.

"The rate at which this happens reflects how much stress the body is under - and importantly, how long it can continue to function.

"In humans, things like smoking, eating foods that are bad for you, and putting your body through extreme physical or mental stress all have a shortening effect on telomeres. In the wild, inbred animals are less able to cope when the environment is bad, and the stress of such situations causes further telomere shortening.

"In short - the healthier you are, or have been, the better telomeres you have and the less quickly you age.

"Inbred animals are more susceptible to disease or poorly developed because they don't have much variation in the genes they carry, plus whenever life gets difficult, they can't cope as well outbred animals."

Previous research from UEA revealed that the length of an animal's telomeres predicts its biological age and how long it will live.

However, this new research is the first to suggest that inbreeding - mating between related individuals - is linked to shorter telomeres in their young.

The research team, led by Prof David S Richardson at UEA, studied a 320-strong population of Seychelles warblers - a small island bird endemic to the Seychelles islands. A total of 1,064 DNA samples were collected from 592 birds over 14 years. The researchers used these samples to analyse telomere length and how this shortens over time.

Prof Richardson, said: "We wanted to understand what happens over an entire lifetime, so the Seychelles Warbler is an ideal research subject. They are naturally confined to an isolated tropical island and we monitor the conditions on the island every year. This way, we can follow individuals throughout their lives and know exactly what stresses they experience."

The scientists showed that the effect of inbreeding on telomeres is mainly found in stressful situations - such as when food is scarce. This may explain why not all studies show a negative effect of inbreeding, but by using telomeres it is possible to pick up these subtle relationships.

"We also found a very interesting trans-generational effect," added Prof Richardson. "The more inbred a mother is, the greater the telomere shortening in her young.

"This could be because more inbred mothers are less able to provide for their offspring - either in terms of investment in the egg, or during early life. This in turn would make the offspring's life experience more stressful, or make them less able to deal with the stress, leading to a

more rapid shortening of their telomeres.

The research team say that in a world where many animal species are declining or even limited to captive zoo populations, the influence of inbreeding is vitally important for conservation.

This newly-discovered link between inbreeding and telomere length could provide a simple way for researchers and zookeepers to monitor the genetic make-up of their animals and ensure they live long and healthy lives.

The research was led by UEA, in collaboration with colleagues at the Universities of Sheffield (UK) and Groningen (the Netherlands). It was funded by the Natural Environment Research Council (NERC).

'Telomeres reveal cumulative and transgenerational inbreeding depression in a passerine bird' is published in the journal *Molecular Ecology* on May 17, 2016.

Provided by University of East Anglia