Is foraging efficiency a key parameter in aging?

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The male wandering albatross, which can live more than 50 years, modifies its foraging behavior with age.

CNRS researchers, working with the Université de Bourgogne (France), have for the first time shown such changes by studying aging in these birds under natural conditions.

The scientists have discovered that old males forage in different waters from younger males, and are less active at the sea surface. However, none of the classic markers of human aging are altered in old albatrosses, which underlines the importance of taking account of foraging efficiency in studies on aging.

The work has been published online on the website of the journal *PNAS*.

Aging in animals, the causes of which are increasingly well understood in laboratory conditions, is hardly ever studied in a natural environment. Researchers from the 'Marine Predator' group at CNRS's Chizé Center for Biological Studies studied wandering albatrosses, which stand out among other birds because they are exceptionally long-lived (over 50 years). With a life expectancy close to that of humans, they therefore make exceptional models for the study of aging in the natural environment. Wandering albatrosses travel huge distances. During their lifetime, they fly millions of kilometers across the Southern Ocean, only returning to dry land to breed once every two years. Their reproductive performance declines from the age of thirty, but the reasons for this

decline were unknown until now.

The scientists undertook the first multidisciplinary study ever carried out on the aging of these seabirds under natural conditions. They did this by observing around a hundred albatrosses aged 6-49 years breeding on Possession Island in the Crozet islands (French Southern and Antarctic Territories). By using miniature devices (Argos transmitters and activity loggers), they were able to analyze foraging trips by the birds during the egg incubation stage.

The researchers discovered that the older male albatrosses foraged in areas of ocean that were somewhat different from those favored by younger birds. For reasons that remain unclear, during the incubation period they undertake very long foraging trips to the cold waters of the Antarctic, at a distance of over 3000 km from their nest. They are less active at the sea surface and return to dry land with elevated levels of stress hormone, which suggests a fall in foraging efficiency (a parameter which is very hard to measure except under natural conditions). Only males appear to modify their foraging strategy with age. No difference was observed between females aged over 30 and younger birds.

At the same time, the researchers measured seven physiological parameters naturally associated with aging in humans, including stress hormone (corticosterone) levels, parental hormone (prolactin) levels, the amount of oxidative stress, the ability of plasma to respond to attack by free radicals, and humoral immunity levels. Quite unexpectedly, no variation in these parameters was detected for the older albatrosses (30-49 years old) within this population. The older birds therefore appear to maintain a 'normal' physiological level.

This study is the first to directly show that, under natural conditions, several aspects of foraging behavior decline with age, without this resulting from a deterioration in their physiological state. As a result, a

fall in foraging efficiency may be one of the first signs of aging.

More information: Patterns of aging in the long-lived wandering albatross. Vincent Julien Lecomte, Gabriele Sorci, Stéphane Cornet, Audrey Jaeger, Bruno Faivre, Emilie Arnoux, Maria Gaillard, Colette Trouvé, Dominique Besson, Olivier Chastel, and Henri Weimerskirch. Proc Natl Acad Sci USA, Online on the PNAS website on 22 March 2010.

Provided by CNRS

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