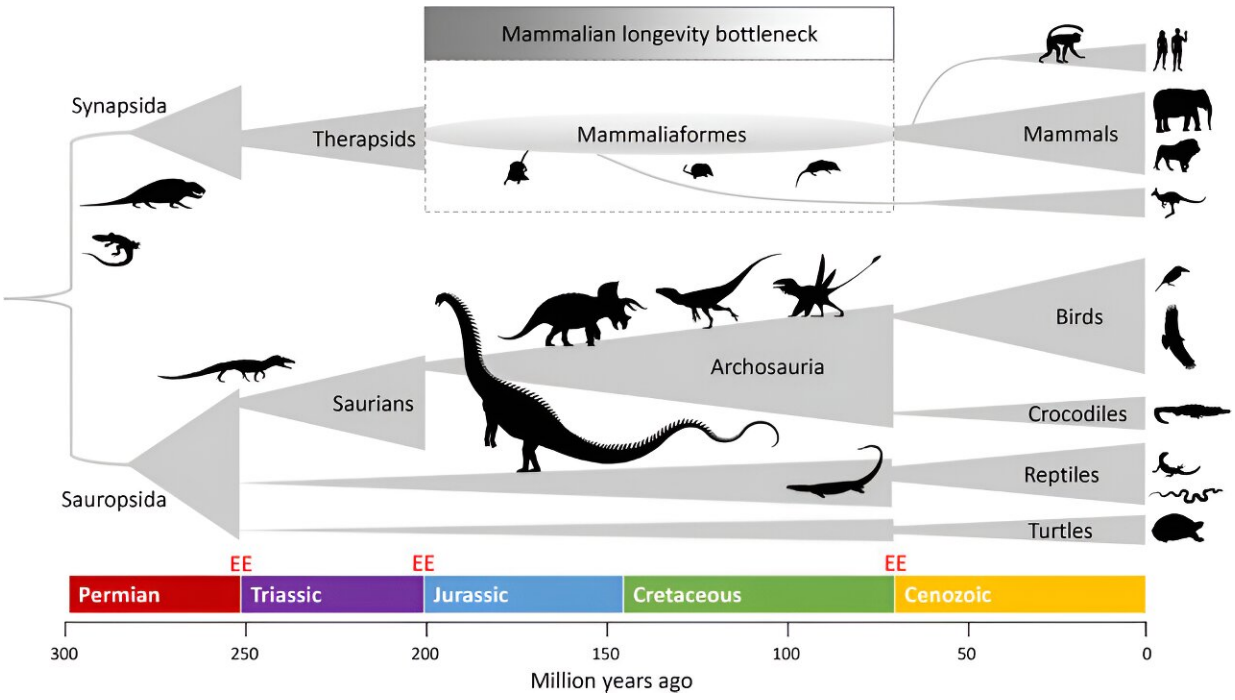
The 'longevity bottleneck' hypothesis: Research suggests that dinosaurs may have influenced how human beings age

November 29 2023



The evolution of mammals and the longevity bottleneck hypothesis. Synapsids, reptile-like ancestors to mammals, diverged from sauropsids, the ancestors of dinosaurs, birds, and reptiles, over 300 mya. After the Triassic–Jurassic extinction event, about 200 mya dinosaurs became the dominant predators. By contrast, mammals survived by becoming small nocturnal insectivores but growing in size once the dinosaurs disappeared after the Cretaceous–Paleogene extinction event, about 66 mya. The longevity bottleneck hypothesis states that early mammals spending over 100 million years as small, short-lived animals led to gene loss or inactivation of traits associated with longevity and left a legacy

that is observed in the marked aging phenotype of modern mammals, in particular in long-lived species such as humans. EE, extinction event. The Cenozoic is featured for simplicity but encompasses three periods (Paleogene, Neogene and Quaternary). Silhouettes from phylopic.org. Credit: *BioEssays* (2023). DOI: 10.1002/bies.202300098

Human aging may have been influenced by millions of years of dinosaur domination according to a new theory from a leading aging expert. The 'longevity bottleneck' hypothesis has been proposed by Professor Joao Pedro de Magalhaes from the University of Birmingham in a new study published in *BioEssays*. The hypothesis connects the role that dinosaurs played over 100 million years with the aging process in mammals.

While some reptiles and amphibians show no significant signs of aging, all mammals—including humans—show a marked aging process.

Professor de Magalhaes' hypothesis suggests that during the Mesozoic Era, mammals faced persistent pressure for rapid reproduction during the reign of dinosaurs, which over 100 million years led to the loss or inactivation of genes associated with long life, such as processes associated with tissue regeneration and DNA repair.

Joao Pedro de Magalhaes, Professor of Molecular Biogerontology at the Institute of Inflammation and Aging at the University of Birmingham, said, "The 'longevity bottleneck hypothesis' may shed light on evolutionary forces that have shaped the mammalian aging over millions of years. While humans are among the longest-living animals, there are many reptiles and other animals that have a much slower aging process and show minimal signs of senescence over their lives."

"Some of the earliest mammals were forced to live towards the bottom

of the food chain and have likely spent 100 million years during the age of the dinosaurs evolving to survive through rapid reproduction. That long period of evolutionary pressure has, I propose, an impact on the way that we humans age."

"We see examples in the animal world of truly remarkable repair and regeneration. That genetic information would have been unnecessary for early mammals that were lucky not to end up as T. rex food. While we now have a plethora of mammals—including humans, whales, and elephants—that grow big and live long, we and these mammals live with the genetic constraints from the Mesozoic era, and we age surprisingly faster than many reptiles."

"While just a hypothesis at the moment, there are lots of intriguing angles to take this, including the prospect that cancer is more frequent in mammals than other species due our evolutionary history."

More information: João Pedro de Magalhães, The longevity bottleneck hypothesis: Could dinosaurs have shaped ageing in present-day mammals?, *BioEssays* (2023). DOI: 10.1002/bies.202300098

Provided by University of Birmingham