

Research team claims fossil-only study of placental mammalian evolution time frame is wrong

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An artist's rendering of the hypothetical placental ancestor, a small insect-eating animal. Credit: Carl Buell

(Phys.org) —A team of researchers from the U.K. (led by Mario dos

Reis) is directly challenging the results of a study conducted by another team (led by Maureen O'Leary) that [concluded last year](#) that placental mammals came to exist after the demise of the dinosaurs, not before. dos Reis et al maintain that their study using what's known as the molecular clock, proves that placental mammals came before the demise of the dinosaurs. They have published a paper in the journal *Biology Letters* describing how they came to their conclusions and why the other team is wrong.

Placental mammals are a kind of mammal, they deliver babies rather than eggs, and include all mammals except marsupials—that much biologists can agree on. When the first such mammals first evolved is still subject to fierce debate. The problem comes down to how those seeking to find the definitive answer go about it. O'Leary et al claim the only proven method of dating timelines for organisms is by studying the fossil evidence—no fossils of placental mammals have been found that predate the time when the dinosaurs died out. dos Reis and others on his side shoot holes in that line of reasoning by noting that it's eminently possible that some organisms, such as placental mammals, existed for which there is no [fossil record](#). Those that agree with him believe that using what's known as the molecular clock is a much more accurate way to construct timelines. It's based on scientific studies that have shown that mutations in the cells of organisms mutate at a constant rate. Thus, to determine when a type of organism first originated, researchers study its genes, discern its mutation rate, and then count backwards to calculate its likely origination date. In the case of placental mammals, dos Reis and his team say using this method (they studied 36 mammalian genomes and included fossil evidence) shows that [placental mammals](#) existed at least as far back as 108 million to 72 million years ago—which of course means they were there when the dinosaurs roamed the Earth.

In their paper last year, O'Leary and her team acknowledged the work of those that rely on the [molecular clock](#), but noted that calculating

mutation rates is still somewhat of an art, rather than a pure science, and thus, conclusions based on them cannot be taken as fact.

Neither side can prove they are right of course, the only way both sides will ever agree, it appears, is if a fossil can be found that belonged to a placental mammal that lived before the demise of the [dinosaurs](#)—until then, the battle will likely rage on.

More information: Neither phylogenomic nor palaeontological data support a Palaeogene origin of placental mammals, *Biology Letters*, Published 15 January 2014 [DOI: 10.1098/rsbl.2013.1003](https://doi.org/10.1098/rsbl.2013.1003)

Abstract

O'Leary et al. (O'Leary et al. 2013 *Science* 339, 662–667. ([DOI: 10.1126/science.1229237](https://doi.org/10.1126/science.1229237))) performed a fossil-only dating analysis of mammals, concluding that the ancestor of placentals post-dated the Cretaceous–Palaeogene boundary, contradicting previous palaeontological and molecular studies that placed the ancestor in the Cretaceous. They incorrectly used fossil ages as species divergence times for crown groups, while in fact the former should merely form minimum-age bounds for the latter. Statistical analyses of the fossil record have shown that crown groups are significantly older than the oldest ingroup fossil, so that fossils do not directly reflect the true ages of clades. Here, we analyse a 20 million nucleotide genome-scale alignment in conjunction with a probabilistic interpretation of the fossil ages from O'Leary et al. Our combined analysis of fossils and molecules demonstrates that Placentalia originated in the Cretaceous.

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