EVIDENCE OF DISPARATE LIFE HISTORIES IN THE PALAEOCENE RISE OF EUTHERIA

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The early Palaeocene (66–61.6 mya) witnessed the establishment of mammal-dominated terrestrial ecosystems after the extinction of the non-avian dinosaurs. Understanding the mammals that formed these communities is crucial not only for disentangling the origin of living mammal clades, but also the forces that structured these first precursors of modern ecosystems. The potential role of life history as a driving factor in the composition of early mammalian ecosystems has long been appreciated but has historically been difficult to evaluate. A central focus thus far has been on differences in reproductive strategy between three major North American mammal clades, specifically multituberculates, metatherians, and eutherians. However, virtually no work has considered whether reproductive strategy was uniform within these clades. Recent advances combining paleohistology with geochemistry have opened a new window into reproduction in extinct mammals, revealing a highly precocial lifestyle in the eutherian pantodont Pantolambda, but it is unclear whether this life history style characterized early eutherians more broadly. Results from another eutherian, the phenacodontid Tetraclaenodon, challenge this notion. Both cementochronology and osteohistology indicate a drastically slower life history in the slightly smaller Tetraclaenodon, at virtually the opposite end of the eutherian spectrum from Pantolambda. After a relatively short gestation period (~2 months), Tetraclaenodon retained slow-growing deciduous teeth for as long as four years. The oldest individual in our sample grew exceptionally slowly towards the end of its life, which spanned at least 8–9 years. The ratio of gestation period to body size (10–15 kg) in Tetraclaenodon is similar to small-bodied carnivorans like the coyote (Canis latrans), Caracal (Caracal caracal), and African civet (Civettictis civetta). However, these extant species vary significantly in the duration of suckling (1.5–4 months), and therefore total maternal investment.

Tetraclaenodon awaits geochemical work to reconstruct nursing patterns. Nonetheless, these results indicate that eutherian life histories were already diverse in the early Palaeocene and raise doubts that more precocial “placental”-style reproduction is solely responsible for the greater proliferation of eutherians than other mammal clades during this interval.