

البحث الرابع

Developmental mechanisms underlying differential claw expression in the autopodia of geckos

Abstract

Background: The limb and autopodium are frequently employed to study pattern formation during embryonic development, providing insights into how cells give rise to complex anatomical structures. With regard to the differentiation of structures at the distal tips of digits, geckos constitute an attractive clade, because within their ranks they exhibit multiple independent occurrences of claw loss and reduction, these being linked to the development of adhesive pads. The developmental patterns that lead to claw loss, however, remain undescribed. Among geckos, *Tarentola* is a genus characterized by large claws on digits III and IV of the manus and pes, with digits I, II, and V bearing only vestigial claws, or lacking them entirely. The variable expression of claws on different digits provides the opportunity to investigate the processes leading to claw reduction and loss within a single species.

Results: Here, we document the embryonic developmental dynamics that lead to this intraspecifically variable pattern,

focusing on the cellular processes of proliferation and cell death. We find that claws initially develop on all digits of all autopodia, but, later in development, those of digits I, II, and V regress, leading to the adult condition in which robust claws are evident only on digits III and IV. Early apoptotic activity at the digit tips, followed by apoptosis of the claw primordium, premature ossification of the terminal phalanges, and later differential proliferative activity are collectively responsible for claw regression in particular digits.

Conclusions: Claw reduction and loss in *Tarentola* result from differential intensities of apoptosis and cellular proliferation in different digits, and these processes have already had some effect before visible signs of claw development are evident. The differential processes persist through later developmental stages. Variable expression of iteratively homologous structures between digits within autopodia makes claw reduction and loss in *Tarentola* an excellent vehicle for exploring the developmental mechanisms that lead to evolutionary reduction and loss of structures