ABSTRACT

Evolutionary modification has produced a spectrum of animal defence traits to escape predation, including the ability to autotomize body parts to elude capture. After autotomy, the missing part is either replaced through regeneration (for example, in urodeles, lizards, arthropods and crustaceans) or permanently lost (such as in mammals). Although most autotomy involves the loss of appendages (legs, chelipeds, antennae or tails, for example), skin autotomy can occur in certain taxa of scincid and gekkonid lizards. Here we report the first demonstration of skin autotomy in Mammalia (African spiny mice, Acomys). Mechanical testing showed a propensity for skin to tear under very low tension and the absence of a fracture plane. After skin loss, rapid wound contraction was followed by hair follicle regeneration in dorsal skin wounds. Notably, we found that regenerative capacity in Acomys was extended to ear holes, where the mice exhibited complete regeneration of hair follicles, sebaceous glands, dermis and cartilage. Salamanders capable of limb regeneration form a blastema (a mass of lineage-restricted progenitor cells) after limb loss, and our findings suggest that ear tissue regeneration in Acomys may proceed through the assembly of a similar structure. This study underscores the importance of investigating regenerative phenomena outside of conventional model organisms, and suggests that mammals may retain a higher capacity for regeneration than was previously believed. As re-emergent interest in regenerative medicine seeks to isolate molecular pathways controlling tissue regeneration in mammals, Acomys may prove useful in identifying mechanisms to promote regeneration in lieu of fibrosis and scarring.