Functional aspects of titanosaur osteoderms

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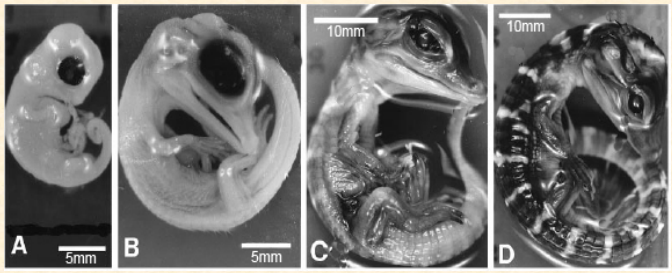
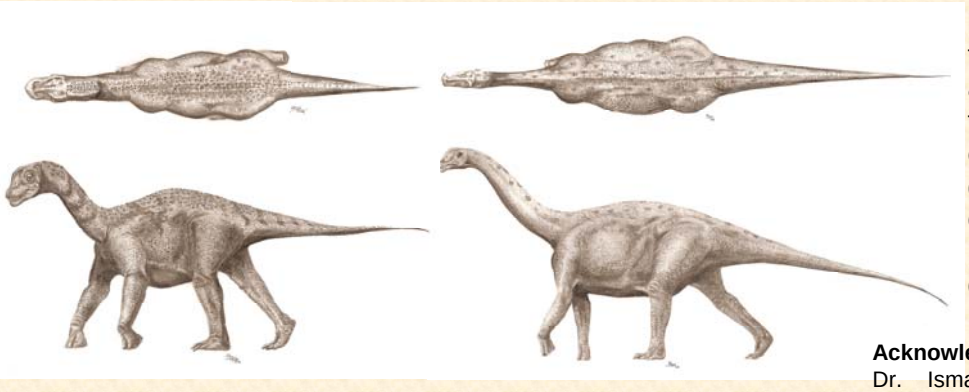
Although titanosaur osteoderms are not common findings, these elements are recorded widely in Gondwana and part of Laurasia. This assembly known by the date offers few resources for studies on the ecology of this group of dinosaurs. Recently, some eggs bearing titanosaur embryos with preserved skin, from Patagonia, Argentina, may shed some light on the function and disposition pattern of these dermic bones. Some of the skin patches associated with the titanosaur embryos show two distinct patterns of tuberosities: a longitudinal row and rosettes, both composed of closely attached tuberosities. These tuberosities do not seem to be ossified, but this might be due to the ontogenetic stage of the titanosaurs. Here is proposed that these tuberosities might have been ossified in later ontogenetic stages, and then turning into real osteoderms providing physical defense for the juvenile titanosaurs.

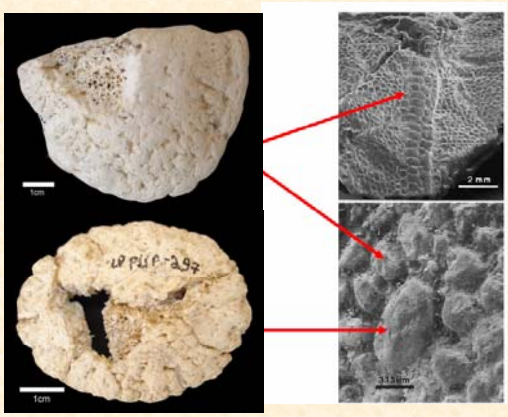


Ontogenetic sequence of Alligator mississippiensis, showing the development of osteoderms and queratinization (modified from Alibardi, L. & Thompson, M.B. 2000)

Amongst the remains of large titanosaurs like *Mendozasaurus neguyelap* some osteoderms were recovered, but it is contrasting small to the animals when compared to other dinosaurs and crocodyliforms. These bones would not provide real defensive advantage to an adult titanosaur as they are small and also have a very spongy internal structure. This apparent fragility also may be the reason that few titanosaur osteoderms have been preserved.



Hypothetical osteoderm pattern on a juvenile titanosaur (left) and on na adult (right). (Drawings by Deverson da Silva “Pepi”)



On the left: two Brazilian titanosaur osteoderms from Peirópolis, Uberaba, Minas Gerais. On the right: fossil embryo´s skin patches from Patagonia, Argentina (modified from Chiappe *et al*. 1998). Arrows point to hypothetical placement of adult osteoderms on embryo´s pattern.

In comparison, the tuberosity of a young titanosaur is much larger than an adult osteoderm and its body armor would be much more effective against small predators like notosuchian crocodyliforms and small theropods. And if the titanosaur osteoderms are originated from the embryo’s tuberosities, the disposition of these elements in an adult animal would be very distant to each other. Therefore, the function of osteoderms in adult titanosaurs would have been of calcium reserve rather defensing.

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