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Scales, lips or venom? A survey of the trigeminal canals in *Tyrannosaurus rex* using X-ray computed tomography

Content

Since the late nineteen-nineties, 3D imaging occupies a place of its own in evolutionary studies, including palaeontology. In this study, we used X-ray Computed tomography (CT) to study in 3D the snout neurovascular system of one of the most famous theropod dinosaur, *Tyrannosaurus rex*. Our work highlights the stunning complexity of the three main branches of the trigeminal canal system that ensured the sensitivity of the snout. The trigeminal canal of *T. rex* shares a lot of similarities with that of crocodiles, especially maxillary ramus, although, in contrast to most archosaurs, the ophthalmic branch is extremely developed. The vomeronasal organ appears very large, which is consistent with the large size of the olfactory bulbs and underlines the importance of olfaction in tyrannosaurids. Comparisons are made with CT scans of an iguana and monitor lizard to evaluate the hypothetical presence of a venomous organ in *Tyrannosaurus rex*. The debates over the proposed presence of lips in theropods is also discussed.

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