First evidence supporting the sensorial function of cephalic appendages in terrestrial snakes (family Viperidae)

Authors and affiliations:

Federico Banfi[1], Paul M. Gignac[2], Tom Hellebuyck[3], Raoul Van Damme[1]

[1] Laboratory of Functional Morphology, Department of Biology, University of Antwerp, Wilrijk, Belgium

[2] Cellular and Molecular Medicine Department, University of Arizona College of Medicine, Tucson, Arizona, USA

[3] Department of Pathobiology, Pharmacology and Zoological Medicine, Faculty of Veterinary Medicine, Ghent University, Merelbeke, Belgium

Abstract:

Several species of vipers and a few other snakes carry enigmatic, horn-like structures on the tip of their snout and/or above their eyes. The exact function of these remarkable appendages remains a mystery. Cephalic appendages in other groups are associated with special sensory and mechanosensory roles, hinting at potentially similar functions for vipers. If true, then viperid horns should be innervated by functionally specific cranial nerves, such as the trigeminal nerve for mechanosensation. Here, we tested whether the rostral horn protruding from the horned viper (*Vipera ammodytes*) could serve a sensorial function. To do so, we used the diffusible iodine-based contrast-enhanced computed tomography (diceCT) scanning technique as the basis for 3D soft-tissue reconstructions in and around the snake's rostral appendage, with special attention for neural tissues. Identifying cranial nerve branches serving the rostral horn would be consistent with sensory capability, and the specific nerve(s) identified would indicate the likely sensory modality. Our preliminary results show that V1 branch of the trigeminal nerve fans out into the rostral horn of *V. ammodytes,* probably making it a highly sensitive structure. This finding constitutes a first for non-aquatic snakes. We are currently employing a combination of traditional and digital histological imaging, scanning electron microscopy, and (in the near future) behavioural experiments to further explore the nature of the information captured and relayed by the horn's neural system. To also assess whether this phenotype may be more common than once appreciated, we are looking for similar nervous tissue arrangements in other horned species of vipers.