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SENSORY SYSTEMS

Charting vomeronasal receptor function

Vomeronasal receptors detect sex- and species-specific chemical cues, such as those found in urine and saliva, and this enables the recognition of predators, competitors and potential mates. However, the specific cues that activate each of the hundreds of vomeronasal receptors that have been identified so far are mostly unknown. In a paper published online in *Nature,* Dulac and colleagues have now devised a high-throughput method to determine the specific activators of a large number of vomeronasal receptors.

The authors exposed mice to various behaviourally relevant stimuli, including the bedding of male and female mice and predator species. They then used *in situ* hybridization to detect co-expression of the immediate early gene early growth response 1 (*Egr1*; a marker of neuronal activation) and probes for individual types or classes of vomeronasal receptor in the vomeronasal organ (VNO) of these mice. They found that most of the stimuli activated receptors from both the vomeronasal receptor type 1 (V1R) and V2R families.

Using a series of probes that could identify specific vomeronasal receptor genes, the authors identified 88 receptors that were activated by particular cues. Of these, 26 receptors responded to cues from either male or female mice (but not both). These neurons might therefore mediate sex-specific responses, such as mating. The authors found that 71 receptors were activated by cues from different species, 60 of which responded exclusively to this type of cue. Interestingly, some receptors responded specifically to certain classes of predators, such as snakes or owls. Furthermore, each predator cue activated a distinct combination of vomeronasal receptors, suggesting a method by which predator identity might be encoded.

The authors also observed a difference in the nature of the responses of V1Rs and V2Rs. In general, V1Rs responded to multiple cues of different types, whereas V2Rs were activated more specifically by cues of a particular type, such as 'male' or 'snake'. Given that the two vomeronasal receptor families activate distinct neural pathways in the brain, this may reflect a difference in the type of information that they encode.

In addition to linking particular cues to the receptors that they activate, this study begins to reveal the molecular organization of the VNO. This information might be further exploited to better understand the pathways linking VNO activity to the behaviours that it regulates.

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ORIGINAL RESEARCH PAPER Isogai, Y. *et al.* Molecular organization of vomeronasal chemoreception. *Nature* 21 Sep 2011 (doi:10.1038/nature10437)