CHEMOSENSATION

Alarm bells

Alarm pheromones are secreted to signal danger to conspecifics, but how mammals detect them has remained unknown. Now Broillet and colleagues have identified the Grueneberg ganglia — located at the tip of the nose — as the alarm-detection system in mice.

Grueneberg ganglia (GG) were first described approximately 20 years ago and have recently been recognized as an olfactory subsystem: on each side of the nose, a bundle of axons from 300–500 GG cells projects to the olfactory bulb. To investigate the structure and function of the GG, the authors used a mouse strain in which all olfactory neurons, including GG cells, were labelled with green fluorescent protein (GFP).

The authors first investigated the organization of the GG using scanning electron microscopy and transmission electron microscopy, and found clusters of round GG cells, each one possessing an axon and a number of ciliary processes that are

the most likely sites for the detection of chemostimuli. The GG cells were ensheathed by glial cells and were located underneath a keratinized epithelium, which lines the nasal cavity and is permeable to water-soluble substances.

To identify the GG stimuli, the authors added different chemical stimuli to a solution with which GG tissue slices were perfused during Ca^{2+} -imaging experiments. Alarm pheromones collected from stressed animals were the only stimulus tested that activated GG cells. This activation was observed in slices obtained from both newborn and adult mice.

To test the behavioural role of the GG, axonal projections from the GG were severed in pups. When exposed to alarm pheromones 30 days after surgery, the mice did not show the freezing behaviour that is seen in control mice.

As GG have been identified in every mammalian species examined, including humans, it is conceivable that GG cells function as the alarm sensory detectors in all mammalian species. It will be interesting to characterize the alarm pheromones themselves in order to gain a better

understanding of how alarm signals are secreted and detected.

Claudia Wiedemann

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