DISTANT HEAT PERCEPTION IN ZAMBIAN MOLE-RATS, GENUS FUKO*M*YS, BATHYERGIDAE

SABINE BEGALL, SARAH FRIELING, REGINA E. WEGNER, HYNEK BURDA

Dept. General Zoology, Institute for Biology, University of Duisburg-Essen, Universitätsstr. 5, D-45141 Essen, Germany, e-mail: sabine.begall@uni-due.de

Subterranean social living mole-rats of the genus Fuko*mys* (formerly known as C*rypt*o*mys*) are perfectly adapted to the underground habitat, demonstrated by many detailed studies on their visual, olfactory and auditory capabilities. Since mole-rats appear to be heterotherm, the ability to detect heat from a distance could be crucial for juvenile mole-rats finding their way back to the nest where many family members huddle together most of the time.

Here, we report on the ability of distant heat sensing in Ansell's mole-rats (Fuko*mys a*n*selli*, Bathyergidae) and its sister species (Fuko*mys* k*a*fue*n*s*is*). Experiments were conducted in a two-choice test apparatus where the animals responded spontaneously to separately heated elements that were placed in 13 cm distance to a decision line. Control experiments with unheated chambers showed that the animals had no side preference (left=12, right=13, χ^2=0.36, P=0.549). In experiments with heated elements (50°C) 39 out of 50 adult animals preferred the warm chamber to the non-heated chamber (22°C room temperature) (χ^2=15.68, P<0.001). Also juvenile mole-rats of an age up to 20 weeks showed a clear preference for the heated chamber (χ^2=5.538; P=0.019; N=26). Surprisingly, the preference for the warm side was only elicited in a shaded test room (<0.03 µmol photons/m^{-2}/s^{-1}). In a lighted room (5 µmol photons/m^{-2}/s^{-1}), no preference could be detected (χ^2=0.017, P=0.986, N=59). Experiments at lower temperatures (40 and 45°C) elicited no spontaneous preference (40°C: χ^2=0.714, P=0.398, N=30; 45°C: χ^2=0.22, P=0.639, N=41). However, three animals could be trained to respond to 45°C heated elements in a positive conditioning procedure. In additional experiments where the mole-rats' noses had been treated with viscous mucosa anesthetics, the animals did not show any preference for the heated side (50°C, darkness: χ^2=0.133, P=0.715, N=30) indicating the nose being the presumptive seat of heat sensing.

Our study shows that mole-rats can perceive distant heat – at least in darkness. The lacking preference for warmth in an unshaded room suggests that in the case of light cues, mole-rats depend on a different sensory mode for orientation. Fuko*mys a*n*selli* has well-developed (though minute) eyes and usually flees the light when given the choice. Hence, we might speculate that vision-elicited avoidance behavior superposes heat sensation under light conditions. To further explore the biological meaning of this rare sense, additional experiments on distant heat sensing are required as well as histological analyses of the rhinarium, which might reveal the nasal structures perceiving the corresponding information.