Reports

Permeable Spots in the Cuticle of the Thin-Walled Pegs on the Antenna of the Grasshopper

The largest of three types of basiconic sensory pegs which are present on the antennal flagellum of the grasshopper is permeable at its tip to water and to aqueous solutions of dyes when they are applied to the outer surface of the antenna of the living insect (*1*). These large permeable pegs, which are thick-walled except at the tip, are found not only on the antennae but on other parts of the body as well, and experimental evidence indicates that they are probably the receptors which are affected by strong repellent odors (*2, 3*). The two smaller types of basiconic pegs, both of which are thin-walled, occur only on the antennae, and these have resisted many attempts to demonstrate that they, too, are permeable to water and to dyes (*1*).

Recently it has been found that each of these types of thin-walled peg is provided with a minute permeable spot near its base and that this is also the point where the distal processes of the sensory neurones are attached. Because of the small size of these spots, their position at the base of the peg, and their own natural, pale brown color, stain, when it does enter, is not easy to detect. The preparations in which the permeability of these spots was first successfully demonstrated were made with the antennae of the large eastern lubber grasshopper, *Romalea microptera* (Beauvois), which is a particularly useful species for the study of fine histological detail. The antenna was removed from the living insect and placed at once in a petri dish between two small squares of cotton gauze that had been wet with a 0.5-percent solution of methylene blue in Ringer-Locke solution. The cut end of the antenna protruded from between the layers of gauze so that the dye could not reach it. Two hours later, the antenna was cut into several short pieces and fixed in ice-cold 8-percent ammonium molybdate for 12 hours or longer. The pieces were then washed in cold distilled water and divided lengthwise, and the soft tissues were brushed out. After a quick dip in 70-percent alcohol and in absolute alcohol, followed by 10 or 15 minutes in dioxan, the pieces were cleared in toluol and mounted flat and with the outer surface uppermost in Harleco synthetic resin. In such preparations, the large basiconic pegs are stained blue at the tip, while the two smaller types of basiconic pegs each show a single, small, rounded, blue patch near the base. The coeloconic pegs, which are also permeable at their tips, are only rarely colored, for the air that occupies the small cavity in which each lies is usually not displaced by the staining solution, and special means must be used to bring the dye into contact with the tips of these pegs (*3*).

It is now possible to state, for the first time, that each of the four types of sensory pegs—three basiconic and one coeloconic—that are present on the antennal flagellum of the grasshopper is provided with a small specialized region through which water and dyes in aqueous solution pass readily. In the coeloconic peg and in the largest of the basiconic pegs, this specialized area is at the tip, while in the two smaller types of basiconic pegs it is located at the base.

In the past it has been generally assumed and often stated in the literature that the thin-walled sensory pegs of the insect function as chemoreceptors, and there is much experimental evidence to support this view (*4*). It is of particular interest, then, to point out that in the thin-walled basiconic pegs on the antenna of the grasshopper it is not the entire wall that is permeable but only a very small specialized region of it.

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Does Starvation Increase Sperm Count?

With reference to a recent article on starvation and sperm count (*1*), we wish to make a few comments. It is common knowledge that sperm count in an ejaculate is subjected to great variations in the same individual and among different species (*2*).

When a simple analysis of statistical significance was applied to the data of this article (*1*), it was found that comparisons of differences in each individual dog before starvation, during starvation, and after starvation have P values of about 0.5. Not one case displayed significant differences (P value of 0.01) either when analyzed according to sperm concentration or for total number of sperm. Furthermore, according to the recent determinations of McMillan and Harrison (*3*), the transportation of sperm from testis to the tail of the epididymis probably takes at least 14 days. Thus, if starvation did increase sperm count, it did not reflect sperm production but the evacuation of a large number of sperm from the epididymis. As for the high birth rate of the undernourished in India, many complicating factors may be involved, from the high selection pressure for fertility (*4*) to the lack of radio and television (*5*).

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The comments of Chang and Scheaffer are of interest because (i) they point up the controversial nature of the effect of starvation on fertility and (ii) they pose further problems for solution. We are now writing a longer article reviewing the literature, which mostly inclines to the opposite view to ours—that is, that starvation, especially malnutrition, decreases fertility. Observation of mating animals, such as the seal, the penguin, and the salmon shows that even 30-percent loss of weight accompanies sexual activity.

Starvation may have a different effect