Newsfronts

A Pheromone Is Worth a Thousand Words

For some people, the word "pheromones" conjures up images of potent, seductive, or even aphrodisiacal chemicals that fuel the mating process, but a new study in mice shows that these compounds may do far more, providing a wealth of information regarding social and reproductive status for decoding by a highly specialized sensory apparatus.

There are two major neural pathways involved in the detection and decoding of olfactory stimuli: the main olfactory bulb (MOB) and the accessory olfactory bulb (AOB). The two systems are similar on several levels, but the AOB pathway displays greater sensitivity and selectivity in its responses to sensory stimuli, and furthermore appears to be the primary mediator of response to pheromonal signals, in that disruption of AOB function dramatically influences sex recognition and mating behavior.

To assess fully AOB responses to pheromones, one must take brain activity readings from alert, behaving mice. To this end, Minmin Luo and her colleagues at Duke University Medical Center (Durham, NC) used a miniature microdrive, a specialized system for precisely navigating electrodes within the brain, to take measurements of the activity of individual neurons within the AOB in response to a test animal's inspection of mice of different sexes and genetic backgrounds (*Science*, 21 February).

Luo's group was excited by the high selectivity of responses that they observed. Many of the trials identified individual cells that displayed strong excitatory or inhibitory behavior only in response to very specific combinations of genetic strain and sex. One neuron responded only to males or females from the BALB/c strain, whereas another's activation depended on exposure to CBA mice. Some cells responded only to females from a particular strain, although the investigators saw no generically sex-specific neuronal responses. Luo's group even identified two neurons that were triggered only by exposure to CBA male castrates, but not to CBA females or normal males. Clean fake mice, on the other hand, triggered no AOB response even after prolonged sniffing.

The authors suggest that the AOB may be involved in assembling "pheromonal images" through the integrated input of a relatively small number of highly specialized neurons. The initial results are compelling, and Luo's group is currently planning further studies to assess the connections between AOB activity and animal behavior.

"We are very interested in studying the pheromonal memories formed within the pathway," says Luo, "[as well as] recording from behaving mice to study the physiological mechanisms underlying pheromone-triggered social behavior."

—*M.E.*

Can "Female" Hormones Make a Dad Bad?

A hormone long recognized for its function in the preparation of the mammalian female body for pregnancy and childbirth may play a considerably darker role in the male brain, suppressing paternal instincts and even triggering infanticidal behavior.

For females, progesterone is involved in the maintenance of the uterine wall in anticipation of the attachment of a fertilized egg; later, during the course of pregnancy, placental progesterone maintains the pregnant physiological state and promotes lactation.

"The functions of progesterone in men are not well characterized," according to Jon Levine of Northwestern University (Evanston, IL). "Progesterone is present in the serum of men in amounts that are less than females, but certainly not negligible. Male brains and pituitary glands, moreover, express progesterone receptors in patterns and amounts that parallel those in females."

Levine's group explored a potential link between progesterone activity in male mice and infant-directed aggression, a behavior commonly seen in most laboratory strains (*Proc. Natl. Acad. Sci. USA*, 4 March). They used a transgenic mouse line lacking expression of the progesterone receptor (PRKO mice) and monitored the reactions of these mice toward pups and other adult males.

The results were striking. Wild-type C57BL/6 mice committed infanticide against their own young with a frequency of 74% for their first litter and 58% for their second. This behavior was absent in the PRKO mice. Relative to other strains, the PRKO mice showed substantially stronger paternal behavior, with only 8% of PRKO males exhibiting aggression upon presentation with a strange pup, as compared with nearly 30% for isogenic wild-type mice. Notably, PRKO male aggression against adult males was not substantially altered, suggesting that different mechanisms govern the two behavior patterns.

These results open a number of potential avenues for future study, including examination of the male-specific molecular and cellular mechanisms of progesterone action, and the manner in which progesterone pathways influence paternal behavior.

"There is little information that has been published…regarding fluctuations in progesterone levels in males in response to female pregnancy or childbirth," Levine tells *Lab Animal*. "We are exploring the idea that fluctuations in progesterone [activity] during gestation, parturition, and lactation of a mate may be responsible for the induction of paternal behavior in those animals that normally exhibit paternal responsiveness—including men."

—*Michael Eisenstein*

Fasting Slows Progression of Huntington's Disease in Mice

Dietary restrictions eased symptoms and increased the life span of mice carrying the gene that causes Huntington's disease (HD), with implications for the treatment of humans with the disease, according to a new study.

HD is a hereditary neurodegenerative disorder affecting about one person in every 10,000 in the United States. The disorder causes deterioration of nerve cells, particularly in the striata and cerebral cortex, and is characterized by numerous neurological defects, such as motor, cognitive, and psychiatric abnormalities. In addition, patients with