

Detection of female sex pheromone by male and female cockroaches: a comparative study

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Many animals depend on pheromone communication for successful mating. The first-order olfactory center in the American cockroach is equipped with two closely located A- and B-glomeruli which process predominantly the two sex pheromone components, periplanone-A and -B, respectively. The A- and B-glomeruli exist in the first larval instar of both sexes. Dye injection into antennal nerves revealed that the female A- and B-glomeruli grow at a relatively constant rate throughout postembryonic development, whereas the male glomeruli show a period of accelerated growth in late larval instars. These different growth patterns resulted in a 1:30 ratio in glomerular complex volumes of adult females versus males.

Next, with the use of intracellular recordings and stainings, we characterized morphological and physiological properties of projection neurons with dendrites in the B-glomerulus (B-PNs) in both sexes. Both soma size and axon diameter were smaller on B-PNs from females compared with B-PNs from males. The female B-PNs also produce fewer terminal arborizations in the protocerebrum than male B-PNs. Female B-PN activity was greatest in response to sex pheromone but lower than that in the male B-PN. These results suggest broad influence of sex pheromone on the behavior of both male and female cockroaches.