Accessory protein determines whether pheromones are detected

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Pheromones are like the molecules you taste as you chomp on a greasy french fry: big and fatty. In research to be published in the October 17 advance online issue of *Nature*, Rockefeller University researchers reveal an unanticipated role for a new CD36-like protein to help cells detect these invisible communication signals that drive a wide range of behaviors, from recognizing a sibling to courting a mate, a finding that may explain what pheromone communication, pathogen recognition and fat taste perception all have in common.

Scientists led by Leslie Vosshall, head of the Laboratory of Neurogenetics and Behavior, have found that this protein, called SNMP, or Sensory Neuron Membrane Protein, plays an accessory, yet essential role in helping neurons detect pheromones. Although SNMP plays a specific role in insect pheromone detection, it is a member of the CD36 family of proteins, members of which are found on the surfaces of many cells and have diverse roles, ranging from fatty-acid breakdown to innate immunity.

The pheromone that Vosshall and her colleagues tested, cVA, also known as cis-vaccenyl acetate, binds to a receptor complex and induces aggregation in Drosophila melanogaster. "I think of it as a 'party pheromone,'" says Vosshall. "If a few male flies are hanging out, other flies, male and female, will smell the cVA and tend to gather, and if the mood hits them, the males will court the females that join the group." When Drosophila do mate, the male transfers cVA to the female and marks her as taken, making her less interesting to other males. Prior

research has implicated the receptor complex in pheromone detection, but this is the first time researchers have shown that SNMP is essential for neurons to respond to these signals.

When neurons detect cVA, those that express SNMP fire very rapidly, a response not seen in neurons that lack SNMP. However, when mutants were reengineered to express the protein, this response was restored. When flies were engineered to express a moth pheromone receptor, these fly neurons got excited by moth pheromone, and this response also required SNMP. So SNMP seems to be essential for handing off insect pheromones of all types, and will probably be important for pheromone reception in all insects.

In this study, Vosshall and her colleagues present a unifying mechanism of action for CD36 proteins, despite their wide range of biological functions. "Our work suggests that wherever you have lipid-like molecules that need to be detected or captured by cells, these CD36 proteins appear to be necessary to grab these molecules and present them to a specific cell-surface receptor," says Vosshall.

In the case of immune recognition, a CD36 protein grabs a bacterial lipid fragment and delivers it to its receptor. These proteins are also found in the tongue, where CD36 has been suggested to function as a fat taste receptor. Based on the SNMP work, Vosshall suspects that CD36 probably plays an accessory, yet essential role - it binds that big, fatty molecule from your french fry and presents it to the real, as yet unidentified, fat taste receptor.

Source: Rockefeller University