UC RIVERSIDE

DEPARTMENT OF ENTOMOLOGY

ENTM250 Series Webinar

Speaker:

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Date: Monday, Jan. 11, 2021
Time: 4:00 pm - 4:50 pm
Zoom: 952-3324-4564
Passcode: 835322

Title:

"Calcium homeostasis in the activation and regulation of sperm motility in mosquitoes."

Abstract:

Prior to fertilization, sperm from most animals, including mammals, marine invertebrates, and insects, are quiescent until they are activated through a variety of mechanisms. In each case, a number of calcium-dependent physiological transformations take place between the initiation of sperm motility and successful fertilization. In mice, humans, teleosts, and sea urchins, calcium signaling in sperm is regulated by a highly conserved and specialized voltage-gated cation channel, CatSper. Existing data has localized CatSper along the entire length of the sperm flagellum from these organisms and the absence of CatSper renders them sterile. Lower invertebrates, including the Culex mosquito, do not express CatSper but still require calcium as a key component for the maintenance of sperm motility. This suggests that the Culex sperm is mobilizing calcium through another channel, potentially the N-methyl D-glutamate cation channel (NMDA) or the odorant receptor coreceptor (Or7 in Culex), both of which exist in the Culex sperm proteome. Literature supports the hypothesis that Or7 can form a functional cation channel gated by an agonist, in the absence of an odorant receptor and may play a part in mobilizing calcium in sperm. It is conceivable that one of these cation channels replaces the role of "CatSper" in the mosquito. Through a series of experiments including using calcium imaging, high frame rate darkfield microscopical imaging, agonists, antagonists, and knock-out methods, I will determine which channel is essential. In addition to calcium, preliminary data supports the importance of protein phosphorylation and kinase activity in the activation and maintenance of sperm motility and shows that in a true calcium free environment, an increase in protein phosphorylation by a serine protease leads to backward motility in the sperm. The seminal vesicles of the Culex male reproductive tract contains a specific serine protease that leads to increased phosphorylation and downstream activation of the mitogen activated protein kinase pathway (MAPK). It is probable that phosphorylation is also taking place in the flagellum of the sperm and it is likely that the Culex specific kinase, shaggy is phosphorylating the tubulin extension, affecting the axoneme leading to the beating of the flagellum. Therefore, the combination of calcium and protein phosphorylation leads to successful forward, progressive motility, and eventually successful fertilization. Further, the substitution of CatSper into the Culex mosquito's genome through CRISPR would be an alternative way to show calcium mobilization in insect sperm.