Researchers discover how a brain hormone controls insect metamorphosis

December 3 2009

A team of University of Minnesota researchers have discovered how PTTH, a hormone produced by the brain, controls the metamorphosis of juvenile insects into adults.

The finding, published in the Dec. 4 issue of *Science*, will help scientists understand how insect body size is programmed in response to developmental and environmental cues and offers the opportunity to develop a new generation of more environmentally safe ways to control agricultural pests as well as insects that carry human pathogens.

Scientists have known for 100 years that a brain-derived neuropeptide known as PTTH controls metamorphosis and although its specific sequence was identified 20 years ago, the way it signaled endocrine tissue has remained elusive until now.

"Understanding the signaling pathway that controls metamorphosis has been a long-term goal for many insect physiologists," says lead author Michael O'Connor, professor of genetics, cell biology and development at the University of Minnesota's College of Biological Sciences, where he holds the Ordway Chair in Developmental Biology.

Although humans don't undergo metamorphosis, passage from childhood through puberty and development of adult sexual characteristics is also regulated by a brain-derived neuropeptide that is controlled by genetics, environment and nutrition. Understanding how this process works in insects sheds light on human development.

"In its overall design, insect metamorphosis is very much like passage through puberty," O'Connor says. "From a biological point of view, both puberty and metamorphosis accomplish the same goal - to provide reproductive capacity for the species at the appropriate developmental time." The brain hormone becomes active when insects have reached a threshold body weight, which is also a trigger for human puberty.

Fruit flies and silk moths were used for the study; however, all insects that undergo complete metamorphosis appear to use this signaling system, O'Connor says. His next step is to learn how environmental and nutritional cues regulate the production of PTTH (prothoracicotropic hormone).

Source: University of Minnesota (news : web)