Fruit fly phlebotomy holds neuroscience promise

March 25 2008

Drawing blood from a fruit fly may only be slightly easier than getting it from a proverbial stone or turnip, but success could provide substantial benefits for neuroscientists.

Researchers at the University of Illinois at Chicago managed the feat and say their method could expedite understanding of the physiology of important insects such as Drosophila melanogaster, the common laboratory fruit fly that shares almost three-quarters of its genetic code with humans.

Scott Shippy, associate professor of chemistry, and doctoral student Sujeewa Piyankarage developed the technique while assisting UIC neuroscientist David Featherstone, who wanted to analyze the blood from two genetic types of fruit flies he was studying.

Under a microscope, the researchers managed to scrape an incision along the body of a fruit fly larva causing it to leak hemolymph -- insect blood -- onto the underlying collecting plate, and then vacuum it up through a narrow tube, getting enough sample for analysis.

The technique enabled them to gather from 50 to 300 nanoliters -- billionths of a liter -- of fluid, about one-thousandth of a drop, without significant evaporation, even when performed in open-air conditions that are prone to evaporation.

Traditional methods require that several flies or larvae be homogenized

to obtain a large enough sample for analysis. In the new method, only a single larva is used, and only one biological fluid -- the hemolymph -- is extracted.

"We know we have hemolymph and nothing else," said Shippy. "It's not diluted with any other cells. And we're doing it on an individual organism."

The method opens up the possibility to study an individual, rather than a general population, to learn how body chemistry affects neurological function.

Fruit flies serve as particularly good laboratory animals because of their ability to quickly breed new generations, including ones with genetic mutations that are analogues to genes that cause human diseases.

"They're exceedingly powerful genetic tools," said Shippy.

He said the method could also be used to extract biological fluids from adult flies, as well as from other important laboratory insects, such as cockroaches, where tiny amounts of fluid could be analyzed to study the workings of neural circuitry.

Shippy said the method might also be used for extracting fluid from humans to pinpoint where diseases are just starting.

"We're particularly interested in retinal diseases," he said. "Disease doesn't happen across the whole of the retina, in many cases. Often there are small hot-spots where a disease might start. It would be very interesting to have a tool, or means to collect small volumes from areas where there's a problem, where there's not a problem, and places in between, to follow what's happening."

The findings were reported in the Feb. 15 issue of *Analytical Chemistry*.

Source: University of Illinois at Chicago