Frozen flies may yield secrets for human organ transplants

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When kitchens become infiltrated with fruit flies, especially during the dog days of summer, homeowners might wish that the flying pests would just turn to ice.

The fruit fly *Drosophila melanogaster* does boast a powerful genetic system making it an ideal organism to test a cool new discovery: how an enzyme regulates body energy levels. Shutting off this molecular thermostat could result in a newfound cold tolerance that has multiple applications, including extending the 24-hour window donated organs now have for optimum use.

Thanks to a $385,419 grant from the National Institute of Health, a team of Rutgers-Camden biologists is working to engineer cold tolerant fruit flies and ultimately human cells within the next three years.

This research breakthrough can be credited to Daniel Shain, a professor of biology at Rutgers-Camden, who has traveled the globe seeking knowledge on how ice worms don't just survive in glaciers, but thrive. When Shain identified a key enzyme that helps ice worms do this - AMP phosphatase - he tapped Nir Yakoby, an expert Drosophila geneticist and assistant professor of biology at Rutgers-Camden, to create this cold-tolerant fruit fly.

"The goal is to make human cells survive on ice. Twenty-four hours on ice is pushing it and many people die waiting," says Shain, who is scheduled to travel to Tibet next year to observe ice worms in the

vicinity. "We're lucky to have an expert Drosophila geneticist on campus to test this genetic switch."

Not just the ice worm lives on ice; the Rutgers-Camden research team, which includes undergraduate and graduate students, observed how other organisms, like bacteria, fungi, and algae, also are breaking through their internal thermostats.

"Shain accomplished this switch in mono-cell organisms and now we are going further up into the evolutionary tree to a more complex species," offers Yakoby, who joined the Rutgers-Camden faculty last year after conducting postdoctoral research at Princeton University's Lewis Sigler Institute for Integrative Genomics. "If we can get these human cells to survive on ice, we should expect organs to do the same. Organs are just a collection of cells."

A graduate of the University of New Hampshire, where he earned both his bachelor's and master's degrees, Shain earned his doctorate from Colorado State University and held a postdoctoral fellowship through the national Institute of Health at the University of California-Berkeley.

Yakoby, who earned his undergraduate and doctoral degrees from Hebrew University in Israel, teaches genetics at Rutgers-Camden. Both Shain and Yakoby are active members of the Rutgers-Camden Center for Computational and Integrative Biology, which offers doctoral and graduate programs and strives to determine the quantitative organizational principles of complex biological systems, using a combination of theoretical and experimental approaches.

Provided by Rutgers University