# New method preserves viable fruit fly embryos in liquid nitrogen

April 27 2021

Credit: CC0 Public Domain

Cryopreservation, or the long-term storage of biomaterials at ultralow temperatures, has been used across cell types and species. However, until now, the practical cryopreservation of the fruit fly (Drosophila melanogaster)—which is crucial to genetics research and critical to scientific breakthroughs benefiting human health—has not been available.

"To keep alive the ever-increasing number of fruit flies with unique genotypes that aid in these breakthroughs, some 160,000 different flies, laboratories and stock centers engage in the costly and frequent transfer of adults to fresh food, risking contamination and genetic drift," said Li Zhan, a postdoctoral associate with the University of Minnesota College of Science and Engineering and the Center for Advanced Technologies for the Preservation of Biological Systems (ATP-Bio).

In new research published in *Nature Communications*, a University of Minnesota team has developed a first-of-its-kind method that cryopreserves fruit fly embryos so they can be successfully recovered and developed into adult insects. This method optimizes embryo permeabilization and age, cryoprotectant agent composition, different phases of nitrogen (liquid vs. slush), and post-cryopreservation embryo culture methods.

Researchers were able to:

- show that the method is broadly applicable and easily adopted by non-specialists, with it being successfully implemented in 25 distinct strains for fruit flies from different sources (e.g., laboratories);
- demonstrate that for most strains, more than 50% of embryos hatch and more than 25% of the resulting larvae develop into adults after cryopreservation; and
- show that flies retain normal sex ratio, fertility and original mutation after successive crypropreservation through generations and long-time storage in liquid nitrogen.

"Our multi-disciplinary team is pleased to contribute an accessible protocol to cryopreserve numerous strains of Drosophila, an important biomedical model, while also hopefully informing other insect and related species embryo preservation," said study co-author John Bischof, director of the Institute for Engineering in Medicine and a professor in the College of Science and Engineering and Medical School.

As humans share more than half of their genes with the fruit fly, Drosophila research and its implications for human health are significant.

"By studying mutants in the Drosophila model system, it can reveal how those genes function in human development and disease," said Tom Hays, head of the Department of Genetics, Cell Biology and Development in the Medical School and College of Biological Sciences. "Fly studies have provided crucial insights on human diseases from Alzheimer's to Zika and revealed genetic pathways and mechanisms underlying embryonic development, olfaction and innate immunity."

Beyond training individuals in this method, the University of Minnesota team is looking to adapt it to other applications.

"It will be important to understand the genetics that influence cryopreservation in Drosophila and other insects," said study co-author Mingang Li, a research associate in the Department of Genetics, Cell Biology and Development. "This method could support research aimed at pest control for Drosophila suzukii, a fruit fly that infests ripening fruits and has become a pest in the Americas and Europe, as well as for malaria research in Anopheles mosquitoes."

**More information:** Li Zhan et al, Cryopreservation method for Drosophila melanogaster embryos, *Nature Communications* (2021). DOI: 10.1038/s41467-021-22694-z

Provided by University of Minnesota