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K-12 'classroom in a test tube' program expands with grant

By *Krishna Ramanujan*

A science education program that offers a classroom in a test tube is expanding, thanks to a five-year, \$1.25 million grant from the National Institutes of Health.

The Science Education Partnership Award (SEPA) grant supports Cornell's Advancing Secondary Science Education with *Tetrahymena* (ASSET) program, which develops science educational materials that use live *Tetrahymena*, a single-celled protozoan, to address key biology concepts. Cells for the program are provided by the NIH-funded *Tetrahymena* Stock Center, the national repository for *Tetrahymena*.

Since 2009, ASSET has provided *Tetrahymena*-based science modules at no charge to teachers in 29 states, benefiting more than 13,000 schoolchildren. Originally focused primarily on providing modules for high school students, ASSET will use the new grant to develop hands-on modules introducing elementary and middle school students to biological concepts ranging from cell structure and function to cellular reproduction to genetics and evolution.

"ASSET provides resources to help teachers engage students in hands-on activities that support the goals of the national Next Generation Science Standards," said Donna Cassidy-Hanley, a senior research associate in the Department of Microbiology and Immunology and ASSET co-principal investigator. Ted Clark, professor of microbiology and immunology at Cornell's College of Veterinary Medicine and director of the *Tetrahymena* Stock Center, is the other ASSET co-principal investigator, and the recipient of the grant.

"We are particularly interested in providing materials for teachers at under-resourced schools serving students traditionally underrepresented in science and science related careers," said Cassidy-Hanley. As part of an effort to provide inexpensive science materials to K-12 classrooms, ASSET is working with researchers at Stanford University to examine ways to integrate the use of innovative paper microscope technology (Foldscopes) into several ASSET modules.

One innovative module being developed and tested for use in biology and health classes demonstrates the effects of smoke and alcohol on cilia, tiny hairlike organelles found on the surface of many types of cells, including *Tetrahymena* and cells lining the human lung, where cilia remove dirt and mucus and help to maintain normal lung function. Students investigate the



Provided
An image of mating *Tetrahymena* magnified 400 times, taken by students using an iPhone and a paper microscope costing less than a dollar.

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effects of smoke on the ciliary activity of live *Tetrahymena*, using provided smoke extract that was collected by bubbling cigarette smoke and electronic cigarette vapor through water.

The new grant will also allow ASSET to expand support for independent research projects by motivated high school students, using *Tetrahymena* as a research organism in their classrooms.

“Many high schools lack the resources needed to support even small scale student research projects. Our goal is to provide information and materials that will enable students at any school to design and carry out a small independent research project under the tutelage of a supportive science teacher,” Cassidy-Hanley said. “Involvement in creative, inquiry-based science is one way we hope to encourage greater interest in science and science related careers among today’s students.”

ASSET also is developing modules addressing the integral relationship between science and society throughout history, encouraging students to remember that “science doesn’t stop at the classroom door” and that “science and technology play a critical role in all aspects of society,” Cassidy-Hanley said.