

The sea squirt offers hope for Alzheimer's sufferers

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Alzheimer's disease affects an estimated 27 million people worldwide. It is the most common form of age-related dementia, possibly the most feared disease of old age. There is no cure, and the available drugs only help to relieve symptoms without slowing progression of the disease. One of the characteristic changes in the brains of Alzheimer's patients is the accumulation of plaques and tangles; currently, the best hope for curing or at least slowing the disease lies in developing drugs that target this buildup. Some drugs are already in clinical trials, but there is still a pressing need for more research, and for more and better drugs directed against both known and novel targets.

One of the big problems in rapidly screening potentially useful drugs has been the lack of a good [model system](#) in which Alzheimer's plaques and tangles appear quickly. However, Mike Virata and Bob Zeller, scientists working at San Diego State University, California, have come up with a new, and perhaps unlikely candidate; the humble sea squirt, *Ciona intestinalis*. Sea squirts are tunicates, marine organisms protected by an outer hard tunic with a soft body inside. Adults spend their lives attached to one spot on underwater structures like the pilings of piers, sucking in water through one siphon, filtering out small plants to eat, and squirting the water back out through another siphon. However, as long ago as Darwin, it has been recognized that sea squirts may be our closest invertebrate relatives; in their immature, tadpole form, they resemble proper vertebrates, and they share about 80% of their genes with us.

Bob Zeller has been a fan of sea squirt [tadpoles](#) since starting work with

them in the 1990s, when he helped develop a way of introducing foreign DNA into fertilized sea squirt eggs with almost 100% efficiency, opening the way for their use as model organisms. He and his colleague Mike Virata decided to see whether it would be possible to model Alzheimer's disease in the tiny animals, which share all the genes needed for the development of Alzheimer's plaques in humans. Incredibly, dosing the sea squirt tadpoles with a mutant protein found in human families with hereditary Alzheimer's resulted in aggressive development of plaques in the tadpoles' brains in only a day, and these, along with the accompanying behavioral defects seen in the tadpoles, could be reversed by treating with an experimental anti-plaque forming drug. This is an important breakthrough, as all other invertebrates tested have been unable to process the plaque-forming protein, and vertebrates take months or years to make plaques. These exciting results make it a real possibility that sea squirts are an excellent model for testing new drugs in the fight against Alzheimer's disease.

More information: Hope for Alzheimer's sufferers from an unlikely source: the sea squirt is presented in the Research Article entitled 'Ascidians: an invertebrate chordate model to study Alzheimer's disease pathogenesis', written by Michael J. Virata and Robert W. Zeller, of San Diego State University, California. The study is published in Volume 3 Issue 5/6 of the research journal, Disease Models & Mechanisms (DMM), dmm.biologists.org/.

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