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Creation of a Molluscan Cell Line

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All along the East Coast of the United States, in the Chesapeake Bay and throughout the Gulf of Mexico, oyster beds are being decimated, or have already been decimated, by water-borne diseases. One of the most virulent of these is Dermo, caused by the parasitic protozoa, *Perkinsus marinus*.

While harmless to humans, the parasite attacks epithelial cells in an oyster's gut, eventually killing its host. Oyster harvesters and growers are left hauling up empty white shells of dead oysters.

More disturbing than its virulence is its prevalence in historically abundant oyster-growing areas where "watermen" have been plying their livelihood from coastal waters for centuries. The EPA reports that all productive beds in the Chesapeake Bay and virtually all in the saline waters of the Gulf of Mexico are infected.

Although some native oysters appear immune to Dermo, there is no cure and no way to protect those few oysters that have not yet succumbed to disease. Dermo and another disease, DMX, truly threaten to destroy the oyster industry in the Mid-Atlantic and Gulf Coast states.

Maryland watermen in the Chesapeake Bay hand tonging for oysters, a 19th century harvesting method that is still used today. Photos: Skip Brown, Maryland Sea Grant

Crassostrea virginica.
Photos: Maryland Sea Grant

The Project

Through the National Sea Grant's Oyster Disease Research Program, scientists from around the country are being funded to find approaches to restoring the ecological and commercial viability of oyster beds. This one-page publication highlights the efforts of Dr. Jane Burns of the Theodore Gildred Cancer Center at UC San Diego's School of Medicine to create a genetically engineered, disease-resistant version of the commercially important oyster, *Crassostrea virginica*.

Conceptually, this could be achieved by inserting appropriate genes from a horseshoe crab—the crab produces antimicrobial proteins that make it immune to disease—into an oyster genome. Though simple in theory, in practice it requires the development of many intermediary techniques and tools.

Burns has been involved in such research for some years with Sea Grant support. In an earlier Sea Grant project completed in 2001, she succeeded in developing a "vector" that makes it possible to insert foreign DNA into a cell.

In subsequent work, Burns succeeded in using this vector to shuttle DNA from fireflies into an oyster genome. Cells in the resulting

oyster emitted a faint glow like that of a firefly, showing that the foreign DNA had not only been successfully delivered but also that these genes were expressed. In other words, the new genetic material had been incorporated and interpreted by the oyster's biological machinery.

Developing a vector and demonstrating the expression of foreign genes are steps toward developing an oyster cell line, a continuously dividing cell that produces an endless supply of identical cells. Such cell lines are highly prized in cancer research and would provide a similar boon to oyster disease research.

To this end, Burns is collaborating with researchers at UC Davis and Bodega Marine Laboratory to develop the first molluscan cell line. This project is scheduled to be completed in 2005.

Collaborators

Dr. Viviane Boulo from the government laboratory in Montpellier, France.
Ralph Elston of AquaTechnics California.

Publication

Boulo, V., J.-P. Cadoret, H. Shike, C. Shimizu, A.Miyanohara, and J.C. Burns. 2000. Infection of cultured embryo cells of the Pacific oyster, *Crassostrea gigas*, by pantropic retroviral vectors. *Vitro Cell. Dev. Biol.* 36:395–399.

Related projects

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