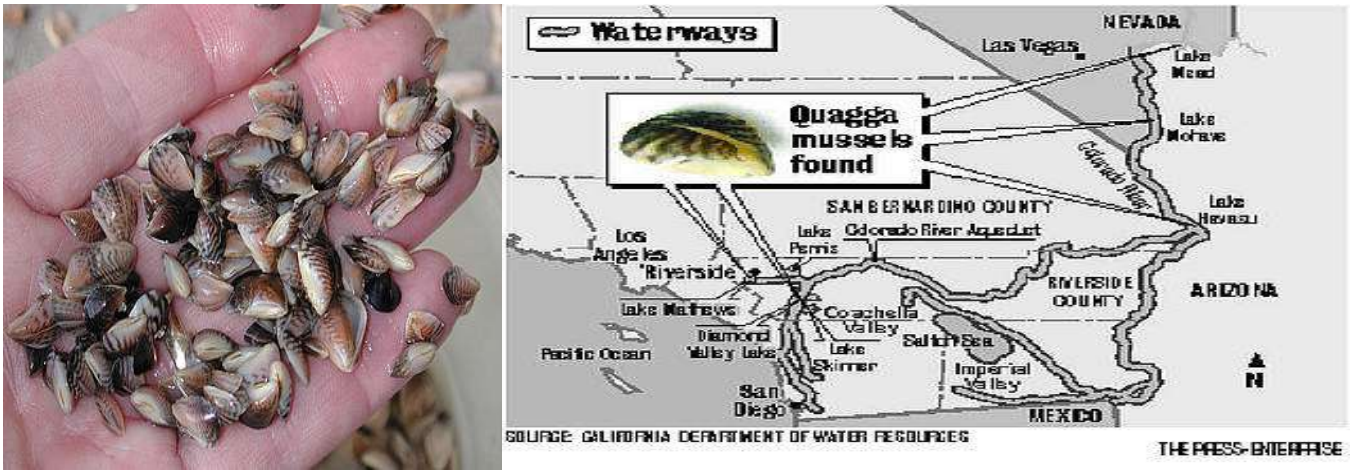
Microbe being tested as non-toxic answer to Quagga mussel problem

Wednesday, October 22, 2008 By JANET ZIMMERMAN The Press-Enterprise

Nearly two decades of research has turned up what could be the first nontoxic treatment for the menacing Quagga mussel, a crustacean that threatens water quality and ecosystems nationwide, including reservoirs near Temecula and Riverside and along the Colorado River. The discovery could save some of the billions of dollars being spent to chemically treat waters infected with the mussels, and alleviate concerns about exposure to cancer-causing substances produced in the treatments, water experts said.

Metropolitan Water District, which serves 18 million Southern Californians, has spent about $10 million fighting quaggas by chlorinating key intake valves and draining parts of the Colorado River Aqueduct. Without treatment, the mussels clog equipment and can give water a bad taste and odor.



New York State Museum

Quagga mussels reproduce so fast that they grow on top of each other and can clog water pipes and pumps. The mussels, first found in the United States in the 1980s, have been a problem in the West for less than two years. They already are well established in Lake Mathews near Riverside and Lake Skinner near Temecula, two drinking-water reservoirs linked to the aqueduct. Quaggas also have polluted the Colorado River lakes of Havasu, Mead and Mohave. For four years, scientist Dan Molloy and his team at the New York State Museum lab tested more than 700 soil and water samples before they discovered the quaggas nemesis: a common and naturally occurring bacterium, Pseudomonas fluorescens. In the process, they combed riverbanks, fields and microbial samples in the labs of other scientists, hoping they would find something lethal to the mussels. The needle-in-a-haystack quest hit pay dirt in a North American river; Molloy wouldn't say which one for proprietary reasons. But Pseudomonas fluorescens, which in nature protects plants from root rot, is ubiquitous. Harmless to humans, the soil-loving microbe is carried into buildings on shoes and the wind, and even into milk bottles from the pipes at dairies.

"It is in your office, your refrigerator ... everywhere," said Molloy, director of the museum's Cambridge Field Research Laboratory in Cambridge, N.Y. Back at the lab, the pesky, pinky-sized mussels gobbled the Pseudomonas fluorescens, which proved lethal within days. It was the first organism the researchers tried that had any noticeable affect on the little crustaceans kept in water-filled jars. "For four years they just looked back at us and thumbed their noses," Molloy said. "Then ... they croaked" less than a week after exposure to the bacteria. Molloy spent the following years getting a patent for this particular strain of the bacteria to be used against mussels. He learned how to grow it in the lab and apply it to water pipes, and then tested it at New York power plants, where it killed 70 percent of quaggas. He found a company to produce the bacteria commercially, and the treatment is expected to be available to power and water treatment plants next year, he said.

Quaggas reproduce so quickly that they grow on top of each other, clogging water intake pipes and pumps and boat motors. Attaching to the bottom of boats, they can be moved among bodies of water. The mussels can cover the bottom surfaces of lakes and dams, consuming food meant for native fish and causing excessive algae growth. They don't threaten human health, but some people believe infestations are linked to a resurgence of botulism in the Great Lakes that has led to massive deaths of fish-eating birds.

Colorado River Tests The U.S. Bureau of Reclamation tested Molloy's bacteria on mussels this summer at the hydroelectric plant at Davis Dam on the Colorado River near Laughlin, Nev. Fred Nibling, a research botanist and zoologist at the bureau, said the results were promising. Next year, tests will expand to a 10-inch-wide, 100-foot-long drinking water intake line that is blocked by mussels, he said. After a massive kill with the bacteria, the bodies of the mussels rot and are washed out of the pipe by the current. Nibling cautioned that all tests have involved dead bacteria and the treated water was released into an evaporative pond at a sewage treatment plant, not into the lake or river. "We're not even releasing any of that water, just to be extra safe," said Nibling, who has heard concerns from people anxious about the effects of bacteria on human health. Molloy said that there's no possibility of infection and that the bacteria grow at temperatures lower than the human body temperature. Later testing in open water would require an experimental-use permit from the U.S. Environmental Protection Agency, Nibling said. Such a permit is required for testing an area bigger than 1 acre and takes about six months to get, said Dale Kemery, an EPA spokesman.

Safer Alternative Current treatments for quaggas, and their relative zebra mussels, use chlorine, which can kill fish and interact with organic matter in the water to create a carcinogen, Nibling said. "If we can find something that can do the job that is much more environmentally acceptable, certainly we would want to look at it," he said. Metropolitan Water District officials are waiting for testing and approvals from the EPA, U.S. Fish and Wildlife and other agencies, spokesman Rob Hallwachs said. "We are watching it and other similar approaches," he said. "We're hoping one of them will be successful, but we're waiting until approvals are granted."

Reach Janet Zimmerman at 951-368-9586 or jzimmerman@PE.com *Questions to be answered on a separate sheet of paper using complete sentences*

1. What is the invasive non-native species threat to water quality that the article talks about, and what is the exciting news the article is explaining.

2. How could this discovery save billions of dollars?

3. Why are Quagga Mussels so dangerous to drinking water systems?

4. When were the mussels first seen in America? What 2 reservoirs in Riverside County have they been found in?

5. What is Pseudomonas fluorescens and why is it such a great find? What is its natural function? Is it harmful to humans?

6. What percent of the Quagga what killed in New York as a result of the bacteria? How long did it take the mussels to die? Why is this significant to humans?

7. How do the Quagga move from lake to lake?

8. What can the mussels lead to in the in places like the great lakes?

9. Explain what happens to the dead mussels in a “massive kill by the bacteria” from the Colorado River tests.

10. What is the current method of treatment for quaggas? Is this potentially harmful to humans?

11. Bioremediation is defined as any process that uses microorganisms, fungi, green plants or their enzymes to return the natural environment altered by contaminants to its original condition. Explain how the senario in the article is an example of that.