Live Oral Bacteria Found In Arterial Plaque

Gum disease has been linked to hardening of the arteries for nearly a decade, and scientists have long fingered a gang of oral bacteria as the obvious suspects behind many cases of the vessel-clogging killer.

Now University of Florida researchers have cornered the bacterial ringleaders of gum disease inside human artery-clogging plaque — the first concrete evidence to place the pathogens at the heart of the circulatory crime scene. Their report appeared in the March issue of *Atherosclerosis, Thrombosis and Vascular Biology.*

"Our finding is important because it has proved there are live periodontal bacteria in human atherosclerotic tissue," said study investigator Ann Progulske-Fox, a professor of oral biology at the UF College of Dentistry. "Now we can begin to understand how these bacteria contribute to the disease process."

The oral bacteria UF researchers found in the plaque, *Porphyromonas gingivalis* and *Actinobacillus actinomycetemcomitans*, are two of the most aggressive offenders in periodontal disease, the leading cause of adult tooth loss. Because of the strong association between periodontal and cardiovascular diseases, scientists have postulated for years that oral pathogens contribute to arterial damage that leads to heart attack or stroke, which kills nearly a million Americans a year.

Progulske-Fox's team took the unusual approach of attempting to grow bacteria from arterial plaque directly on human artery cells. They obtained a section of a diseased carotid artery from a 74-year-old, partially toothless male patient undergoing surgery to remove an 80 percent blockage at Shands at UF in Gainesville. After removal, the sample was rinsed and placed on ice, then rushed to Progulske-Fox's nearby lab in a sealed, sterile container.

Researchers pureed plaque from the artery and incubated it. After 24 hours, the cells were separated from the slurry and subjected to a series of fluorescent baths containing antibodies sensitive to *P. gingivalis* and *A. actinomycetemcomitans* bacteria. If any of the artery cells were infected with the bacteria, fluorescent antibodies would light them up.

Progulske-Fox and her team found the endothelial cells were infected with both *P. gingivalis* and *A. actinomycetemcomitans*, proving live bacteria had been present in the atherosclerotic plaque.

Progulske-Fox plans to study atherosclerotic tissue samples from 50 to 60 more patients to better understand how bacteria infect arterial cells. She suspects some strains of the bacteria may be more successful in breaching the barriers separating oral tissues from the bloodstream.

"More study samples will show us which strains are implicated in the disease process, so we can design simple diagnostic technology that could be used in a dental office to identify specific bacteria the patient is carrying and whether that bacteria is known to cause atherosclerotic disease," said Progulske-Fox.

She envisions those diagnostic tests would be the first step in the war against periodontal and cardiovascular diseases, eventually leading to the development of a vaccine that would prevent oral bacteria from ever gaining a stronghold in the mouth.

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Lindy McCollum-Brounley

Detectors Used on Shuttle's Fuel Tanks

The engineers who built the massive external fuel tank that will power the shuttle Discovery into orbit used sophisticated X-ray detectors developed by UF researchers to reduce the chance of a defect in the foam insulation covering the tank.

The detectors, first invented as a new technology to find land mines, can identify tiny gaps, or air-filled voids, in the insulating foam without causing any damage. It is believed that such a gap — possibly located between the foam and the tank's surface — caused a suitcase-sized piece of foam to break off during Columbia's liftoff in January 2003. The chunk struck the edge of the shuttle's left wing, seriously damaging it and spurring the shuttle's destruction during re-entry on Feb. 1.

"We can do the inspection of the foam as it exists already sprayed onto the tank. We don't have to cut into it," said Warren Ussery, team leader for the return to flight nondestructive evaluation team at Lockheed Martin's