ENAMEL RESTORATIONS ON THE HORIZON?

Researchers hope that one day current restorative materials can be replaced with dental restorations that are identical or similar to natural tooth enamel.

Researchers at the University of Southern California's School of Dentistry's Center for Craniofacial Molecular Biology, or CCMB, have been studying tooth enamel to determine how it is created. They have identified tiny spheres that regulate the formation and organization of tooth enamel by controlling the substance's crystalline growth. These spheres—called nanospheres because they are only 18 to 20 nanometers in diameter—are formed by a naturally occurring family of tooth-specific proteins known as amelogenins.

Amelogenins self-assemble to form the extracellular matrix within which the inorganic enamel crystals start to form. At first, the crystals grow only on their end surfaces. With the nanospheres acting as spacers, they build a scaffold on which mature enamel can eventually form. After enzymes have broken down the amelogenins, the crystals start to grow on all of their surfaces. They thicken, clump together and create mature enamel.

In 1994, researchers took the gene for an amelogenin from a mouse and produced an identical recombinant amelogenin, using a bacterial reproductive process. This recombinant amelogenin, which researchers can now produce in quantity, can self-assemble to make nanosphere structures identical to those seen in humans and other animals.

Researchers currently are growing crystals within synthetic matrices made from recombinant amelogenin.

“We get very long, straight structures, and the crystals grow only on their end faces,” says A.G. Fincham, Ph.D., a CCMB researcher. “We can't make enamel yet, but we can see how nature does it. And the nanospheres clearly have a capacity to regulate the way crystals grow.”

STREPTOCOCCUS MUTANS UNSTUCK

Streptococcus mutans could be prevented from adhering to teeth and, as a result, causing cavities, European researchers report in the January issue of Nature Biotechnology.

Researchers from England and the Netherlands say that they have synthesized a peptide—a short protein—that binds to teeth where S. mutans ordinarily would adhere. When the peptide binds to the teeth, it crowds out S. mutans.

In a preliminary trial, researchers treated 11 volunteers with a drug that kills oral bacteria, and then applied the synthetic peptide, another peptide or salt water twice a week for three weeks. In addition, each subject used a mouthwash twice a day that contained the same substance the dentist applied to his or her teeth.

After analyzing saliva and plaque samples from the subjects at four months, researchers detected S. mutans in only one of four subjects who received the synthetic peptide. In contrast, they detected S. mutans in six of the remaining seven subjects.

Researchers suggest that peptides, such as the one they created, may have wide applicability in fighting infections in humans and animals. And, as their antiadhesion peptide does not disrupt benign microorganisms in the mouth, resistance to synthetic peptides is less likely to develop than is resistance to antibiotics.

DENTAL SURGERY BOOSTS BLOOD PRESSURE

Blood pressure increases at a greater rate in middle-aged and older patients undergoing tooth extraction than in their younger counterparts, according to a study in the November issue of American Journal of Hypertension.

Japanese researchers studied 40 patients between the ages of 19 and 74 years of age who underwent tooth extraction. The 14 men and 26 women were divided into two groups of 20: patients up to 40 years of age and patients older than 40 years of age.

Two patients from the younger group and four patients from the middle-aged and older group had been diagnosed with high blood pressure; three of these patients were taking antihypertension medication.

Researchers averaged each patient's blood pressure and pulse rate before dental surgery, during administration of a local anesthetic, during surgery and after surgery, using an electrocardiograph.

They found an increase in systolic blood pressure during surgery.