

Stem cells and more: How dentists of the future may fix your teeth

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The next time you lose a tooth, could your dentist just grow you a new one? Not yet, but research at USC brings dentists a step closer. Here are a few ways Herman Ostrow School of Dentistry of USC scientists could

revolutionize dental care.

Tooth Regeneration

Rats and mice use their incisors—their two pairs of front teeth—to gnaw. The teeth would probably wear out if it weren't for a peculiar fact: They never stop growing. That gives USC researchers some insight into regenerating teeth in humans.

A research team led by Yang Chai, associate dean of research at the Ostrow School and director of the Center for Craniofacial Molecular Biology, compared two kinds of stem cells in mice: stem cells that eventually lead to the growth of incisors and those that develop into molars, which stop developing in mice just as they do in humans. Learning how the [stem cells](#) differ may help scientists determine how to manipulate cells' development to reactivate tooth growth.

The work means that, one day, a dentist might reach for a living tooth regenerated in a lab to replace a broken tooth, Chai says.

Enamel Restoration

Janet Moradian-Oldak of the Ostrow School and her USC team may have found a secret to regrowing [tooth enamel](#), the hardest substance in the human body.

Her research showed that the enzyme MMP-20, found in teeth, plays a key part in helping enamel grow correctly. That fits perfectly with the work of Qichao Ruan, a postdoctoral research associate at USC's Center for Craniofacial Molecular Biology. Ruan developed a water-based gel that creates an enamel-like layer and repairs early tooth decay when placed on teeth. Its recipe includes a special protein known to interact

with MMP-20, as well as a substance that comes from shellfish like shrimp and crab. The gel could be more effective in restoring the tooth than traditional crowns, whose adhesion weakens over time, Ruan says.

Don't look for [clinical trials](#) yet, but Moradian-Oldak hopes one day their work will result in a gel-filled mouthguard worn overnight that could strengthen [teeth](#) and reduce their sensitivity.

Safeguarding Gums

After a tooth extraction, the gum surrounding the tooth's root can be vulnerable to collapse. To prevent that, Neema Bakhshalian MS '14, a periodontist and researcher at USC's Laboratory for Immunoregulation and Tissue Engineering, worked with a team at the Ostrow School to develop an innovative rigid cage shaped like a tooth's root. Called Socket-KAGE, it's made of a unique resorbable material and can be immediately placed in the space left after a [tooth](#) is removed, helping the bones in the jaw repair without further surgery.

Provided by University of Southern California

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