

SPEAKER:

Eating is one of the great pleasures and necessities of life. And to enjoy everything from energy bars to apples we rely on one part of our bodies to do an important job, our teeth. Teeth are the hardest substances in our bodies. They're harder than our bones and they're even harder than iron or steel. While we chew our teeth experience forces of up to 225 pounds.

So why doesn't our jaw just crumble under all of those forces? Between your tooth and your jaw bone there's a specialized piece of tissue called the periodontal ligament, or a PDL for short. The PDL can easily absorb the normal forces that a tooth experiences when we chew, say, an apple, cushioning or protecting our jaw bone from our teeth. And inside the PDL there are all kinds of cells. One type called mechanoreceptors sense forces of movement or pressure applied to the tooth.

Teeth sound like they're already perfectly designed but sometimes we really need to force them in a certain direction, like with braces. As the braces slowly force the teeth to move the PDL gets squeezed in one direction and stretched in the other, kind of like a rubber band.

Here's where it gets interesting. To make room, the mechanoreceptors in the PDL trigger cells called osteoclasts that actually come in and dissolve part of your jaw to make extra room. The mechanoreceptors also trigger another kind of cell called an osteoblast, which comes in and builds up part of the jaw bone. This allows the PDL to get back into its regular cushioning shape, thus holding the tooth securely in position.

So if braces use osteoblasts to physically reposition teeth for cosmetic reasons, what if we want to use them to replace things in our bodies? Dental implants replace teeth that are damaged or missing to restore chewing function. And MIT engineers are using the properties of osteoblasts and osteoclasts that are already in our bodies to create a chemical coding for these implants. Just like in a mouth with braces, this coding helps create natural bone to help lock the implant into place.

Your jaw isn't the only place where these osteoblasts and osteoclasts are altering your bone structure. In fact, this boney remodeling process is happening throughout your entire body. And these implants aren't just limited to teeth. Doctors can replace knees, hips, and even spinal disks.

Right now these implants are designed to have the exact same functionality as the parts that they're replacing but, in the future, scientists may even use implants to improve our brains. Just like with braces, we could modify our bodies to be more perfect. Once we've tasted the forbidden fruit of perfection, will we still be human?