

Science Out Loud.

Every day, we rely on a substance that's harder than iron or steel, our teeth.

[MUSIC PLAYING]

So if teeth are harder than steel, they must also be harder than bone.

And if they're harder than bone, then why does your jaw, which is made of bone, not crumble under all that pressure?

There's a bit of tissue called the periodontal ligament, or PDL, around your teeth under your gums.

The PDL is a shock absorber, cushioning your jawbone from all the chewing forces.

OK, so far, so good.

But what if your teeth come in all funky?

Sure, it looks kind of goofy.

But that's not the only reason that somebody might want to fix it.

Funky teeth can interfere with the way you talk and the way you eat.

So how do we fix this?

Well, we basically break our mouths with braces, except it's actually our bodies that do the breaking.

The PDL has these cells called mechanoreceptors.

And when these cells detect a force on your teeth that's too big, like if you accidentally bite into your fork, they signal the brain to stop biting down before you hurt yourself.

Braces tether your teeth, pulling them together or pushing them apart.

Either way, they're applying a steady force to your teeth.

And when mechanoreceptors in the PDL sense this kind of smaller but sustained force, they signal cells called osteoclasts to the area, which spew out acid and proteins to dissolve parts of your jawbone.

Then the mechanoreceptors signal osteoblasts to come.

And those cells deposit minerals that make bone.

Osteoblasts rebuild the jawbone in a new shape that lets the PDL hold teeth in the new position.

So braces basically force your body to dissolve itself and then rebuild itself according to their evil whims.

Sounds barbaric, right?

But your body is actually breaking down and rebuilding bone using osteoclasts and osteoblasts all the time, not just if you have braces.

Bone remodeling is just the way our body grows.

The infant body replaces almost all of its original skeleton by the time it's a year old.

And it happens throughout our entire life.

10% of my bone material is technically new since last year.

We can manipulate the bone remodeling process to not only get straighter teeth, but also to treat diseases, like osteoporosis, which make your bones very brittle.

By keeping overactive osteoclasts from dissolving the bone so much, or by boosting osteoblasts to produce more bone, drugs can prevent bones in those patients from breaking so easily.

People with severe bone injury have to rely on bone transplants, where they take bone from other parts of their body and move it to the damaged area, which is sometimes not even possible and is always painful.

So instead, Paula Hammond's group at MIT has created a new material-- --that very slowly releases proteins.

And these proteins cause osteoblasts to go right to the site where the injury happened and generate new bone.

Now, this was a really big deal for us, because it's really hard to generate something that very slowly releases the protein.

Most of the time, the protein comes out very rapidly and gets swept away in the body, so that it no longer has any effect.

It's easy to write braces off as a form of medieval torture.

But it's kind of amazing that this mouth torture actually works.

And the technology that makes it possible is not just in your braces, it's in your bones.

Hi, my name is Andrea, and thank you for watching this episode of Science Out Loud.

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And visit our website.

And visit our website. [LAUGHING] They're separate things?