How Discarded Frog Skin and Fish Scales Help With Bone Regrowth

Promising Research From Singapore's Nanyang Technological University

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Photo of *Asst. Prof. Dalton Tay, Dr. Wang Jun Kit and Prof. Matthew Hu Xiao from* Nanyang Technological University, Singapore (NTU Singapore)

In Singapore, many people consume fish and perhaps to the surprise of others in the world, a lot of frog meat too. Recently, researchers from Singapore's Nanyang Technological University have discovered ways to convert this food waste into material that can help human bones regrow.

For example, when people are in accidents (or harbour diseases) that result in the loss of bone, usually physicians aim to replenish those losses by harvesting them in another part of the body. For example, these typically come from the legs, ribs, or even hips.

Basically, this is a very invasive procedure, and can potentially weaken the bones from where the replacement bone was taken.

Advances in Bone Tissue Engineering

A viable and modern-day alternative involves filling in these gaps with human-made material, instead of actual bone, such as using a scaffolding-like implant, which could be "reverse" 3D printed. These are often called Negative Embodied Sacrificial Template 3D (NEST3D) printing.

The research surrounding all this is relatively new and heavily seeped in medical terminology, so to break it down into normal people's terms, this material would be three-dimensional. Think of it as a kind of "scaffolding" that could fill in the gaps between nearby bone cells.

Your nearby bone cells would essentially migrate into this area and start gradually reproducing. The material inside would simply biodegrade harmlessly and would be fully replaced with your newly and gradually generated bone tissue.

Using Discarded Fish Scales and Frog Skin

Researchers at Nanyang Technological University have a created a new version of this material where discarded fish scales and American bullfrog skin could be used as the scaffold.

Collagen

By removing impurities from the discarded skin and scales, it is blended to form a thick paste. This thick paste is then diluted from the water where collagen can be extracted.

In this context, collagen forms the "scaffold" for our bones, muscles, skin, and tendons. It's very abundant in your body, kind of like glue.

Simultaneously, calcination occurs. This is when you heat a substance under controlled environments and temperatures, and this process is used to extract a compound called hydroxyapatite.

Hydroxyapatite

Hydroxyapatite is a naturally occurring mineral of calcium apatite that can be used for bone strength, bone substitution, and bone repair — can also be found in our bones and teeth.

However, as mentioned earlier, extracting bones from other parts of our bodies can be invasive and can sometimes weaken that other bone.

Combining Collagen and Hydroxyapatite

From there, the hydroxyapatite is air-dried and grounded into a powder and added to the collagen. This mixture is poured into a mold where it can solidify and become a porous scaffolding material.

Finally, bone-forming cells can "seed" themselves into the material, reproduce, and distribute throughout the scaffold within the confines of one week.

To top it off, there is no compromisation in the immune system, such as the rejection of a foreign object, like some people see when they get a lung or kidney transplant.

Final Thoughts

In summary, scientists in Singapore created a newer and safer way to regrow bones in the body, such as through discarded fish scales and frog skin. These materials were going to be thrown out

anyway and became the foundational material for a scaffolding-like device, which required collagen and hydroxyapatite.

Even though our bodies have things like collagen and hydroxyapatite, it is less invasive, doesn't hurt another bone in your body, takes roughly a week, and our immune systems do not get significantly impacted. Overall, the science for bone regrowth is promising.