

## Hagfish slime makes silken threads - Tehran Times

Jesse Emspak

03 December 2012 14:33 -



Natural fibers come from silkworms and spiders, and now we can add the gross-looking hagfish to the list. Researchers have turned hagfish slime into a base for a protein-based fiber that can also be made into sheets. Along with other natural fibers such as spider and silkworm silk, hagfish fibers could serve as a greener alternative to polymers such as rayon, nylon or polyester — all of which have to be made with petroleum, scientists say.

A paper outlining the researchers' work at Canada's University of Guelph appears in the current issue of the journal *Biomacromolecules*.

Hagfish — which aren't true fish and resemble eels — make a slime that contains thousands of fibers when bothered or threatened.

Glands on their skin quickly release a mucous-like substance that expands as it mixes with seawater.

The result is a kind of slimy, viscous region around the hagfish that some marine biologists think serves as a defensive mechanism by clogging gills.

Certainly predators, such as sharks, that try to bite or swallow the hagfish are quickly convinced to back off.

The fibers hagfish make are about 70 percent the strength of spider silk. Unlike spider silk, however, hagfish fiber might be amenable to mass production, said Douglas Fudge, associate

professor of integrative biology who leads the lab where the research was done.

“There's been this huge amount of research into [mass]-producing spider silk,” he said, “but there isn't a lot to show for it.”

### **Animal's reproductive habits**

It's probably not possible to farm hagfish, as little is known of the animal's reproductive habits, for one thing. But it might be possible to synthesize the fibers once their chemistry is better understood, the team says.

To make the fibers, the researchers anesthetized an Atlantic hagfish (*Myxine glutinosa*) and stimulated it to make the slime.

When outside of seawater, hagfish only secrete the slime in small amounts, on the scale of milliliters, and the form is called mucin.

The fibers are made by single cells inside the slime gland, but they aren't long strings at that point — they are more like coiled-up balls of yarn contained in the mucin.

To get the fibers, the team put the mucin into a solution of sodium citrate, which separates the fibers from the mucin.

The threads are then freeze-dried in a vacuum at minus 80 degrees Celsius (minus 112 Fahrenheit). Once dried, the threads are dissolved in formic acid.

When the dissolved threads are dropped into a salt solution, the proteins that make up the

fibers would form a film on top of it — and that film can be extruded into threads. The film can also be made into a coating.

“That was another interesting phenomenon,” said Atsuko Negishi, a postdoctorate researcher who was lead author of the paper. “You could make these thin films. One question we had was if we can do something interesting with those.”

The next steps will involve digging into the chemistry of the threads, and looking for ways to make them without the hagfish. Fudge noted that cell biologists have a number of ways to make cells produce specific proteins, but this particular study didn't touch on that.

“We're trying to create something more sustainable and renewable,” Negishi said. “Ultimately, we don't want to depend on the hagfish.”

**(Source: LiveScience.com)**