Spiders are good for our health

Professor Vollrath and Nephila edulis, *the golden web spider*

Transcript of an interview with Fritz Vollrath, Professor of Zoology

When I originally was trained, it was as a neurophysiologist. When you get up in the morning you have to read a lot of stuff that other people have done, and I said, 'Isn't there another system that is barely studied, yet very interesting?' And spiders – spider webs – at the time were really not studied at all. When I published a paper in Scientific American in 1992 there were 30–40 papers a year, and now I think it's about three papers a day coming out. So the field really exploded, and my group and I were in it very early, which is great fun.

In all cultures, worldwide, people that have a wound will seek out spider webs and slap them on the wound, and it heals. It heals because the spider webs are highly hygroscopic, so they glue everything together quite nicely, and they have a bactericide because a spider does not want bacteria or fungi to grow in the web and just eat up the proteins. The fibres are very small, so they are good for blood clotting; they contract when wet, they pull the wound together; you don't have to pull them off, because they are biodegradable, they fall apart.

That makes it very interesting for more modern medical application: to make devices out of silk that can be implanted. So you get cocoons from somewhere; from the silkworm, because spider silk is too precious, it'll be very, very expensive. We let the silkworms spin the cocoons, we take the cocoons, then we dissolve them. And then you have these molecules and can do things with them. You can, for example, cast them into a shape. We have one project where we cast them into a meniscus – the little cushion that sits between the joints in your knee. Well, knee replacement is really not a good idea. If you're 40, and you need a knee replacement, that implant will last about five years, and then you have a real problem, because they cut away bits, so it's really not an option. And this is why doctors always say, 'Well, wait as long as long as you can for a knee replacement.'

Replacement, now, we're not doing that. The idea here is we're repairing something, so we're putting in a biological material, not a plastic, not a titanium or anything, a biological material that will be accepted by the body, will be integrated into the body by the cells, and will hopefully therefore last. We're just clearing all the hurdles to go into humans, and it looks very positive. So we'll be going into humans at the beginning of next year.

We could use silkworms directly, but the goal at the moment is trying to understand how the silk is folded, because somehow, independently, the spiders and the silkworms have hit on a way of making this 'soup' that can be spun out very energy-efficiently. This now of course is very interesting: what are the similarities between the two silks, and what is the difference between the silks and man-made polymers, synthetic polymers? Can we, by studying the silk, learn how to make a polymer that behaves just like the silk? And silk by definition is different from all other biological material, because it is spun. All other biological materials are grown, and growing is a rather tricky thing [for us]. Spinning, that we understand, as humans, from all our plastics production. Silk has been around for about 6,000 years as a textile. Can it be one of the polymers of the future, when, oil-based polymers are no longer around?

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