Kinesis Magazine

Spider-Man is coming to UCL

Do you have what it takes to be the next Spider-Man? All you need is some sugar, water, and genetically engineered bacteria to produce your own spider silk.

It is the UCL iGEM team which is looking to make Spider-Man a reality. Equipped with students from engineering and science, the team have been spending most of their summer in the lab. They'll be mixing test tubes, growing cells and spinning silk all day to achieve the strongest possible fibres.

iGEM is a synthetic biology competition held in Boston each year where 340 universities from around the world come head to head and battle it out with their engineered microbes. Each microbe aims to serve a different purpose, from making spider silk and biofuels to designing new cures for genetic diseases. The competition aims to facilitate genetic engineering so that one day, anyone can replicate Dolly the Sheep in their back gardens.

Width for width, spider silk is understood to be stronger than steel, making it the strongest biomaterial known to man. It can safely replace petroleum-based plastics and rapidly biodegrade, putting an end to turtle-choking beer can holders. What's more, the material is biocompatible, meaning that it can be used as a scaffold in the human body without causing any adverse reactions.

It is no wonder that companies such as *Bolt Threads* have started mass-producing the material. Scaling up spider silk production is a major hurdle, going from test tube to large vessel. Things behave differently when the size changes – it is harder to mix a large vessel than a test tube. Although a tie still costs $314, *Bolt Threads* is slowly getting over that hurdle by commercialising this technology.

Before genetic engineering, people used spider webs found in the trees. Why did they stop? Because it took a team of 70 humans, 1.2 million Madagascan spiders, and 4 years of time to weave together a single robe which is currently displayed at the V&A.

But UCL's iGEM team is taking all of this one step further. Why stop at standard spider silk? Why not bind other proteins to the material? Imagine a green fluorescent protein on a spider silk robe – glow-in-the-dark clothing. Or spider silk with metal-binding proteins – a filter for contaminated water.

Spider silk is not the only biomaterial UCL iGEM is working with. Collagen also has its fair share of fame. The protein is found in our skin and is what makes it elastic. Since it is naturally found in nature, it causes no harm to the human body and hence makes a perfect tissue scaffold.

Growing organs in a lab will be one step closer if the iGEM team's project is successful. Their vision is to bind proteins to collagen which stimulate cell adhesion. That way, the cells stay in place and can grow around the collagen.

What is essentially being created is a modular platform for chimeric biomaterials. Choose a material, choose an enhanced property and combine them together. A library of protein biomaterials will be available: spider silk, collagen, keratin, elastin… All with enhanced properties. These can be made without ever harming animals, without depleting fossil fuels and without contributing to landfills.

Synthetic biology has the potential to solve many of society's issues. However, phrases like 'genetically modified' carry a negative perception which slows down research in the field. In order to go forward, the public must embrace the science.