Artificial bee silk a big step closer to reality

February 3 2010

Honeybee larvae produce silk to reinforce the wax cells in which they pupate and now CSIRO scientists have produced this silk artificially. Photo: CSIRO

(PhysOrg.com) -- CSIRO scientist Dr Tara Sutherland and her team have achieved another important milestone in the international quest to artificially produce insect silk.

They have hand-drawn fine threads of honeybee silk from a 'soup' of silk proteins that they had produced transgenically.

These threads were as strong as threads drawn from the honeybee silk gland, a significant step towards development of coiled coil silk biomaterials.

"It means that we can now seriously consider the uses to which these biomimetic materials can be put," Dr Sutherland said.

"We used recombinant cells of bacterium *E. coli* to produce the silk

proteins which, under the right conditions, self-assembled into similar structures to those in honeybee silk.

“We already knew that honeybee silk fibres could be hand-drawn from the contents of the silk gland so used this knowledge to hand-draw fibres from a sufficiently concentrated and viscous mixture of the recombinant silk proteins.

“In fact, we had to draw them twice to produce a translucent stable fibre .”

Dr Sutherland said numerous efforts have been made to express other invertebrate silks in transgenic systems but the complicated structure of the silk genes in other organisms means that producing silk outside silk glands is very difficult.

“We had previously identified the honeybee silk genes and knew that that the silk was encoded by four small non-repetitive genes - a much simpler arrangement which made them excellent candidates for transgenic silk production.”

Possible practical uses for these silks would be tough, lightweight textiles, high-strength applications such as advanced composites for use in aviation and marine environments, and medical applications such as sutures, artificial tendons and ligaments.

More information: Sarah Weisman, Victoria S Haritos, Jeffrey S Church, Mickey G Huson, Stephen T Mudie, Andrew JW Rodgers, Geoff J Dumsday and Tara D Sutherland. 2010. Honeybee silk: Recombinant protein production, assembly and fiber spinning. doi:10.1016/j.biomaterials.2009.12.021

Provided by CSIRO