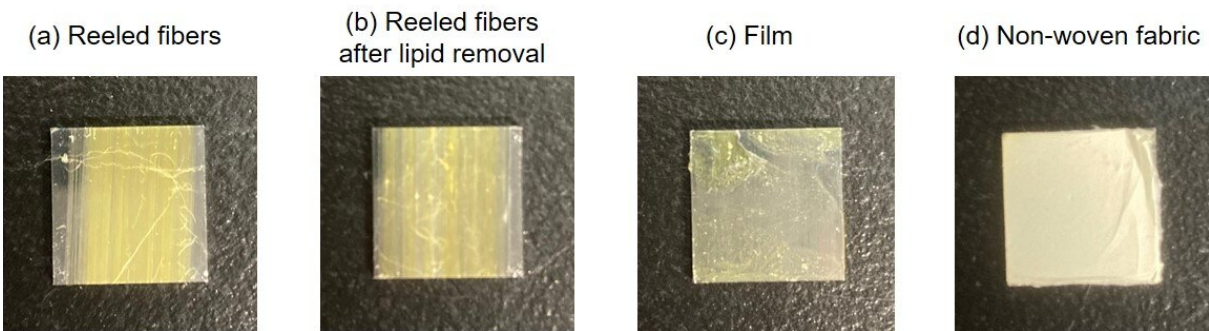


Spider silk properties analyzed for use as bio-based fibers in the medical field

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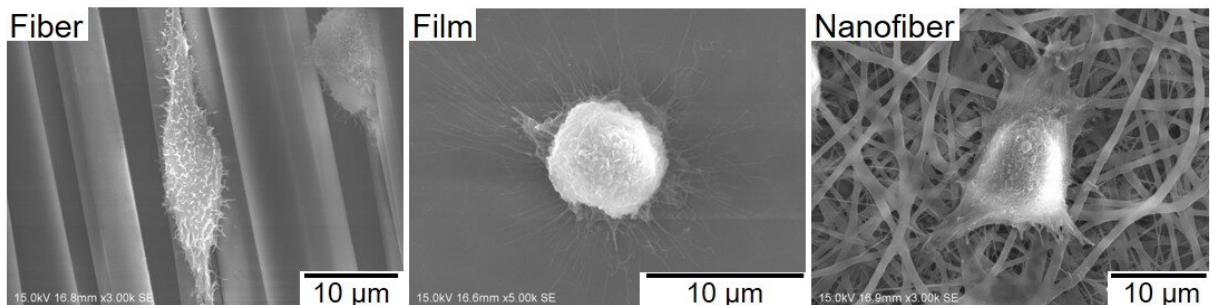


Appearance of the native spider silk samples on stainless steel plate: (a) reeled fibers, (b) reeled fibers after removal of lipid layers, (c) films, and (d) non-woven fabrics. Credit: *Langmuir*

Silk has been cultivated for centuries by domesticated silkworms, but it has been difficult to commercially produce spider silk in bulk due to their cannibalistic tendencies. However, spider silk fibers are attracting attention for their fineness, mechanical properties, and lustrous appearance. Spider silk produced through recombinant protein expression systems and chemical synthesis has been shown to have superior properties for medical use to prevent the formation of blood clots and have excellent knot strength to endure repetitive loading and unloading. In this study, published in *Langmuir*, the cell adhesion behavior of native spider silk was investigated.

The development of cell culture substrates is indispensable for the progress of regenerative medicine. In conventional research, many cell culture substrates made of petroleum-derived polymers have been developed, but the development of protein-derived cell culture substrates has not made much progress. Among the protein-based materials, silkworm [silk](#) has been used since [ancient times](#). In recent years, attention has been focused on spider-derived silk, which has better [mechanical properties](#) than silkworm silk. However, little is known about the cell behavior on spider silk. Therefore, for this study, researchers lead by Dr. Kenjiro Yazawa of Shinshu University aimed to investigate the cell adhesion behavior on spider silk.

In previous studies, experiments were conducted with recombinant spider silk-like proteins instead of natural spider silk. Therefore, the size of the protein was about 1/10 of that of natural spider silk. The research group that includes Dr. Jun Negishi, an expert in biomaterials believed that it is important to collect spider silk directly from live spiders and observe cell adhesion of natural spider silk.



TOC graphic. Credit: *Langmuir*

The researchers prepared three types of spider silk; reeled fibers, film,

and nanofiber (non-woven fabric). It was challenging to wind live spider thread so that it would be oriented in the same direction. However, they were able to achieve this and found that there was a difference in the shape of cell adhesion among the three shapes of spider silk.

This study clarified the adhesion behavior of fibroblasts on spider silk, but it is still necessary to investigate whether there is a difference in cell activity depending on the surface topography. For example, if you know that the cell activity is high on a thread or non-woven fabric or that it is low on film, it will be a new finding. This aspect of native [spider silk](#) is currently under investigation.

More information: Kenjiro Yazawa et al, Cell Adhesion Behaviors on Spider Silk Fibers, Films, and Nanofibers, *Langmuir* (2022). [DOI: 10.1021/acs.langmuir.2c00818](https://doi.org/10.1021/acs.langmuir.2c00818)

Provided by Shinshu University

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