

## Spider silk biomaterials for tissue engineering matrices

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Tissue engineering is one of the fastest emerging fields nowadays and plays a vital role in tissue regeneration and regenerative medicine. Tissue engineering requires tissues of a particular lineage and scaffolds or matrix to increase the attachment of the cells. Matrices are usually synthesised using naturally derived materials or synthetic materials like collagen or polylactide-co-glycolide.

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The main issue behind the usage of matrices derived from these polymers is their poor tensile strength and early degradation. This has forced scientists to find a substitute with better mechanical strength and degradation properties. Dragline silk, formed by the *Nephila* sp. spider, has been suggested as one of the alternatives to matrices formed by polymers. The dragline silk is made of five layers including a lipid coat on the exterior as protection, a glyco-coat which ensures water balance and a two-layered skin, the outer and inner core. The dragline silk is usually woven on rectangular frames which form a meshwork of sizes ranging from 10-100  $\mu\text{m}$ .

These frames are sterilised thoroughly and the fibroblasts are introduced into them. After 15 days, keratinocytes are added to produce a skin model. The fibroblasts and keratinocytes proliferate in spider silk fibres. Further, the proteins spidroin 1 and spidroin 2, present in the core layers of the fibre, provide strong mechanical stability to the silk. The stability of the silk fibre at high temperatures makes it a suitable option for matrices. Besides, the silk fibre promotes cell growth and shows a low immunogenic response, thus making it a valuable alternative to matrices. Moreover, well-developed cultivation of skin cells can be easily achieved with the help of silk fibres. Hence, spider silk has created a new modified way of replacing matrices in the field of tissue engineering.

*Keywords: Spider silk, Matrix, Tensile strength, Meshwork, Tissue engineering*

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