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Regenerative medicine for skin repair

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In the field of plastic reconstructive surgery, there is an increasing need for innovative matrices for skin repair and wound healing as conventional scaffolds such as collagen and other synthetic polymers exhibit poor mechanical properties in vivo. Therefore, the desired properties of a biological matrix include promoting attachment, proliferation and growth of cells. It should also degrade after performing its function without releasing toxic substances or eliciting an immune reaction. Studies have shown that these characteristics are met by spider dragline silk from the genus, Nephila to a large extent. The spider dragline silk is harvested directly from Nephila clavipes and woven on steel frames. Additionally, fibroblasts are cultured for a fortnight after which keratinocytes are added to obtain a bilayered skin model, consisting of dermis and epidermis layer equivalents. The spider dragline silk constructs are then sterilised and seeded with the fibroblasts and keratinocytes culture. After three subsequent weeks, it was observed that both the fibroblasts and keratinocytes attached to the spider silk constructs and the growth of cells were guided by the silk fibres. Hence, this proved that spider silk fibres can function efficiently as a biodegradable matrix for skin reconstruction and provide an alternative to traditional techniques. However, producing sufficient quantities of spider dragline silk on a larger scale and meeting regulatory demands has been found to be a challenge. Further studies need to be carried out to facilitate and optimise this innovative method for clinical use.

Keywords: Skin regeneration, Skin tissue engineering, Artificial skin development, Spider silk, Biomaterial

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