Functional polyaniline nanofibre mats for human adipose-derived stem cell proliferation and adhesion

ABSTRACT

Conductive polymer poly(aniline-co-m-aminobenzoic acid) (P(ANI-co-m-ABA)) and polyaniline (PANI) were blended with a biodegradable, biocompatible polymer, poly(l-lactic acid) and were electrospun into nanofibres to investigate their potential application as a scaffold for human adipose-derived stem cells (hASCs). These polymers, in both conductive and non-conductive form, were electrospun with average fibre diameters of less than 400 nm. Novel nanoindentation results obtained on the individual nanofibres revealed that the elastic moduli of the nanofibres are much higher at the surface (4–10 GPa, hmax <75 nm) than in the inner fibre core (2–4 GPa, hmax >75 nm). The composite nanofibres showed great promise as a scaffold for hASCs as they supported the cell adhesion and proliferation. After 1 week of cell culture hASCs were well spread on the substrates with abundant focal adhesions. The electrospun mats provide the cells with comparably stiff, sub-micron sized fibres as anchoring points on a substrate of high porosity. The conductive nature of these composite nanofibres offers exciting opportunities for electrical stimulation of the cells.

Keyword: Biomaterials; Electronic materials; Nanostructures; Polymers.