Correlation between the stem cells differentiation and topography of Zinc oxide nanorods

Newsha Kavosh, James Doonan, Joe Brisco, Farahnaz Ansari, and Jeremy J. Ramsden

Cranfield UNIVERSITY

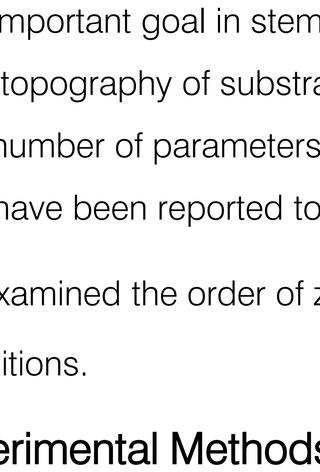
The important goal in stem cell research is to control differentiation and direct it to the desired call lineage. Here we demonstrate the effect of nanotopography of substrates.

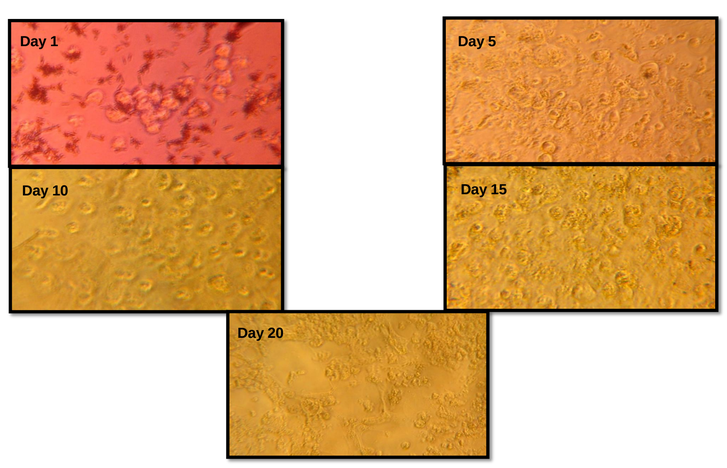
The number of parameters is important in guiding stem cell behaviour. These parameters include geometry, size, lateral spacing and surface chemistry and have been reported to affect the adhesion, growth and differentiation of stem cells [1]. Since conformation and symmetry may be equally important, we examined the order of zinc oxide nanorods on the surface to simulate in vitro differentiation of stem cells to nanoscale features under the same conditions.

Experimental Methods:

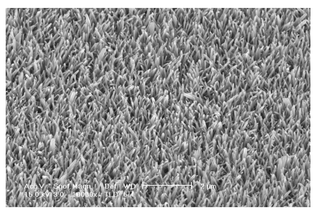
- The cells used for this work were human embryonal carcinoma stem cells.
- Cells were cultured at 37 ° C in a 5% CO_2 environment with growth media in cell culture flask.
- Cells were detached using trypcin and collected using centrifugation (1500 rpm for 3 minutes).
- Zinc oxide nanorods which had been grown on glass slides were placed under UV(to sterilize the surface before the experiment).
- Stem cells were transferred to wells containing Zinc oxide nanorodes..
- Feeding the stem cells twice a week and studying their growth with light mycroscope.

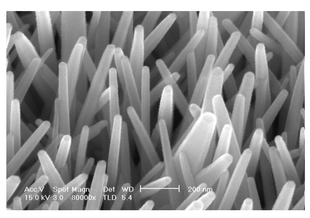
Stem cells grown on Horizontal Zinc oxide nanorods:

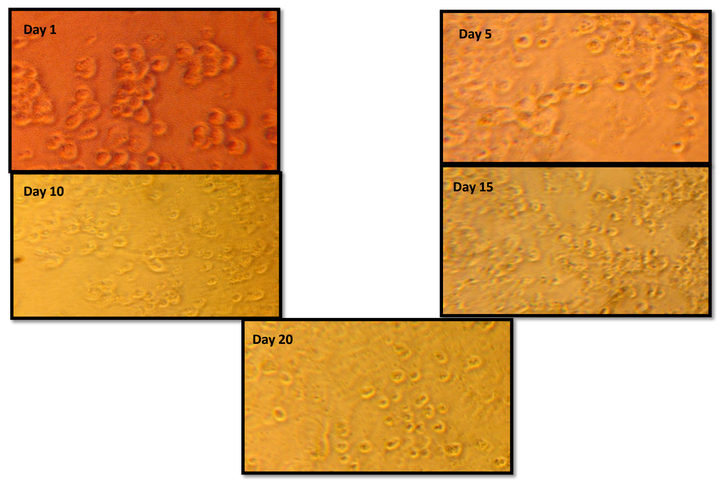




Stem cells grown on Vertical Zinc oxide nanorods:







Orientation of nanorod zinc oxide on the surface revealed changes in stem cell behaviour, offering a promising nanotechnology-based route for unique tissue engineering.

Lreferences: (1) Lino Ferreira, Jeffrey M. Karp, Luis Nobre, and Robert Langer, New Opportunities: The Use of Nanotechnologies to Manipulate and Track Stem Cells, Cell Stem Cell, 3, 136 – 146.

www.cranfield.ac.uk/sas/nanotech

n.kavosh@cranfield.ac.uk

Microsystems & Nanotechnology Centre, School of Applied Sciences,

Cranfield University, MK43 0AL, UK