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Nanofibrillar cellulose hydrogel promotes 3D cell culture

Yan-Ru Lou

University of Helsinki, Finland

Abstract

Over the recent years, various materials have been introduced as potential 3D cell culture scaffolds. These include protein extracts, peptide amphiphiles, and synthetic polymers. Hydrogel scaffolds without human or animal borne components or added bioactive components are preferred from the immunological point of view. Here we demonstrate that native nanofibrillar cellulose (NFC) hydrogels derived from the abundant plant sources provide the desired functionalities. We show 1) rheological properties that allow formation of a 3D scaffold in-situ after facile injection, 2) cellular biocompatibility without added growth factors, 3) cellular polarization, 4) to maintenance of the pluripotency of hPSCs for up to 26 days 5) the formation of 3D SC and iPS spheroids with strong OCT4 expression**,** 6) *in vitro* embryoid body and *in vivo* teratoma formations after removal enzymatically the NFC hydrogel, and 6) differentiation of human hepatic cell lines HepaRG and HepG2.

At high shear stress, the aqueous NFC has small viscosity that supports injectability, whereas at low shear stress conditions the material is converted to an elastic gel. Due to the inherent biocompatibility without any additives, we conclude that NFC generates a feasible and sustained microenvironment for 3D cell culture for potential applications, such as drug and chemical testing, tissue engineering, and cell therapy.

Biography

Yan-Ru Lou has completed her Ph.D. in 2005 from the Faculty of Medicine, University of Tampere, Finland. She has previously worked in Regea Institute for Regenerative Medicine (Finland) and Institute of Bioengineering and Nanotechnology (Singapore). She is currently a University researcher in the Faculty of Pharmacy, University of Helsinki, Finland. She has published 24 papers in reputed journals (H-Index 15, 556 citations) and 3 patents.