

Professor Robert A Brown

Director of Bioregenerative Science Centre
(UCL Institute of Orthopaedics),
Professor of Tissue Engineering

Abstract

'Rapid Engineering of Nano-Fibrous Collagen Tissues: While-u-wait Bedside Grafts?'

Tissue engineering began to stir European public hopes 10-15 years ago around the relatively simple (now clearly simplistic) idea that culture of tissue-forming cells within suitably shaped 3D materials could produce new, functional tissues (ie. grafts) to replace bodily decay and damage. Trouble is that many, many repetitions of this formula have generated only a few, modestly successful steps towards the dream. In recent years the strategy and route map have undergone modification, to rely on special (stem) cells which may re-capitulate some elements of embryonic tissue. However, this is likely to depend on considerable progress in our understanding of these enigmatic cells and how to control them, particularly in bioreactors or after implantation. In the meantime however, recent studies at UCL on basic technologies involved in bioreactor growth of bulk 3D tissues have led us to a new and surprisingly ambitious approach. This involves engineering of the bulk NATIVE material of connective tissues (such as skin, tendon, bone, cornea), towards fabrication of living *tissues* with increasingly biomimetic and subtle micro-nano structure. The process itself involves controlled, rapid assembly of collagen nano-fibrous materials, containing cells (ie. simple tissues), with the same rigour as used routinely in developing synthetic polymers (controlling fibril packing density, diameter and orientation). Key to this new tissue fabrication is the regulated removal of fluid from native gels (termed plastic compression: PC), allowing dense tissue-like constructs to be fabricated in minutes, with controlled, customised properties. This *direct* approach to the fabrication of the natural nano-fibrous fabric of tissues, avoids the conventional dependence on synthetic cell-in-polymer intermediates and long (up to weeks) of synthesis in bioreactor culture. Perhaps still more surprisingly, the speed, control and huge flexibility of PC tissue-fabrication makes it amenable to automated, machine-based application. As a result we have now developed the first level technologies towards bench scale devices capable of fabricating tissues to order (ie customized closely to the patient/surgeon's immediate needs), at the bedside and while-you-wait. It may be, then, that by applying a biomimetic-engineering approaches to fabrication of natural nano-fibrous structure, we may yet exceed the early paradigm of tissue engineering by setting ourselves an even higher ambition: grafts while-u-wait.

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***Speaker Biography
(following page)***

Professor Robert A Brown

CAREER HISTORY

1977-1980	<i>Post Doctoral</i>	Research Assistant	Manchester University
1980-1983	<i>Deputy Head of R & D</i>	Project Scientist	Blood Products Laboratory, Elstree
1984-1992	<i>Deputy Director of Experimental Pathology</i>	Lecturer/ Senior	Institute of Orthopaedics and Royal National Orthopaedic Hospital
1992-2001	<i>Director of Tissue Repair Unit & UCL Tissue Engineering Centre</i>	Reader	University College London (Surgery) Centre for Plastic & Reconstructive Surgery
2002-Present UCL Professor of Tissue Engineering (1st) - & Director Tissue Repair & Engineering Centre, UCL Institute of Orthopaedics at Royal National Orthopaedic Hospital (Stanmore Campus).			

HONORARY POSITIONS & CONSULTANCIES

2003-	<i>Honorary Consultant</i>	Royal National Orthopaedic Hospital
1999-2002	<i>Research Consultant</i>	Intercytex Ltd, Manchester (UK cell therapies Co).
2003-2006	<i>Research Consultant</i>	Teijin Corporation, Japan
2003-	<i>Research Consultant</i>	Ethicon Gmb.
2007-	<i>Research Consultant</i>	Evexar Ltd.
2008-	<i>Research Consultant</i>	The Automation Partnership Ltd.

Recent & Present Membership Of Committees, Organisations, Review Bodies Etc.

FORESIGHT COMMITTEE: Biomaterials.	[2002-3]
European 'Neural Tissue Engineering Consortium' Technical Coordinator.	[2000-4]
SECRETARY to European Tissue Engineering Soc.	(2002-)
DIRECTOR of the -EPSRC- British Tissue Engineering Network	(2001-)
COORDINATOR: -London Tissue Bioreactor Collaboration (TIBS)	(2002-)
IEEE Trans. NANO-BIOSCIENCE; journal editorial board	(2002-)
Tissue Engineering & Regenerative Medicine: editorial Board.	(2006-)
Advisory committee (IFMBE Working Group) 5 th to 8 th IFMBE Conferences in Cell Eng:	(1999-)
UK-China Partnership in 'BIOMATERIALS' Steering Committee.	(2006-)
Chair/Organiser, 2nd TERMIS-EU. Annual Conference, London	(2007)
President Tissue & Cell Eng Society (UK)	(2008-)

GRANT and COLLABORATIVE GRANT SUPPORT OVER PAST 5 YEARS: **approx £4M**

PEER REVIEWED PUBLICATIONS: **~160**

PATENTS: **15**