

Professor Bryan Turner PhD, FMedSci

Professor Of Experimental Genetics

School of Cancer Sciences

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About

Bryan Turner is Professor of Experimental Genetics and Head of the Chromatin and Gene Expression Group in the Institute for Biomedical Research.

He has published over 140 research papers in peer-reviewed biomedical science journals, as well as reviews and book chapters. He is a leading figure in the rapidly developing field of epigenetics. He has written a long-lived book on his specialist research area (Chromatin and Gene Regulation: Mechanisms in Epigenetics, Blackwell Scientific 2001). He has received major grants from Cancer Research UK, The Wellcome Trust, Leukaemia Research Fund and Medical Research Council. He is a regular referee/editorial adviser for Cell, Nature, EMBO Journal and EMBO Reports, amongst others, and on the editorial board of Clinical Epigenetics.

Qualifications

- Fellow of the Royal Society of Chemistry (FRSC 2011)
- Fellow of the Society of Biology (FSB 2011)
- Member of European Molecular Biology Organization (EMBO 2003)
- Fellow of the Academy of Medical Sciences (FMedSci 2000)
- PhD Human Biochemical Genetics, University of London 1973
- BSc (Hons) Biochemistry, University College London 1969

Biography

Bryan Turner carried out his PhD work in the MRC Human Biochemical Genetics Unit at the Galton Laboratory, UCL, following a year (1969-70) as a research technician at the National Institute for Medical Research (NIMR), Mill Hill. He spent 5 years (1973-78) in Clinical Genetics at the Mt Sinai School of Medicine, New York, researching lysosomal storage diseases and carrying out early gene mapping studies. He then spent three years back at NIMR in the Division of Immunology where he attempted to define ways in which monoclonal antibodies (then a relatively new technology) could be used to identify and characterise proteins involved in DNA packaging and function. Antibody-based technologies continued to underpin his research following his move to the Anatomy Department, University of Birmingham, in 1981. He hit on the idea of trying to raise antisera that could discriminate between histones (the major DNA packaging proteins) chemically modified at specific amino acids by cellular enzymes. Over succeeding years, supported by grants from the Cancer Research Campaign (now CRUK), the novel reagents developed by the Birmingham team revealed previously unexpected mechanisms of gene regulation (Cell 69, 375-384, 1992). Antibodies, often made in the way developed here 20 years ago, are now standard research tools in molecular cell biology and a multi-billion pound business worldwide. More importantly, laboratories worldwide took up the issues raised by these modest beginnings and the principles that developed underpin much of the modern science of epigenetics.

Bryan Turner was one of ten co-applicants on the successful bid to the Wellcome Trust that provided funding to build the Institute for Biomedical Research (IBR), into which he moved in 2003.

Bryan Turner's main focus is on research and related activities. Over the past three years he has led the establishment of the Postdoctoral Training and Career Development programme, a College of Medical and Dental Sciences initiative designed to increase awareness of postdoctoral researchers, and their laboratory supervisors, of the wide range of career opportunities open to them. Responsibility for this expanding programme was handed on to Prof Roy Bicknell in 2011, but Bryan Turner continues to take a close interest in the career progression of young researchers.

Teaching

Teaching Programmes

- [BMedSc \(/undergraduate/courses/med/medical-sci.aspx\)](#)
- [MBChB \(/undergraduate/courses/med/medicine.aspx\)](#)
- [BDS \(/undergraduate/courses/med/dental-surgery.aspx\)](#)
- MRes lectures and tutorials

Postgraduate supervision

The Chromatin and Gene Expression Group takes on graduate students with an interest in epigenetics, control of differentiation, gene expression and related areas, particularly as they relate to the growth and behaviour of cancers. The group currently hosts three graduate students registered for PhDs, plus variable numbers of undergraduate and masters students

For a full list of available Doctoral Research opportunities, please visit our Doctoral Research programme listings

Research

RESEARCH THEMES

- How protein modifications influence DNA packaging and control of gene expression.
- Environmental influences on gene function, particularly in the early embryo.
- How epigenetic control mechanisms are disrupted in cancer.

RESEARCH ACTIVITY

Since establishing his research laboratory in Birmingham in the early 1980s, Bryan Turner's research has focused on how the packaging of DNA by proteins (primarily the histones) can influence gene expression (ie. can turn genes on and off). The primary focus, and achievement so far, has been to show that the histones can be modified at specific amino acid residues by an ever growing variety of enzymes. These enzymes attach and remove chemical moieties such as acetate, methyl or phosphate groups, thereby altering the packaging of DNA in subtle ways and potentially influencing how genes are expressed. Using novel antibodies as molecular probes, the Birmingham group demonstrated that modification (by acetylation) of just a single amino acid residue on one of the four core histones could exert a significant effect of gene expression. It was proposed that individual histone modifications usually operate by acting as receptors for non-histone binding proteins that then, in turn, alter DNA packaging and gene expression (Cell 75, 5-8, 1993). The identification of such binding proteins has confirmed this proposition and the Turner group continues to explore ways in which environmental factors, including chemotherapeutic agents, can alter gene expression through changes in the activities of histone modifying enzymes or binding proteins.

The group uses model systems based primarily of human or mouse cells grown in culture, including embryonic stem cells. Experimental; approaches continue to be based on the use of antibodies specific for particular modified histones, primarily chromatin immunoprecipitation (ChIP) and immunomicroscopy. Novel approaches have been developed that allow the group to work with small numbers of cells and thereby to explore environmentally induced changes in the early embryo or in cell sub-populations isolated by flow cytometry. Sophisticated microscopical approaches provide information on the distribution of histone modifications in single cells, allowing comparison of normal and cancer cells.

The Chromatin and Gene Expression Group comprises Bryan Turner, academic colleagues Laura O'Neill and Karl Nightingale, two postdoctoral Research Fellows, three PhD students and a Clinical Scientist. We work closely with other groups in the IBR, including those headed by Constanze Bonifer, Ferenc Mueller (zebrafish), Jon Frampton and Paul Badenhorst (Drosophila). The groups come together for a weekly joint lab meeting.

His research is currently funded primarily by Cancer Research UK

Other activities

- Steering committee of London Chromatin Club (1995 – present)
- Chairman of the Small Grants Committee, CMDS Research Development Fund.
- Consultant for CellCentric (IP management) (2005 – present)
- Regular refereeing for Cell, Nature, Leukaemia and Lymphoma Research and Cancer Research UK
- Editorial advisor for EMBO Journal, EMBO Reports, Biochemical Journal, Chromosome Research, Clinical Epigenetics (past or ongoing)
- Governor of Handsworth Grammar School (1996-2007)

Publications

Recent publications

Turner, B.M. (2011) Environmental sensing by chromatin: an epigenetic contribution to evolutionary change. *FEBS Lett.* 585, 2032-40 (*Epigenetics Special Issue*)

Lin H, Halsall JA, Antczak P, O'Neill LP, Falciani F, Turner BM (2011) Relative overexpression of X-linked genes in mouse embryonic stem cells is consistent with Ohno's hypothesis. *Nature Genetics* 43 (12) 1169-70.

Terrenoire E, McDonald F, Halsall JA, Page P, Illingworth RS, Taylor AMR, Davison V, O'Neill LP and Turner BM (2010) immunostaining of modified histones defines high-level features of the human metaphase epigenome. *Genome Biol.* 11 (11) R110.

Turner BM (2009) Epigenetic responses to environmental change and their evolutionary implications. *Phil.Trans.Roy.Soc.B* 364, 3403-3418

VerMilyea MD, O'Neill LP and Turner BM (2009) Transcription independent heritability of induced histone modifications in the mouse preimplantation embryo. *PLoS ONE* 4 (6) e6086

Turner BM (2007) Defining an epigenetic code. *Nature Cell Biol.* 9, 2-6

Lin, H., Gupta, V., VerMilyea, M.D., Falciani, F., Lee, J.T., O'Neill, L.P. and Turner, B.M. (2007) Dosage compensation in the mouse balances up-regulation and silencing of X-linked genes. *PLoS Biology* 5 (12) e326

Nightingale, K.P., Gendreizig, S., White D.A., Bradbury, C., Hollfelder, F. and Turner, B.M. (2007) Cross-talk between histone modifications in response to histone deacetylase inhibitors: MLL4 links histone H3 acetylation and histone H3K4 methylation. *J.Biol.Chem.* 282, 4408-4416
84.

O'Neill, L.P., VerMylea, M.D. and Turner, B.M. (2006) Epigenetic characterization of the early embryo with a chromatin immunoprecipitation protocol applicable to small cell populations. *Nature Genetics* 38, 835-841

Expertise

How environmental agents, including dietary components and therapeutic drugs, affect the function of our genes; anti-cancer drugs and their effects on stem cells

Alternative contact number available for this expert: [contact the press office \(http://www.birmingham.ac.uk/news/contacts/index.aspx\)](http://www.birmingham.ac.uk/news/contacts/index.aspx)

