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Professor Graham Anderson PhD, BSc

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About

Graham Anderson is Professor of T-Lymphocyte Biology and a Theme Lead in the MRC Centre for Immune Regulation.

Grahams research focuses on T-cell development and thymus development and function, as well as the regulation of T-cell responses in lymphoid tissues. Graham has over 100 publications in scientific journals in the fields of Immunology and developmental biology. He is holder of an MRC Programme Grant as Principal Investigator, and co-investigator on a Programme Grant from ARUK.

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In this video Professor Graham Anderson describes his background and career to date, what drives his research and how it affects the world. He discusses his research work with postgraduates from the UK and overseas - and explains our unique relationship with the University of Tokushima in Japan.

Qualifications

- PhD Immunology 1993
- BSc (Hons) Anatomical Studies 1987

Biography

Graham Anderson gained a BSc (Hons) in Anatomical Studies from the University of Birmingham in 1990. He then studied for a PhD in Immunology as a Wellcome Prize PhD student. He then continued his research into thymus biology as a Wellcome Prize Fellow until 1994, and was appointed to a lectureship in the Department of Anatomy in 1995. Since then, Graham has continued to work in Birmingham studying the role of the thymus in the development of a self-tolerant T-cell pool.

Following project grant support from The Wellcome Trust, and MRC Programme Grant support, Graham was appointed to a Chair in T-Lymphocyte Biology in 1995.

He has acted as as a member of the ARUK Research Subcommittee (2007-2009), as Deputy Chairman (2009-2012) and as a member of the ARUK Programme Triage Committee (2010-2012). Graham is also an active Editorial Board member of 'Journal of 'Immunology' 'European Journal of Immunology' and 'Trends in Immunology', and 'Frontiers in Immunological Tolerance'.

Teaching

TEACHING PROGRAMMES

- **MBChB (/undergraduate/courses/med/medicine.aspx)**
- **MedSci (/undergraduate/courses/med/biomedical-science.aspx)**

Postgraduate supervision

Graham supervises doctoral research students in the areas of thymus biology and T-cell development.

If you are interesting in studying any of these subject areas please contact Graham on the contact deatils above, or for any general doctoral research enquiries, please email: **dr@contacts.bham.ac.uk (mailto:dr@contacts.bham.ac.uk)** or call +44 (0)121 414 5005.
For a full list of available Doctoral Research opportunities, please visit our Doctoral Research programme listings.

Research

RESEARCH THEMES

T-cell biology, Thymus and T-cell development, T-cell Tolerance and Immunity.

RESEARCH ACTIVITY

Overview

Major laboratory interests focus on the mechanisms that regulate the generation of a self-tolerant T-cell pool. These events occur within the thymus, an organ that provides specialised microenvironments to support the development of mature T-cells from their bone marrow derived precursors. In particular, epithelial cells within the thymus provide essential signals to these migrant precursors that regulate their proliferation, commitment, and differentiation. Defects in thymic epithelial cell development and function are known to be linked to autoimmunity and immunodeficiency, making analysis of these cells important in understanding normal immune system development and function. Specifically, we study:

Thymic Epithelial Cell Development And Function

Thymic epithelial cells provide unique environments to support the generation of a self-tolerance T-cell repertoire. Over several years we have focused on the cellular and molecular regulation of thymic epithelial cell development. Major findings include:

- Identification of a bipotent progenitor for cortical and medullary thymic epithelium (Nature, 2006).
- First demonstration of a role for the TNF-Receptor RANK in development of Aire-expressing medullary epithelial cells and the establishment of self-tolerance (J. Exp. Med. 2007).
- Demonstrating the importance of thymic epithelial niches for optimal thymus growth and T-cell output (Blood 2007, J. Immunol. 2008).

T-cell Commitment, Development and Selection

As the thymus has no inherent haemopoeitic stem cell capacity, progenitors must be recruited to the thymus throughout life. We have investigated the mechanisms of thymus colonization and intrathymic T-cell development, and major findings are summarised below:

- Thymus colonisation involves multiple T-cell progenitor subsets that home to the thymus differ in their responses to chemokines (Eur. J. Immunol. 2007)
- Demonstration of a role for CCR9 during intrathymic T-cell development (J. Leuk. Biol. 2007).
- Identification, of a clonal molecular signature of thymus settling progenitors (J.Immunol. 2011)

Lymphoid Tissue Inducer Cells At The Interface Between Tolerance and Immunity.

With Peter Lane's laboratory, our research has highlighted a key role for Lymphoid Tissue Inducer (LTI) cells in the establishment of intrathymic medullary microenvironments that regulate central tolerance. Critically, we have also shown that LTI play an essential role in the generation of memory CD4+ T-cells, and we are currently investigating further the role of LTI and tolerance and immunity. Major findings include:

- First demonstration of a role for RANKL+ LTI cells in the generation of Aire-expressing medullary epithelial cells (J. Exp. Med. 2007).
- Identification of OX40L+ LTI as key regulators of memory CD4+ cells in the gut (J. Immunol. 2009).

Experimental Manipulation of Lymphoid Organs In Vivo

Using techniques based on in vitro manipulation of the thymus in combination with in vivo thymus transplantation assays, we recently defined precursor-product relationships in the developmental pathway of thymic epithelial cells (Nature 2006, J. Exp. Med. 2007). Within Birmingham, we collaborate with several laboratories including those of Peter Lane, Antal Rot, Chris Buckley and Jorge Caamano to study molecular and cellular regulation of T-cell migration and responses in both primary and secondary lymphoid tissues.

Other activities

- Deputy Chair, ARUK Research Subcommittee
- Member, ARUK Programme Grant Triage Committee
- Editorial Board Member, European Journal of Immunology
- Editorial Board Member, Trends in Immunology.
- Editorial Board Member, Journal of Immunology
- Editorial Board Member, Frontiers in Immunological Tolerance.
- Visiting Professor, Institute for Genome Research, Unversity of Tokushima, Japan.

Publications

Roberts N, White A, Jenkinson W, Turchinovich G, Nakamura K, Withers D, McConnell F, Desanti G, Benezech C, Parnell S, Cunningham A, Paolino M, Penninger J, Simon K, Nitta T, Ohigashi I, Takahama Y, Caamano J, Hayday A, Lane P, Jenkinson E, and Anderson G. (2012) Rank signalling links the development of invariant gamma delta T-cell progenitors and Aire+ medullary epithelium. Immunity 36:427-437.

Gibson VB, Benson RA, Bryson KJ, McInnes IB, Rush CM, Grassia G, Maffia P, Jenkinson EJ, White AJ, Anderson G, Brewer JM, Garside P (2012). A novel method to allow non-invasive. Longitudional imaging of the murine immune system in vivo. Blood. 2012 Jan 23. [Epub ahead of print].

Gaspal F, Withers D, Saini M, Bekiaris V, McConnell FM, White A, Khan M, Yagita H, Walker LS, Anderson G, Lane PJ (2011). Abrogation of CD30 and Ox40 signals prevents autoimmune disease in FoxP3-deficient mice. J. Exp. Med. 208:1579-1584.

Desanti-G; Jenkinson-WE; Parnell-SM; Boudil-A; Gautreau-Rolland-L; Eksteen-B; Ezine-S; Lane-P; Jenkinson-EJ; Anderson-G (2011). Clonal Analysis Reveals Uniformity

In The Molecular Profile And Lineage Potential Of CCR9+ and CCR9-Thymus Settling Progenitors. J. Immunol, 186:5227-5235.

White-AJ; Nakamura-K; Jenkinson-WE; Saini-M; Sinclair-C; Seddon-B; Narendran-P; Pfeffer-K; Nitta-T; Takahama-Y; Caamano-JH; Lane-P; Jenkinson-E; Anderson-G (2010). Lymphotoxin signals from positively selected thymocytes regulate the terminal differentiation of medullary thymic epithelial cells. J. Immnol. 185:4769-4776.

Benezech-C; White-A; Mader-E; Serre-K; Parnell-SMl Pfeffer-K; Ware-CF; Anderson-G; Caamano-JH (2010): Ontogeny of stromal organizer cells during lymph node development. J. Immunol. 184: 4521-4530.

Kvell-K; Varecza-Z; Bartis-D; Hesse-S; Parnell-SM; Anderson-G; Jenkinson-EJ; Pongracz-JE (2010): Wnt4 and LAP2alpha as pacemakers of thymic epithelial senescence. PLoS One May 18 5:e10701.

Shakib-S; Desanti-G; Jenkinson-WE; Parnell-SM; Jenkinson-EJ; Anderson-G (2009). Checkpoints in the development of thymic cortical epithelial cells. J. Immunol. 182:130-137.

Roberts-NA; Desanti-GE, Withers-DR, Scott-HR; Jenkinson-WE; Lane-PJL; Jenkinson-EJ; Anderson-G (2009). Absence of thymus crosstalk in the fetus does not preclude haemopoietic induction of a functional thymus in the adult. Eur. J. Immunol. 39:2395-2402.

Bekiaris V, Gaspal F, Kim MY, Withers DR, Sweet C, Anderson G, Lane PJ. (2009). Synergistic OX40 and CD30 signals sustain CD8 T-cells during antigenic challenge. Eur. J. Immunol. 39:2120-2125.

Withers DR, Jaensson E, Gaspal F, McConnell FM, Eksteen B, Anderson G, Agace WW, Lane PJ. (2009). The survival of memory CD4 T-cells within the gut lamina propria requires OX40 and CD30 signals. J. Immunol. 183: 5079-5084.

Expertise

The development of the immune system; the organs in the body that support the generation of a range of cells, including lymphocytes, that are responsible for fighting infections

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