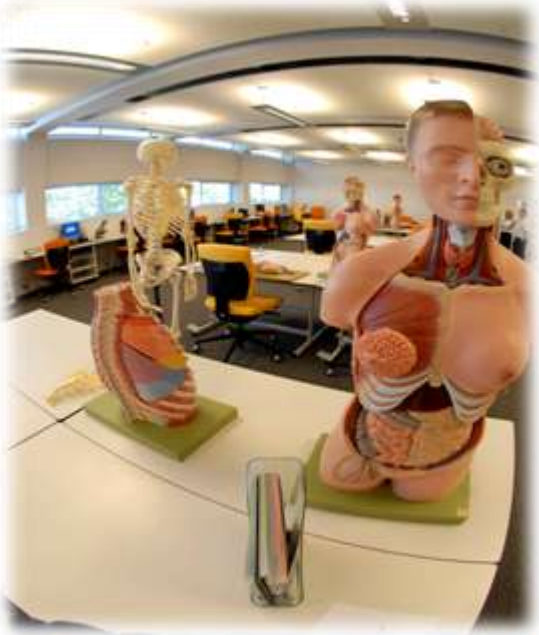
LANCASTER UNIVERSITY

Lancaster University has high ratings in each of the UK's major university league tables: The Times (12th), the Guardian (7th) and the Complete University Guide (9th). Overall, 91 percent of final year students at Lancaster say they were satisfied with their course. The Sunday Times reports that an above-average proportion of students obtain graduate-level jobs (74 percent).
Lancaster University is a member of the N8 Group which focuses on five areas of research: Ageing and Health; Energy; Molecular Engineering; Regenerative Medicine, and Water. The group includes the top 8 most research intensive universities in the North of England.
Lancaster University is a member of the 1994 Group of universities which were established to promote excellence in research and teaching. More than £350m has been invested into the campus since 2002, creating new academic facilities, sports and social facilities and improved teaching space. The new practical laboratories in the Faraday Building hold up to 100 students and contain all of the equipment needed for practical sessions. **The new £1.6m Clinical Anatomy Learning Centre provides students with a state of the art learning resource to study the human body using detailed anatomical models, high-quality DVD screen-based imaging.**

Lancaster University, the Lune Valley, Morecambe Bay and the Cumbrian Fells.



Images above of the official opening of the Clinical Anatomy Learning Centre by Chief Medical Officer: Professor Sir Liam J. Donaldson 23/02/2007.

THE FACULTY

The Faculty's strategic aim is to produce excellent research that is both interdisciplinary and translational – it translates findings into practical applications for human and societal benefit. Major research topics include study of end-of-life care, disability, mental health, epidemiology, neurodegenerative disease, cancer and developmental biology, immunology and microbiology. The Faculty interacts with other parts of the University that carry out related research. It has strong links with NHS and social care partners, health-related industries and the voluntary sector. The Clinical Research Hub was established in 2010 to increase NHS/University collaborative research in Lancashire and Cumbria.

Clinical Research Hub

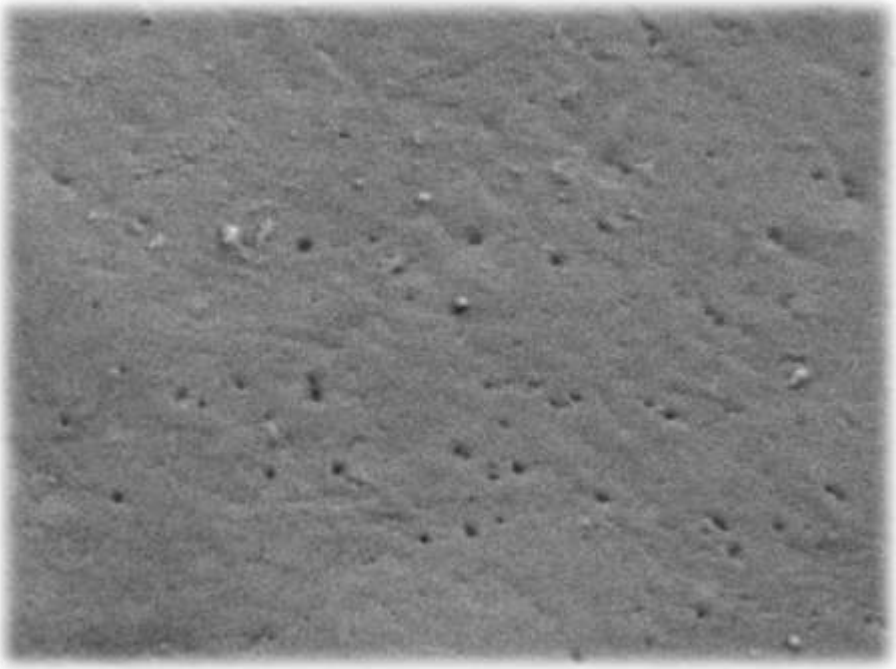
This includes working with NHS partner Trusts as well as with other key organisations including the NIHR Cumbria and Lancashire Comprehensive Local Research Network (CLRN) and the NIHR Research Design Service for the North West (NIHR RDS NW).

THERE ARE FOUR DIVISIONS IN THE FACULTY OF HEALTH AND MEDICINE

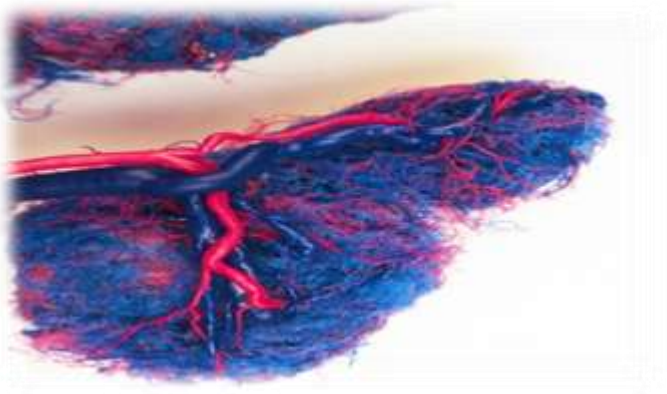
TWO DIVISIONS of the FOUR conduct basic medical science research. Together they entered the 2008 RAE in the Unit of Assessment Allied Health Professions topping the national league table in that area.

Lancaster Medical School is the newest grouping at Lancaster University it was formed to deliver the MB ChB degree. A collaborative venture with the Universities of Liverpool, Cumbria and Central Lancashire and Local NHS trusts. Research in the Division spans all aspects of Medicine including basic biomedical research. It is *where anatomy research is centred.*

(image below: Scanning Electron Micrograph of endothelial caveolae)



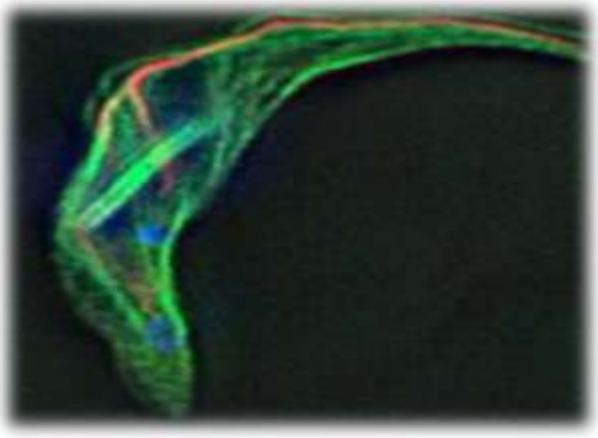
(image below: vascular cast of placental cotyledon)



The Medical School also conducts research in sociology of medicine, medical education, medical statistics and epidemiology. There are 20 full and part-time academic staff.

The Division of Biomedical and Life Sciences (BLS) with more than 21 academic staff is responsible for delivering undergraduate and postgraduate programmes of research in this area in the Faculty. The main focus of BLS research is on fundamental molecular and cellular aspects of human disease. The research is grouped around core themes: Cancer Biology, Neurodegenerative Disease, Microbiology, Cell Biology and Biochemistry.

(*image below: Trypanosome*).



LANCASTER MEDICAL SCHOOL

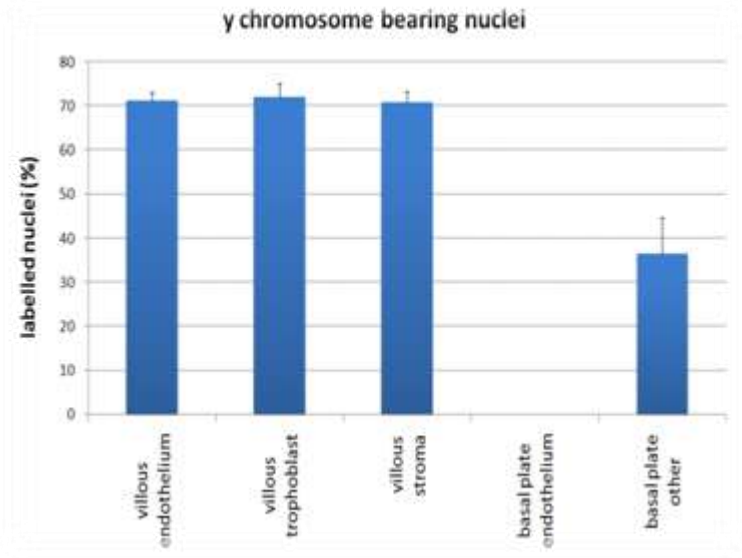
Lancaster Medical School (LMS) scientists pursue modern approaches to health and medical research which demand expertise from scientists with depth of knowledge in specific disciplines http://www.lancs.ac.uk/shm/med/research/ . LMS comprises 3 active research foci.
DIG The Development and Immunology Group where anatomists work alongside colleagues from other disciplines,
IDR Medical Sociology and CME the Centre for Medical Education,
CHICAS (Combining Health Information, Computation and Statistics).

Clinical Anatomy Learning and Biomedical Science practical classes take place in the Faraday Building. BLS undergraduates include a number who go on from the accredited degree programme to study medicine and postgraduate medical research. The Lancaster Medical School acts as a catalyst to promote interactions and to enhance links with the NHS Trusts and to develop translational research in the region.

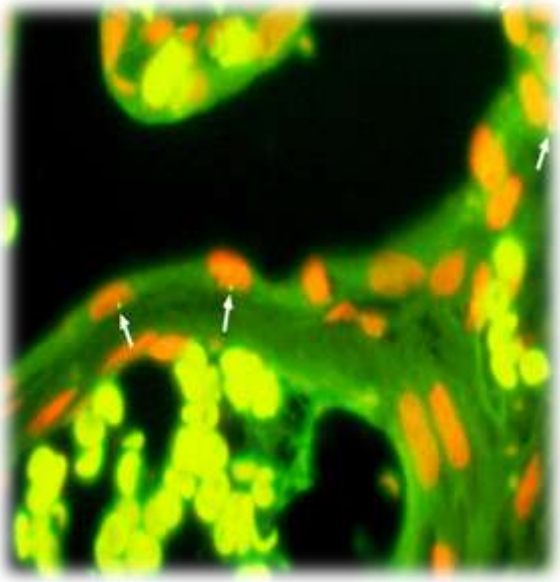
DIG main areas of research include:

Reproductive Immunology and Pathology

The role of the innate immune system (Dr Gill Vince) the allo-epi-endothelium of the human placenta, and the pathology of pre-eclampsia and the cord illustrated

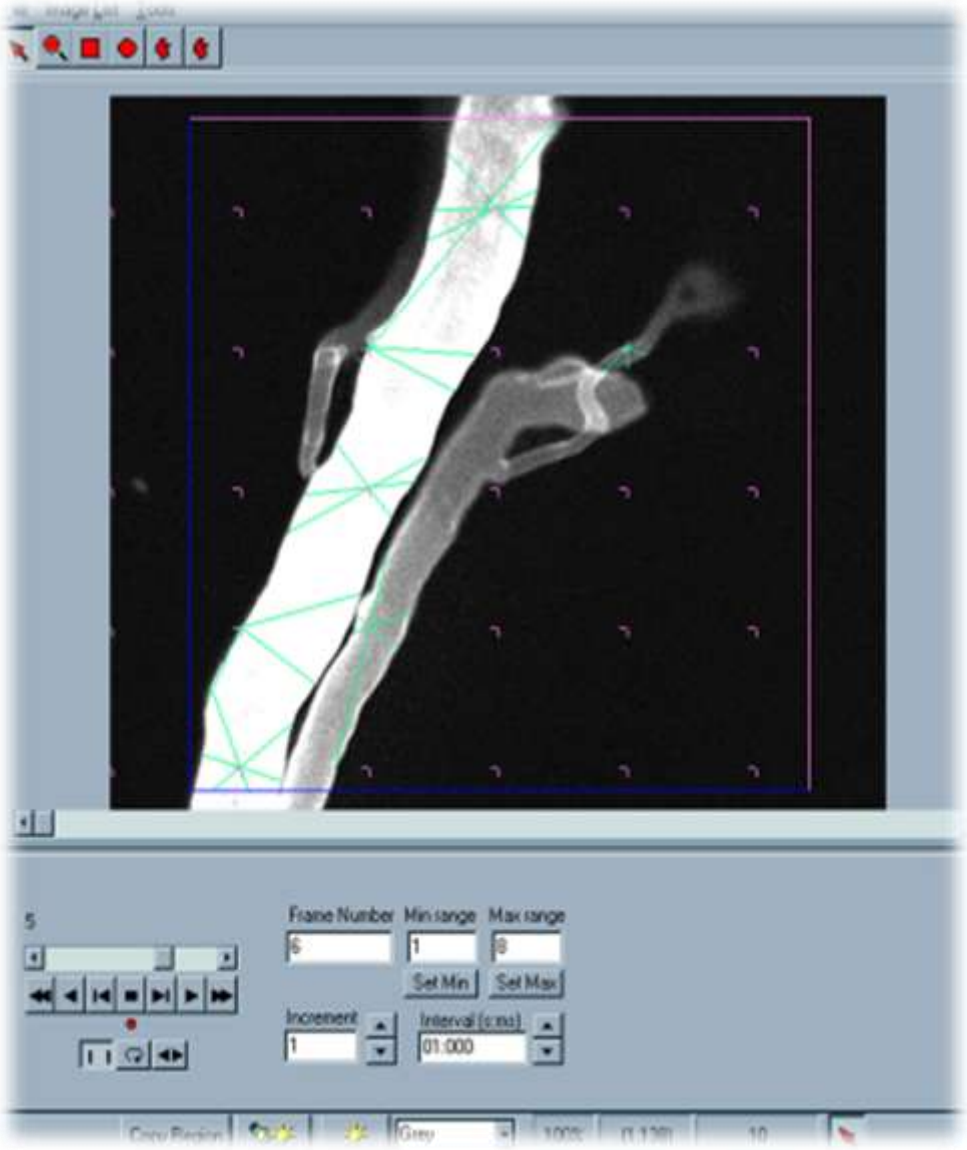


Professor Colin Ockleford: Bar Chart of counts of in situ hybridisation labelled boy baby syncytiotrophoblast nuclei



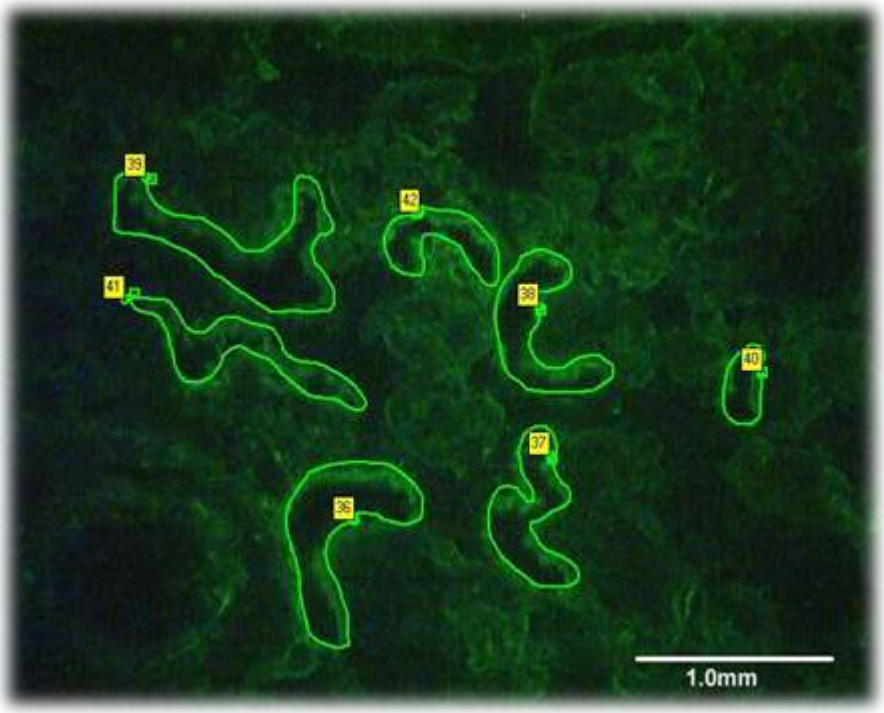
FISH image of labelled y chromosomes

umbilical cord stump regression



Professor Colin Ockleford and Dr Gill Vince have studied aspects of reproductive health in collaboration with labs in Liverpool and Leicester. Colin has undertaken development of methods to study placental quantitative morphology using fluorescent microcasts of villous vasculature (image above: digital-stereology). His group recently described an hemi allo-epi-endothelium that lines the basal and chorionic plate surfaces of the intervillus space in the placenta a layer with a composition that changes in pre-eclampsia. Their results are inconsistent with the classical embryological germ layer theory and suggest a role for maternal endothelial progenitor cells in pregnancy.

Images below: Collaboration with Leicester University: Colin Ockleford, John Ahenkorah and Simon Byrne Laser microdissection-capture and nano- gold labelling studies of cytokeratin 18 in healthy and pre-eclamptic pregnancies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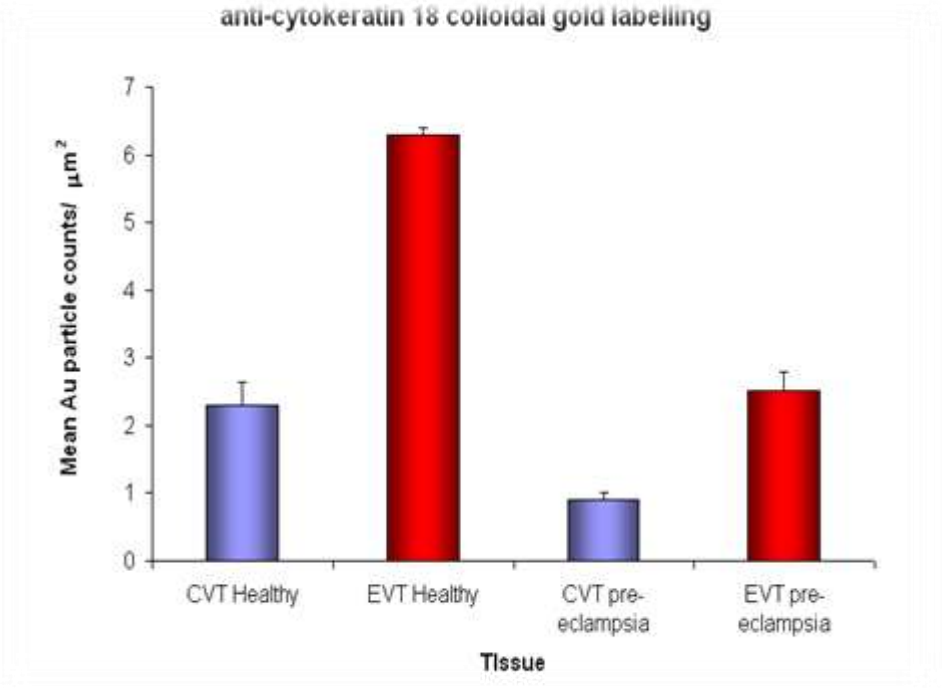
anti-cytokeratin 18 colloidal gold labelling
Mean Au particle counts/ µm²
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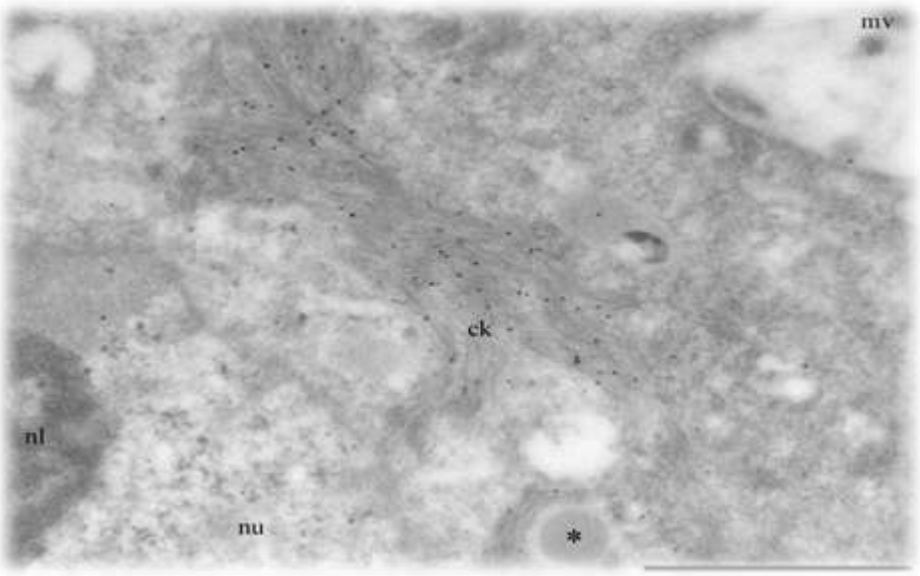
CVT Healthy
EVT Healthy
CVT pre-eclampsia
EVT pre-eclampsia
Tissue



Dr Rachel Isba has interests in vaccination and malarial immunopathology.

Malarial Immunology **(Dr Rachel Isba), Sudden Infant Death and genetic immunological and microbial hypothesis in pathology (Professor Jim Morris).**
Musculo-skeletal disease **ochronotic arthropathy in alkaptonuria (Dr Adam Taylor), diagnosis of pathologies of the knee (Professor John Goodacre), Development of the costamere in dystrophic muscle (Professor Colin Ockleford), Psychophysical approaches to radiological interpretation (Professor David Manning), Ultrasonography (Gail Jefferson, and Gareth Bolton).**
Cancer Biology **DNA damage response pathways integrated with the cell cycle machinery and the development of cancer (Dr Howard Lindsay and Dr Elaine Taylor).**

Musculoskeletal Research

Dr Adam Taylor, Lecturer in Anatomy, and clinical researcher Dr Marwan Bukhari have research interests in bone pathology. They investigate the turnover and maintenance of bone and cartilage, the implications that exercise has on these tissues and the pathologies associated with bone and cartilage; particularly Osteoarthritis, Rheumatoid Arthritis and Osteoporosis. Adam is a member of the Bone Research Society, Osteoarthritis Research Society International, the Anatomical Society and the American Society for Bone and Mineral Research. http://www.research.lancs.ac.uk/portal/en/people/adam-taylor%28833b737c-bf8e-4ef8-9eff-2b2864e24d6b%29.html

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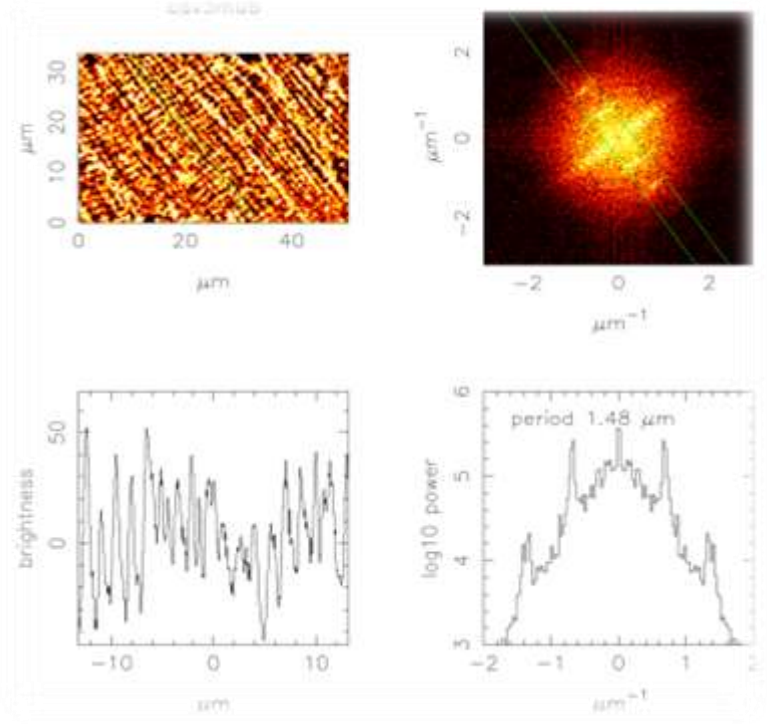
Professor John Goodacre (image: left) is a Musculoskeletal Scientist and Honorary Consultant in Rheumatology at the Blackpool Teaching Hospitals NHS Foundation Trust, and he leads the NIHR for Lancashire and Cumbria Musculoskeletal Specialty Group. He is also Clinical Director of the NIHR Cumbria & Lancashire Comprehensive Local Research Network. He undertakes a variety of advisory and leadership roles for the NIHR, as well as UK and EU research councils and medical research charities.



Muscle costamere

Professor Colin Ockleford has a research interest in the mechanical links across the muscle fibre membrane (image left: shows his Fourier analysis of the costamere). He has clarified the role of caveolin-3 in skeletal muscle fibre differentiation and pathology of limb-girdle muscular dystrophies.

Psychophysics

Professor David Manning is an imaging scientist. He uses psychophysical techniques to investigate the interpretation and reporting of radiological images David Manning's research interests centre on the perceptual

factors involved in medical image interpretation. Experimental approaches to evaluating diagnostic performance in radiology must always involve observer studies and the most rigorous methods available must then be applied to the decision data. Signal detection methods have been the analysis of choice but data from eye-tracking have also made contributions to numerous investigations of radiological error and the development of expertise. Recent studies using these techniques have proved their value in a European training programme for CT colonography, a low invasive radiological alternative to endoscopic colonoscopy investigating pre-cancerous polyps in the large bowel. Current work is focused on quantifying the diagnostic effects of breast compression in mammography.

DNA Replication

Dr Howard Lindsay is a cancer biologist with research interests in mechanisms that maintain genome stability, particularly the cellular responses to DNA damage and DNA replication stress. Dr Elaine Taylor is similarly interested in genome stability, particularly the role of post-translational modification in coordinating the cellular response to DNA damage and DNA replication stress. The primary aim of the cancer biology group is to obtain a greater understanding of the way DNA damage response pathways are integrated with the cell cycle machinery and how failure of these pathways can lead to the development of cancer.

IDR research interests include:

Quality assurance and professionalism in medical education (Professor Anne Garden), innovation in medical education admissions (Dr Karen Grant), public health and medical education (Dr Rachel Isba), and medical education elearning (Dr Fiona Curtis). Social science studies on: medical ethics, science and technology in clinical practice, disaster and recovery, health policy and politics, and the use of qualitative methods in health research (Dr Laura Machin, Dr Maggie Mort, Dr Dawn Goodwin. The health and social consequences of the 2001 UK foot-and-mouth epidemic (acquired and archived by ESRC as a classic study), understanding expertise in anaesthesia, and the social construction of evaluation in tele-medicine and tele-health care. The interdisciplinary research IDR group is an inclusive group of medical educators with clinical, natural science and sociology backgrounds and medical education research as a main theme. IDR studies of clinical

practice draw upon anthropological research methods and various – sometimes critical - bodies of social science literature.
Dr Maggie Mort is a Reader in sociology with interests in Science & Technology Studies that include: technological change, telemedicine and telecare, innovation in health science and technology, health policy and politics (image relates to her highly regarded foot and mouth outbreak research), disaster and recovery studies. She works largely with ethnographic and participative methodologies.

Dr Dawn Goodwin is a sociologist. Her work has concentrated on ethnographic studies of clinical practice and draws primarily on Science & Technology Studies, Ethnomethodology and Workplace Studies, and Medical Sociology. Research topics she is currently interested in include learning about bodies - the intersection of anatomical, technological and embodied knowledge; the role of the home environment in supporting people with dementia and the construction of patient safety in general practice.
Dr Laura Machin is an ethicist with recent publications on stem cells from cord blood and IVF, Currently she is investigating moral aspects of the donation, and use, of cadavers in medical education with Social Scientist Dawn Goodwin and Anatomist Adam Taylor. She also researches the ethical aspects of medical self-discharge.
Dr Karen Grant undertakes collaborative research in the field of rational drug design at the interface of biology and chemistry. Her research focuses on novel drug target identification, characterisation and validation; assay development for drug screening; design, discovery and optimisation of protein kinase inhibitors in collaboration with organic synthetic chemists and structural biologists.
Medical Education Research
Professor Anne Garden is author of two books on paediatric and adolescent gynaecology. She is also a leader in Quality Assurance in Medical Education, having served as a QAA Subject Specialist Reviewer

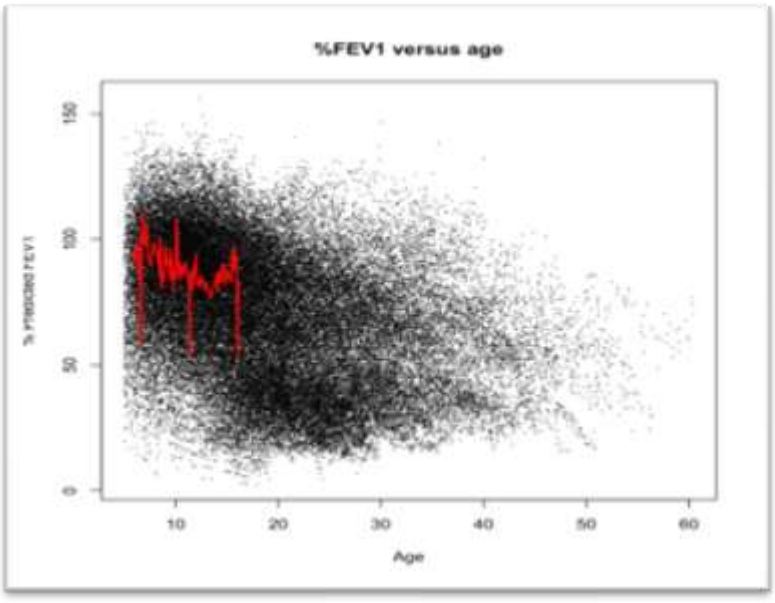
for Medicine from 1998 to 2001. Anne is now one of the Team Leaders for the GMC's Quality Assurance in Basic Medical Education (QABME) programme and a member of Council of the newly formed Academy of Medical Educators. Her main interest in Research is in Professionalism in Medical Education. She led the successful bid for a Centre for Excellence for Learning and Teaching for Developing Professionalism while at Liverpool. She is called on as a medical education consultant to review the medical curricula of a network of Caribbean and Bahamian Medical Schools and has recently led the setting up of the new Medical Degree at Lancaster University.
Dr Karen Grant is pursuing research in medical education with an emphasis on evidence-based admissions procedures and how theories of learning apply in a medical education context.
Dr Fiona Curtis's main research interest is e-Learning in Medical Education.
Other active contributors to Medical Education Research are Dr Gill Vince, Dr Rachel Isba and Dr Laura Machin.

Images below: 1st medical Graduation ball 2011 and 1st year anatomy class.

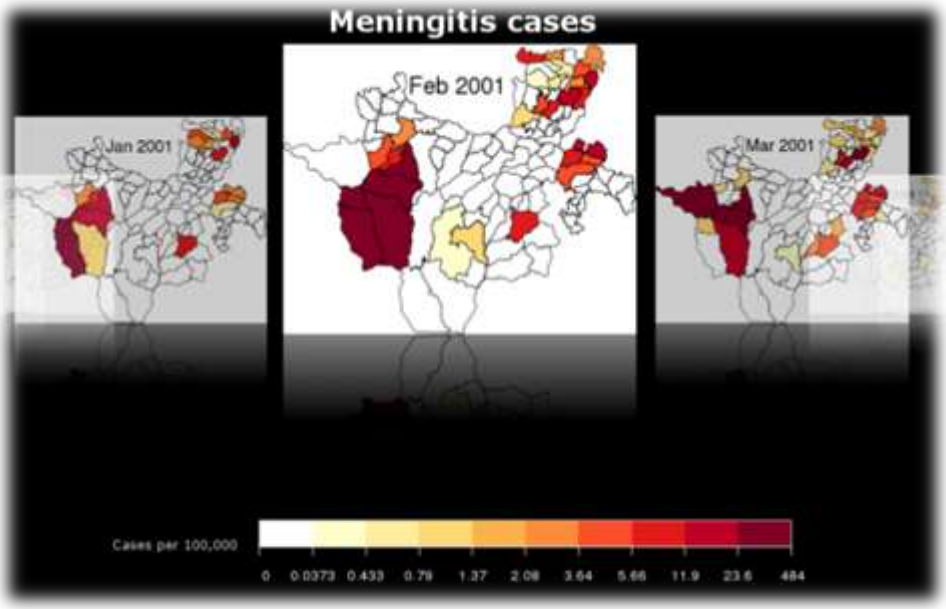
CHICAS research topics include:

Study of spatial and longitudinal data analysis, environmental and tropical disease epidemiology and pre-eclampsia (Professor Peter Diggle). The risk of childhood cancer from high voltage power lines and effects on soldiers of chemical weapons tests (Dr Tom Keegan). Disease risk-mapping the African Programme for Onchocerciasis Control strategies for meningitis in sub-Saharan Africa (Barry Rowlingson). Research in the Combining Health Information, Computation and Statistics Group is headed by Distinguished Professor Peter Diggle. Scientific staff members include Dr T. Keegan, Barry Rawlingson, Anna Hart, Dr R.Ramis, Dr O.Grigg, Dr B. Taylor. CHICAS is concerned with development and application of novel statistical methods to problems in biomedical and health sciences. Current methodological research interests within the group include spatial and spatio-temporal statistical models and methods, longitudinal data analysis and latent graphical modelling. They have research links with many clinical and academic colleagues in a wide network of institutions. Current application areas include: human and veterinary epidemiology; real-time disease surveillance; environmental exposure measurement; tropical disease prevalence mapping; longitudinal studies in cardio-thoracic surgery, cognitive psychology, mental health and renal medicine and reproductive anatomy and pathology.

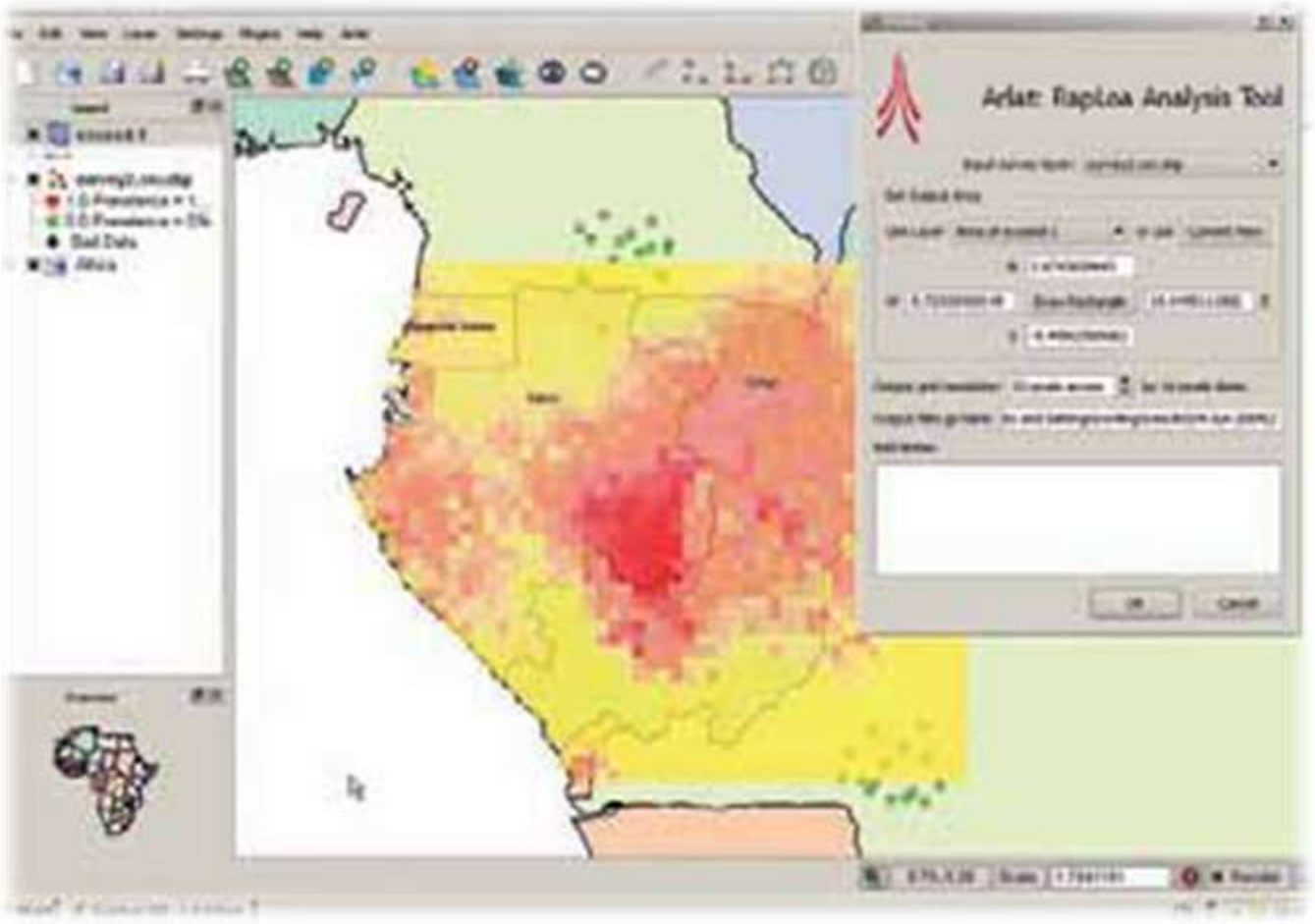
Environmental Epidemiology
deals with issues of environmental exposures and their health effects. This covers determinants of the distribution of disease, as well as the environmental conditions and hazards that may pose risks to human health. Identifying and quantifying the adverse health-effect of exposures to environmental contaminants assists the conduct of risk assessment and surveillance and understanding of disease aetiologies. Current applied projects in this area include studies of adverse birth outcomes (with University of Newcastle-upon-Tyne), campylobacter (with Preston Public Health Laboratory and Liverpool University Veterinary School) and childhood meningitis with Alder Hey Children's NHS Foundation Trust.



Spatial Epidemiology
is related to the prediction of disease prevalence. demographic, environmental, behavioural or genetic risk-factors and infectious transmission processes. A range of applications in disease mapping, geographic correlation studies and disease clustering are ongoing. The advances in geographic information systems, in statistical and geostatistical methodology, as well as the increasing availability of high-resolution spatially or spatio-temporally referenced health and environmental quality data enable a fuller understanding of observed patterns of spatial variation in disease incidence and prevalence. Spatial statistical modelling is especially useful in developing country settings, where the lack of census or registry data requires the formulation, fitting and validation of spatial stochastic models for spatial interpolation. In collaboration with the Johns Hopkins University School of Public Health, Baltimore, WHO Tropical Disease Research, Geneva, and the International Research Institute for Climate and Health, New York CHICAS are modelling spatio-temporal incidence patterns for a variety of endemic tropical diseases including Loa loa, malaria and meningitis.



Microarray data analysis



has been an active area of research since technology emerged in the late nineteen nineties. A basic objective in many microarray experiments is to determine sets of differentially expressed genes, which may provide clues to genetic pathways. The focus of CHICAS work in this area is to adopt a model-based approach to the analysis of gene expression data, in which multi-dimensional questions of scientific interest are addressed by computing predictive probabilities, rather than through the more traditional approach of significance testing.

CHICAS Model Impact Case Study: Targeting treatment for tropical disease

- River blindness (onchocerciasis) is a major health problem in wet tropical regions.
- The African Programme for Onchocerciasis Control (APOC), co-ordinated by the World Health Organisation across 19 nations, seeks to reduce the public health burden by treating whole communities with Ivermectin, a drug that fights the parasites that cause river blindness.

- More than 30 million people have been treated. Ivermectin can cause severe, sometimes fatal, adverse reactions when given to people who are also heavily infected with ‘eye worm’ (Loa loa). APOC therefore takes precautions in areas of high eye worm prevalence before mass treatment with Ivermectin, and spatial statistical modelling by Professor Peter Diggle is helping with this by enabling treatment to be better targeted

National Research Roles

Professor Goodacre is a member of the Medical Research Council (MRC) College of Experts.
Professor Diggle is chair of the MRC Strategic Skills Fellowships Schemes panel and a former member of the Medical Research Council's Population and Systems Medicine Board.
Professor Ockleford is a visiting Professor at the University of Leicester where he is head of the laboratory for Developmental Cell Sciences. He is a member of the Education, Finance, Meetings and the Research Committees and is on the Council of the Anatomical Society.

International Research Dimensions

All of the research divisions are active internationally helping to establish Lancaster in the international league tables at a high level for a relatively small University less than 50 years old. It is ranked in the top one percent of universities in the world, listed at 131 in the Times Higher Education international table and 153 in the QS World University Rankings.

Professor Diggle is an Adjunct Professor of Biostatistics at the Johns Hopkins School of Public Health, Adjunct Senior Researcher at Columbia University International Research Institute for Climate and Society, Professor in the University of Liverpool Department of Epidemiology and Population Health, and a trustee for the Biometrika Trust.

Professor Goodacre is a member of EU Framework Programme research review panels, and UK advisor to the Government of Bulgaria on its national strategy for biomedical science and clinical research.

Dr Maggie Mort has extensive experience in international interdisciplinary research projects including coordination of the EC FP7 Collaborative Research project: Ethical Frameworks for Telecare Technologies for older people at home (EFORTT).

Professor Ockleford has reviewed grant applications for the Croatian Ministry of Science as well as for major UK and US granting bodies such as NSF. His group has had extensive research links over a 10 year period with the Chinese Academy of Natural Sciences funded by the CAS, the Royal Society and the Welcome Trust. He is also active through European collaborations.

Scholarship in LMS

Alongside curriculum, research provision and postgraduate thesis review Faculty have carried out a wide range of refereeing and editorial work for granting bodies, charities and academic journals. The latter including roles as:

Founding co-editor and member of the Advisory Board for the Journal Biostatistics

Member of the Editorial Board of Journal of Epithelial Biology and Pharmacology

Member of the Editorial Board of Reproduction and Contraception

Member of the Editorial Board of Immunobiology

Former member of the Editorial Board of the Journal Placenta
Former Receiving Editor and member of the Editorial Board of Journal of Anatomy
Former member of the Editorial Board of the European Journal of Morphology

Image below: Ruskin Centre Lancaster University

Third Mission

The LMS has a strong interest in promoting third mission activity and this spans a nested contribution in local, regional, national and international arenas where expertise is harnessed for societal benefit. Consequences of the hard work of a small group setting up a new Medical School are enhanced medical opportunities and training in North Lancashire and Cumbria illustrated by our roles in the Research Design Service (Dr Fanshawe), the CLRN and the Clinical Research Hub (Professor Goodacre).
Achievements range from "The Health and Social Consequences of the 2001 UK Foot and Mouth Disease Epidemic" a highly rated Department of Health Report by Maggie Mort to health services research for patient benefit (Dawn Goodwin).
Through his expertise in reproductive and developmental pathology Colin Ockleford has acquired extensive responsibilities. His knowledge of the human materno-fetal interaction and the effects of toxins on reproductive and developmental processes has been in demand in

advisory roles ahead of the introduction of the "The Plant Protection Products (Sustainable Use) Regulations", 2012 by EU member states including the UK.
An extract from the relevant EU directive:
"The purpose of this Regulation is to ensure a high level of protection of both human and animal health and the environment and at the same time to safeguard the competitiveness of Community agriculture. Particular attention should be paid to the protection of vulnerable groups of the population, including *pregnant women, infants and children*. The precautionary principle should be applied and this Regulation should ensure that industry demonstrates that substances or products produced or placed on the market do not have any harmful effect on human or animal health or any unacceptable effects on the environment."
A major recent piece of work published in 2012 is in the form of a ministerial report from a short life working group the Pesticides Adverse Health Effects Surveillance Schemes (PAHES). The group reviewed our national regulatory framework and compared this with provisions internationally then made suggestions to ministers as to how aspects of the sustainable use directive can optimally be conformed with in this area.
Relevant Board and Committee Memberships: Colin Ockleford

Independent scientific expert Member European Food Safety Authority External Review Working Group

Independent scientific expert Member European Food Safety Authority Plant Protection Products Committee

Independent scientific expert Member of the DEFRA Ministerial Advisory Committee on Pesticides

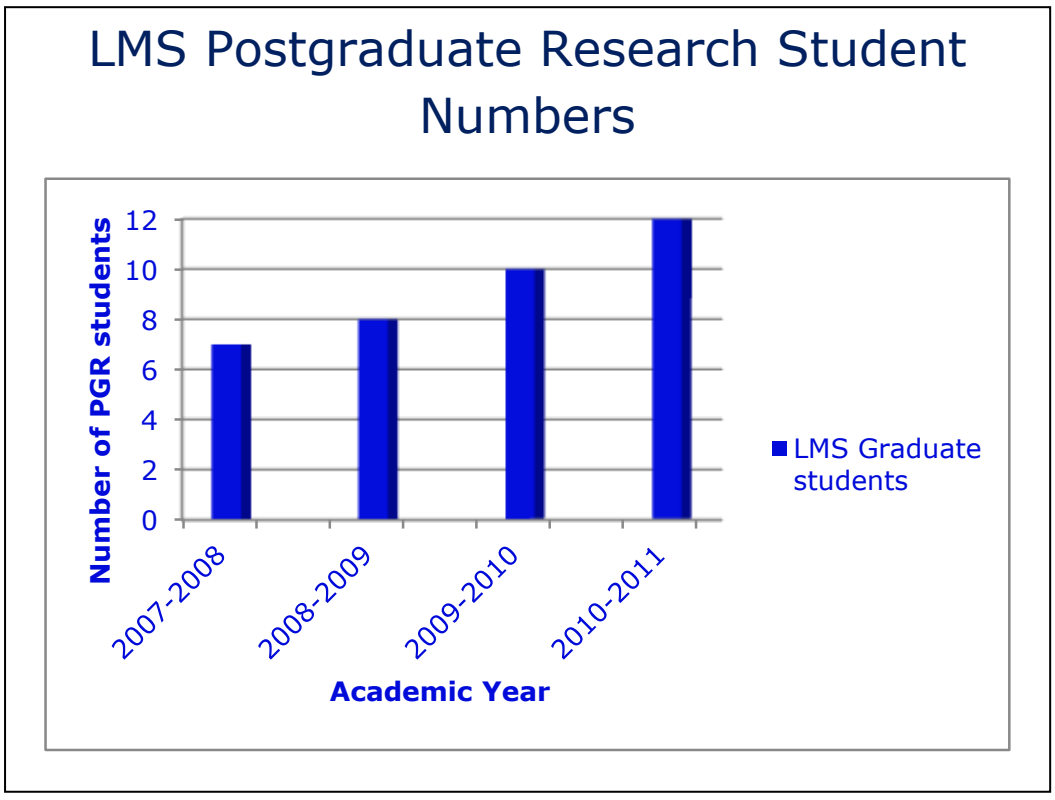
Former Independent scientific expert Member of Pesticides Safety Directorate Medical and Toxicology Panel

Independent scientific expert Member of the Poisons Board Home Office Ministerial Advisory Body

Independent scientific expert Member of the Health and Safety Executive HAPPI Group.

Lancaster Medical School Research Degrees

Postgraduate and Intercalated Research Degrees
MPhil/PhD Medicine
MSc (research) Medicine
MPhil/PhD Medical Statistics and Epidemiology
Doctor of Medicine (MD)
Taught Programmes
PG Certificate in Clinical Research



Director of Postgraduate Studies Professor Colin Ockleford
Tel +44 (0)1524 594515
Email fhm-pg-admissions@lancaster.ac.uk
www.lancaster.ac.uk/fhm/med/