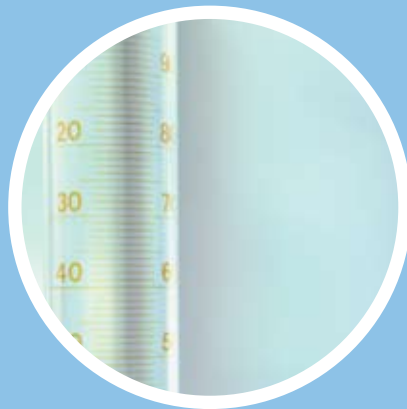


Scottish Academic Health Sciences Collaboration

A World Leading Clinical Platform for
Patient Orientated Research

Scotland has a world leading position in translational medicine - harnessing the collaborative power of world class research and clinical expertise with an ability to deliver translational projects which meet research, clinical and commercial objectives.

Scotland is the partner which offers effective progress from *'bench to bedside'*.



Scottish Academic Health Sciences Collaboration (SAHSC)

Sir David Cooksey's 2006 report **"A Review of UK Health Research Funding"** emphasised the need for government investment targeted at promoting the translation of laboratory discoveries into clinical development and the adoption by the NHS of new interventions provided by the clinical development pipeline. The Scottish Academic Health Sciences Collaboration (SAHSC) will serve as a strong catalyst to address these priorities as well as ensuring that Scotland's researchers are provided with the



best possible opportunity to bring in external research funds from government, charity and commerce.

The SAHSC establishes a world-leading clinical research platform for patient oriented research. It builds on the close NHS Scotland and academic partnerships already existing in Aberdeen, Dundee,

Edinburgh and Glasgow and through these to other Scottish Health Boards and universities. It will be supported by significant re-investment in NHS research infrastructure in key areas such as scanning capability, tissue banking, clinical research support and IT capacity. The SAHSC will also provide a harmonised and streamlined system through NHS Research Scotland (NRS) for contracting and costing of clinical studies.

The collaboration will involve the creation of up to 250 multi-disciplinary posts across partner organisations in the NHS dedicated to supporting clinical research. This will include increasing the availability of radiologists and radiographers to facilitate studies requiring imaging and screening, increasing pharmacy support and numbers of skilled research nurses available to assist in clinical research protocols, that are centred around Scotland's Clinical Research Facility infrastructure.

Contemporary clinical research studies are providing new challenges including those associated with the design and

evaluation of complex drug interventions. Scotland already has research leadership in the areas of clinical trial design and evaluation. The SAHSC will enhance this by providing additional resource to enable clinical research studies to be robustly optimised to maximise their potential for patient health benefit.

Scotland has an enviable reputation for clinical records linkage. This serves as a key resource in the pathway of translational medicine by helping to establish the feasibility of undertaking clinical studies in patient populations. Through the SAHSC, Scotland's advantage in this area will be enhanced by coordinating resources to support local and national capabilities in informatics and e-Health as well as creating additional capacity associated with tissue biorepositories and disease biomarker identification.

With partner organisations coming together to create a single platform, the SAHSC offers a truly world-class resource for industry and academia engaged in translational medicine research that will enhance our nation's health and wealth.

Take advantage of our investment in state-of-the-art research facilities with direct access to the clinic, including cutting edge imaging infrastructure.

“Ongoing large scale investment in clinical infrastructure and informatics will enable Scotland as a “single site” to offer significant advantages in the conduct of multi-centre trials, especially in automated follow up using electronic health records.”

Professor Chris Packard, R&D Director, NHS Greater Glasgow & Clyde

Speed drug development by accessing cross-discipline expertise in a collaborative environment that includes Universities and the national health system.

“Scotland has led the way in establishing an effective mechanism to rapidly move new therapies from bench to bedside, through effective collaboration between academic research groups in universities and clinicians within the NHS working together for the benefit of patients.”

Professor Steven Heyes, Professor of Translational Medicine, University of Aberdeen

Take advantage of a well characterised patient population and comprehensive medical information.

“The spirit of collaboration across Scotland and between Clinician Scientists and the NHS has been remarkable - it has allowed us to create a family-based bio banking resource that is unrivalled in Europe. Most importantly the support of the people of Scotland for scientific research, allied to a stable population and ability to follow cohorts of patients longitudinally, puts us in a unique position for health and wealth creation.”

Professor Andrew Morris, Professor of Diabetic Medicine, University of Dundee

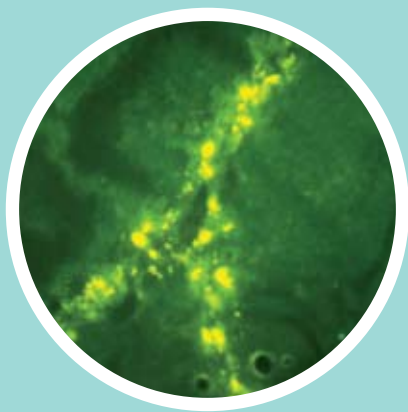
Life Sciences Research Capabilities

Take advantage of world class translational expertise in key therapeutic areas.

Scotland has always been at the fore-front of medical discoveries – from anaesthesia and antiseptics, through MRI to Dolly the sheep! Scotland today is no exception, home to innovation, dynamic product development and meeting patient and industry needs – Scotland is the ideal partner for undertaking early clinical exploratory studies.

Translational medicine in Scotland can predict drug safety and efficacy in man by:

- Accelerating your understanding of the relationship of a drug target to human disease.
- Improving experimental models and developing biomarkers that better translate to humans.
- Developing new biomarkers in humans to objectively measure drug responses.

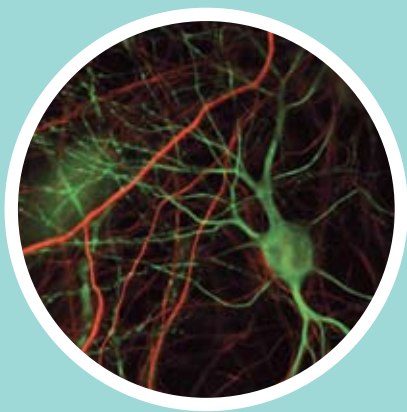


Areas of strength are cardiovascular and metabolic disease, inflammation, neuroscience, oncology, regenerative medicine and reproductive medicine where Scotland has significant academic and clinical expertise.

Some key examples:

- **Generation Scotland** is a unique partnership between the Scottish University Medical Schools, Biomedical Research Institutes, the NHS in Scotland and the people of Scotland. It aims to create a family and population-based genetic information bank to identify the genetic basis of common complex diseases.
- **The Translational Medicine Research Collaboration (TMRC)** is a collaboration between US pharmaceutical giant Wyeth, four Scottish universities, NHS Scotland and Scottish Enterprise. The partnership is a world first in translational medicine, combining commercial, clinical and academic expertise to improve understanding of a wide range of diseases.
- Some of the world's most prominent cancer studies are being conducted at the **Cancer Research UK Beatson Laboratories** in Glasgow.

Life Sciences Research Capabilities



- A major investment of £60 million in a world-leading centre for excellence in regenerative medicine and stem cells is being built at **Edinburgh BioQuarter** and will open in 2010. Research will span basic mechanisms of stem cell regulation, to translational research, and to provide rigorous proof of principle for stem cell therapies.
- **Dundee University** is collaborating with a consortium of five of the world's leading pharmaceutical companies in one of the largest-ever industrial research deals originally worth £16 million, and recently renewed for another 4 years. Research is wide ranging but focuses on cancer, infectious diseases and diabetes.
- Edinburgh is a major centre for genomics and bioinformatics research, with world-class capabilities at **Edinburgh University, Roslin Institute** and the commercially focused **Division of Pathway Medicine**.
- World leading medical imaging research groups in Aberdeen with a long track record in positron emission tomography (PET). **The John Mallard Scottish PET Centre** is a state-of the art facility which has grown to encompass both clinical and pre-clinical PET.
- Nationally Scotland's universities through **SINAPSE** are creating a shared, standardised environment for brain imaging to meet the emerging opportunities and challenges posed by neuroscience research in Scotland.
- **Edinburgh BioQuarter** – £600 million investment to provide a leading centre for translational and medical research, with extensive experience of working with commercial partners.

Clinical Infrastructure

Take advantage of our investment in state-of the-art research facilities with direct access to the clinic, including extensive imaging infrastructure.

With recent major strategic investments in clinical research infrastructure, NHS Scotland and the University Medical Schools in Scotland are committed to positioning Scotland at the forefront of medical research. The NHS and Universities have worked together to deliver a framework for a “fully connected” network to deliver Scotland as a single clinical research site.

NHS Research Scotland

Coordinating Centre (NRS CC)

NRS CC offers a portal for the approval of multi-centre clinical research studies. The centre is located in Aberdeen and provides a single point of contact for liaison with NHS Board R&D offices to facilitate the approval of clinical studies.

NRS CC has developed a system for multi-centre studies which separates criteria reviewed only once by a generic reviewer from those reviewed at each local NHS site where the clinical study will take place.

The new system, which is integral to the SAHSC, will remove time-consuming duplication. It thus enables approval to be undertaken as quickly as possible for multi-centre clinical studies taking place within NHS Scotland. Central to efficient approval is the adoption of a Scotland-wide document set ranging from non-disclosure agreements, standard contracts

through to common costings that remove the need for these matters to be negotiated on a study by study basis.

NRS CC complements a well connected and networked Scotland which offers:

- State-of the art, joint university/ NHS clinical research facilities will be sited in the four major academic centres. Facilities at Aberdeen and Edinburgh are fully established.
- Highest quality clinical researchers – with national education and training programmes following the requirements of research governance and EU legislation.
- National disease registers in key disease areas in a virtual network to provide a stable platform for their development and exploitation.

- An integrated approach to the establishment, development and use of advanced imaging techniques which are the core of 21st century medicine.
- Clinical research facilities which form a ‘backbone’ support structure accessible to local clusters of academic biomedical research institutes and the biotechnology industry.
- Edinburgh BioQuarter which offers an ideal location for translational medicine – co-located with a world-class teaching hospital and research university.

Clinical Infrastructure

Biomedical Imaging

Scotland has been at the forefront of pioneering advances in medical imaging. The field is still rapidly expanding as molecular imaging is becoming increasingly important for both translational and clinical studies. Scotland's medical imaging cluster is based around a very large academic and clinical network and Scotland's universities are continuing to invest in the latest biomedical imaging techniques including PET, SPECT, MRI, ultrasound, NMR and tracer development. This academic excellence is supported by a number of companies developing novel products in this segment. Scotland also has extensive expertise in live cell imaging and imaging of molecular interactions.

Scotland's internationally competitive clinical researchers, chemists, physicists and computer scientists, can provide new research/collaborative opportunities to elucidate disease mechanisms,

speed drug discovery and develop new novel imaging tracers.

Genomics and Proteomics

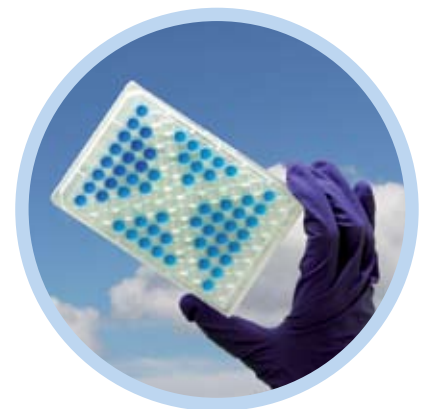
Scotland has great expertise in genomics and proteomics which adds significant value to translational medicine. This will provide the basis for the development of new medical innovations for the diagnosis and treatment of human diseases.

The Sir Henry Wellcome Functional Genomics Facility (SHWFGF) at the University of Glasgow combines state-of-the-art technology and expertise in genomics, proteomics, tissue microanalysis and bioinformatics with the aim of promoting biological and biomedical research.

The Post Genomic Molecular Interaction Centre in Dundee is a suite of purpose-built laboratories equipped with state of the art facilities for bioinformatics, proteomics, DNA-Microarrays and

molecular interactions. The Finger Prints Proteomics Facility in Dundee provides general mass spectrometry and proteomics, peptide mass fingerprinting and sequence tag analysis.

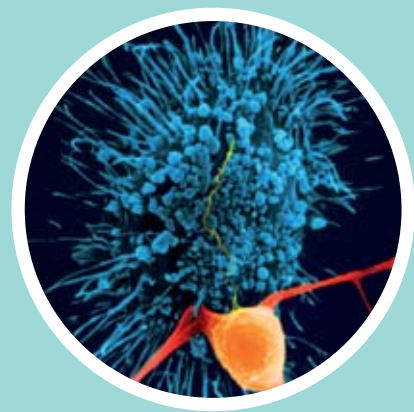
The Division of Pathway Medicine at the University of Edinburgh integrates post-genomic science with medicine in order to provide a better understanding of disease processes.



Scotland's Health Informatics Platforms

Take advantage of a well characterised patient population and comprehensive medical information.

Scotland is an excellent location within which to conduct clinical trials and epidemiological studies. NHS Scotland is the single healthcare provider with all individuals registered with a single general practitioner. Coupled with a stable population and a unique NHSiS personal identifier, this facilitates recruitment and longitudinal follow-up in clinical studies. There is a general positive attitude to clinical trials, with 20% of patients involved in clinical trials.



The General Practice Administration System for Scotland (GPASS) facilitates recruitment and data access in the primary care setting.

Launched in February 2006, **Generation Scotland**, is an ambitious and ground-breaking project exploring the ways genetic

and lifestyle factors cause cancer, heart disease and mental illness. The Public sector is funding the project with initial grants of £6.2m.

Leading doctors and scientists from the key medical schools are driving forward the multi-million pound project, which is following the health of 50,000 Scots family members over the next generation. The project is being conducted in full and close collaboration with the NHS in Scotland.

Health and genetic data collected from Scottish families will build a rich store of material to explore not only the inherited nature of common diseases, but also how lifestyle, diet and environment influence the development of common conditions like heart disease, dementia, cancer and diabetes, amongst others. The findings will help identify those at high risk of developing genetic conditions, and allow early treatments with new drugs designed to combat such diseases. The genetic information will also help adapt prescription drugs to individual needs.

www.generationscotland.org

The Health Informatics Centre (HIC) aims to prevent data users from the complexity of obtaining ethical and NHS clearance to access anonymised data. The Community Health Index (CHI) Number is the key to linking each person's distinct health records in Scotland. Procedures ensure that all health related activities, from prescriptions and tests to surgical procedures and dental appointments are electronic recorded. Such a wealth of data - all linked to the patient but rigorously anonymised - is revealing important patterns of health and disease which had previously gone undetected. HIC provides a powerful resource for the development of new ways to treat disease with a range of collaborations that extend the research reach and offer research sponsors extended study options. Particular strengths include data richness, the record-linkage capabilities, the extensive longitudinal coverage, extremely low loss to follow up and ability to track some outcomes (e.g. hospitalisation) in other areas of Scotland by linking to national data sets.

www.dundee.ac.uk/hic/

Scotland's Health Informatics Platforms

Biostatistics

Translational medicine in Scotland can also benefit from significant biostatistics expertise. The Robertson Centre for Biostatistics undertakes projects ranging from small university research projects to major international multicentre clinical trials, and in addition to the design, conduct, analysis and interpretation of clinical trials has interests in the development of novel informatics solutions for clinical research, statistical issues in epidemiology, and health economic evaluation. The Robertson Centre has extensive experience in the use of national registries for the identification of death, incident cancers and inpatient hospitalisations to facilitate the design and follow-up of clinical trials and for epidemiological purposes.

www.rcb.gla.ac.uk

Bioinformatics

Scotland has an internationally unique, integrated bioinformatics research community that is recognised for its excellence in academia and industry world-wide. Scottish Bioinformatics' strengths lie in its close integration of biology and bioinformatics researchers, as well as in the wide range of interactions between universities and business. The Scottish Bioinformatics Research Network (SBRN), has as its focus the Universities of Dundee, Edinburgh, and Glasgow. SBRN provides the infrastructure necessary to enhance bioinformatics research across Scotland and so speeds the development of new treatments for disease in humans. The members of the SBRN have access to a wide range of databases. The Scottish Bioinformatics Forum (SBF) supports both the academic

research base and commercial organisations by actively promoting training and facilitating access to bioinformatics skills.

www.sbforum.org

UK BioBank

Aberdeen, Dundee, Edinburgh and Glasgow Universities, and the Information and Statistics Department of NHS Scotland take part in the UK Biobank a major UK medical research initiative which plans to house samples of about 500,000 people. Pharmaceutical and other health-based companies will be able to access the study data for approved research, as this may help in the identification of new treatments.

www.ukbiobank.ac.uk

“The existence of record linkage to routinely collected health data has permitted a 10 year post trial follow-up of the 6595 participants in the WOSCOPS trial for all hospitalisations, cancers and deaths, providing a unique degree of post-trial follow-up in a clinical trial. The same Scottish Record Linkage system provides a basis for follow-up of all major clinical events for the more than 90,000 screenees in WOSCOPS providing, at low cost, a major epidemiological resource.”

Professor Ian Ford
Director
Robertson Centre for Biostatistics
University of Glasgow

Therapeutic Areas

Take advantage of Scotland's significant clinical and academic expertise in a number of key therapeutic areas including cardiovascular disease, neuroscience, diabetes, inflammation, oncology and reproductive medicine. The following pages give a flavour of the expertise across Scotland.

Cardiovascular

In response to Scotland's high prevalence of cardiovascular disease, the biomedical community has developed a long-standing record of excellence in cardiovascular research and associated epidemiology. Four universities have specialised cardiovascular units within their accompanying hospitals. Many Scottish clinicians have made a significant impact in the development of medical practice across the world. In addition, the well documented stable patient population makes Scotland an ideal location to conduct clinical trials. For example, the West of Scotland Coronary Prevention Study (WOSCOPS) was a landmark primary prevention trial of the drug Pravastatin in 6,000 middle-aged men.

The British Heart Foundation Cardiovascular Research Centre at the University of Glasgow carries out research on genetics and vascular biology applied to cardiovascular disease. The University of Edinburgh

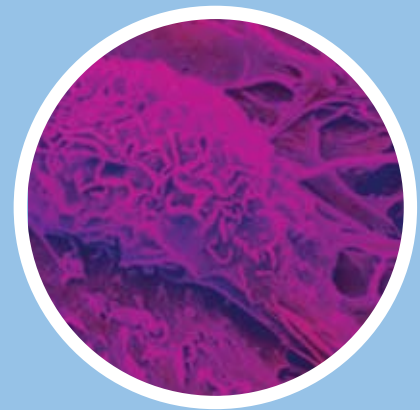
British Heart Foundation Centre of Excellence for Cardiovascular Science is a diverse medical research centre comprising several research groups that span clinical and scientific disciplines including endocrinology, vascular biology, molecular physiology, vascular injury & cardiology and cell biology.



Diabetes and Metabolism

The University of Dundee lies at the centre of Scotland's research into diabetes with many other innovative developments also being made in Edinburgh, Glasgow and Aberdeen. Commercial activity is also very strong and offers many opportunities for skilled

researchers. The top-rated Dundee Diabetes Research Centre has some of the finest researchers in the world. Disease registers in diabetes, renal disease, stroke, child health, mental health and many others have grown from local initiatives into national commodities. The DARTS database now includes data from

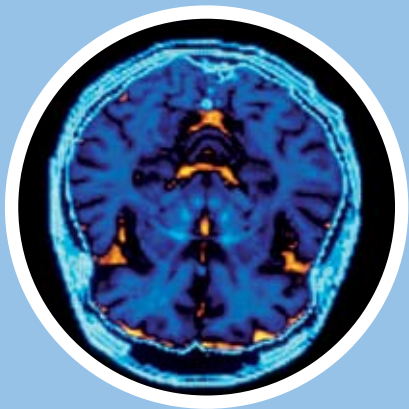


some 150,000 diabetics across Scotland. Information on diabetes care is linked to health records for studies of drug safety, epidemiology and patient management. Scotland is therefore an ideal location to conduct clinical trials in diabetes.

Therapeutic Areas

Neuroscience

Neuroscience is a major strength in Scottish organisations and is a major focus of research. The Southern General Hospital has led the world in brain trauma evaluation, developing the Glasgow Coma Score and is leading the way in innovative imaging of brain function. SINAPSE is a consortium of six Scottish universities; Aberdeen, Dundee, Edinburgh, Glasgow, St. Andrews, and Stirling. It has been established with



funding from the Scottish Funding Council, the Chief Scientific Office and the Universities. The aim of this world-class consortium is to create a strong dynamic network for a shared environment for strategic research development in brain imaging. The focus is primarily on the technologies of magnetic resonance imaging (MRI), positron emission tomography

(PET), single photon emission computed tomography (SPECT), and electrophysiology (EEG).

The Centre for Cognitive Neuro-Imaging (CCNi) is a strategic priority of the University of Glasgow. It is an interdisciplinary effort to understand the complex relationship between brain, cognition and behaviour at multiple levels of analysis. An integrated programme of research will bring together a platform of complementary state of



the art imaging facilities including a 3T fMRI scanner, a MEG system, a TMS system, and several EEG systems.

Fundamental and clinical research is enhanced by world class brain imaging facilities at The SHEFC Brain Imaging Research Centre for Scotland, located in the Division of Clinical Neurosciences (DCN) at the

Western General Hospital and the Institute of Neurological Sciences at the Southern General Hospital.

The Centre for Biomedical Functional Imaging is an integrated biomedical imaging facility run by the University of Aberdeen and located on the site of the Grampian University Hospitals NHS Trust, one of the largest single-site acute hospitals in Europe. The Centre's imaging strategy is based around the 5 main imaging modalities of positron emission tomography, nuclear medicine, magnetic resonance imaging, free radical imaging and ophthalmic imaging.

Psychiatric Research Institute of Neuroscience in Glasgow (PsyRING) provides an integrated portfolio of services and collaborative opportunities incorporating a strong clinical component to companies active in the research and development of drugs for psychiatric disease. PsyRING offers a range of high quality models and tools for target identification, target validation and compound testing in preclinical and clinical settings. PsyRING is an excellent collaborative partner to initiate or expand discovery programmes.

Therapeutic Areas

Oncology

Scottish Universities and Research Institutes are extremely active in oncology research and have made many contributions to the diagnosis and treatment of cancer, including the discovery of the p53 gene. There is also a growing base of companies active in drug discovery and development. Due to the incidence of cancer in Scotland, there is a strong network of experienced clinicians in the oncology field, conducting a large number of clinical trials.

The world renowned Cancer Research UK Beatson Institute for Cancer Research in Glasgow pursues research into fundamental cancer causing and fighting mechanisms, while the adjacent Centre for Oncology and Applied Pharmacology focuses on translational aspects of oncology research. The Beatson Oncology Centre has recently moved to a new state-of-the-art clinical facility at Gartnavel Hospital. The New Leukaemia Research Centre opened on this site in 2007 creates a centre of excellence in translational haematology in Glasgow.

The Dundee Cancer Research UK Co-operative Centre hosts 17 research teams with overlapping

research interests in the biology of cell proliferation and its regulation, epithelial cell biology and the molecular biology of nucleic acids.

The University of Edinburgh Cancer Research Centre (ECRC), Scotland's only Cancer Research UK clinical centre, is a translational research centre with expertise in basic science research and bridges from the laboratory to the clinic and back again.

scheme has been managed by ISD since 1997 and has been collecting information on cancer since 1958.

CACTUS (Cancer Clinical Trials Unit Scotland) located at the Beatson Oncology Centre is NCRI accredited to co-ordinate oncology clinical trials, one of only a small number of licenses in the UK.



Scotland has some of the best health service data in the world. Few other countries have information which combines high quality data consistency, national coverage and the ability to link data to allow patient based analysis and follow up. ISD is Scotland's national organization for health information, statistics and IT services. The Scottish Cancer Registration

Therapeutic Areas

Inflammation and Rheumatoid Arthritis

Scottish researchers are undertaking pioneering work in a number of important therapeutic areas in inflammation and immunity including rheumatoid arthritis.

The Neurovascular Inflammation Group (NIG) is an inter university collaborative venture with a primary focus on neurovascular regulatory mechanisms, and their disturbance during disease processes such as rheumatoid arthritis. Other clinical interests include dermatological vascular disturbances and their treatment. Research spans fundamental to clinical levels.

The MRC Centre for Inflammation Research (CIR) at the University of Edinburgh brings together a critical mass of internationally outstanding researchers in inflammation, harnessing the skills of both basic and clinical scientists. Within a grouping of over 200 researchers, there is a strong clinical influence based around liver disease, respiratory medicine, renal medicine and histopathology. The University of Glasgow operates a translational science programme in which state of the art cellular and molecular biology techniques are applied to elucidate the mechanisms underlying the perpetuation of

synovial inflammation in rheumatoid arthritis, psoriatic arthritis and septic arthritis. It is also internationally renowned for basic research into the role of nitric oxide and cytokines in autoimmunity and infection.

The College of Life Sciences at the University of Dundee, is world renowned for research on the signalling pathways involved in the uncontrolled production of pro-inflammatory cytokines (PIC), such as tumour necrosis factor (TNF) and interleukins 1, 6 and 8 and especially TNF.

The Bone and Muscle Research Programme at the University of Aberdeen, has laboratory and clinical scientists focussing on Bone and Cartilage Biology, Bone Pharmacology, Molecular Exercise Physiology, Skeletal Imaging and Clinical and Translational Studies.

Reproductive Biology

Scotland has world class expertise in reproductive biology and developmental medicine.

The Centre for Reproductive Biology, located at the Edinburgh BioQuarter houses the Division of Reproductive and Developmental Sciences (School of Clinical Sciences and Community Health, College of

Medicine & Veterinary Medicine) and the Medical Research Council Human Reproductive Sciences Unit. The MRC Human Reproductive Sciences Unit is the UK's leading institution undertaking research into reproductive health, having integrated programmes on male and female infertility, contraception and hormone-dependent diseases.

Clinical research activities include the world renowned Contraceptive Development Network and there are strong links with the Reproductive Medicine Laboratory in the adjacent Royal Infirmary of Edinburgh. At the Division of Developmental Medicine at the University of Glasgow, research interests are a continuum from the pre-pregnancy to the post partum state primarily in the study of vascular biology relevant to reproductive physiology and pathology.

The Scottish Academic Health Sciences Collaboration is a partnership between:



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