

2010

NHS North West R&D

Nandini Sreenivasan



# [RESEARCH INFRASTRUCTURE PROJECT]

An in-depth analysis of the various health related infrastructure & facilities in North West

## Table of Contents

<b>Executive Summary .....</b>	<b>3</b>
<b>Introduction – Reason behind the exercise.....</b>	<b>4</b>
<b>Methodology &amp; Approach.....</b>	<b>5</b>
<b>Infrastructure analysis based on research phases across the innovation pathway .....</b>	<b>7</b>
<b>Infrastructure analysis based on various Research Areas.....</b>	<b>15</b>
<b>Infrastructure and research theme analysis in various prominent educational institutions.....</b>	<b>28</b>
<b>Strategic Analysis of North West Infrastructure.....</b>	<b>42</b>
<b>Way Forward .....</b>	<b>43</b>
<b>Appendix 1 .....</b>	<b>45</b>

## Executive Summary

NHS North West is the Strategic Health Authority for the whole of the North West area, providing strategic leadership for the region's healthcare and ensuring that the £12 billion annual investment in staff and services delivers the best possible care and support for the public and patients. North West is home to various world-class research infrastructure and expertise; however we don't have any comprehensive information regarding the excellent facilities we have in the region to promote health related R&D. This scenario pointed out the need to have a study to understand our strengths and weaknesses regarding our research infrastructure and to analyse how to improve the current situation.

The study which followed aimed to create a holistic picture by analysing the health research in the entire North West using different perspectives and the 2 approaches which were mainly used in the study:

- To analyse the research facilities based on different phases of the innovation pathway like Early phase, Later Phase and Adoption & Diffusion
- To analyse the research facilities based on different research areas which are mostly the research strengths/focus areas of North West

The study was successful in understanding and presenting various research focus areas and the associated infrastructure facilities and there was no doubt that North West is one of the best places in terms of health research infrastructure. It is a place of choice to undertake more and more innovative research and boasts a promising talent pool. However the study identified that there is a need to change the way currently the research infrastructure information is collated and presented. There is no single source which provided comprehensive information regarding the research facilities in North West, and this may limit the visibility of our various strong research areas and the associated excellent facilities. It was also found that to repeat similar infrastructure studies every year is time consuming and costly.

As a result, the study recommends a digitised version of North West research infrastructure information - A website - which can be further updated on a regular basis so as to ensure that our picture of NW R&D infrastructure is both up to date and relevant and more importantly, to further emphasise that North West is indeed *'THE BEST POSSIBLE LOCATION TO CARRY OUT INNOVATIVE HEALTH RESEARCH'*

## Introduction – Reason behind the exercise

North West is home to some of the best research facilities in UK and worldwide like

- Several world class research networks
- Largest cancer treatment and R&D centre
- Specialised Biomedical Research Centres
- 15 National Institute for Health Research Senior Investigators
- The Manchester Academic Health Science Centre
- And, various new initiatives like NW Industry Exemplar Project and CLAHRC

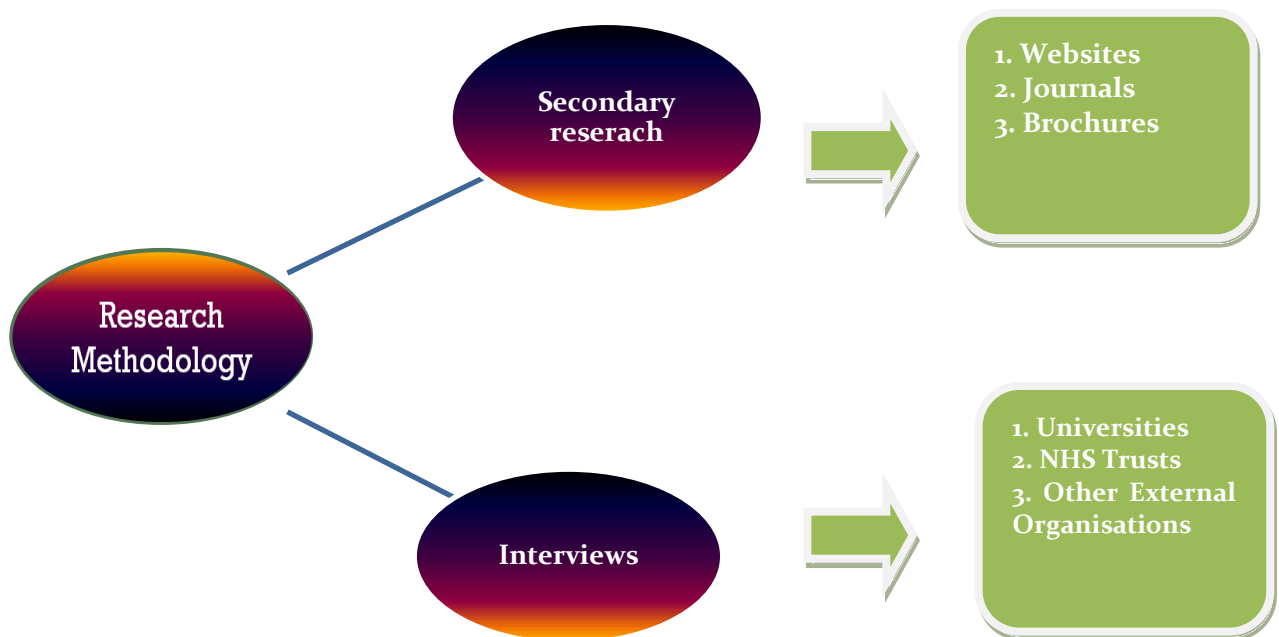
However, to have a holistic view about the infrastructure, facilities and expertise is crucial to identify some of our key strengths and areas of improvement to further build upon the strong foundation to deliver best possible results. Therefore, the infrastructure research project initiated by North West R&D team aims to create a holistic view by understanding the research facilities and research focus areas across North West. To make this study more comprehensive, it was made sure that the analysis will not just be around NHS organisations but also around academic institutions and other various external industrial organisations which are equally successful in producing world-class innovative research & development.

So the primary aims of this project were mainly to identify the health related R&D infrastructure, equipment and specialist skills and expertise within the NHS, the Universities and the industry undertaking health research and also to review the current methods, systems and processes for collating information on R&D infrastructure and skills in the North West and to analyse how these methods can be improved to produce better results. So through this research NHS North West R&D team wants:

- To ensure that our picture of NW R&D infrastructure is both up to date and relevant
- To show the evidence of our support to high quality research in North West and our investments in high quality R&D facilities and equipment
- And above all to positively promote North West as a place of choice to undertake high quality health research

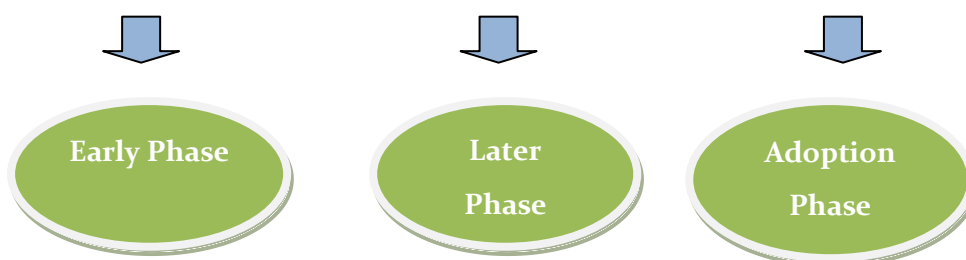
## Methodology & Approach

To achieve the required results and to make the project a success it was required to have an in-depth analysis about health care in North West. A combination of secondary research and interviews was carried out to understand the research themes and infrastructure in NHS organisations, academic institutions and various other external organisations. Around 34 interviews were conducted with research managers and directors of various trusts and other research institutes.



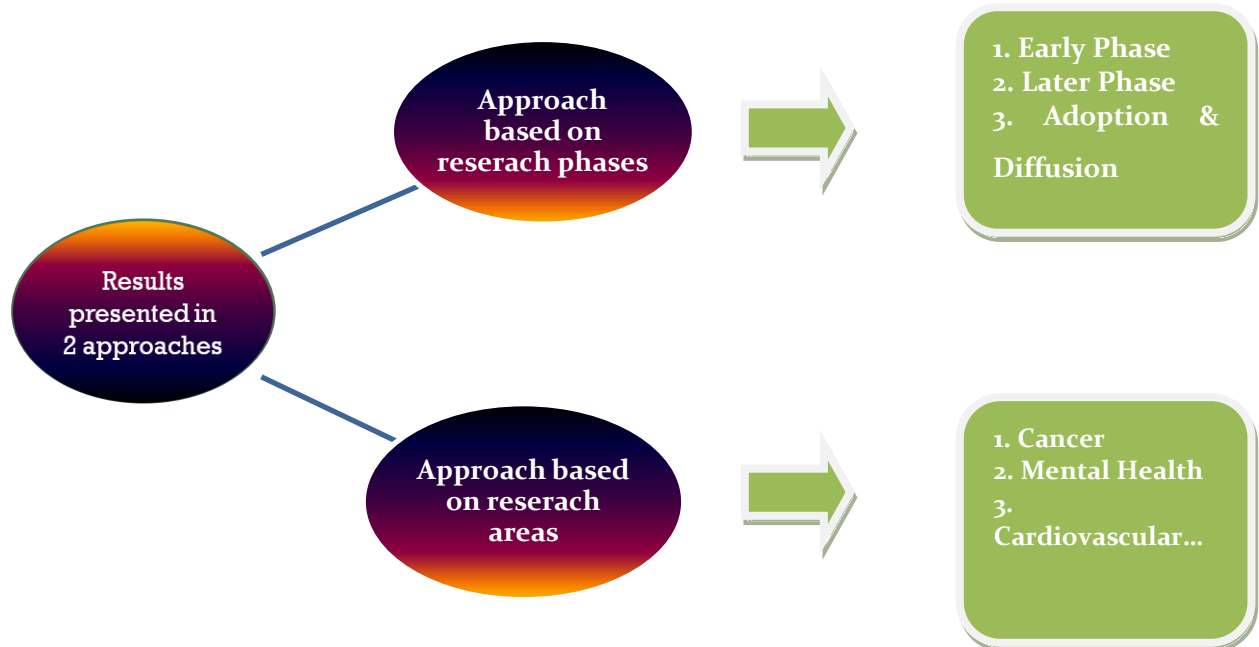
This combination methodology of secondary research & primary research was very useful in having a holistic view about the entire North West and its health research scenario. However the challenge was to present the information in a way so as to create the maximum benefit out of this research project. For this 2 approaches are defined:

1. *Approach based on Research phases* – Here the infrastructure, facilities & expertise in North West is analysed and presented based on different phases of the research & innovation pathway.



This approach was successful in analysing how North West supports the different research phases and the expertise the region boasts in each phase.

2. *Approach based on Research areas* - Here the infrastructure, facilities & expertise in North West is analysed and presented based on different research areas which can be considered as the strengths of North West. For this, first the main research themes or focus areas of North West are identified, followed by a rigorous analysis of the involvement of different research institutes in these areas.



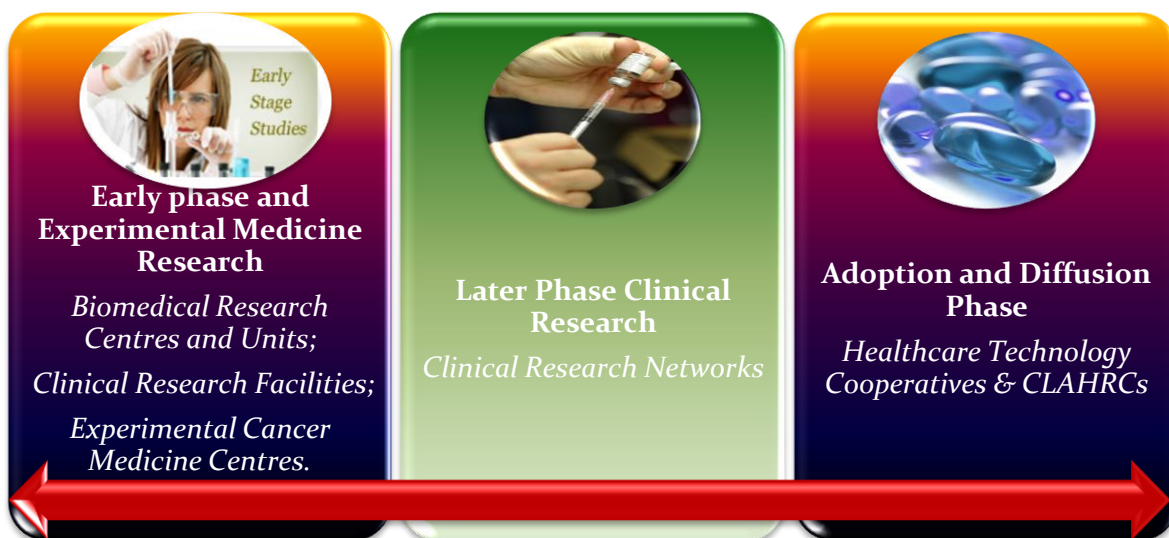
Also during the research it was found that, the educational institutions in the North West plays an important role in the research activities along with various NHS organisations and external industry. So in the report mainly 3 findings are reported:

- Infrastructure and research themes analysis based on various phases across the innovation pathway
- Infrastructure and research themes analysis based on various phases across the innovation pathway
- Infrastructure and research themes analysis in various prominent educational institutions

## Infrastructure analysis based on research phases across the innovation pathway

NHS North West boasts high quality infrastructure and facilities to support high quality research across the innovation pathway which includes invention, evaluation, adoption & diffusion. The main health related facilities and infrastructure in Northwest is analysed with respect to different research phases like:

- Early phase & Experimental Medicine research
- Later Phase research
- Adoption & Diffusion



### *Early phase & Experimental Medicine Research*

The early-phase and experimental medicine research is supported in NHS Northwest via Biomedical Research Centres and Units, Clinical Research Facilities and via Experimental Cancer Medicine Centres. These research facilities have been studied in-depth to understand and it was found that early phase and experimental medicine research is quite strong in North West and so is the facilities & infrastructure.

*North West Biomedical Centres & Units in North West*

North West boasts two ‘specialist’ biomedical research centres and one biomedical research unit to drive progress on innovation and translational research in biomedicine.



- Genetics & Developmental Medicine Biomedical Research Centre, Manchester
- Microbial Diseases Biomedical Research Centre, Liverpool
- Pancreas Biomedical Research Unit, Liverpool

The £35 million Manchester Biomedical Research Centre (Genetics & Developmental Medicine) was set up by the National Institute for Health Research (NIHR) on 1 April 2008, and is one of 12 elite centres of medical research excellence across the UK.

The specialist Biomedical Research Centre in Microbial Disease was initiated in April 2007 by the Royal Liverpool & Broadgreen University NHS Trust along with its partners University of Liverpool and the Liverpool School of Tropical Medicine. It has some excellent facilities which include a fully equipped general laboratory as well as some specialist equipments. The main facilities in this research centre can be summarized as follows:

General Facilities	Specialist Facilities
General Laboratory	PBL/plasma/serum isolation
PCR machines	DNA Sequencing
Flow cytometer	Genotyping
Gel Documentation system	Spirometry
Incubator	Mass spectrometry
Blood gas analyser	DNA extraction
Class 2 and 3 biological safety cabinet	Bronchoscopy

The Liverpool NIHR Pancreas Biomedical Research Unit (PBRU) is based at the Royal Liverpool University Hospital. It is a leading global translational research unit dedicated to the management of pancreatic digestive diseases, such as acute and chronic pancreatitis and pancreatic cancer. The PBRU is the premier centre in the UK and one of the top three centres in Europe, carrying out translational research into pancreatitis and pancreatic cancer. It is a partnership between the Royal Liverpool and Broadgreen University Hospitals NHS Trust (RLBUHT) and the University of Liverpool and is the only NIHR funded specialist unit to research into pancreatitis and pancreatic cancer in the UK. The PBRU has a broad access to clinical and scientific state-of-art research facilities and has developed an ambitious ground breaking research programme, focused on three research themes:



- Drug discovery & development of new interventions
- Application of new diagnostic & imaging strategies
- Validation of new Biomarkers and Screening protocols

General Facilities	Specialist Facilities	Imaging Facilities
General Laboratory	PBL/plasma/serum isolation	Colonoscopy
PCR machines	DNA Sequencing	Gastroscopy
Flow cytometer	Genotyping	MRI scanner
Gel Documentation system	Spirometry	Confocal endoscope
Incubator	Mass spectrometry	Confocal Laparoscope
Confocal microscope	DNA extraction & Micro satellite analysis	PET-CT
Class 2 biological safety cabinet	Proteomics	Endoscopic ultrasound
	HPLC	Transabdominal ultrasound

#### *Experimental Cancer Medicine Centres and Clinical Research Facilities in North West*

Experimental medicine, also known as translational research, is a hot topic in the world of cancer science. It can be defined as "the investigation undertaken in human beings to identify mechanisms of disease and to test the validity and importance of new discoveries or treatments." Put simply, it's all about taking discoveries made in the lab and turning them into effective new treatments and diagnostic tools for cancer, such as biomarkers.

North West boasts 2 experimental cancer medicine centers – ***Manchester Experimental Cancer Medicine Centre and Liverpool Experimental Cancer Medicine Centre***

The following types of clinical research can be undertaken within the Manchester Experimental Cancer Medicine Centre:

- Experimental medicine
- Phase I
  - First-in-man
  - Pharmacokinetic studies
  - Pharmacodynamic studies
- Phase II
- Other
  - Biomarkers
  - PET and MRI Imaging
  - Targeted radiotherapy and radio immunotherapy
  - Immunotherapy and gene therapy

The following types of clinical research can be undertaken within the Liverpool Experimental Cancer Medicine Centre:

- Experimental medicine
- Phase I
  - First-in-man
  - Pharmacokinetic studies
  - Pharmacodynamic studies
- Phase II
- Phase III
- Other
  - Biomarkers
  - PET Imaging
  - Targeted radio-immunotherapy
  - Gene therapy

Both these centres have high quality facilities and equipments to carry out world-class research & development like:

General Facilities	Imaging Facilities	Specialist Facilities
General Laboratory,	MRI Scanner, MR Spectroscopy	DNA extraction , Tumour biopsy facilities
Phlebotomy	PET (including GMP tracer production)	Microarray facility
Pulse-oximetry	Multi-Slice CT imaging	DNA sequencing
Infusion devices	Endoscopy	Microsatellite analysis
Chemotherapy administration	Cell imaging facilities	Mass spectrometry, Proteomics , HPLC
Radio-pharmacy laboratory	Anatomical and dynamic CT, Combined CT/PET	Molecular pathology
Comprehensive GCLP compliant laboratories,	In line arterial metabolite estimation	Cell separator facilities, Genotyping, Confocal laparoscope

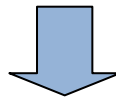
*Manchester Wellcome Trust Clinical Facility*

The Manchester Wellcome Trust Clinical Research Facility provides a supportive, participant focused environment to host quality research of the highest scientific excellence from trial design to completion.

The following types of clinical research can be undertaken within the Manchester Wellcome Trust Clinical Research Facility:

- Experimental medicine
- Phase I
  - First-in-man
  - Pharmacokinetic studies
  - Pharmacodynamic studies
- Phase II
- Phase III
- Phase IV
- Other  
Epidemiological studies, observational studies, screening studies

Currently WTCRF supports research in the following areas of health or diseases



*Cancer , Cardiovascular, Congenital Disorders , Ear , Eye , Infection , Inflammatory and Immune System , Injuries and Accidents , Mental Health , Metabolic and Endocrine , Musculoskeletal , Neurological , Oral and Gastrointestinal , Renal and Urogenital , Reproductive Health and Childbirth , Respiratory , Skin , Stroke , Generic Health Relevance and other various specialist Interest Areas like Paediatrics, technical research, psychological research, emergency care, learning disabilities, nursing, older people, orthopaedics, pain management, physiotherapy and rehabilitation, primary care, public*

WTCRF boasts a wide range of world class facilities and equipments to support its vast research themes.

General Facilities	Imaging Facilities	Specialist Facilities
General Laboratory, Fume Cabinet	DXA Scanner	Gait analysis, Isokinetic testing, Isometric testing
Cognitive testing	Optical Tomography	Coherence Spinal strength measurement, Electromyography

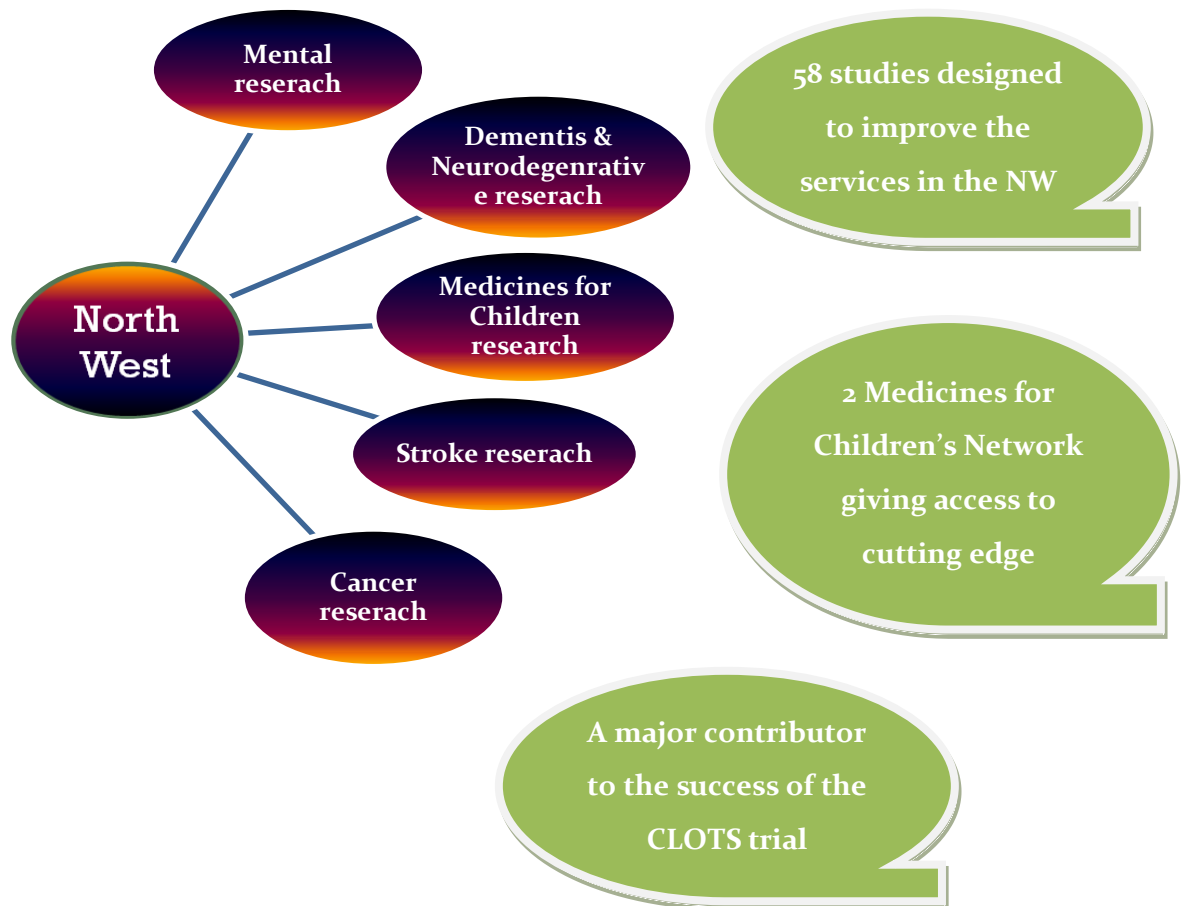
Pulse wave analysis	MRI scanner	Lumbar motion monitor, Spirometry , Upper limb plethysmography
Infusion devices	Dark Field Imaging	Sub-lingual Lower limb plethysmography, Minor procedures Room
ECG, Cannulation, BMI	Micro vascular facilities	imaging movement control and tracking facility

**Later Phase clinical Research**

The Northwest is the only region to be successful in providing local area networks (LANs) for all of the UK CRN therapeutic centres.

Just like the early phase and experimental research phase, North West is also quite strong in its later phase research activities and particularly in the academic and clinical research interface. With a population of around 7million people and a diverse ethnic mix, the region boasts recruitment rates second to none in the UK. The region is home to two of the six co-ordinating centres of the UK Clinical Research Network which are designed to address clinical research in specific disease topics.

Manchester is the co-ordinating centre of the UK Mental Research Network which was established to provide the NHS infrastructure for clinical trials addressing mental health and social care. Liverpool is home to the Medicines for Children Research Network based at the Institute of Child Health at the Royal Children's Liverpool Hospital, leading the evaluation of drugs for use with children.



To support this extensive amount of later phase clinical research, north west have widespread infrastructure facilities and research centres including Clinical Research Organisations (CRO's), organisations, which facilitate, co-ordinate, and performs clinical trials and medical research studies.

Some of the main Infrastructure in NW which facilitates clinical research are:
Liverpool Clinical trials Centre; The Kissileff Lab – (The Royal Liverpool & Broadgreen University Hospitals NHS Trust)
University of Liverpool Cancer Research Centre & Institute of Cancer Studies (Partners : Royal Liverpool University Hospital, Clatterbridge Centre for Oncology and the NW Cancer Research fund)
Wellcome Trust Clinical Research Facility and Central Manchester & Manchester Children's University NHS Trust
Trustech – ACTNoW Database ; Orphanet – Database of rare diseases
Christie Hospital NHS Trust, Clinical Trials Unit & Technology Platform
Icon Development Solutions (Early phase clinical trials)
Smerud Medical Research (CRO) (specialising in proof-of-concept clinical trials and pivotal

regulatory trials (phase IIb and III))
Synexus Ltd, Manchester - manages clinical trials for the pharmaceuticals industry.
Trial Forum Support (CRO) (dedicated exclusively to clinical drug development process.)
Catalent - (provides specialist clinical trials packaging, storage and distribution for the lifetime of a trial)
CDSS - A CRO specialises in Phase I to IV clinical trials
The Clinical Trial Company (CRO)
NIBHI - collaborative venture between the Universities of Manchester, Liverpool, Lancaster, Central Lancashire (UCLAN), Salford, Liverpool John Moores University (JMU) and AstraZeneca
The MEU specialises in performing clinical trials (from Phase I to IV) in respiratory / inflammatory medicine and related areas

### *Adoption & Diffusion Phase*

North West is increasing its emphasis on the adoption and diffusion phase through various new initiatives like CLAHRC's and Healthcare Technology Cooperatives.

**CLAHRC** undertake high-quality applied health research focused on the needs of patients and to support the translation of research evidence into practice in the NHS and is a partnership between NHS Trust Salford Teaching Primary Care Trust & University of Manchester.

**Healthcare Technology Cooperatives** are NHS-led virtual organisations that bring together patients and carers, healthcare staff, academics, inventors and industry to develop practical and innovative healthcare products to address areas of unmet patient and clinical need. Manchester, North West has various associated groups for Enteric Bowel function Healthcare Technology Cooperative.



## Infrastructure analysis based on various Research Areas

NHS Northwest, home to innovative companies, trusts and research organisations, boasts world class research facilities and expertise in various biomedical research areas. The region have substantial academic research, NHS partners and other external biomedical and medical technology companies which altogether makes it one of the most innovative and prosperous medical research areas in UK and in other parts of Europe. The North West is also home to several big pharma with several global pharmaceutical companies operating a facility in the region. Speke, Liverpool is home to the largest cluster of biologic manufacturing in Europe.

*NHW Northwest have more than 200 biomedical companies and also is home to UK's pharmaceutical giants like AstraZeneca, GSK, Eli Lilly, Novartis, Sanofi-Aventis and so on*

The study helped to identify some of NHS Northwest's medical research strengths and the various facilities the region enjoys which helps to further promote these research activities.

***OUR BIOMEDICAL STRENGTHS ARE IN FOLLOWING RESEARCH AREAS:***



Cancer

Infectious Diseases

Cardiovascular

Neuroscience & Mental health

Tissue Engineering & Regenerative medicine

Clinical genetics

Genomics & Proteomics

Medical & Molecular Imaging

Health Care - Wound care, orthopaedics, diagnostics & specialist nutrition

Bio/Health Informatics

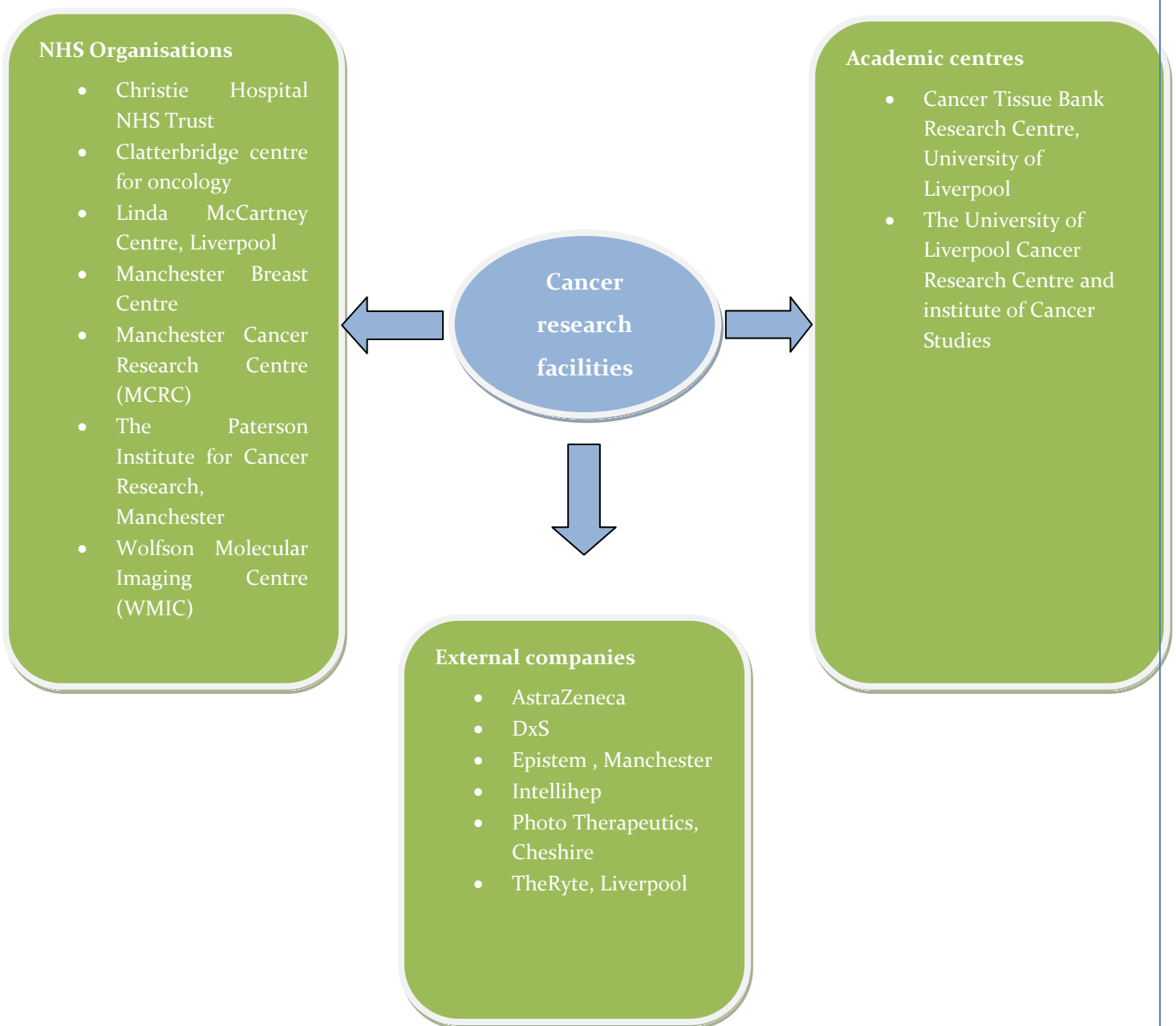
Instrumentation

Pharmaceuticals

**CANCER**

NHS Northwest is very strong in cancer related research and boasts one of the world’s best research facilities and expert skills. World-class cancer research, and product development is carried out in a number of hospitals, research & academic institutions and companies in the region.

*Some of the main Cancer research facilities/centres are:*



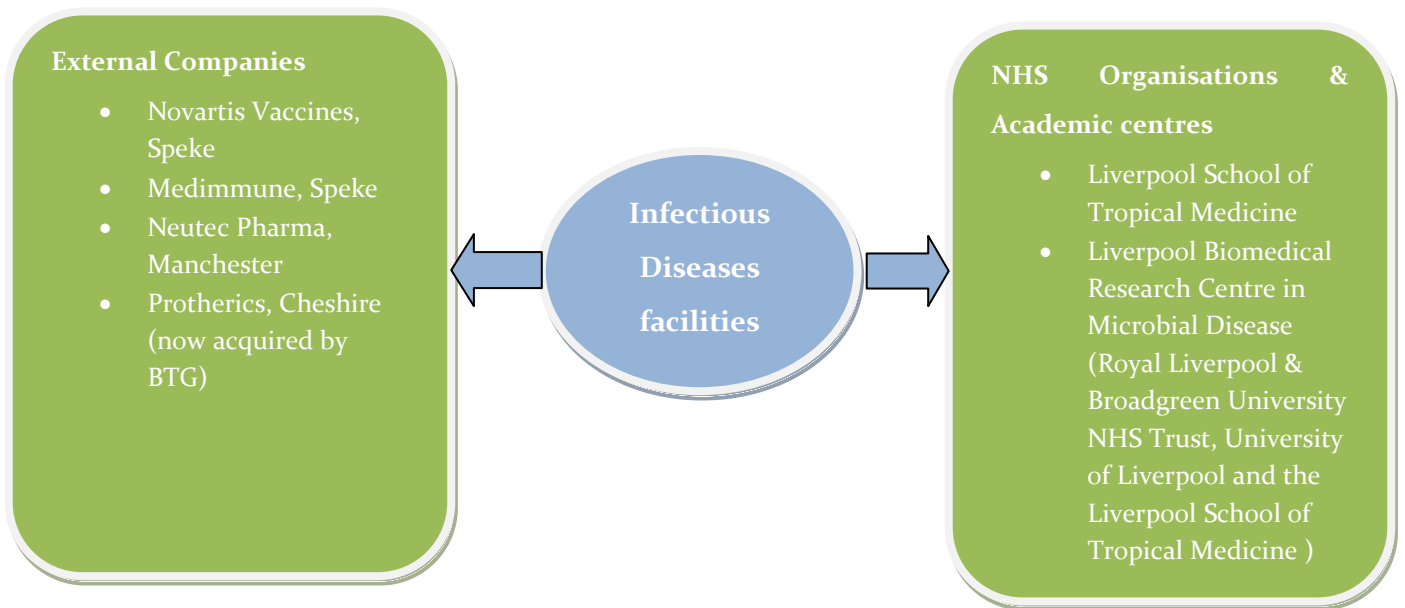
Refer Appendix 1 for a detailed description of the research centers.



**INFECTIOUS DISEASES**

Northwest have substantial expertise in vaccines and infectious diseases related research and boasts lot of success stories in this research area. World-class research, and product development is carried out in a number of hospitals, research & academic institutions and companies in the region for this area.

*Some of the main research centres involved in this research & development are:*

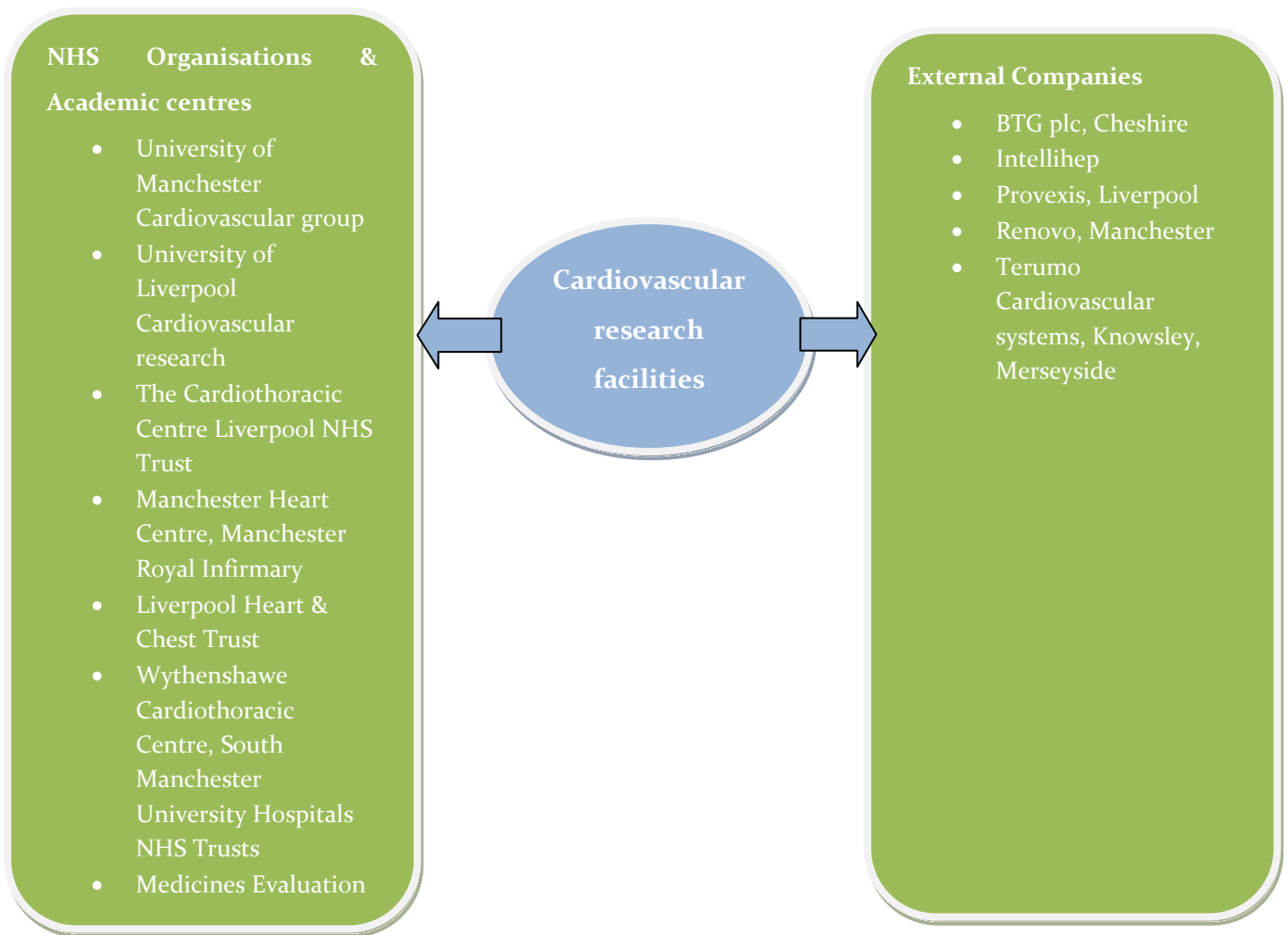


Refer Appendix 1 for a detailed description of the research centers.

**CARDIOVASCULAR RESEARCH**

The North West has a strong cardiovascular research profile with world class research groups in the region's universities and companies working closely with local NHS teaching hospitals in advancing treatment and management of cardiovascular disease.

*Some of main facilities involved in cardiovascular research & development are:*

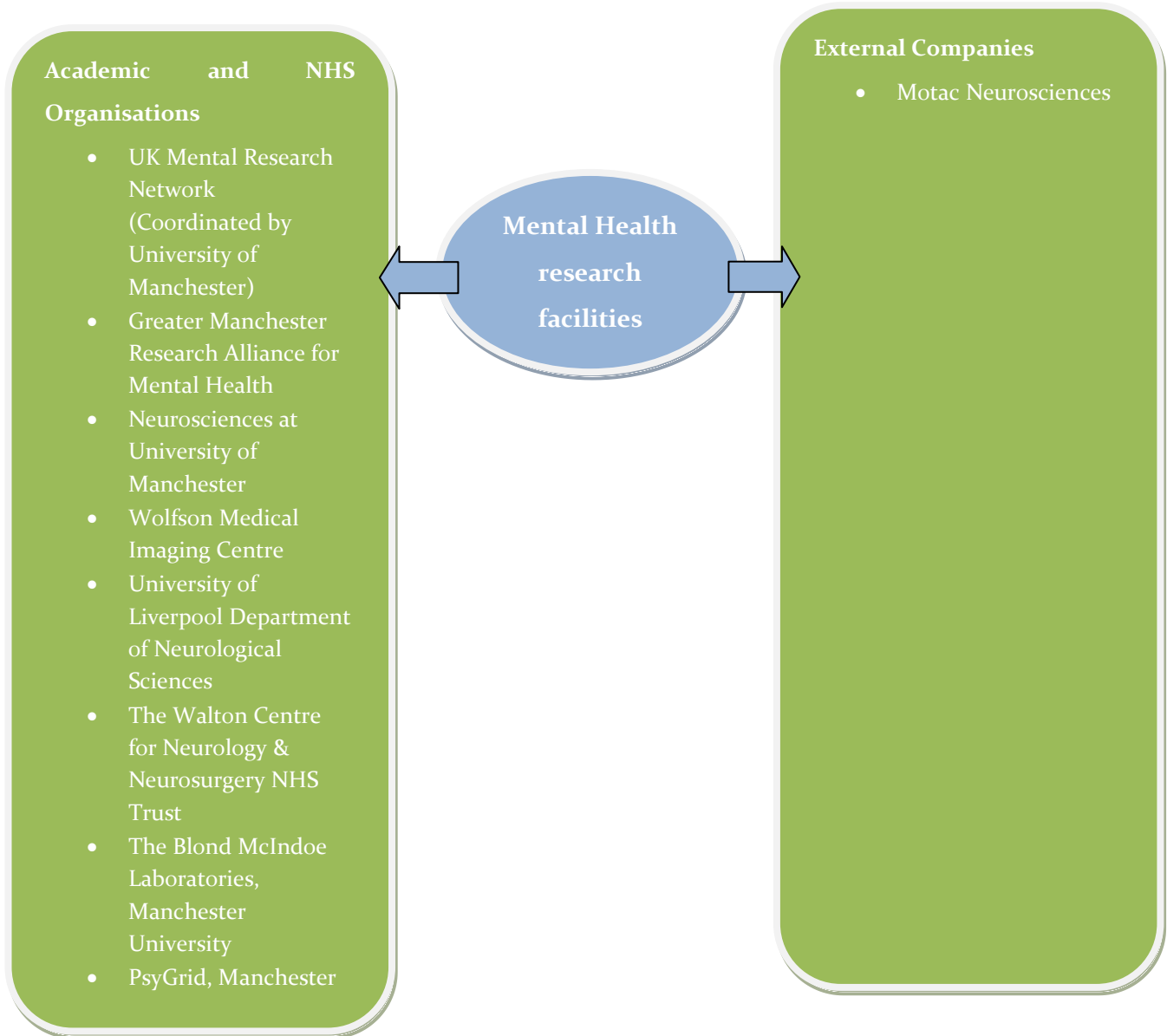


Refer Appendix 1 for a detailed description of the research centers.

**Neurosciences & Mental Health**

Northwest have extensive research background in mental health and neurosciences which includes a vast network of research institutions and external organizations as well as academic institutions which are successful in producing ground breaking research & development.

*Some of main facilities for mental health and neurosciences research & development are:*

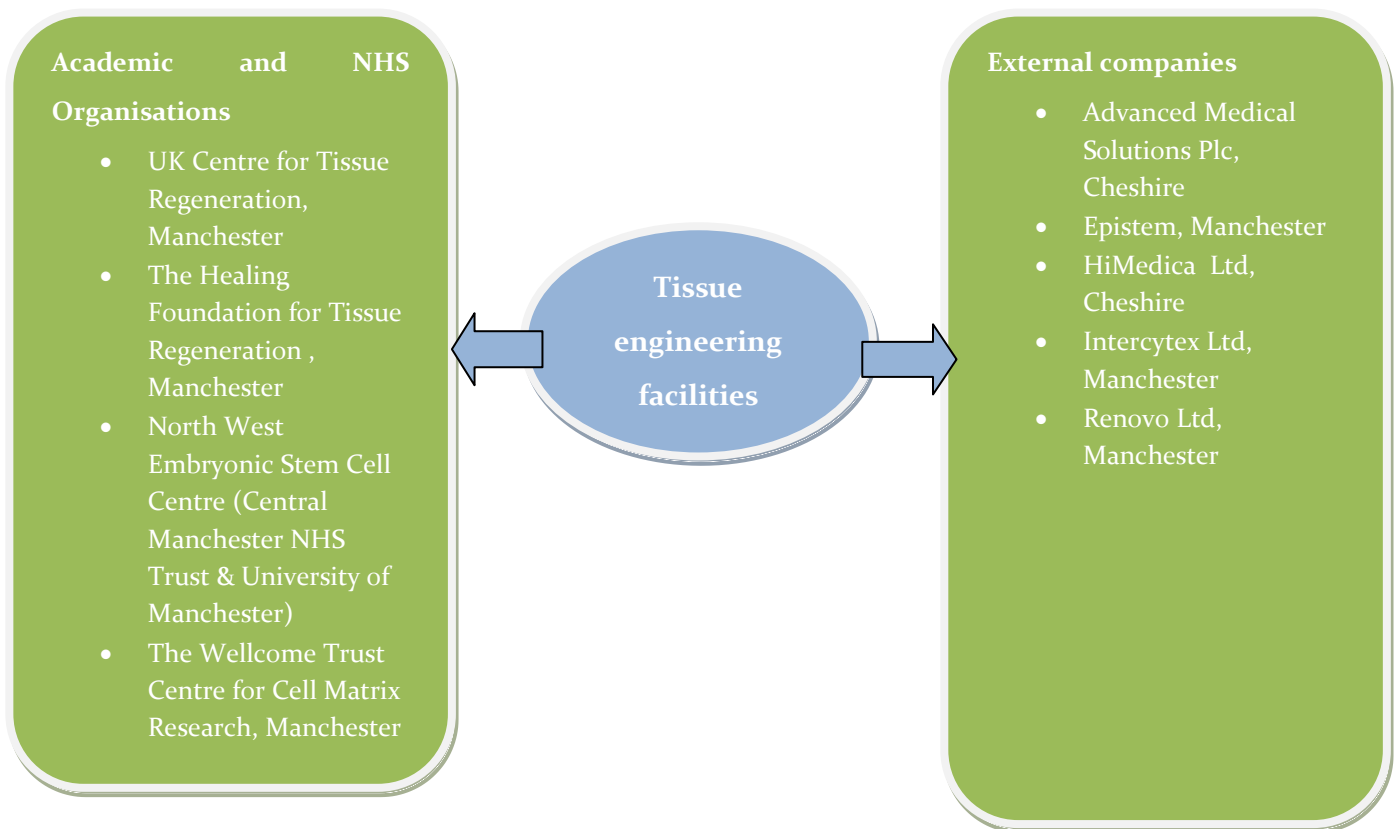


Refer Appendix 1 for a detailed description of the research centers.

**Tissue Engineering & Regenerative Medicine**

Northwest have a strong research background in tissue engineering and regenerative medicines with the main research themes around skin and laminar structures; Cartilage, IVD Compressive & Tensile Structures and Vascular & Tubular Structures. Northwest have lot of facilities in universities, NHS organisations and in external industry organisations which is designated for tissue engineering and regenerative medicines. The Manchester Initiative for tissue regenerative medicine includes various facilities like Wellcome Trust Centre for Cell Matrix Research, NW Embryonic Stem Cell Centre, UK Centre for Tissue Regeneration, Material Science Centre, Healing Foundation Centre, Manchester Stem Cell Network along with various NHS trusts/hospitals and biomedical research centers.

*Some of main facilities involved in tissue engineering & regenerative medicine in NW are:*

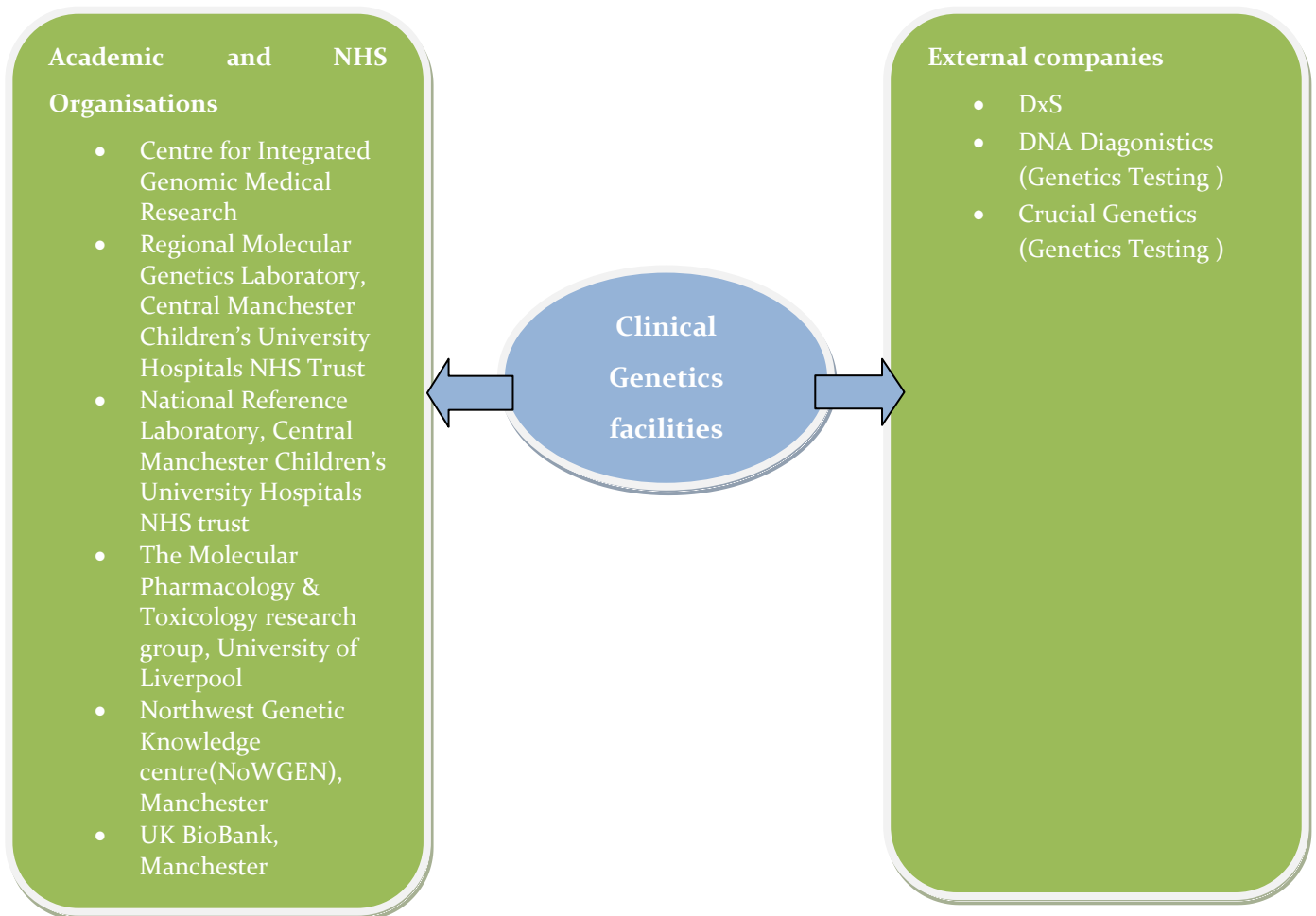


Refer Appendix 1 for a detailed description of the research centers.

**Clinical Genetics**

The Northwest has internationally recognised centres of excellence in clinical genetics and is the only UK region to host both a National Reference Laboratory and a Genetic Knowledge Park.

*Some of main facilities involved in clinical genetics R&D in NW are:*

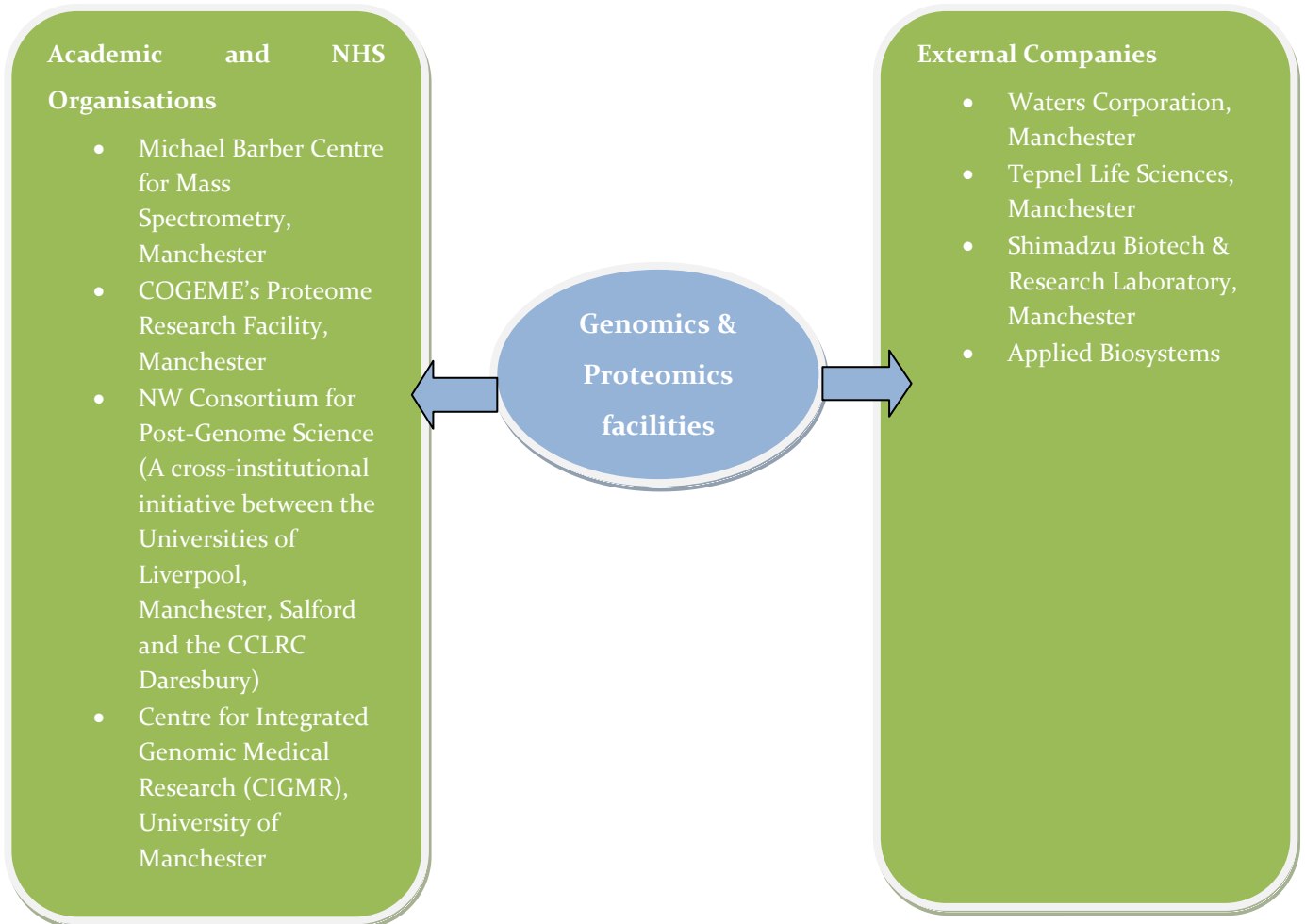


Refer Appendix 1 for a detailed description of the research centers.

**Genomics & Proteomics**

The NW has a significant expertise in genomics and proteomics, including probably the largest cluster of mass-spectrometry companies in the world.

*Some of main facilities involved in genomics & proteomics research & development are:*

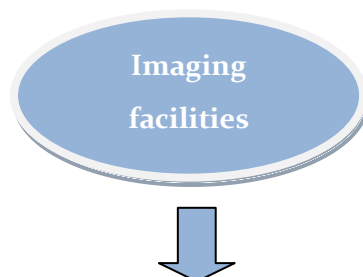


Refer Appendix 1 for a detailed description of the research centers.

## Medical & Molecular Imaging

A number of world-class specialist facilities exist in the NW region for medical & molecular imaging in academic institutions and in NHS organizations.

*Some of main facilities involved in imaging in NW are:*

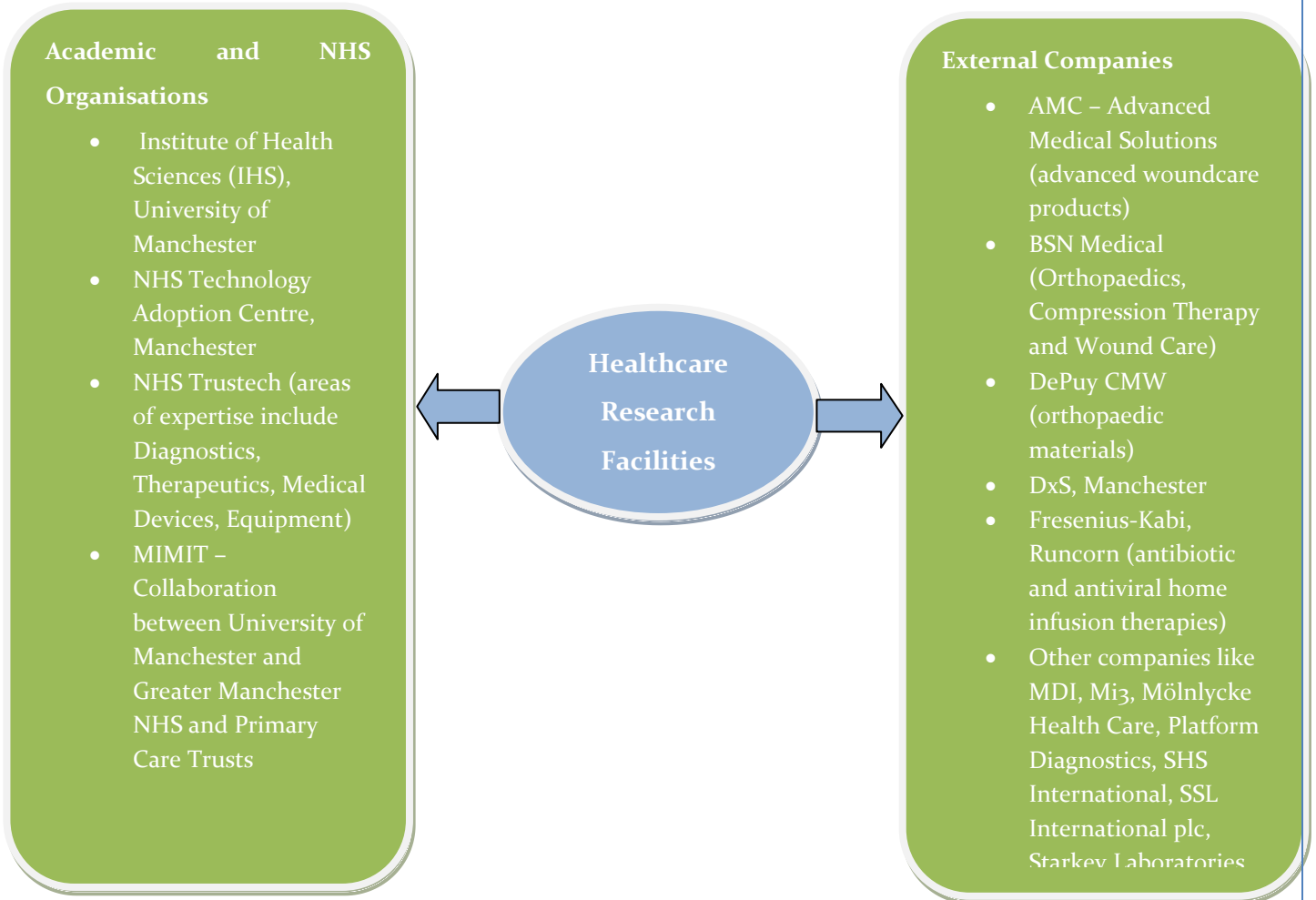


- The Wolfson Medical Imaging Centre, Manchester
- The Clatterbridge Centre for Oncology Imaging Facility
- Daresbury Laboratory, Cheshire
- State of the Art Department of Radiology, Royal Lancaster NHS university
- Dedicated Medical Imaging Unit, University of Liverpool
- Biomedical Imaging Institute, University of Manchester
- MARIARC, The Pain Research Unit
- ManPET, Manchester
- South Manchester Hospitals Mammography
- Royal Liverpool & Broadgreen Hospital Imaging Unit

**HEALTHCARE – Wound-Care, Orthopaedics, Medical devices, Diagnostics & Nutrition**

The North West is home to a diverse and vibrant Healthcare sector covering the areas of wound care, orthopedics, diagnostics, specialist nutrition and medical devices. Global healthcare companies and early stage, high technology spin-out companies choose to invest in the region.

*Some of main facilities involved in this area of research & development in NW are:*

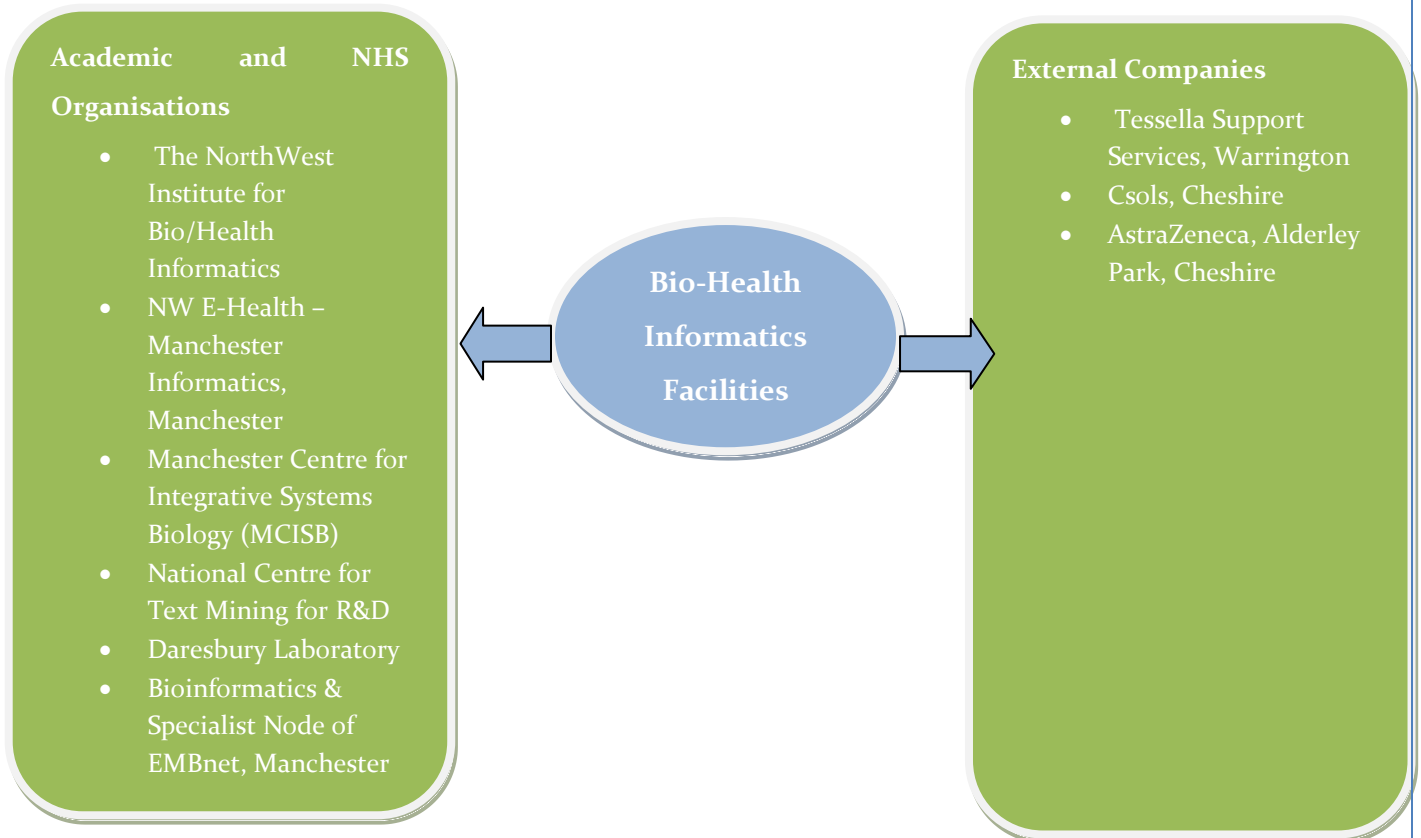




**Bio-Health Informatics**

Northwest have lot of organizations which are involved in various R&D activities to apply Bio-Health Informatics theory into practice and ensure that Bio-Health Informatics research is informed by the needs of the biological, clinical and population health research.

*Some of main facilities involved in this area of research & development in NW are:*



## Pharmaceuticals

Northwest has a strong biotechnology and pharmaceuticals sector with particular research expertise and commercial capability in pharmaceutical production and formulation. More than twenty companies operate in this area from development through to market and the region employs more a quarter of the UK's pharmaceutical and chemical sector's workforce.

*Some of main facilities in these companies are:*

- *Astrazeneca* – They have major research bases at Alderley Park & Macclesfield with main research focus in Cancer, Cardiovascular, Diabetes, Obesity, Infection and Inflammatory conditions such as arthritis.
- *Baxter*- They has research bases in Liverpool with lot of reserach & development in renal diseases.
- *Carbogen Amcis* – Based in Manchester they specialize in CGMP material supply
- *Eli Lilly*- Based in Speke they have the largest biologics research & manufacturing plant in the UK
- *GSK*- Based in Cumbria they manufacture bulk APIs both steriles and non-steriles
- *ICON Development Solutions*- Based in Manchester and specialise in Early phase clinical development.
- *Intercytex*- Based in North West is involved in regenerative medicine research
- *Medimmune* – Based in Speke, they are involved in antibody discovery and research
- *Novartis Vaccines and Diagnostics* – They have major research & manufacturing facility at Speke, Liverpool for flu vaccines
- *Renovo* – They have research & development on aerosol and spray technologies
- *Sanofi Aventis* -They have major research facilities in North West for inhalation product development and research
- *Teva Pharmaceutical Industries Ltd* – They do R&D in generic and proprietary branded pharmaceuticals as well as active pharmaceutical ingredients
- *BTG Group*- Based in Cheshire they have R&D with focus on bio-therapeutics to treat snakebites
- *Neutec Pharma* – They have major research facilities in North West with R&D in genetically recombinant antibodies
- *Avecia Biotechnology*- Based in Manchester they have R&D facilities for advanced medicines, including DNA medicines, peptide pharmaceuticals and biologics.

## Instrumentation

The Northwest has leading strengths in high-end instrumentation and is home to both R&D and Manufacturing in mass spectrometry and clinical diagnostics instrumentation

*Some of the main facilities with expertise in this area in NW are:*

- [Farfield](#) - They are the global supplier of analytical instruments with applications in biophysical characterization, structural and functional proteomics, bio-molecular interactions, drug discovery and diagnostic development
- [Invitrogen](#) - Invitrogen operate two facilities in the Northwest. Applied Biosystems (Warrington) serves the life science market by developing and marketing instrument based systems, consumables, software and service. Invitrogen-Dynal (Bromborough) produce and market Dynabeads® for magnetic separation
- [Kratos](#) - Kratos develop and manufacture high performance MALDI mass spectrometers which are marketed by Shimadzu Biotech. Typical analytical applications include pharmaceutical drug discovery, industrial polymer analysis and proteomics, genomics and biomarker discovery.
- [Shimadzu Research Laboratory](#) - SRL is the European research centre for Shimadzu Corporation with particular interests in ion optics, biological mass spectrometry and electron microscopy, designing new instrumental and analytical techniques from concept to working prototype.
- [Thermo Fisher Scientific](#) - Following a merger in 2006 Thermo Fisher Scientific serves its customer through two premier brands Thermo Scientific and Fisher Scientific, helping to solve analytical challenges from routine testing to complex research and discovery. Thermo Fisher Scientific is investing in a new, multi-million pound Global Centre of Excellence in Runcorn in support of their global growth plans. Commencing with the relocation of the existing Anatomical Pathology and Chromatography business operations, in Runcorn, the CoE will be developed through 2009-2012.
- [Waters](#) - Waters (Manchester) is the global HQ of Waters mass spectrometry, part of Waters Division. Waters Corporation, head quartered in Milford, Massachusetts, holds worldwide leading positions in complementary analytical technologies - liquid chromatography, mass spectrometry, rheometry and microcalorimetry. Waters Division products (ULPC, HPLC and MS instruments and consumables) are used by pharmaceutical, life science, biochemical, industrial, academic and government organizations working in research and development, quality assurance and other laboratory applications.

## Infrastructure and research theme analysis in various prominent educational institutions

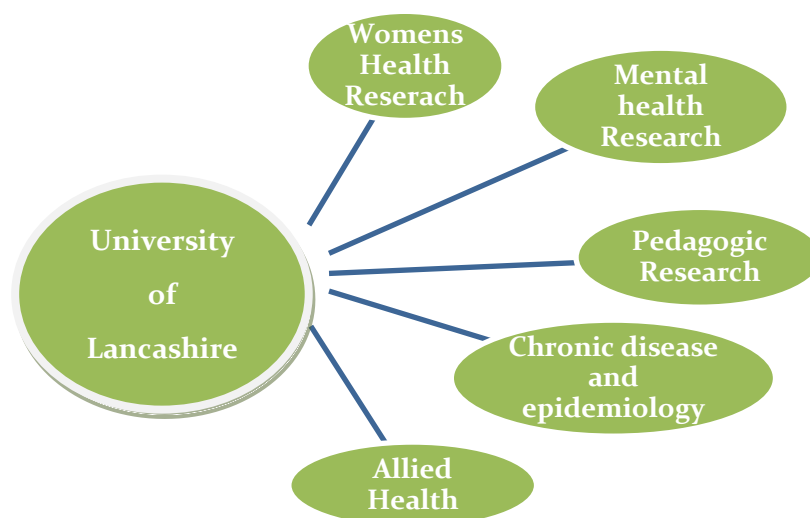
There are many world-class academic institutions in the North West, and all, to a greater or lesser extent, are engaged in health care research. Some of the more established research institutions have a strong history of research and have benefitted from diverse and substantial funding support, have established collaborative networks and enjoy international reputations in their respective fields of expertise. Others are at various stages of development, many with small but growing 'pockets of excellence' often with strong links with practice, and often engaging with new and emerging research ideas and methods.

### University of Central Lancashire

Research in the School of Public Health and Clinical Sciences in University of Central Lancashire is interdisciplinary and inter-professional and integrates both individual and population perspectives of health and wellbeing. The school embraces laboratory-based research, epidemiological research, applied health research and implementation research but the emphasis is on the translation or application of high-quality research findings to guide clinical and policy decision-making.

The School has a critical mass of active researchers from a range of academic disciplines including biomechanics, statistics, sociology, epidemiology, genetics and informatics and from a variety of health backgrounds including midwifery, allied health, public health and psychiatry. Researchers work collaboratively to support a number of productive research streams in women's health, chronic disease and rehabilitation, evaluation of complex interventions including health policy, occupational epidemiology and mental health care.

*Main research areas in UCLAN can be classified as:*



One of the main research facilities in UCLAN is a state of the art Movement Analysis Laboratory which is equipped to conduct: advanced motion analysis, force measurement, pressure measurement, muscle and strength assessment, and thermal imaging. The lab currently houses a ten camera Qualisys movement analysis system, four AMTI force plates, eight channels Biopac electromyography, eight channels DelSys electromyography, electrogoniometry and accelerometer. It is one of the top facilities of its type currently in use in Europe. Other main facilities include:

Facilities	Description	
Data Processing Suite	This facility makes the lab ideal for researchers to collect, analyse, and securely back up data with any of the systems in the laboratory	
Pressure Measurement System	The F-Scan system provides bipedal plantar pressure and force measurements on the feet using paper-thin reusable sensors placed in to the patients' shoes.	
Electromyography equipments	Biopac telemetry electromyography, eight channels of Biopac wired electromyography, eight channels DelSys electromyography, electrogoniometry and accelerometry.	
Isokinetic Dynamometer	Used in therapy studies	
Near Infrared Oxygenation Monitor	Used in muscle tissue oxygenation for sports medicine and rehabilitation	

These extensive research facilities, combined with significant staff expertise will allow high level research.

## University of Bolton

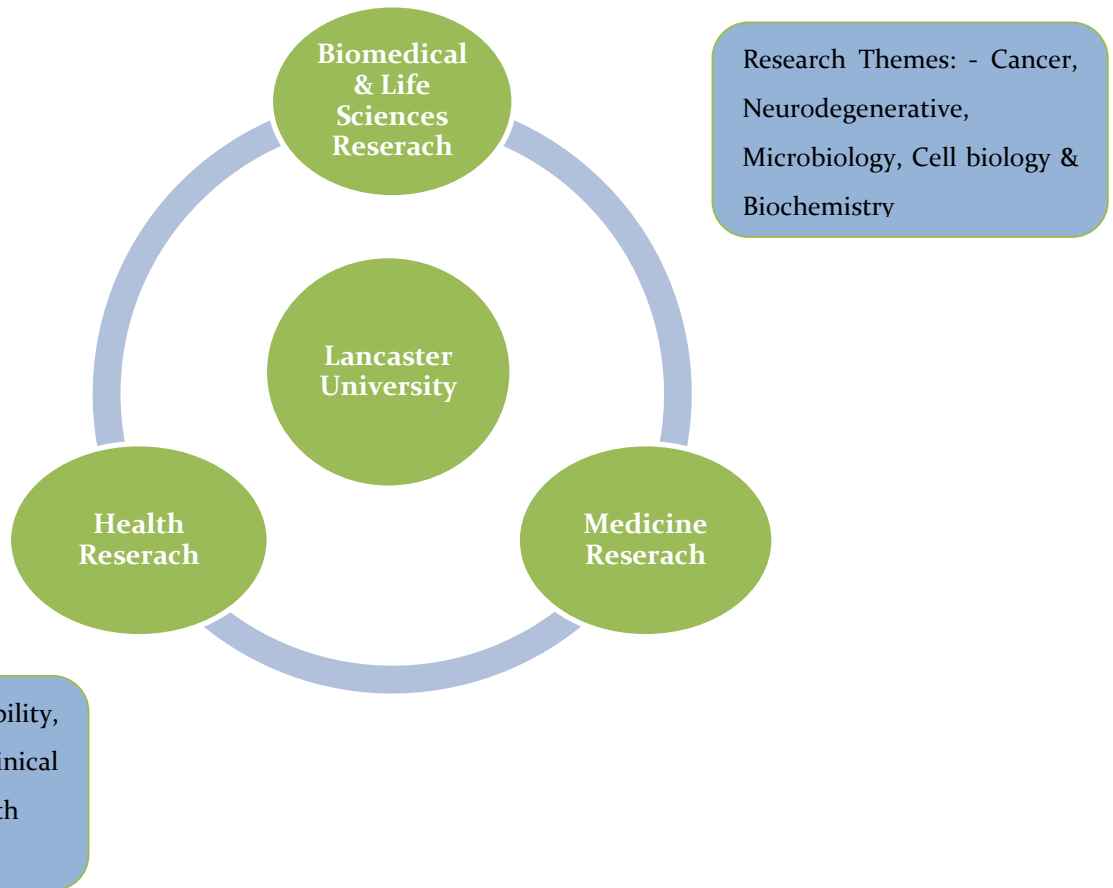
Bolton has strong industry, community links and strong emerging collaborations with NHS organisations. The School for Health and Social Science incorporates the departments of health and well being, social care, psychology and sport. Health and social research in community settings is a theme across the School, with themes of community engagement, user involvement, research ethics and research training. Health and social care are often interrelated in applied research projects. Psychological work relevant to health include decision making, risk and uncertainty, cyber psychology, mental and physical health and disability, neuropsychology, brain and spinal injury, eating disorder. Developmental psychology research includes the study of child social and cognitive development. There is also an applied criminology group.

Interdisciplinary research themes are; economic psychology and decision research, sustainable communities and well being, supporting professional practice in health and social care and the community.

Bolton also has a Centre for Materials Research and Innovation (CMRI) which is currently working on several health related projects. Many of the current research groupings have relevance to health care research; some are specifically geared towards medical innovation. They include Medical and health care devices which is currently working on novel biomaterials, microwave radiometry and bacterial elimination, multifunctional wound dressing and management, venous leg ulcer management, smart functioning polymers, the development of therapeutic agents, bio-analytical chemistry, NMR analysis and metabonomics. Other research themes include Smart materials and systems, Speciality smart composites (relevance for dental health), Technical textiles, Materials modelling and Microsystems (miniaturised medical devices, biological sensors).

### Lancaster University

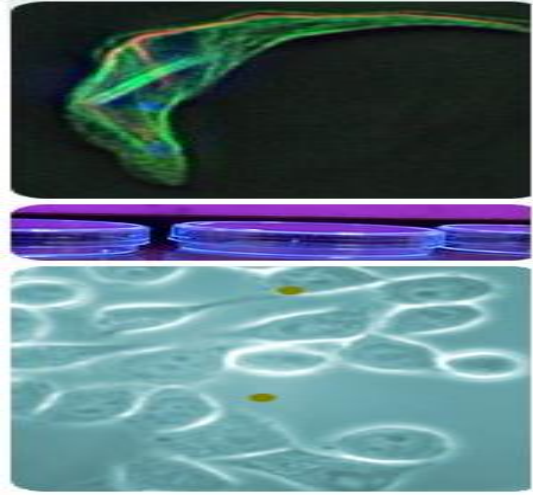
Health related research and development in Lancaster University is becoming increasingly active and it covers almost all the major areas of health research. The university boasts a wide range of facilities and supporting infrastructure including a £3m SPECTRUM Centre for Bi-Polar Research to facilitate and promote research and development



The school have some excellent facilities for undertaking research in all the above research themes like:

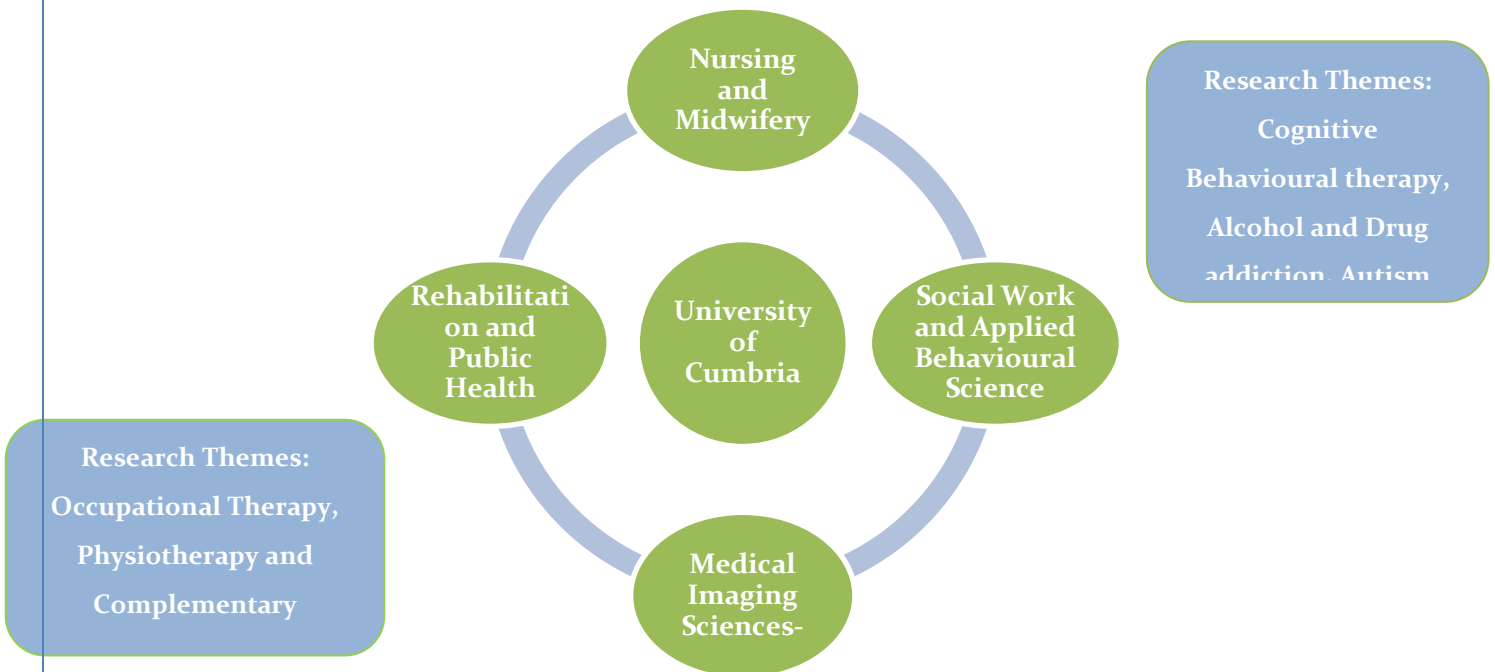
**Facilities**

- DeltaVision deconvoluting microscope
- Two confocal microscopes
- Scanning and transmission electron microscopes
- An ion trap mass spectrometer with online HPLC for proteomics and metabolomics
- GC-MS, a Typhoon variable mode fluorescent imager
- Real time PCR
- Flow cytometry
- DNA sequencing
- HPLC and protein purification equipment



**University of Cumbria**

Within the Faculty of Medical and Human Science in University of Cumbria there are 4 Schools with varying degrees of health related research activities.



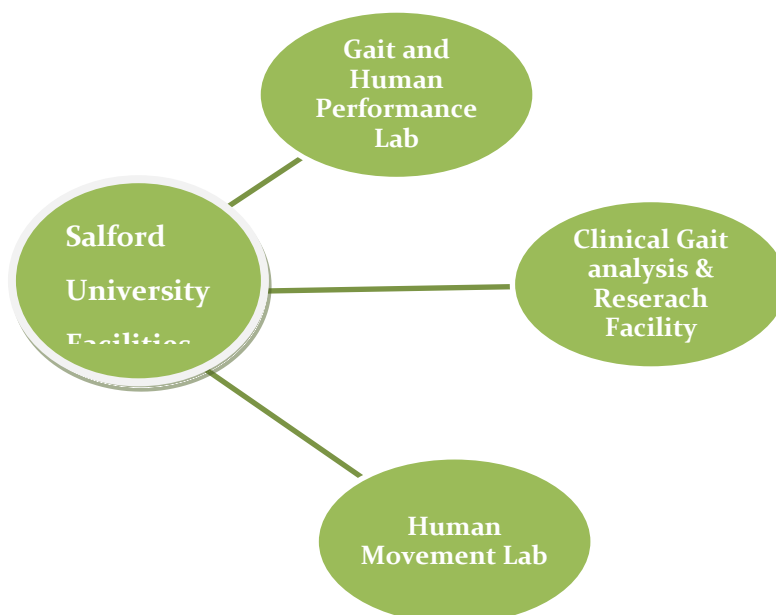


## Salford University

Research in the School is managed through the internationally renowned Centre for Health, Sport and Rehabilitation Sciences Research (previously Centre for Rehabilitation and Human Performance Research). Research is organised through nine research programmes linked directly to health, health care and to the practice of health, sport and exercise professionals

- Clinical biomechanics of health and rehabilitation
- Technologies for human movement measurement and rehabilitation
- Foot and ankle biomechanics
- Neurological Rehabilitation Research
- Function Electrical Stimulation (FES)
- Physical activity, exercise and health
- Strength and conditioning in Sport
- Rheumatology Research
- Diagnostic Imaging
- Emotional Intelligence Research Project

The Centre is a highly multidisciplinary environment with members drawn from the health professions, including physiotherapy, podiatry, sports rehabilitation, prosthetics and orthotics and occupational therapy, as well as engineering, sport science, and computing science. The Centre enjoys world class facilities including three gait and human performance laboratories, a clinical imaging suite, sports and podiatry clinical facilities, and sports strength and conditioning rooms.



### Main Equipments

- Foot Pressure platform and insole system
- Isokinetic dynamometer,
- Ultrasound imaging
- 10 camera Proreflex
- Motion analysis system
- 10 OQUS motion analysis cameras
- 8 channel Telemetry G2T wireless EMG system

### University of Liverpool

University of Liverpool have very establishes health research activities and within its Faculty of Medicine there are 10 schools, which host numerous research units, centres and facilities. The University boasts a diverse, successful medical research background which spans around vast research themes like:



- Biomedical Sciences
- Cancer Studies
- Clinical Sciences
- Dental Sciences
- Health Sciences
- Infection & Host Defence
- Medical Education
- Population, Community & Behavioural Sciences
- Reproductive & Developmental Medicine
- Tropical Medicine

#### *The School of Biomedical Science*

It hosts the NIHR funded Biomedical Research Unit in conjunction with The Royal Liverpool University Hospitals. Research themes include tropical disease, pancreatic and gastrointestinal disease, molecular pharmacology and toxicology and calcium, epithelial, neuronal and smooth muscle signalling and signalling in development. The unit also hosts the Centre for Drug Safety Science.

The school boasts an extensive list of infrastructure and facilities for undertaking research & development in all the above mentioned areas like:

Research Areas	Facilities	Equipments
Biomedical Sciences	Bioanalytical facility, Electron microscopy, Protein interactome facility, Confocal microscopy	Multidimensional LC; MALDI and Q-Star MS; FEI 120kV TEM, AFS2 and EMPACT2 high-pressure freezing and freeze substitution apparatus; High-throughput, high-stringency yeast 2 hybrid equipment; Leica confocal microscope

#### *The School of Cancer Studies*

It hosts the Liverpool Institute of Cancer Studies, incorporating the Cancer Research Centre (ULCRC) and the Liverpool Experimental Cancer Medicines Centre with strong links with RLUH and Clatterbridge. Research themes include cell growth and division epithelial malignancy markers, experimental cancer therapy and haemato-oncology.

*The School of Clinical Sciences*

It hosts 11 research units; clinical chemistry, clinical engineering, critical care, endocrinology, gastroenterology, inflammation, neuroscience, obesity biology, ophthalmology, palliative care and pathophysiology. The Palliative Care Research Unit incorporates the Marie Curie Palliative Care Institute Liverpool.

*The School of Dental Sciences*

It holds £7million in research grants. The research themes are Dental Public Health; Mechanisms of oral development and disease; clinical phenotyping of orofacial anomaly and disease, oral cancer studies, salivary gland research. Plaque related disease; cariology and toothwear, periodontology (microbiology and enzymes)

*The School of Health Sciences*

It has 5 divisions, nursing, occupational therapy, medical imaging and radiotherapy, orthoptics and physiotherapy plus the Health and Community Care Research Unit (HACCRU). The Centre for Applied Social Research into Health and Medicine is a cross faculty collaboration. Research groups currently include eye and vision science, health and care in the community (public health and social care) health technology and informatics, new approaches to the delivery of care (service delivery and organisation, emphasis on mental health) and patient and professional practice, communication and decision making. Currently projects include wide ranging service evaluations, applied mental health, ageing, communication/decision making. There is evidence of collaborative links with the Cognitive Science and Neuroscience research group.

*The School of Infection and Host Defence*

It has active research grouping in medical microbiology, genitourinary medicine, bacterial pathogenicity, molecular virology, zoonoses and reproductive immunology.

*The School of Population, Community and Behavioural Science*

It has 5 divisions, clinical psychology, primary care, psychiatry, public health and clinical effectiveness. There are 5 research themes which cross cut the divisions - Psychological process from pathways to intervention; Impact of clinical communication on health outcomes; Reducing burden of chronic disease; Social context and consequences of ill health; Methodological issues in health research. There are cross cutting research groupings in health technology and informatics, innovations in service delivery and regional and international economic development.

*The School of Reproductive and Developmental Medicine*

It has strong links with Aldey Hey and Liverpool Womens Hospital and specialises in child health and reproductive medicine. There are currently 3 research themes - Pre term labour

and birth which includes obstetrics and neonatology; Biology of the developing lung ; and Health research methodologies, RCTs and systematic reviews.

#### *The Liverpool School of Tropical Medicine*

It hosts one of the largest international research groups in the world ,with a large and diverse funding base, and active collaborations with government and EU agencies, charitable foundations, and other universities. Staff within the school work across other research groupings where relevant to UK health care and the NHS, and provide a diagnostics laboratory for the detection of human parasites. However, most research activity is focused on the study of major international disease such as malaria, HIV and wolbachia (river blindness and elephantiasis) and the study of snake venom and insect vectors. There are 5 main research groupings:

- Child and reproductive health;
- Clinical studies; Pulmonary immunology, diagnostics (human parasites) disease control strategy, the ABBA programme consortium (Addressing the Balance of and the Centre for Neglected Tropical Diseases
- International health group; Gender, health systems development. Incorporates the Effective Health Care Research Consortium which is a collaboration of several Cochrane networks and universities, funded by the Dept of International Development.
- Molecular and biochemical parasitology includes the Alistair Reid Venom Research Unit AntiMal, an EU funded (17.5 million euros) anti malaria consortium, A-WOL an anti wolbachia consortium funded by the Bill and Melinda Gates Foundation.
- Vector group, one of the largest group of insect vector biologists in the world.

#### *The School of Biology*

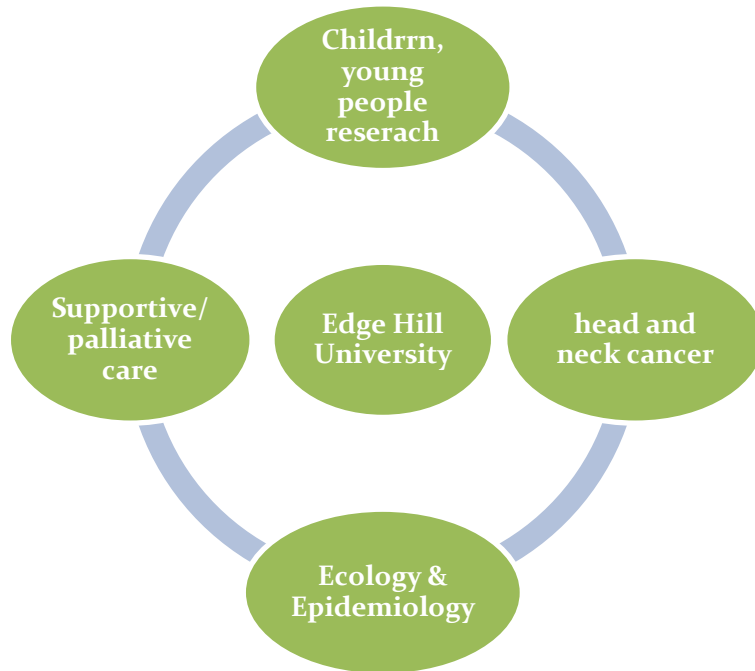
It has 3 Divisions and 12 active groups some of which are relevant to health care services though it is generally basic research. Where translational work is taking place it tends to be in collaboration with applied clinical research units such as HaCCRU. Research groups include; Cell signalling and chemical biology both with the Centre for Cell Imaging. Functional and comparative genomics; host -parasite biology; microbiology; molecular oncology and stem cell biology and structural biology which are mostly focused on the understanding of disease pathways (Centre for Structural Biology). The Rheumatology Research Unit is closely affiliated to the School and some of its research groups.

#### *The School of Psychology*

It has 3 main research groupings and several themes within like Biological Psychology; Cognitive science and neuroscience and Applied Social Psychology

**Edge Hill**

Edge hill University have a strong history in health related R&D. The Evidence-based Practice Research Centre (EPRC) which is part of the Faculty of Heath is a good facility which is primarily concerned with advancing evidence-based practice through education, research and development. The main research themes are around:



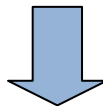
Edge Hill also collaborates with the Mersey Deanery for medical education and has an active relationship with the Marie Curie Research Centre in Liverpool for supportive and palliative care research.

## MMU

MMU has some very good infrastructure and facilities for health related research & development. The university have collaborations with other universities, NHS organisations and some external organisations. Some of its main facilities include:

*The Institute for Biomedical Research into Human Movement and Health*

It collaborates with the Science and Engineering Faculty, Manchester University and Manchester Royal Infirmary. All of their research activity is relevant to the NHS. The Institute holds major UK and European research grants. Research themes include:



Growth, disuse and ageing; muscular skeletal mechanisms in normal populations and disease groups.

Molecular and cell biology; tissue growth and repair, muscle and fat stem cell characterisation, fat metabolism and regulation of gene expression.

Angiogenesis and vascular biology; tissue perfusion, angiogenesis and inhibition in diabetic retinopathy and cerebral atherosclerosis.

Neuromuscular Function; Biochemical and neuromuscular mechanisms influencing mobility; Musculoskeletal mechanisms; Motion analysis in the elderly ; Neural and Visual Control; Motor behaviour and brain function in

*The Research Institute for Health and Social Change (RIHSC)*

The Research Institute brings together an impressive array of research activity from across the University, in partnership with field-based colleagues and organisations. RIHSC is organised as three centres reflecting the three major themes –

- Health, Rehabilitation and Psychology- Main research areas are
  - Applied behavioural science;
  - Disability, injury and rehabilitation
  - Learning disability group
  - Health service, education, delivery & evaluation
- Qualitative Research, Subjectivity and Critical Theory
- Social Change and Well Being

- Critical community & disability studies
- Well being, ageing & social care

#### *The Dalton Research Institute*

The Centre for Materials Science works on many healths related projects with potential for the NHS. Much is original research with major science grant funding.

#### **University of Manchester**

University of Manchester is very strong in it links with NHS and other external organisations to carry out world class health research & development. Manchester operates an immense infrastructure to support a diverse range of health care research. The organisational structure operates in a manner which encourages multidisciplinary working, and encompasses the full spectrum of activity from original theory, experimentation and analysis to epidemiology, applied therapeutics and service delivery.

The School has a 50% success rate for grant applications, and currently holds over £5 million.

The university have various departments and institutes which are pioneers in various research areas like:

#### *The Faculty of Life Sciences and the School of Medicine*

They have huge and diverse range of research activities and are host to a number of Research Centres and Institutes, including several research centres, some of which have links with The Faculty of Health and Medicine.

#### *The School of Pharmacy and Pharmaceutics*

The school is primarily concerned with the discovery end of pharmaceutical science, identifying and developing novel lead drug candidates. There are numerous industry and international academic collaborations, and links across the university in for example computational chemistry, NMR structural teams and pharmaceutical formulation. The school hosts D2M Discovery to Medicine, a world class scientific advisory board with industry and academic expertise to bring together original and applied research and testing. The Wolfson Foundation has provided funding to resource the Wolfson Centre for Rational Structure Based Design of Molecular Diagnostics.

#### *The School of Dentistry*

They conduct basic research in the areas of craniofacial genetics, biomaterials and biomechanics and stem cell research. The School also undertakes the study of applied health sciences via the Oral Health Unit which works within the *NPCRDC*. Themes include informing policy, commissioning and practice, e.g., fluoridation, service delivery and organisation, young children, clinical effectiveness and a prisons research programme. Current

work includes systematic reviewing, clinical craniofacial research, diagnostic research, oral radiology and imaging, implant research and surgery and control of pain and anxiety.

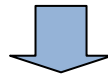
### *The School of Psychology*

They run mainly three main research groups

- Language and communication
- Cognition and cognitive neuroscience;
- Experimental perception and cognition.

The school leads the HTA funded ACTNoW project concerned with speech therapy in aphasia. The school also hosts the Neuroscience and Aphasia Research Unit (NARU). The Institute cross cuts with the Neuroscience Research Institute and the Institute of Health Sciences.

Overall the main health related research themes in University of Manchester are the following:



Bioinformatics/functional genomics; Cell matrix research- Wellcome Trust Centre; Channels and transporters; Eye and vision science; Gene expression; Immunology; Molecular cancer studies; Molecular microbiology; Neuroscience; Tissue regeneration/stem cell research; Structural biology/biophysics; Mental health care in both primary and secondary care, and ageing & dementia;

Long term care and Rehabilitation; Promoting Positive Ageing and Self Management in Long term Conditions; Child and family health and social care; Cancer; cardiovascular medicine, clinical neuroscience, dermatology, endocrine, epidemiology;

Gastroenterology, genomic epidemiology, health methodology, imaging, maternal/fetal health; medical education research, medical genetics, occupation and environmental health, primary care, psychiatry, respiratory medicine and tissue injury and repair

The university have some excellent infrastructure and facilities to promote R&D in the health care sector and have some major collaboration with the NHS and other external organisations. Some of the notable infrastructure facilities the university boasts include:

- The Institute for Health Science (IHS) which works closely with the schools and 19 research organisations in the North West
- The Healing Foundation Research Centre which is opened in 2007 and focussing on basic and clinical research into wound healing and tissue regeneration.



- Cancer and palliative care research facilities, including the MacMillan Research Unit in conjunction with Southampton University.
- The Nowgen Centre for genetics in health care
- The MRI facility
- The Manchester Cancer Research Centre which incorporates The Paterson Institute for Cancer Research, a therapeutic centre.
- The ARC Epidemiology Unit
- The Biomedical Imaging Institute
- The Centre for Integrated Genomic Medical Research
- The National Primary Care Research and Development Centre (NPCRDC)
- The Wellcome Trust Clinical Research Facility,
- The UK Biobank
- The Maternal/Fetal Health Research Centre
- And other numerous facilities for multidisciplinary research, including The Wolfson Molecular Imaging Suite and Systems Biology facilities
- Neuroscience Research Institute
- The Biomedical Imaging Institute
- The Collaboration for Leadership in Applied Health Research and Care (Greater Manchester CLAHRC).

## Strategic Analysis of North West Infrastructure

NHS North West covers a wide geographic footprint from Crewe to Carlisle with a population of nearly 7 million, spending nearly £12 billion per annum on healthcare. We have a unique economy, with a strong R&D base, a range of healthcare providers, from traditional models of NHS provision, some internationally renowned leading-edge NHS provision, innovative social enterprises and a strong independent sector. Alongside this we have a high concentration of small and medium enterprises in the medical technology area and pharmaceutical industries. We also have some world class infrastructure and facilities and expert skills which makes it possible to achieve many excellent research success stories.

However, the analysis clearly shows a lack of consolidation and collation of R&D infrastructure information across NHS North West. There has been also noted a lack of recording of this information and to make it publicly accessible and these trend is observed in almost every NHS organisation expect few. On the contrary, universities and other external organisations usually have clear, easily accessible information regarding their facilities and infrastructure details and are available for all interested stakeholders.

Such a situation can lead to several possible future issues including:

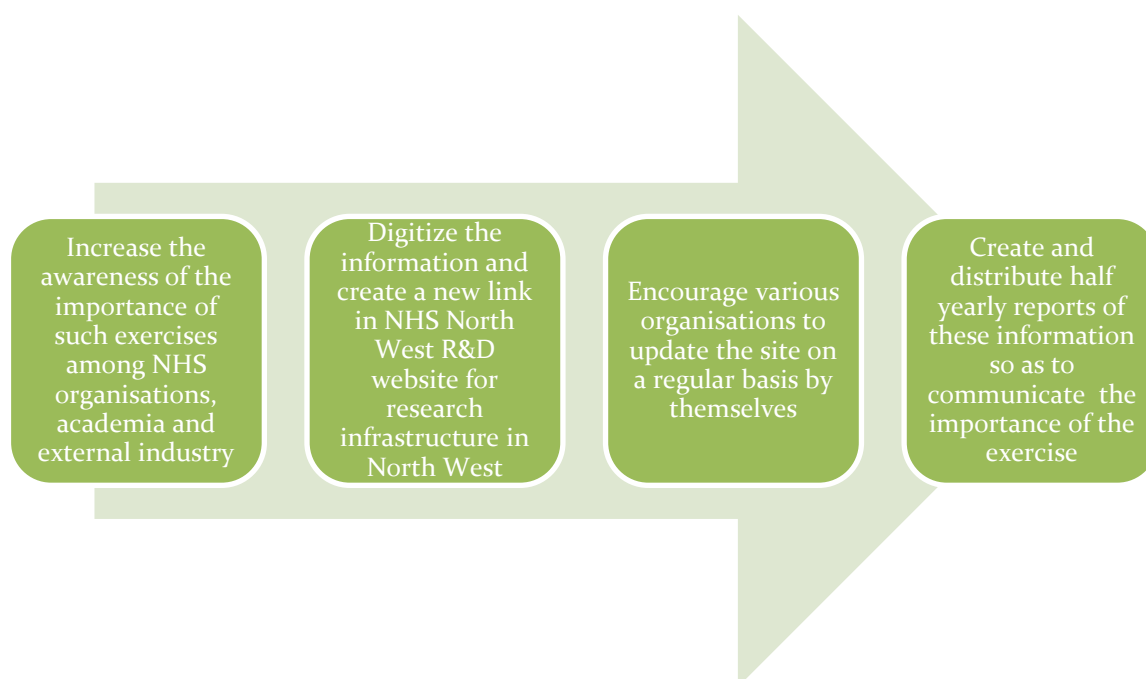
- *Less co-ordination among different organisations & incomplete utilisation of the resources and facilities:* The above study makes it evident that there are lot of organisations and research institutes which conduct research in similar areas. An availability of research infrastructure & facilities information across all the research organisations will further increase co-ordination and better utilization of resources. This can also be a way to further reduce the costs of funding for new equipments and facilities by encouraging cross-utilization.
- *Less informed decision making and future planning:* Lack of comprehensive information about the infrastructure facilities across North West may result in less informed decisions.
- *Most importantly, inability in conveying the true value because of lack of an holistic view:* We have some excellent expert skills and world-class infrastructure, however lack of a comprehensive resource which points our strengths in research facilities limits the visibility of North West's research potential.

The study undertaken aims to mitigate some of these issues by creating an in-depth analysis of our strengths; however, this information will need to be updated on a regular basis which is time consuming and less cost & resource effective. This calls for the need for a permanent solution – ***A website for the research infrastructure and facilities for North West.***

## Way Forward

The North West has a multitude of organisations and people with good innovative ideas and talent. We also have excellent infrastructure and facilities to exploit these resources to their maximum potential. And with a culture of permissiveness and a platform to enable these good ideas to be shared and adopted, and by making our strengths more visible we will be able to achieve more world-class results so as to make North West the best place to carry out medical research & development.

The research project carried out by NHS North West R&D team tried to come up with a comprehensive report which is a holistic, big picture analysis of research situation and associated infrastructure facilities in North West. But no exercise can be completely successful if it is not updated and reviewed on a regular basis. So to make this study more effective, following 3 steps are recommended for the immediate future:



### *Creating the Website*

To create a new website to have the information in a more easily accessible version is a regular practice; however, it will have the complete benefits only when there is proper planning and implementation. To make sure that new NHS North West website for infrastructure is a success the following action points are recommended:

- Have an initial design plan – What information need to be there in the website, where it has to be located, whether it should be in an interactive way or in an informative way
- Contact the website developers and share the requirements
- Develop the overall website plan – budget, timelines

- Intermediate review of the development
- Develop a promotional plan for the new website so as to increase maximum participation from various stakeholders
- Make sure the website is regularly updated and encourage the various stakeholders to update by creating and distributing the website contents in report formats

## Appendix 1

### Research Areas

#### Cancer Research Institutes

[Cancer Tissue Bank Research Centre](#) is a University of Liverpool resource located within the Department of Pathology, School of Cancer Studies. It has been collecting tumor and adjacent non-malignant tissues, surplus to diagnostic requirement, since 1992 from patients who are undergoing surgery to remove tissue where cancer is a confirmed or likely diagnosis. These samples have been banked to provide an invaluable resource for research groups investigating the molecular mechanisms involved in cancer.

[The Christie Hospital NHS Trust](#) in Manchester. This is the largest cancer treatment centre of its kind in Europe, and second in the world only to MD Anderson in Houston. The Christie is a significant centre for clinical trials with access to a large patient population via the cancer network.

[Clatterbridge Centre](#) for Oncology is one of the largest cancer centres in the UK, with nearly 7,000 new patients registered each year. They deliver treatment for patients through radiotherapy and chemotherapy services. To achieve this they have state-of-the-art imaging services to detect and plan treatment, together with supportive care from nursing and allied health professionals to address the palliative aspects of care and needs of family supporters.

[The University of Liverpool Cancer Research Centre](#) and institute of Cancer Studies. The ULCRC is undertaking a wide range of research into cancer, as well as training scientists and health workers. The University is already internationally renowned for its research work in the areas of gastric, colon, pancreatic, breast and lung cancer. Partners include: Royal Liverpool University Hospital, Clatterbridge Centre for Oncology and the NW Cancer Research fund. The Centre was awarded UK Cancer Research Status in 2009.

[Linda McCartney Centre](#) in Liverpool. The centre provides treatment for breast cancer, liver/colorectal cancer, eye cancer, chemotherapy and bone marrow transplantation.

[Manchester Breast Centre's](#) mission is to create a world-class centre for basic and translational breast cancer research, leading to effective detection and treatment of women at risk, and ultimately elimination of the disease. Breast cancer research in Manchester has a long history of excellence and we are currently enlarging our Centre, which consisted of seven principal investigators in 2007 and expanded to thirteen during 2008.

[Manchester Cancer Research Centre \(MCRC\)](#). The MCRC brings together the expertise, ambition and resources of partner organisations which already have formidable individual reputations in the fields of cancer treatment and clinical research. Partners include Cancer Research UK, The Christie, Paterson Institute for Cancer Research and the University of Manchester.

[The Paterson Institute for Cancer Research](#) in Manchester. The institute receives £8million annually from charitable sources, notably Cancer Research UK, and is part of the Christie Trust. The Institute is also developing a Translational Research Centre that will include the latest facilities for gene therapy, molecular diagnostics, and pharmacokinetics and pharmacodynamic studies.

[Wolfson Molecular Imaging Centre](#) (WMIC) adjacent to the Christie Hospital and the Paterson Institute for Cancer Research. This centre, the first of its kind in the world, provides imaging for cancer research using Positron Emission Tomography (PET) and also houses a cyclotron source with a GMP manufacturing laboratory for testing short-lived radiolabelled drugs.

Companies addressing Oncology include: [AstraZeneca](#), Alderley Park in Cheshire. Research and development is carried out in the areas of cancer, anaesthetics and heart disease. AstraZeneca are world leaders in drug development for the treatment of prostate cancer (e.g. Casodex, the world's leading anti-androgen therapy) and breast cancer (e.g. Nolvadex, the world's most commonly-prescribed breast cancer treatment).

[DxS](#) is a personalised medicine company providing molecular diagnostics to aid doctors and drug companies in selecting therapies for patients. DxS offers products, technology and services to the healthcare industry to enable the delivery of safe and effective medicines. Working predominantly in the field of cancer, DxS have a range of companion diagnostic and research kits that detect mutations in oncogenes associated with drug response. DxS have recently become part of the Qiagen group.

[Epistem](#) in Manchester. Epistem provides a pre-clinical contract research service focused upon epithelial tissues and their stem cells with specific expertise in cancers and cancer therapy side effects. Epistem is also developing oncology therapeutics and biomarkers.

[Intellihep](#) develop Heparin based therapeutics with a wide range of applications including inflammation, neurodegeneration, angiogenesis, wound healing, cancer, cardiovascular disorders and infectious diseases.

[Photo Therapeutics](#) in Cheshire. The company develops photodynamic therapies for the treatment of non-melanoma skin cancer and precursor lesions.

[TheRyte](#) in Liverpool. TheRyte develop protein markers for cancer diagnostics and drug development.

### Infectious Diseases Research Institutes

The Royal Liverpool & Broadgreen University NHS Trust along with its partners University of Liverpool and the Liverpool School of Tropical Medicine were awarded a specialist [Biomedical Research Centre](#) in Microbial Disease. This award was made following a competitive bidding process. It was in recognition of the research excellence within the field in the city. The Trust has been awarded £2.5 million per year over the next five years to develop research which focuses on Microbial Disease

[Liverpool School of Tropical Medicine](#) is the oldest such school in the world. LSTM is an international postgraduate centre of excellence, devoted to research, education and training, and consultancy. LSTM has a portfolio of research based in the developing countries of the tropics. This is run alongside laboratory-based programmes, particularly in the area of parasitic and other communicable diseases.

[Novartis Vaccines](#) in Speke manufactures an extensive range of products including: *Begrivac*<sup>™</sup>, the first preservative-free vaccine; *Encepur*<sup>™</sup>, a vaccine against tick-borne encephalitis; and *Fluvirin*<sup>™</sup>, a triple-antigen flu vaccine, approved for sale in more than 20 countries.

[MedImmune](#) in Speke is focused on using biotechnology to produce innovative products and this site provides a significant volume of their biomanufacturing capability for *Flumist*<sup>™</sup>.

[Neutec Pharma](#) in Manchester is a biopharmaceutical company, which specialises in the development of genetically recombinant antibodies, or "grabs", for the treatment of life-threatening infections. NeuTec's two leading drug candidates are *Mycograb*<sup>®</sup>, which targets systemic candidiasis, and *Aurograb*<sup>®</sup>, which targets *Staphylococcus aureus* including methicillin-resistant *Staphylococcus aureus* ("MRSA").

[Protherics](#) in Cheshire. This research and development site focuses on bio-therapeutics with products such as *Crofab*<sup>™</sup>, to treat snakebites.

### Cardiovascular Research Institutes

[The University Of Manchester Cardiovascular Research Group](#) The group comprises a large number of teams looking at clinical aspects of the causes and management of high blood pressure, diabetes and hypercholesterolaemia. The group also co-ordinates international multi-centre drug trials as well as supervising their own lab based projects.

[The University of Liverpool Cardiovascular Research](#)  
This group pioneered fabrication techniques for small diameter vascular implants. They are active in a number of research areas including haemodynamics, endovascular repair of aortic aneurysms, haemorheology and tissue engineering of blood vessel substitutes.

Major clinical research groups are located in a number of teaching hospitals:

[The Cardiothoracic Centre Liverpool NHS Trust](#)  
The Trust has developed as a Centre of Excellence in cardiovascular medicine and is now one of the largest specialist heart and chest hospitals in the United Kingdom serving a population of nearly 3 million people.

[Liverpool Heart and Chest Trust's](#) vision is to be a national and international leader in

cardiothoracic care, delivery clinical excellence and a first class patient experience. The Trust provides specialist services across the North West with five areas of clinical expertise that is offered to patients. They are cardiac Surgery, Thoracic Surgery, Cardiology, Respiratory Medicine (Inlc. adult cystic fibrosis) and Upper Gastrointestinal Surgery.

[The Manchester Heart Centre, Manchester Royal Infirmary](#)

The Centre specialises in cardiothoracic surgery and cardiology. It carries out a range of open heart and other surgical procedures, thoracic surgery, diagnostic angiography and interventional cardiology (angioplasty) plus various testing and imaging procedures. A large part of the cardiology activity includes electrophysiology studies and inserting pacemakers and devices. There are clinical research programmes focusing on the causes and management of heart failure and cardiac dysrhythmia.

[Medicines Evaluation Unit \(MEU\)](#) - The MEU specialises in performing clinical trials (from Phase I to IV) in respiratory / inflammatory medicine and related areas. With the company's position within hospital premises it has the advantages of specialist equipment and ITU access availability, and is therefore ideally suited to perform early phase exploratory studies.

[Wythenshawe Cardiothoracic Centre, South Manchester University Hospitals NHS Trust](#)

This is one of the 5 national heart and lung transplant units in the UK providing diagnostic services, interventional cardiology (angioplasty and electrophysiology), cardiac surgery and thoracic surgery.

Companies with products and research programmes addressing cardiovascular diseases are:

[AstraZeneca](#) in Alderley Park, Cheshire. AstraZeneca is a world leader in cardiovascular medicine with a large range of products for hypertension and high cholesterol levels. It has a number of cardiovascular research programmes focused on delivering new and more effective medicines to treat cardiovascular diseases and metabolic risk factors such as Type II diabetes, obesity and metabolic syndromes.

[BTG Plc](#) in Runcorn, Cheshire. The company is developing an angiotensin vaccine for the treatment of high blood pressure (hypertension), a major risk factor for serious diseases such as heart attacks and strokes.

[Intellihep](#) develop Heparin based therapeutics with a wide range of applications including inflammation, neurodegeneration, angiogenesis, wound healing, cancer, cardiovascular disorders and infectious diseases.

[Provexis](#) in Liverpool, Merseyside develops proprietary bioactives for the functional and medical food industry. The Company is developing products for the prevention and management of cardiovascular disease, obesity and Type II diabetes .

[Renovo](#) in Manchester is developing novel pharmaceuticals to prevent vascular scarring or restenosis, a common cause of vascular graft failure occurring after cardiac-by-pass surgery.

[Terumo Cardiovascular Systems](#) in Knowsley, Merseyside. Part of the Terumo Corporation of Tokyo, Japan, Terumo Cardio develop and manufacture precision-focused products, such as perfusion circuits, for the specialized needs of the cardiac surgical team with an emphasis on cardiopulmonary bypass and intraoperative monitoring.



## Neurosciences & Mental health Research Institutes

[Motac Neurosciences](#) in Manchester. This Manchester University spinout company provides highly specialised services to support the discovery and development of proprietary therapeutics and diagnostics to treat disorders of higher brain function such as movement disorders (including Parkinson's disease) and dementias (including Alzheimer's disease).

[Neurosciences at the University of Manchester](#) cover Neural Injury & Repair; Neuroimaging; Sensorimotor Neural Coding; Signalling in the Nervous System and Vision Sciences. Neurodegeneration, repair and neuronal plasticity are major interests of the University with programmes on central and peripheral nervous systems, and mechanisms of cell death and regeneration. Professor Dame Nancy Rothwell FRS leads a major research group in stroke.

[The University of Manchester Wolfson Molecular Imaging Centre](#) adjacent to the Christie Hospital and the Paterson Institute for Cancer Research. This centre, the first of its kind in the world, provides imaging for cancer and neuroscience research, using Positron Emission Tomography (PET) and also houses a cyclotron source with a GMP manufacturing laboratory for testing short-lived radiolabelled drugs.

[The University of Liverpool Department of Neurological Sciences](#). The department is based in the Walton Centre for Neurology and Neurosurgery. The Centre is a secondary and tertiary referral centre for people with neurological diseases.

[The Walton Centre for Neurology and Neurosurgery NHS Trust](#). This internationally acclaimed centre provides a range of neurology, neurosurgery, pain relief and specialised diagnostic services.

[The Blond McIndoe Research Laboratories](#) at Manchester University is the most prominent UK unit working on peripheral nerve injury and regeneration, and uniquely employs side by side scientists and young surgeons, allowing this combination of different academic training to explore the scientific and clinical problems examined in various projects. The group is part of the [UK Centre for Tissue Regeneration](#).

### Mental Health

North West Universities and NHS Trusts play a leading role in mental health research and clinical trials.

[UK Mental Health Research Network](#). Part of the UK CRC programme, the Network supports large scale clinical trials and acts as a central point of information and reference connecting industry, mental health professionals and patients. The Network is co-ordinated by the University of Manchester and supports research and innovative approaches to mental health diagnosis and treatment (such as [PsyGrid](#)).

[Greater Manchester Research Alliance](#) - Currently the largest UK research group in primary care mental health, the Alliance has particular expertise in psychosis treatment and prevention, depression treatment in children, suicide prevention and dementia.

[PsyGrid](#) Set up by the University of Manchester, PsyGrid is an e-science project facilitating clinical trials and longitudinal studies in first episode psychosis. Such a system allows the

collection and sharing of large clinical, biological and demographic data sets facilitating hypothesis driven epidemiological research.

### Tissue Engineering & Regenerative Medicine Research Institutes

[UK Centre for Tissue Regeneration \(UKCTR\)](#) at Manchester University is translating basic discoveries to clinical and commercial benefit in GMP Clean Laboratories. The centre will develop and manufacture a variety of tissues for potential therapeutic use. Projects include Cartilage, Intervertebral Disc, Material Engineering, Nerves and Vascular Tissue Engineering. Collaboration's between businesses and existing groups is an integral part of the UKCTR's work.

[The Healing Foundation Centre for Tissue Regeneration](#) is a pioneering initiative at the University of Manchester to advance the understanding of wound healing and tissue regeneration. The centre opened in September 2007 and seeks to advance the understanding of wound healing and tissue regeneration.

[The North West Embryonic Stem Cell Centre](#) (NWESCC) is a joint project between Central Manchester NHS Trust and the University of Manchester, the Patterson Institute for Cancer Research and the University of Liverpool. The Centre is funded by the NW Development Agency and the Medical research Council. The Centre has GMP IVF laboratories to for tissue banking standards as well as a new laboratory also accredited to GMP, for derivation, culture and storage of hES cells. The NWESCC is closely linked to the new UK Centre for Tissue Regeneration (UKCTR) on an adjacent site.

[The Wellcome Trust Centre for Cell-Matrix Research](#) is an interdisciplinary research centre embedded within the Faculty of Life Sciences at The University of Manchester. The foundation of the Wellcome Trust Centre for Cell Matrix Research is the team of world-class principal investigators. The Centre is responsible for a high number of world-class publications from its principal investigators each year.

[Advanced Medical Solutions plc](#) in Cheshire is a technology company supplying the \$15 billion global woundcare market with advanced woundcare dressings and tissue adhesives for wound closure.

[Epistem](#) in Manchester. Epistem provides a pre-clinical contract research service focused upon epithelial tissues and their stem cells with specific expertise in cancers and cancer therapy side effects. Epistem is also developing oncology therapeutics and biomarkers.

[HiMedica Ltd](#) based in Cheshire is a research-based company developing products in the areas of wound care and thin-layer tissue structures.

[Intercytex Ltd](#) in Manchester. This regenerative medicine company focuses on developing and commercialising cell-based therapeutic solutions for treatment of tissue and organ failure.

[Renovo Ltd](#) in Manchester is developing innovative and efficacious approaches to prevent scarring and enhance tissue repair, from discovery phase to clinically proven commercial products.

## Clinical Genetics

CIGMR - Centre for Integrated Genomic Medical Research based at the University of Manchester, is a comprehensive facility for the analysis of complex diseases by combining epidemiological, statistical and genetic approaches. Concentrating on the analysis of inflammatory, infectious, autoimmune and neurocognitive phenotypes, it offers services such as advice on genetic study design, ethics, committee applications, bioinformatics, data analysis and comprehensive in-house laboratory services for clinicians and research scientists wishing to pursue genetic approaches to understanding complex traits.

The Central Manchester Children's University Hospitals NHS Trust houses both the Regional Molecular Genetics Laboratory and one of only two National Reference Laboratories in England.

The Molecular Pharmacology and Toxicology Research Group at the University of Liverpool led by Professor Kevin Park encompasses the spectrum from molecular aspects of drug action to translational research on drug safety using utilising technologies such as microarrays, proteomics, transgenics and pharmacogenetics. This group is supported by BBSRC, CRUK, MRC, Wellcome Trust and UK Department of Health. Also within this group Professor Munir Pirmohamed was appointed to the NHS Chair in Pharmacogenetics which will complement a £10m Centre for Personalised Medicines being created by the University aided by a £2m grant from the Wolfson Foundation. Research will be carried out in collaboration with the Royal Liverpool University Hospital and other hospitals in the North West and will collect genetic information to build a detailed clinical picture of individual patients and their response to particular drugs.

The Northwest Genetic Knowledge Centre (NoWGEN) in Manchester. The centre aims to create a cohesive community of highly informed professionals that shares information, discoveries, expertise and experience in genetics. The focus of the centre is Applied Genetics to house multi-disciplinary research groups that will deliver cost-effective genetics services.

The UK Biobank in Manchester. This national project is the world's biggest resource for the study of the role of nature and nurture in health and disease. Up to half a million participants aged between 45 and 69 years will be involved in the study. Information from participants will create a powerful resource for biomedical researchers.

Companies with interests in this field DxS is a personalised medicine company providing molecular diagnostics to aid doctors and drug companies in selecting therapies for patients. DxS offers products, technology and services to the healthcare industry to enable the delivery of safe and effective medicines. Working predominantly in the field of cancer, DxS have a range of companion diagnostic and research kits that detect mutations in oncogenes associated with drug response.

## Genomics & Proteomics Research Institutes

[The NW Consortium for Post-Genome Science](#) is a cross-institutional initiative between the Universities of Liverpool, Manchester, Salford and the CCLRC Daresbury. The consortium is designed to accelerate developments in post-genome science and technology for the benefit of scientists, clinicians and companies. Its members are carrying out core programmes of

research, focussing on strategic research areas: Centre for Bioarray Innovation, Microfluidics Analytical and Screening Technology Centre, Centre for Integrated Genomic Medical Research, 3rd Generation Proteomics, Structural Biology and the Northwest Institute for Bio/Health Informatics.

[The Centre for the Functional Genomics of Microbial Eukaryotes](#) (COGEME) houses a Proteome Research Facility in Manchester, which provides unique services from protein extraction to data archiving in the PEDRo proteomics database.

[Applied Biosystems](#) in Warrington. The company manufactures and develops laboratory equipment for molecular genetics.

[Michael Barber Centre for Mass Spectrometry](#) - The interests and expertise of the centre are in the development of mass spectrometry and related analytical techniques, and their application to problems of biological importance. In particular, we are concerned with the understanding of the gas-phase ion chemistry of biomolecules (notable peptides and proteins) and the exploitation of that understanding in enhanced analytical approaches.

[Shimadzu Biotech & Shimadzu Research Laboratory](#) in Manchester. Shimadzu has its European Headquarters in the region. The company are applying innovative technologies to create the world's most powerful analytical solutions for life science and drug discovery.

[Tepnel Life Sciences](#) in Manchester. The company specialises in the development of diagnostics and automation in genetics.

[Waters Corporation](#) in Manchester. Waters develop analytical equipment for such issues as protein identification from membrane fractions.

### Medical & Molecular Imaging Research Institutes

[Wolfson Molecular Imaging Centre](#) (WMIC) adjacent to the Christie Hospital and the Paterson Institute for Cancer Research. This centre, the first of its kind in the world, provides imaging for cancer research using Positron Emission Tomography (PET) and also houses a cyclotron source with a GMP manufacturing laboratory for testing short-lived radiolabelled drugs.

[Clatterbridge Centre for Oncology](#) - Clatterbridge Centre for Oncology is the single provider of non-surgical oncology in the Merseyside and Cheshire Cancer Network, one of the largest cancer networks in the UK. The Centre offers a full range of services in radiotherapy and systemic therapy for all patient groups (except for systemic therapy of haematological malignancy) and currently has the only operating proton therapy facility in Britain.

[Daresbury Laboratory](#) in Cheshire. Daresbury is 'the birthplace' of the synchrotron. This facility provides radiation detectors, synchrotron radiation, image analysis and high performance computing.

[Royal Lancaster NHS University](#). The hospital has a state-of-the-art Department of Radiology which consists of 9 rooms equipped to undertake a wide variety of diagnostic investigations including MRI Scan, Spiral CT, Trans-oesophageal and trans-thoracic Echocardiography, Ultrasound and Gamma Camera Imaging

[Liverpool University](#) (Directorate of Medical Imaging & Radiotherapy). The university has a dedicated Medical Imaging Unit that provides teaching, research activities and access to silicon detectors, magnetic resonance and image analysis.

[Magnetic Resonance and Image Analysis Research Centre \(MARIARC\)](#). MARIARC has expertise in MRI, MEG and FTCD scanning. The centre has particular expertise in functional MRI (fMRI), Diffusion Tensor Imaging (DTI), perfusion imaging, Arterial Spin Labeling (ASL) and Magnetic Resonance Spectroscopy (MRS). Strong links with the Walton Centre for Neurology and Neurosurgery, the Pain Research Institute in cognitive and clinical neuroscience.

[Royal Liverpool & Broadgreen Hospital](#). The hospital has expertise in medical physics, nuclear medicine, image production and processing.

[South Manchester Hospitals Mammography](#). The hospital can provide nuclear medicine and sentinel node analysis.

[ManPET](#) in Manchester. ManPET is a collaborative research venture between The University of Manchester, the Paterson Institute for Cancer Research and the Christie Hospital NHS Trust, providing access to facilities within each organisation.

[University of Manchester Biomedical Imaging Institute](#) - The Biomedical Imaging Institute is a hub for Interdisciplinary activity across the University of Manchester. It has been established to encourage use of multi-modal imaging techniques, the development of new imaging methods and the integration of pre-clinical and clinical imaging. Members of the Institute have particularly strong expertise in neuroimaging and cancer imaging, as well as PET and MRI methodology and image analysis. Members include:- Salford Royal NHS Foundation Trust, Wellcome Trust Clinical Research Facility, Wolfson Molecular Imaging Centre, University of Manchester, Christie Hospital and Paterson Institute.

## HEALTHCARE – Wound-Care, Orthopaedics, Medical devices, Diagnostics & Nutrition

[Institute of Health Sciences](#) - The Institute of Health Sciences (IHS) promotes health sciences research and postgraduate education in Greater Manchester. The institute is a networked organisation made up of research groups within The University of Manchester in partnership with local NHS Trusts.

[NHS Technology Adoption Centre](#) - The Healthcare Industries Task Force identified the need to establish Health Technology Adoption Centres to improve the uptake of innovation by the NHS (device & diagnostics not drugs). Launched in autumn 2007 the NHS Technology Adoption Centre, is located in Central Manchester with NHS Trustech and Medilink North West creating an environment where synergistic opportunities can be recognised and exploited for both commercial growth and improved patient care.

[NHS TrusTECH](#) - TrusTECH, the North West NHS Innovation Hub is established to actively manage healthcare innovations and the associated Intellectual Property assets of the NHS in the North West and Wales. TrusTECH's activities also include sourcing innovations and IP solutions to NHS problems from industry. TrusTECH's areas of expertise include Diagnostics, Therapeutics, Medical Devices, Equipment, Software and Training and Education.

[MIMIT](#) - The University of Manchester and Greater Manchester NHS and Primary Care Trusts have joined forces to create MIMIT™ - a new and exciting initiative which facilitates collaborations between clinicians, scientists, engineers and industry to develop innovative technology for patient benefit. MIMIT™ will seize opportunities to enable clinical problems to be identified more readily and, most importantly improve patient outcomes by bringing innovative technology developments to fruition. MIMIT™ is the first international affiliate of the highly successful Center for Integrating Medicine & Innovative Technology (CIMIT®), Boston, USA.

[Medilink NW](#) - Medilink NW is a Medical Device and Healthcare Technology Network, which is part Medilink UK, a flourishing national network of regional healthcare organisations. The services offered by Medilink NW include the provision of consultancy and support for member companies, educational seminars on relevant topics, such as regulatory requirements, finance and research collaborations and the provision of a networking forum for the sector within the NW region.

[The University of Liverpool Cardiovascular Research](#) - This group pioneered fabrication techniques for small diameter vascular implants. They are active in a number of research areas including haemodynamics, endovascular repair of aortic aneurysms, haemorheology and tissue engineering of blood vessel substitutes.

[The UK Centre for Tissue Regeneration](#) - The centre develops and manufactures a variety of tissues for potential therapeutic use. The research includes cartilage, Intervertebral Disc, Material Engineering, Nerves, Vasular Tissue Engineering.

[Advanced Medical Solutions](#) - Advanced Medical Solutions (AMS) is a leading provider of advanced woundcare products to the global market. New technologies are taken to market via major branded partners and AMS is also well placed to address the growing trend towards private label products in advanced woundcare through provision of own-label ranges AMS is investing in a major new facility in Winsford, Cheshire to house its R&D Manufacturing and European Distribution centre.

[BSN Medical](#) - BSN Medical is a global leader in the worldwide healthcare market specialising in the areas of Orthopaedics, Compression Therapy and Wound Care.

[DePuy CMW](#) - DePuy CMW specialises in the design and manufacture of orthopaedic acrylic cements, mixing and delivery systems and bone substitutes, supplying global orthopaedic markets. DePuy CMW, based in Blackpool, is a division of DePuy International and is a wholly owned subsidiary of Johnson & Johnson.

[DxS](#) - DxS is an established genotyping products and services company providing pharmaceutical, biotechnology and clinical research companies with rapid and reliable pharmacogenetic analysis to support drug discovery, clinical development and personalised medicine. DxS operates from purpose built laboratories equipped with fully automated handling systems in Manchester.

[Fresenius-Kabi Ltd](#) - Fresenius-Kabi is the European leader in the field of nutrition and infusion therapy. Calea provide over thirty therapeutic concepts including antibiotic and antiviral home infusion therapies, ambulatory chemotherapy and supportive therapies such as parenteral nutrition operating from a state-of-the-art aseptic manufacturing unit in Runcorn, the largest in the UK.



[MDI \(Medical Device Innovations\)](#) - Focused exclusively on interventional medical devices MDI, based at the Daresbury Innovation Centre, aims to source, assess, finance and develop new technologies for commercialisation via partnerships with major healthcare companies.

[Mi3](#) - With manufacturing and cleanroom operations in Preston, Mi3 offers a complete plastics solution for disposable medical devices and specialist components for OEM instruments.

[Molnlycke Health Care](#) - Molnlycke Health Care is one of the world's leading providers of single-use surgical and wound care products and services to the healthcare sector.

[Platform Diagnostics](#) - Platform Diagnostics is developing Capillary Agglutination Technology with applications for digital, rapid, low-cost diagnostic tests to serve the point of care market. The company will licence the technology and provide support to allow companies to enter the market at low capital cost. Platform Diagnostics is based at the MerseyBio Incubator in Liverpool.

[SHS International](#) - SHS International, based in Liverpool, is part of the Medical Division of Danone and specialises in nutrition to support metabolic disorders and food allergies (e.g cow's milk allergy, phenylketonuria and Crohn's disease). They also produce a range of supplements for patients with special energy requirements (the elderly and those with acute or chronic illness).

[SSL International plc](#) - SSL International plc is a manufacturer & distributor of a broad range of healthcare products sold into consumer markets worldwide, with their global HQ and manufacturing base in Cheshire. The company's product portfolio includes Durex and Scholl, both being market leading global brands.

[Starkey Laboratories \(UK\) Ltd](#) - Starkey Laboratories is a world leading manufacturer of custom hearing instruments with facilities in 23 countries throughout North America, Central America, Europe, Asia and Australia, including a manufacturing and design facility in Stockport.

[Synergy Healthcare \(UK\) Ltd](#) - Synergy Healthcare (UK) Ltd is a leading provider of patient care services, including infection control, linen management, continence care and wound care. The company is also the UK's largest provider of decontamination and sterilisation services for hospitals and PCTs and a provider of wider surgical support services. Synergy's Patient Care division is headquartered in Chorley and they have a manufacturing facility in Oldham.

[Vernacare](#) - Vernacare, Bolton manufacturer and distributor of a wide range of patient care and infection control products.

### **Bio-Health Informatics Research Institutes**

[The Northwest Institute for Bio/Health Informatics](#) (NIBHI) is a research partnership centered at The University of Manchester and linked to the Universities of Liverpool, Salford, Lancaster, UCLAN, Liverpool John Moores and Daresbury Laboratories. The Institute provides the focus for all Bio and Health Informatics activities in the region, strengthening the interfaces between academia, industry and the health service and creating a world-class capability in research, training and support. Research and included themes: functional genomics, molecular evolution, sequence analysis, structural bioinformatics, systems biology and e-science.

[NW E-Health \(Manchester Informatics - University of Manchester\)](#). A Population e-Lab, a computer-based facility for integrating and using health, lifestyle and social information. Salford Royal Hospital Trust has been nominated as the place-holder 'delivery organisation' in the ETHOS proposal for funding by the NW Science Council.

[Manchester Centre for Integrative Systems Biology \(MCISB\)](#). The BBSRC/EPSRC funded centre at the University of Manchester, is one of only three such centres in the UK. It pioneers the development of new experimental and computational technologies in systems biology and their exploitation.

[National Centre for Text Mining \(NACTEM\)](#). The centre operates from the University of Manchester in close collaboration with the University of Tokyo and provides a solution to the challenge of 'data deluge'. The centre works closely with Bioinformatics at Manchester.

[The University of Manchester's Bioinformatics and Specialist Node of EMBnet](#) apply computational, mathematical and statistical approaches to the study of biological molecules and systems.

[The Daresbury Laboratory](#) in Cheshire. The laboratory hosts a Protein Crystallography Computing Centre and an e-Science Centre, which includes a super-computing facility.

[AstraZeneca](#), Alderley Park in Cheshire. The site hosts the largest of the company's two informatics centres, part of a 'Corporate University' which provides distance learning material in biohealth informatics to scientists company wide. AstraZeneca are key sponsors of NIBHI.

[CSols](#) in Cheshire. The company is a leading supplier of instrument-LIMS integration products and services. Sectors serviced include: Pharmaceutical manufacturing and research & development; Biotechnology; Chemical and petrochemical.

[Tessella Support Services](#) in Warrington. This software services company specialises in the support of scientific, technical and engineering establishments.

## Pharmaceuticals Research Institutes

Astrazeneca (Alderley Park) - Global pharmaceutical company Astrazeneca has one of its major research bases at Alderley Park employiing 4,500 people. Alderley Park has a major focus on new medicines to combat cancer. It also plays an important role in our work in several other areas including Cardiovascular, diabetes and obesity and Inflammatory conditions such as arthritis, and infection research.

Astrazeneca (Macclesfield)- Macclesfield is the second largest Manufacturing & Supply site in AstraZeneca and the site supplies products for all of AstraZeneca's therapy areas, and currently sources 130 markets worldwide. Macclesfield is also a New Product Launch Site, and is the sole global supplier for one of Astrazeneca's leading cancer products.

Baxter Healthcare - Baxter Liverpool is an FDA/MHRA approved site responsible for the development and manufacture of Icodextrin, an API used in a product to treat end stage renal disease.



Bristol Myers Squibb - Bristol Myers Squibb at Moreton, Wirral is the UK Formulation Centre and a CoE for stability testing.

Carbogen Amcis - Carbogen Amcis, Manchester, offers a range of chemical development services to support all stages of drug development, including process R&D and cGMP material supply.

Eli Lilly - Elis Lilly, Speke is the largest biologics manufacturing plant in the UK, producing a treatment for multi drug resistant TB, human growth hormone and five animal antibiotics under the Elanco Animal Health brand.

GlaxoSmithKline - GSK, Ulverston, Cumbria manufacture bulk APIs (cephalosporin antibiotics) both steriles and non-steriles, of which almost all is exported.

Icon Development Solutions - ICON Development Solutions, Manchester is a leading CRO with expertise in clinical pharmacology, regulatory affairs, pharmacokinetics, pharmacometrics, biopharmaceutics, and bioanalytical, ICON specializes in the strategy, management, and execution of product development and early phase clinical development.

Intercytex - Intercytex is a leading developer of regenerative medicine products to restore skin and hair, and uses its fully integrated cell technology platform to develop living, human dell-based products.

IS Pharma - IS Pharma is a specialised hospital medicines group operating internationally through a network of distribution partners with a commercial infrastructure in the UK.

Medimmune - Medimmune is the worldwide biologics business for the Astrazeneca Group. UK facilities include vaccine manufacturing operations in Speke and antibody discovery and research laboratories in Cambridge.

National Biomanufacturing Centre - The NBC comprises three cGMP suites, catering for mammalian, microbial and live virus production, three process development suites with dedicated upstream and downstream areas and an extensive analytical laboratory area. Eden Biodesign, the commercial operator offers state of the art biotech development services worldwide.

Novartis - Novartis Vaccines and Diagnostics is a new division of Novartis, focused on the development of preventative treatments. Novartis Vaccines is the world's fifth-largest vaccines business and the world's second largest manufacturer of flu vaccines with a major manufacturing facility at Speke, Liverpool.

Pharmaserve - Pharmaserve northwest is a division of the O'Brien Group (OBG) offering development and manufacturing services that focus on aerosol and spray technologies.

Recipharm - Recipharm is one of Europe's leading pharmaceutical Contract Development and Manufacturing Organisations (CDMO). Recipharm Ashton offers solid dose, sterile biological and pharmaceutical fill/finish, dry powder handling, process development, packaging, stability testing and full analytical testing.

Renovo - Renovo is a biopharmaceutical product company and is a leader in the discovery and development of drugs to improve the appearance of scars and enhance wound healing at

multiple body sites including skin, eyes and nerves.

Sanofi Aventis - Sanofi Aventis specialise in inhalation product development and industrialisation supplying medicinal products to the global market. The site supplies products to over fifty markets worldwide including USA, Europe and Japan. The modern production facility has experience of supplying metered dose aerosols, dry powder inhalers and nasal spray products. The range of platform delivery technologies available may offer opportunities to companies that are seeking collaborations to develop or manufacture their own products and consideration will be made for the potential to supply to third party customers. Enquiries relating to contract manufacturing opportunities can be directed to [info.holmeschapel@sanofi-aventis.com](mailto:info.holmeschapel@sanofi-aventis.com).

TEVA - Teva Pharmaceutical Industries Ltd. is a global pharmaceutical company specializing in the development, production and marketing of generic and proprietary branded pharmaceuticals as well as active pharmaceutical ingredients. Teva is among the top 20 pharmaceutical companies and among the largest generic pharmaceutical companies in the world.