The College of Medicine is committed to innovative health and life sciences research from basic research about mechanisms of disease through to improving health and social care delivery. Alongside and integrated with this is a distinctive approach to innovation and learning and teaching. The College translates basic research into medical discoveries, which positively impact the health, well-being and wealth of the nation.

The strength of the College’s research was emphasised by the results of the 2008 Research Assessment Exercise (RAE), with 87 per cent of staff assessed as producing research of international quality or above, placing the College seventh in the UK rankings. The 2012 UK Health Research analysis shows that whilst Swansea is still small by UK medical school standards, it was the fastest growing medical school in the UK between 2005 and 2010, the most recent year for which standards, it was the fastest growing medical school in the

The College adopts an interdisciplinary approach to translational medicine from basic laboratory science to health care delivery, underpinned by health informatics, mathematical modelling, world-class supercomputing and mass spectroscopy. There are outstanding laboratory and clinical research facilities in the College’s Institute of Life Science (ILS).

More than £80 million has been invested in our research and innovation facilities in the ILS phases 1 and 2. This collaboration between Swansea University and the Welsh Government, together with Abertawe Bro Morgannwg University (ABMU) Health Board, IBM and external business partners, is partly funded through the European Union Convergence Funding Programme and is the single largest investment made in a university campus by the Welsh Government.

Central to delivery is our cross disciplinary research pipeline from research groups working in nanotechnology and biological sciences, medical physics and clinical engineering, mass spectrometry, medical physics and clinical engineering, and bioinformatics represent crosstheme cognate activity. Since its launch in 2001, the College has grown to become one of the UK’s leading centres for medical research, and the opening of the second phase of the ILS in 2011 was a significant milestone in its history.

With an ambitious approach to its strategy for future research growth, the College looks forward to strengthening its position as at the forefront of medical innovation, which will positively impact the healthcare of millions.

Professor Ian Russell,
Director of Research, College of Medicine
Institute of Life Science

With a strong interdisciplinary ethos, the College of Medicine’s research is conducted at the state-of-the-art, purpose-built Institute of Life Science (ILS) – the first phase of which opened in 2007.

Described after its opening as “The Jewel in the Crown of Wales” by the Rt Hon Rhodri Morgan, then First Minister for Wales, the ILS is Wales’ premier medical research and business facility. The ILS phases 1 and 2, an investment of more than £80 million, comprise 12,000 square metres of high quality research and business space, co-located on University and ABMU Health Board land, next to Singleton Hospital, and with access to more than 600,000 patients.

The first phase of ILS has delivered a state-of-the-art building, housing specialists in medical research, business incubation, and technology transfer.

In addition to providing further facilities for an extended range of business incubation units, the second phase of ILS, which opened in 2011, houses a Clinical Research Facility, incorporating jointly-located business incubation units, the second phase of ILS, which opened in

Nearly 90 per cent of ILS research was independently judged (2008 RAE) as international or world-leading standard.

Innovation space and commercial partners

The ILS is dedicated to building links with business and creating a vibrant life science and healthcare cluster in south west Wales. It is home to a growing number of companies including standards-based software development company Cal2Cal Europe Ltd, Calon Cardio-Technology Ltd, which specialises in the development of blood pumps for the treatment of chronic and acute heart failure, CyDen Ltd, the beauty and health company pioneering light treatments for use at home, Haemair Ltd, which provides support for people with lung disease or injury through the development of its “artificial lung”, Maimonides (UK) Ltd, a specialised pharmaceutical company developing drugs for treating autoimmune inflammatory diseases and cancer, and Pulse Medical Technologies and Pulse Innovate, which focus on the development of innovative pain relief solutions.

The ILS business incubation suites bring businesses closer to scientists and experts in medicine and other fields across Swansea University from Engineering to Economics to Law.

Businesses and individuals can choose to affiliate themselves with the ILS. This is a ‘soft-landing’ option developed for organisations and individuals that are not yet ready to base themselves permanently at the ILS, but want access to its facilities and expertise.

Membership provides early stage businesses with one of the swiftest routes to market in the UK. CIPHER is designed to undertake research using health records.

The Centre for Improving Population Health through E-Health Research (CIPHER) is one of four new UK e-health research Centres of Excellence, based at Swansea, London, Manchester and Dundee, and established with a £19 million investment from a consortium of funders led by the Medical Research Council (MRC) – the first of its kind ever to be set up in the UK.

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Nearly 90 per cent of ILS research was independently judged (2008 RAE) as international or world-leading standard.
The BEACON Biorefining Centre of Excellence

The ILS has an international reputation in microbial and molecular technologies using yeast, other fungi and bacteria.

The BEACON partners.

co-sponsorship and support for their scientists to visit It is also expected that international institutions will provide R&D centres in the USA who are conducting similar activities.

BEACON is building on and extending contacts with leading US researchers are keen to explore alternatives to the resource.

The USA consumes 40 per cent of the world’s oil resource and there is concern that a growing population will mean there is not enough resource for use in basic products such as food and fuel.

Using pioneering techniques known as biorefining, the project is investigating the production of second generation fuels by using a process which aims to replace some of the industrial chemicals currently produced from oil with similar molecules from plants.

The project, supported with funding through the European Regional Development Fund (ERDF) by the Welsh European Funding Office (WEFO), part of the Welsh Government, has allowed BEACON to move to large scale production and allow the development of Centres of Excellence across Wales to respond to this major global challenge.

BEACON will work with companies in Wales and overseas to convert biomass relevant to Welsh agriculture and Aberystwyth University plant breeding skills into a wide range of products including pharmaceuticals, chemicals, fuels, cosmetics and textiles.

The initiative is a key part of a drive which could put Wales in a leading position in the use of renewable bio-based materials. The Swansea research team is focused on developing their expertise in using bacteria and fungi to digest, or ferment, plant matter within the biorefining process.

A key to success in building Wales’ world-leadership in biorefining capacity is the development of overseas collaborators and technical ‘intelligence’, to complement and accelerate the BEACON initiative.

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It is also expected that international institutions will provide co-sponsorship and support for their scientists to visit BEACON partners.

The Institute of Mass Spectrometry

Swansea University has long been established as a centre of excellence for mass spectrometry, dating back to the mid 1970s, with the establishment of the Royal Society Research Unit led by Professor John H Beynon FRS.

The established mass spectrometry research unit attracted the string of the Engineering and Physical Sciences Research Council (EPSRC) Centre in 1986. This prestigious EPSRC mid-range facility is open to all UK university research groups, with priority given to EPSRC-funded research, and some capacity is reserved for commercial service.

It specialises in difficult analyses that scientists cannot do within their own institutions due to lack of expertise or instrumentation and is particularly relevant in the fields of chemistry, biological sciences, medicine, materials science, forensics, pharmaceauticals and environmental analysis.

Mass spectrometry involves the ionisation of a sample to produce either positive or negative ions of the molecule species. These ions are passed to the mass spectrometer analyser where the mass, elemental composition and structure of the molecule are determined from the spectra produced. Analysis of complex mixtures can be accomplished by attaching a chromatographic technique to the mass spectrometer to separate the various species in the mixture prior to mass measurement.

Research at the Institute of Mass Spectrometry includes medical mass spectrometry, led by Professor William J Griffiths and Dr Yuqin Wang, and analytical mass spectrometry and instrumentation development/design by Professor Gareth Brenton.

Professor Griffiths’ group leads research into lipidomics, metabolomics and proteomics and has established an international reputation in the field of cholesteral metabolism. Current work involves studies of the involvement of cholesteral metabolites in the aetiology of neurodegenerative and inflammatory diseases.

The Institute of Mass Spectrometry has, over the last three decades, been responsible for many innovations in mass spectrometry and instrumental design that have been taken up by major manufacturers’ of scientific instrumentation.

The Institute of Mass Spectrometry has developed postgraduate and professional training courses in Mass Spectrometry and separation sciences. These unique programmes are designed to give science and engineering graduates a vocationally-relevant qualification which will equip them with skills and expertise to enter a wide range of industries.
The College’s vision is to build on its success by producing sustainable excellence in research and industry engagement, as well as in learning and teaching. Its vibrant research environment is divided into two areas of expertise – laboratory-based biomedical research, and public health, population sciences, and health services research.

These two areas of expertise cover research interests from the molecular aspects of disease and treatments, to promoting health and enhancing the delivery of health and social care.

Inter- and multi-disciplinary research is the College’s mantra and the most prominent example of collaboration is that between the Colleges of Medicine and Engineering in the Centre for NanoHealth (see page 21).

Some of the leading laboratory-based biomedical research undertaken at the College includes the following projects:

### Preventing infections in the womb

Microbial infection of the female genital tract is a major disease problem in humans and cattle, with a substantial impact on their health and welfare.

Research conducted by Professor Martin Sheldon at the Centre for Reproductive Immunobiology (CRIB) in the ILS, focuses on the mechanisms of infection, inflammation and immunity in the female reproductive system of dairy cattle.

Dairy cows help feed the world by converting proteins from plants to higher value proteins in milk for human consumption. Lactation depends on pregnancy, but there is a problem because uterine disease after parturition affects about 40 per cent of animals each year.

Despite treatment many of these animals are infertile, which compromises global food security. Keeping additional animals to replace infertile cows also degrades the environment.

Professor Sheldon is leading a European Commission ERA-NET project worth €3.2 million (approx £2.6 million) to combat microbial disease of the female reproductive system by uncovering the mechanisms of infection, inflammation and immunity.

The integrated systems approach for Preventing Uterine Disease in dairy cattle (IPUD) research involves collaboration with research groups at the University of Glasgow, the University of Veterinary Medicine Hannover, Germany, the French National Institute for Agricultural Research (INRA), and Pfizer Animal Health as industry partner.

Professor Sheldon’s Biotechnology and Biological Sciences Research Council (BBSRC) funded work through a grant of more than £420,000 helps maintain food security and improve animal health. However, the fundamental mechanisms of such host-pathogen interactions are very similar between animals and humans – the One Biology One Health concept – so findings are also important for understanding health and disease in the wombs of women.

### Neurological genetics

A £600,000 Medical Research Council (MRC) funded study led by Professor Mark Rees with ILS colleagues Dr Seo Kyung Chung and Dr Rhys Thomas, and Professor Robert Harvey of the University College London (UCL) School of Pharmacy, has helped to identify a second major cause of ‘startle’ disease, which can cause infant death.

‘Startle’ disease, also known as hyperekplexia, is characterised by an exaggerated reaction to unexpected stimuli, such as touch or loud noises. The startle reaction can be detected as an abnormal increase in muscle tension causing rigidity and the inability to move. During these rigid periods, breathing can stop for minutes at a time.

Although rare, this disorder can have serious consequences, including infant death.

Professor Rees, who has been involved in startle disease research for more than 20 years, has identified all the main genes in this disorder, which has been adopted into diagnostic programmes worldwide.

In the past, changes in one particular gene were thought to be the only major cause of this disorder.

However, the new study by Professor Rees and his colleagues has identified a number of new changes in another gene in 21 cases from the UK, Australia, Canada, France, Italy, Jordan, the Netherlands, Portugal, Spain, and the USA.

These findings firmly established a second gene – GlyT2 – as a major disease factor. People with GlyT2 changes also had a high rate of early infantile breathing problems and childhood learning difficulties.

Professor Rees, who is Director of the Wales Epilepsy Research Network (WERN) and Chair of the Scientific Advisory Committee at Epilepsy Research UK (ERUK), has also established an expert team at the ILS that works closely with ERUK, attracting some £7 million of funding to investigate epilepsy, particularly in children and young adults.

The team has epilepsy collaborations with the University of Liverpool and University College London (UCL) in the UK, and internationally with Stanford University, Vanderbilt University, and Duke University in the US, with the University of Melbourne in Australia, and with Auckland University in New Zealand.
DNA is becoming ever closer.

possible, the prospect of treatments being uncontrolled epilepsy.

remain drug-resistant and suffer recurrent Currently, 30 per cent of all cases will population at any one time – or five per cent

Epilepsy, which affects 0.75 per cent of the accurate prognoses for individual patients.

hope that the identification of clinical of almost £100,000, and his colleagues

Once a person develops JME, they have it as not paying attention or ‘day-dreaming’.

Diagnosing blood clot abnormalities

One of the College’s particularly successful collaborative research projects with the NHIS involves early diagnosis of blood clot abnormality.

Funding of £1.5 million from the Welsh Government’s National Institute for Social and Healthcare Research (NISCHR) has seen the establishment of a Haemostasis Biomedical Research Unit at Morriston Hospital in Swansea, to develop vital research into clot abnormality.

The successful bid, led by Professor Adrian Evans, Professor of Emergency Medicine and Haematology at the College and Unit Director of the Haemostasis Biomedical Research Unit, has established the unit as a model of multi-disciplinary working, involving specialist biomedical engineers, respiratory experts, cardiologists, colorectal surgeons, consultants in anaesthesia and local businesses.

Diagnosing blood clot abnormalities

Reducing animal testing in cancer research

One of the College’s particularly successful collaborative research projects with the NHIS involves early diagnosis of blood clot abnormality.

Professor Garath Jenkins and the DNA Damage (Genotoxicity) research group, which includes Dr Shareen Doak and Dr George Johnson, are developing new testing methods based on human cells, which will substantially reduce animal testing for cancer-causing chemicals in the future.

The group has longstanding expertise in the study of chemically induced DNA damage in vivo (The paradigm shift of genotoxic thresholds in drug discovery), including close to £2 million of grant income in the last five years from the Medical Research Council (MRC), Engineering and Physical Sciences Research Council (EPSRC), Unilever, GlaxoSmithKline, and AstraZeneca.

Professor Jenkins plans to study how chemicals interrupt the mechanisms by which cells communicate with each other, and to combine this information with current data to provide a better prediction of which chemicals are potential carcinogens.

It builds on work started in 2003 that discovered a new diagnostic biomarker with the potential to improve methods of determining blood coagulation abnormalities. The new biomarker is proven to be superior to conventional coagulation tests in healthy and therapeutically modified blood.

Reducing animal testing in cancer research

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Some of the leading public health, population sciences, and health services research undertaken at the College includes the following centres and projects:

Centre for the Development and Evaluation of Complex Interventions for Public Health Improvement (DECIPHer)

The Centre for the Development and Evaluation of Complex Interventions for Public Health Improvement (DECIPHer) is one of five UK Public Health Research Centres of Excellence established in 2009 by a £20 million investment by the UK Clinical Research Collaboration (UKCRC)*.

DECIPHer represents a strategic partnership between Cardiff University, the University of Bristol and Swansea University. It is led by Professor Laurence Moore, Director (Cardiff) with Professor Rona Campbell (Bristol) and Professor Ronan Lyons (Swansea) as Co-Directors.

DECIPHer brings together leading experts from a range of disciplines to tackle public health issues such as diet and nutrition, physical activity, and alcohol, tobacco and drugs, with a particular focus on developing and evaluating multi-level interventions that will have an impact on the health and well-being of children and young people. The Centre engages strongly with policy, practice and public user communities as our stakeholders to translate the research results into practical outcomes.

Swansea researchers are focused on the development of population-wide data linkage to help understand the role of particular factors in complex relationships and to provide a platform to support the evaluation of interventions to improve health and well-being, prevent self-harm and reduce health inequalities.

DECIPHer has supported the development of a large number of successful collaborative multi-institutional research bids, including the creation of the ground-breaking £804,000 Wales Electronic Cohort for Children (WECC), the Carmarthenshire Housing Health and Regeneration Study (www.phr.nihr.ac.uk/funded_projects/09_3007_02.asp), and the Change in alcohol outlet density and alcohol-related harm to population health study (www.phr.nihr.ac.uk/funded_projects/09_3006_02.asp).

The five UK centres have been invited by the Medical Research Council (MRC) to submit an application for a further five years funding from 2014-2019

*Funding bodies: Economic and Social Research Council, British Heart Foundation, Cancer Research UK, Medical Research Council, National Institute for Social Care and Health Research (Welsh Government) and the Wellcome Trust.

www.decipher.uk.net/
"Health Cloud is a good example of collaboration between academia and Welsh businesses that can potentially benefit the health care system and the Welsh economy."

Edwina Hart, Welsh Government Minister for Business, Enterprise, Technology and Science

"I was pleased to read of the work that you and your team at the MS Society have undertaken in setting up the UK MS Register, and would like to congratulate everyone who has made this project such a resounding success. It stands as a clear example of the benefits of sharing data, whilst ensuring the right protections for patient confidentiality."

Prime Minister David Cameron, in a letter to the MS Society

"Life sciences is one of the key sectors of the Welsh economy and its strategic importance was highlighted in our Science for Wales strategy. I am pleased the Welsh Government is supporting this project to drive forward greater collaboration and knowledge sharing with the aim of increasing research and development and investment into the sector."

Edwina Hart, Welsh Government Minister for Business, Enterprise, Technology and Science

Health Informatics and e-health

Professor David Ford, Director of Health Informatics, is leading a number of significant projects in the rapidly-developing area of eHealth, including the £200,000 Health Cloud project, supported by a £240,000 grant through the Welsh Government’s European funded Academic Excellence for Business (A4B) programme.

The project brings the University and Welsh eHealth companies together to develop cloud computing technology to deliver significant long-term benefits to the national NHS and the Welsh economy. The project involves partnership with Monmouthshire-based The Ascent Group, and Applied Health Intelligence Limited, a division of Gesundheitsforen Leipzig GmbH, based in Swansea, to support clinical care and enable the effective allocation of resources across the healthcare system, bridging the gap between Welsh eHealth companies and the NHS UK market.

The initiative aims to create a secure NHS Health Cloud environment, where accredited applications used to analyse healthcare data are developed and hosted, and then made available to NHS staff UK-wide on an on-demand ‘pay per use’ basis. This would allow users to trial various software products at a significantly reduced cost and before reaching the stage where a formal procurement process was required. As a result, this would give the NHS the key advantage of sampling and comparing different applications within the Health Cloud, and before making a significant financial investment in any single application.

Welsh health companies would also benefit from access to their potential NHS market, which has previously been inaccessible to them, with a rapid return on investment when developing applications.

Another initiative led by Professor Ford is the £600,000 project to develop an online Multiple Sclerosis Register for the UK, funded by the MS Society UK.

The pilot register, which has been developed by researchers at the College of Medicine in partnership with the MS Society, has been constructed to offer a more accurate picture of the impact of MS in the UK.

The project has developed an innovative online platform to allow people with MS to record the details of their condition, treatments, and lives, which combined with data from hospitals, will support the design and delivery of better health and social services. More than 9,600 people with MS in the UK have volunteered to join the register so far. By getting information directly from patients and combining it with data from NHS sources, the information collected will help create better policy, health services and improve treatments.

Professor Ford is also leading a major new project to connect and expand the life science sector in Wales. The Life Science Wales scheme, which is the first of its kind in Wales, will enable and encourage high-level dialogue between businesses, academics, the NHS and Welsh Government in order to maximise the huge potential of life science in Wales, and make Wales an acknowledged world leader in this sector.

This Knowledge Exchange Project (KEP) has been supported by a £229,000 grant through the Welsh Government’s European funded Academic Excellence for Business (A4B) programme. It was the first KEP to benefit from ‘Grand Challenge’ funding, which is targeted specifically at priority areas in which Wales has a track record of excellence in-line with the Welsh Government’s science policy.

The eHealth Industries Innovation (ehi2) at the ILS serves as the project base and provides an industrial model that could be applied to other sectors.

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SAFER 2 (Support and Assessment for Fall Emergencies) — Improving care for older people who fall

Emergency calls to ambulance services are frequently made for older people who have fallen — many of whom are not taken to hospital, but left at home with no ongoing care pathways available. Ambulance services are encouraged, through national policy documents, to develop alternative responses for patients who do not need immediate conveyance to hospital, but there is little evidence about the safety or effectiveness of new models of care.

SAFER 2 is an evaluation of a new clinical protocol which allows paramedics to assess and refer older people who have fallen and do not need hospital care to community-based falls services.

Professor Helen Snaokes is leading this £1.8 million study, funded through the National Institute for Health Research (NIHR) Health Technology Assessment programme.

The research is being carried out in collaboration with Swansea University colleagues from the Colleges of Medicine, Human and Health Sciences and School of Business and Economics, as well as colleagues from universities around the UK.

Outcomes, processes and costs of care will be compared between the intervention and control groups for six months following the index call. Focus groups and semi-structured interviews will identify factors which facilitate or hinder the use of the intervention and explore how patients experience the new health technology.

The research is being carried out in collaboration with Swansea University colleagues from the Colleges of Medicine, Human and Health Sciences and School of Business and Economics, as well as colleagues from universities around the UK.

The research findings will be used to inform policy and service development on a national scale.

www.saferproject.org

Three ambulance services across England and Wales – East Midlands Ambulance Service, the Welsh Ambulance Service and London Ambulance Service – are participating. Volunteer paramedics based at stations randomised to the intervention group received training and support in the use of the new protocol, and access to falls service referral pathways. Paramedics based at control stations delivered their usual care.

College of Medicine
The paradigm shift of genotoxic thresholds in drug discovery

Research conducted by Professor Gareth Jenkins and the DNA Damage (Genotoxicity) group, including Dr Shareen Doak and Dr George Johnson, has convincingly demonstrated that genotoxic agents – chemical or other agents that damage cellular DNA, resulting in mutations or cancer – display “thresholded” dose responses, meaning low level exposures are insignificant in terms of damage to DNA.

This finding changed many regulatory guidelines concerning low-dose chemicals and drugs are assessed. It also offered assurance to tens of thousands of patients accidentally exposed to a genotoxic substance and saved millions of Euros for the pharmaceutical company involved.

DNA damage was previously assumed to be induced in a linear fashion with respect to dose, and any chemical or drug showing genotoxicity was discarded. This often led to the discarding of drugs and chemicals at late stages of development and after a significant investment of time and money.

Theoretical discussions continued for over a decade about whether non-linear or thresholded dose responses existed for genotoxic agents. The implication was that “safe” low doses could exist for some genotoxins and human exposure to such low doses may theoretically be tolerated, but the idea remained controversial.

Conversely, much of the “linear” argument stemmed from estimations of radiation risks, but these were not always relevant to chemicals and there was little or no data to inform the argument.

The concept of genotoxic thresholds was discussed theoretically by the late Professor James (Jim) Parry and colleagues at Swansea University from the mid-1990s onwards, and they drove these discussions at an international level. This work was taken on further by Professor Gareth Jenkins and colleagues after the retirement of Professor Parry.

The work at Swansea on genotoxic thresholds during a 15-year period stimulated a paradigm shift, which led to an acceptance of genotoxic thresholds and the acceptance of the concept of “safe” exposure levels to some genotoxins.

Swansea researchers embarked upon an ambitious programme to generate data addressing the shapes of the dose response to known genotoxins in vitro. The work initially concentrated on genotoxic dose response curves for alkylating agents, classic genotoxins often used as chemotherapeutics.

After five years, comprehensive data could be provided to demonstrate that two alkylating agents, ethyl methanesulfonate (EMS) and methyl methanesulfonate (MMS), showed clear thresholds for chromosome damage and point mutation in cultured cells in vitro.

These data resulted in a paradigm shift that was accepted by major regulatory agencies and the scientific community as a whole.

A significant contribution to the paradigm shift involved an infamous contamination incident reported by Roche pharmaceuticals in 2007, where one of their drugs – Viracept – had accidentally been contaminated with EMS (one of the alkylating agents shown to be thresholded).

Discussions between the Swansea researchers and Roche toxicologists led to a major in vivo study investigating the genotoxic dose responses of this alkylator in mice. The largest and most expensive study of DNA damage in vivo ever undertaken, this study confirmed that there was a threshold for EMS in vivo.

The new threshold dose identified from this in vivo study was extrapolated to a safe human exposure level through complex risk assessment models. It revealed that patients taking contaminated tablets were not at risk of DNA damage and the doses of alkylator that they received were well below the threshold dose. These data were accepted as unprecedented proof that the patients were not at an elevated risk of cancer.

Swansea University research has directly offered a reprise to some substances with genotoxic activity, resulting in changed international regulations.

The European Medicines Agency (EMA) also accepted that there was no long-term risk to the patients who received the contaminated Viracept tablets because of the threshold dose response to the contaminant.

In 2009, Professor Gareth Jenkins was invited to join the UK Government’s Committee on Mutagenicity (COM), which subsequently issued a statement on genotoxic thresholds in 2010, citing the role of the work at Swansea.

The threshold paradigm also has the potential to impact on the use of animals in safety testing and may lead to fewer animals being used in the future (see page 114, “Reducing animal testing in cancer research.”)

We know that Swansea University is heavily supporting research into thresholds for genotoxic effects and their impact on cancer risk assessment. It is needless to say that the original in vitro work published by Shareen Doak and colleagues in Cancer Research in 2007 was the ultimate and indispensable trigger for Hoffmann-La Roche to enter further work in vivo to conduct a proper risk assessment for HIV patients that have ingested Viracept tablets contaminated for some period in 2007 with EMS.

Based on the in vitro studies conducted in Swansea under supervision of the late Professor Jim Parry, Roche was successful in proving a threshold in vivo and justifying that the affected patients were not at an increased mutation, cancer or teratogenic risk. This reasoning was accepted by many authorities around the world after having been presented to the EU authorities in 2008.

The studies served as a basis for further research activities around the world and proved to withstand all investigational challenges so far. Hence, we can assume that the scientific basis of what has been originally done in Swansea is rock-solid. It continues to be worthwhile to prove the mechanisms behind it and to extend the evidence beyond simple alkylating agents.

There is enormous value of such basic research for the industry and for the society at large. In this context, I hope that the research into this area can continue with sufficient funding at Swansea University...
Selected recent publications

Allen, S.

Cheung, W.
2009, 'Cost effectiveness of nurse delivered endoscopy: findings from randomised multi-institution nurse endoscopy trial (WINuET)', BMJ.

2009, 'Effectiveness of nurse delivered endoscopy: findings from randomised multi-institution nurse endoscopy trial (WINuET)', BMJ.

Dook, S.
2012, 'The role of von renox state in the genotoxicity of ultrafine superparamagnetic iron oxide nanoparticles', Biomaterials.


Evans, A.
2010, 'Gel point and fractal microstructure of incipient blood clots are significant new markers of hemostasis for healthy and anticoagulated blood', Blood.

Francis, N.


Harrison, K.

Hawkins, K.
2010, 'Gel point and fractal microstructure of incipient blood clots are significant new markers of hemostasis for healthy and anticoagulated blood', Blood.

Prior, S.
2009, 'Association between the adrenocorticotropic hormone 2.46/2.47 gene variant and oxidative stress in patients with diabetes mellitus', European Heart Journal.

Russell, I.


2009, 'Cytological surveillance compared with immediate referral for initial colposcopy in management of women with low-grade cervical abnormalities: multicentre randomised controlled trial', BMJ.

Sheppard, S.

Stephens, J.

Stephens, J.
2009, 'Association between the adrenocorticotropic hormone 2.46/2.47 gene variant and oxidative stress in patients with diabetes mellitus', European Heart Journal.

Taylor, R.


Thomas, B.
2012, 'Incidence of diabetic retinopathy in people with type 2 diabetes mellitus attending the Diabetic Retinopathy Screening Service for Wales: retrospective analysis', BMJ.

Wagstaff, J.
2010, 'Pazopanib in Locally Advanced or Metastatic Renal Cell Carcinoma: Results of a Randomized Phase III Trial', Journal of Clinical Oncology.

Supporting higher level skills and innovation:

Tough and research programmes within the College of Medicine demonstrate innovative links with industry.

**MB BCh Graduate Entry Medicine**

The programme involves early and repetitive exposure to clinical practice through learning Opportunities in the Clinical Setting (ICCS), community-based learning, clinical apprenticeships and specialty attachments.

The College works closely with the Welsh Postgraduate Deanery to aid transition into ‘Foundation’ training, and there is an annual medical careers’ evening with talks from GPs, consultants and careers advisors.

A project entitled ‘Tracking our Graduates examines the ambitions and aspirations of current and past trainees to improve future training.

**MSc and PG Diploma in Liquid Chromatography Mass Spectrometry and PG Certificate in Applied Liquid Chromatography Mass Spectrometry**

The College has developed three handson schemes (MSc, PG Diploma and PG Certificate) in conjunction with major UK industrial partners.

Course content has been designed with industry, for industry and to support professional development programmes, and there are opportunities for handson training in a research led institute with extensive inhouse equipment to improve analytical science skills.

Students benefit from expert guest lecturers from industry, and there will be assessments to encourage transferable skills essential for employment, including case studies, presentations, data processing and informatics exercises.

**MSc and PG Diploma Trauma Surgery and Trauma Surgery (Military)**

The College has developed two innovative, handson programmes (Trauma Surgery and Trauma Surgery (Military)) in association with the NHS as well as the Academic Department of Military Surgery and Trauma (ADMS), Royal Centre for Defence Medicine, Birmingham and associated military facilities.

Educational sessions focus on moulage scenarios and surgical skills simulations to cement experience and factual knowledge with clinical application. The courses provide handson experience of practical skills, including planning, execution and communication of treatment strategies and surgical tactics.

The College is working with trainees to plan further professional development.

**Postgraduate research degrees**

Students on the College’s research degrees have access to undergraduate and taught master’s modules to broaden their knowledge, and attendance at a ‘Statistics for biomedicine’ course and at weekly biomedical and health services research seminars is compulsory. These regularly feature eminent speakers from academia and industry.

Research students benefit from links with the industrial and pharmaceutical sectors, and visits from industrial bodies.

An annual postgraduate research day helps develop transferable skills, including presentation, poster development and networking, and there are casebased courses offered by the University’s careers service as well as studentship sponsors, such as the Biotechnology and Biological Sciences Research Council (BBSRC).