CCRCB
Centre for
Cancer Research
& Cell Biology

Annual Report 2011 - 2012

WE ARE QUEEN'S UNIVERSITY BELFAST
We are exceptional

Queen's University
Belfast

CONTENTS

DIRECTOR'S INTRODUCTION

Dennis McCance, Director

This annual report outlines the research activities of the Centre over the past twelve months (1 August 2011 – 31 July 2012) and highlights some of the outstanding achievements of our scientists.

During the past year, the Centre was recognised – as part of Northern Ireland's Comprehensive Cancer Services programme – with a Queen's Anniversary Prize for Higher and Further Education, the most prestigious UK honour a higher education institution can receive. The awards – part of the national honours system – recognise and honour outstanding achievement by universities and colleges in the United Kingdom. The award was presented by Her Majesty the Queen on 24 February 2012 at a ceremony in Buckingham palace. The University-led Comprehensive Cancer Centre (which comprises the Clinical Cancer Centre at Belfast City Hospital, the Centre for Cancer Research and Cell Biology (CCRCB), and the Northern Ireland Cancer Registry at Queen's University Belfast) is recognised nationally and internationally for its excellence and is seen as a flagship for health research in Northern Ireland.

CCRCB investigators can now take advantage of the Northern Ireland Molecular Pathology Laboratory (MPL), which opened in March 2012 and is led by Professor Manuel Salto-Tellez. The MPL is a hybrid laboratory which carries out molecular diagnostics for the hospital trusts in Northern Ireland but also hosts a full range of molecular pathology techniques for research interrogation, covering the full spectrum of hybridization-based techniques and PCR-based techniques, from TMA construction to Next Generation Sequencing (NGS) analysis. There are already examples available on how this synergy is helping biomarker analysis and biomarker validation in the translational component of key publications from our Centre.

Two of our academic staff have taken sabbatical leave during the past year. Dr Frank Emmert-Streib spent a sabbatical at the Department of Biostatistics and Computational Biology at the Dana-Farber Cancer Institute, Harvard School of Public Health in Boston, hosted by Professor John Quackenbush, and at the Cambridge Computational Biology Institute at the University of Cambridge, hosted by Professor Simon Tavare. During his research stay Dr Emmert-Streib worked on high-throughput data generated by NGS technologies investigating their experimental design, statistical analysis and biological interpretation. Dr Jackie James, a senior lecturer/consultant within CCRCB, is currently taking a three month sabbatical at the Johns Hopkins University, Baltimore, Maryland US to complete further training in molecular diagnostics.

The principal investigators in CCRCB have also been recognised for their research nationally and internationally. Professor Patrick Johnston was elected to the Fellowship of the Academy of Medical Sciences in June 2012 for his outstanding contribution to the advancement of medical science and, in particular, his work on cancer research and treatment of patients. Dr Sandra Van Schaeybroeck received a prestigious £688,000 Cancer Research UK Clinical Scientist Fellowship which commenced in January 2012. The award, which is one of only four fellowships awarded to UK clinical investigators, renews Dr Van Schaeybroeck's current funding from the charity for a further three years. Her research aims to develop new treatment strategies to improve bowel cancer patients' response to treatment and increase survival of particular groups of patients with bowel cancer. Dr Mohamed El-Tanani won the BioTech award, life science section winner in the £25k Entrepreneurship Awards, organised by NISP Connect on 29 September 2011. The OncoTech project, led by Dr El-Tanani, is based around the novel Ran biomarker, which is in development as a diagnostic assay to identify cancer patients at high risk of metastasis. Professor Kevin Prise, Dr Alan Hounsell and Professor Joe O'Sullivan have all been appointed to serve a further two year term of office on the Clinical and Translational Radiotherapy work groups of the National Cancer Research Institute.

Our post doctoral fellows continue to carry out internationally competitive research as witnessed by Dr Paula Hyland, the Northern Irish Cancer Prevention Fellow and Research Fellow in the Genetic Epidemiology Branch (GEB) at the National Cancer Institute (NCI), who received the 2012 NCI Director's Innovation Intramural Award from

Dr Harold E Varmus (Nobel Laureate in Medicine and NCI Director) for her project entitled "Global chromatin accessibility patterns in melanoma-prone individuals with and without CDKN2A mutations". Two CCRCB post doctoral research fellows have just been awarded fellowships – Dr Niamh O'Brien has been awarded a five year Breast Cancer Campaign Fellowship and Dr Kienan Savage a four year Cancer Focus Northern Ireland Fellowship. Dr O'Brien was also awarded the 2011 Roche Prize and a bursary of £400 and gained second place at the Roche Researcher of the Year Award in Dublin on 8 November 2011. Furthermore, Dr O'Brien was awarded the European Associated Cancer Research (EACR) Young Scientist Award at the Irish Association for Cancer Research (IACR) Conference in March 2012. Dr Karl Butterworth was elected Vice-Chair of the Scholars in Training Committee of the US Radiation Research Society and will serve as Chair from 2013 – a highly prestigious position with the world's premier radiation research society.

During 2011/12, the conference "Challenges in Cancer – Answering the Difficult Questions", was jointly hosted by the CCRCB and the Society for Translational Oncology (STO). STO is a professional association committed to accelerating the discovery and translation of important new treatments in the field of cancer medicine to the practice of global oncology. The event was held on 7-8 September 2011 at the Waterfront Hall, Belfast. Scientists from around the world discussed the latest advances in cancer therapies as well as discussing the difficulties in the global fight against cancer.

Clinicians and scientists from twenty-two countries around the world attended the fifth Molecular Diagnosis of MyeloProliferative Neoplasms (MPN) and MPN related congenital diseases meeting on 7-9 March 2012, organised by Professor Mary Frances McMullin. Participants to the fifth MPN and MPNr-EuroNet meeting had the opportunity to hear from the leading experts about the newest developments in the molecular diagnosis of MPN and related congenital diseases. The programme included presentations from Professor Mary Frances McMullin, Professor Ken Mills, Dr Claire Arnold and other clinical colleagues in the Belfast City Hospital.

Finally, congratulations to Professor Joe O'Sullivan who was appointed to the Chair in Radiation Oncology, to Dr Paul Mullan who was promoted to Senior Lecturer and to Dr Chris Scott who has been promoted to Reader during the past year. A complete list of the CCRCB staff can be found on our website: **http://www.qub.ac.uk/ccrcb/.**

RESEARCH STRATEGY

Our mission is to improve patient care through the development of:

- **biomarkers for prognosis, prediction and markers of response;**
- **biologically determined targeted therapies.**

To achieve our mission we are pursuing the highest quality clinical and basic science research programmes. The hallmark of our research programme is a close collaborative interaction between clinical and laboratory research experts that ultimately enhances the quality and scope of our integrated research programmes in cancer.

Our goals are:

- to provide an internationally competitive, interdisciplinary research centre of the highest quality;
- to foster and generate scientific knowledge and to share that knowledge with researchers, clinicians, patients and the public through educational activities, local engagement, outreach activities, training programmes and publications;
- to improve patient care through clinical trial research and the translation of applied basic science into the clinical arena;
- to educate and train future clinical and scientific leaders in cancer research;
- to develop strong collaborative interactions with research organisations, nationally and internationally;
- to support commercialisation of our research and accelerate the translation of our discovery to clinical implementation and patient care.

STRUCTURE AND GOVERNANCE

The Centre comprises two divisions – Cancer Cell and Molecular Biology (CCMB) and Experimental Cancer Medicine (ECM) – each with its own Head of Division and research focus. Strong emphasis is placed on the value of collegiality and investigators meet monthly to discuss specific topics and grant submissions. The Heads of the Divisions report to the CCRCB Directorate Board. Research activities in the Centre are promoted and monitored by the CCRCB Directorate and Strategy Group, chaired by the Scientific Director, and future research initiatives are discussed and developed. Peer review of research is the responsibility of an external Scientific Advisory Board. This expert panel carries out site visits, reviews progress and provides advice on strategy and overall direction.

Underpinning the two divisions within the Centre there are six translationally specific focus groups:

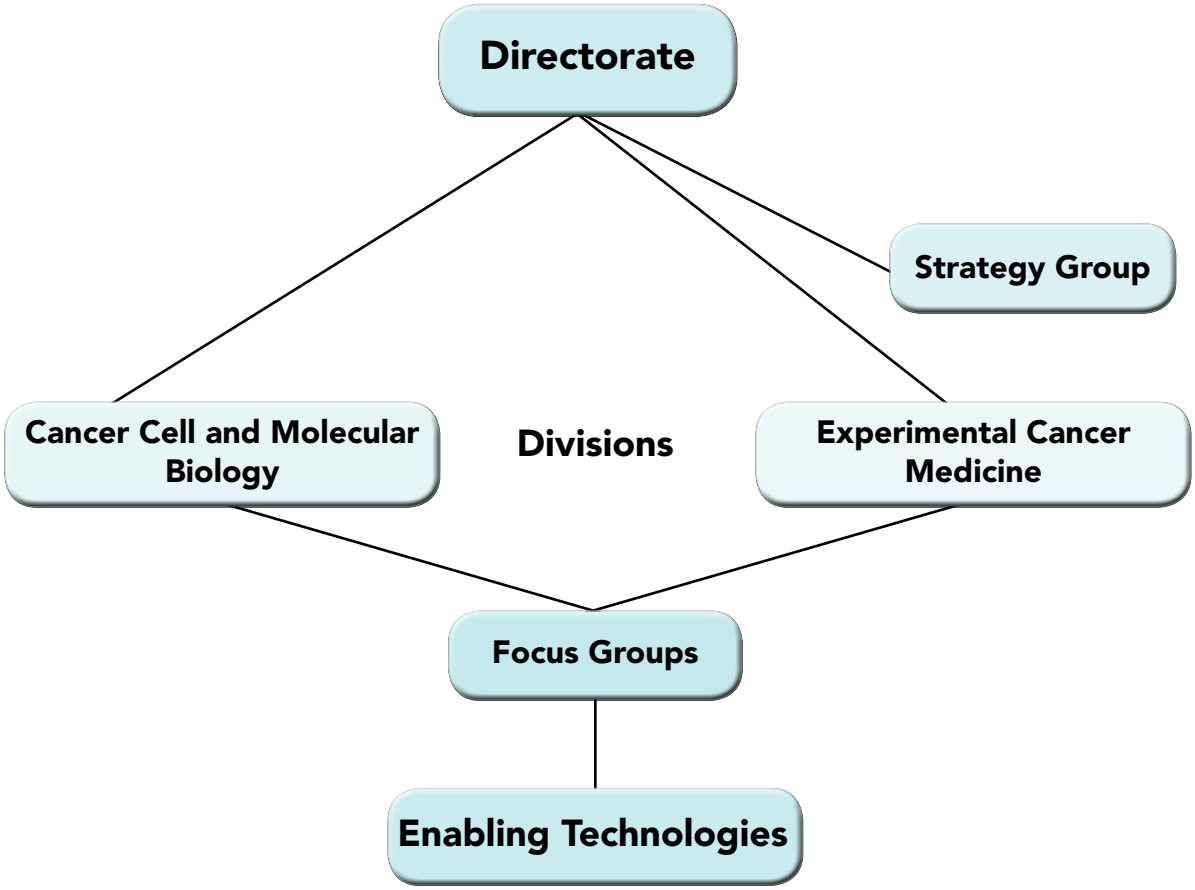
- Breast and Ovarian
- Gastrointestinal
- Haematological Malignancies
- Prostate and Bladder
- Radiation Sciences
- Thoracic Oncology

The focus groups feed into the two main research divisions – Cancer Cell and Molecular Biology and Experimental Cancer Medicine. The overall strategic aims of cancer research within the Centre are to combine strengths in basic cancer research with emerging technologies and to link science and clinical activities in a synergistic manner, with translational and discovery science at the heart.

The focus groups are supported in their research by four enabling technologies within the Centre:

- Bioinformatics and Imaging
- Northern Ireland Cancer Trials Centre
- Drug Discovery
- Molecular Pathology and Biobanking

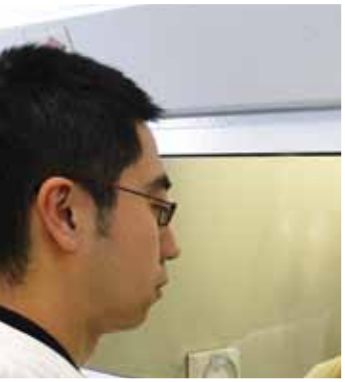
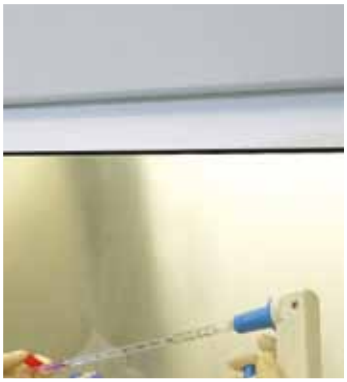
These enabling technologies serve to strengthen the clinical and basic science research programmes by providing expertise in specialised areas.

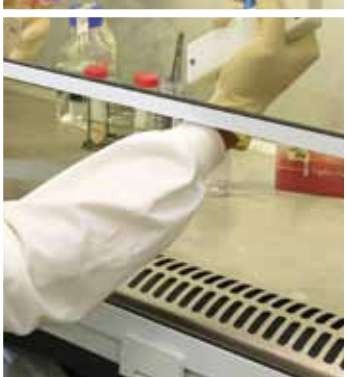










RESEARCH DIVISIONS

CANCER CELL AND MOLECULAR BIOLOGY

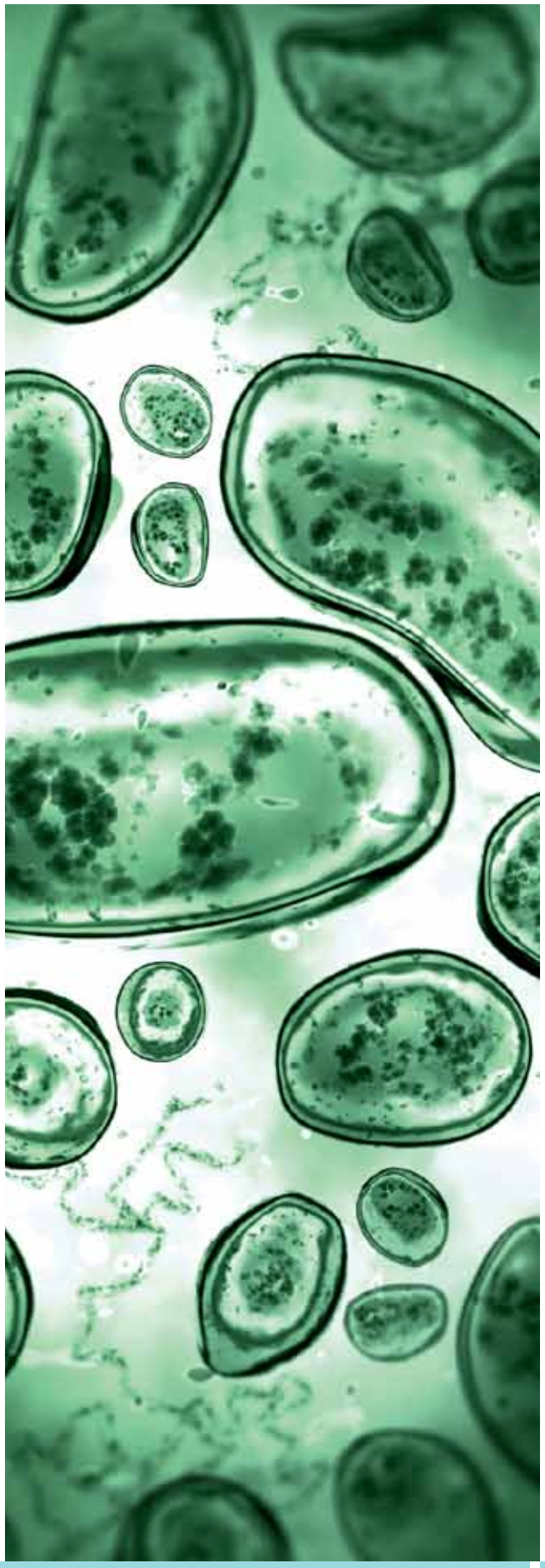
David Waugh, Head of Division

The principal investigators in the Cancer Cell and Molecular Biology division conduct a variety of activities designed to promote basic and clinical research in cancer and other serious diseases. Strong emphasis is placed on the elucidation of the mechanisms of disease and translational research.

Cancer research in the post-genomic era is aimed at the prevention, elimination and modulation of the disease. Key to these aspirations is a deep understanding of the cellular, genetic, epigenetic and molecular mechanisms in the pathogenesis of cancer and this is reflected in the ongoing research efforts in the Centre. These include:

- basic studies of biological processes such as cell signalling and gene regulation;
- the identification of molecular defects responsible for disease;
- the identification of molecular signatures of cancer cells; and
- translational research concerned with monitoring disease and the identification of drug targets.

New translational technologies are providing useful links in building the bridge between basic science and clinical research for better patient care. In Cancer Cell and Molecular Biology the "Omics Revolution" is clearly in evidence as investigators have embraced advances in genomics, proteomics, transcriptomics, metabolomics molecular imaging and bioinformatics. In particular, microarrays are being used in early disease screening; tumour classification, diagnosis and staging; prediction of outcome to therapy and toxicity; and the identification of novel drug targets.



EXPERIMENTAL CANCER MEDICINE

Ken Mills, Head of Division

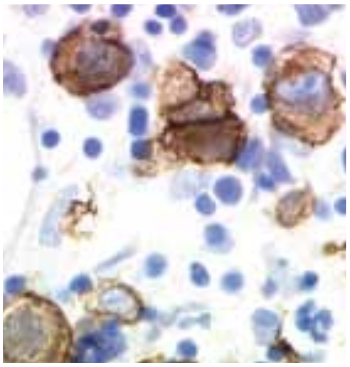
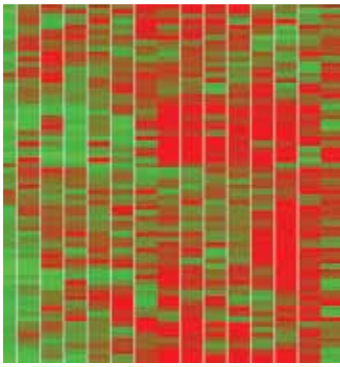
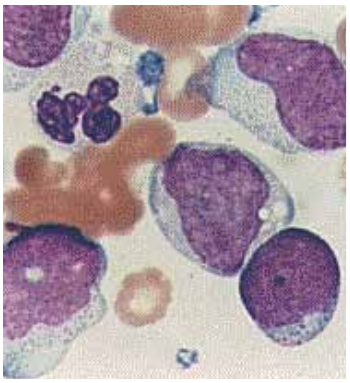
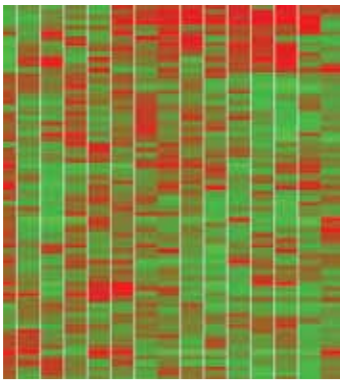
The Experimental Cancer Medicine Research Division (ECMRD) integrates clinical and scientific translational studies across pharmacology, haematology, pathology, radiation and oncology with pre-clinical and early phase clinical trials. Membership of the division recognize that the effective translation between laboratory studies and clinical studies is bi-directional with experimental studies into later phase clinical research equally as important as the generation of new hypotheses to be explored in the laboratory. The members of the ECMRD conduct high quality experimental cancer medicine research, to integrate clinical science into our basic and translational science research programmes and to facilitate access to clinical material for these programmes. This aims to fit with the strategic focus of the CCRCB and the scientific advances can include molecular or cellular biomarker studies, bio-imaging studies and bioinformatic advances.

The ECMRD works in close collaboration with the Northern Ireland Clinical Cancer Centre (NICCC) and the Northern Ireland Cancer Trials Centre (NICTC). Several members of the Division are also involved in the Belfast Experimental Cancer Medicine Centres (ECMC) Network which was renewed during the past year and will facilitate the implementation of early phase clinical trials. Clinical trials are a key component of our research within ECMRD and our studies represent a growing proportion of the trials portfolio within the NICTC. Early phase clinical trials are open for patients with advanced solid tumours but there are also disease-specific phase I and II trials in first, second and third-line treatment of common solid and haematological cancers.

A major part of the ECMRD and ECMC activities are focused on the development and implementation of biomarker studies within the CCRCB, NICTC and Belfast Trust. This activity has been enhanced by the recent refurbishment of the basement area of the CCRCB into the Northern Ireland Molecular Pathology Laboratory under Professor Manuel Salto-Tellez. This laboratory will act as the focus for biomarker and translational studies across the cancer research arena.

FOCUS GROUPS





BREAST AND OVARIAN

Paul Mullan, Chairperson

Focus Group Membership:		
Dr Jaine Blayney	Professor Richard Kennedy	Dr Jennifer Quinn
Dr Alison Clayton	Professor Dennis McCance	Dr Tracey Robson
Dr Mohamed El-Tanani	Dr Glenn McCluggage	Professor Manuel Salto-Tellez
Professor Paul Harkin	Dr Stuart McIntosh	Dr Steven Walker
Dr Ian Harley	Dr James Murray	Dr David Waugh
Dr Gareth Irwin	Dr Kostantin Panov	Dr Richard Williams
Dr Colin James	Professor Kevin Prise	Dr Shu-Dong Zhang

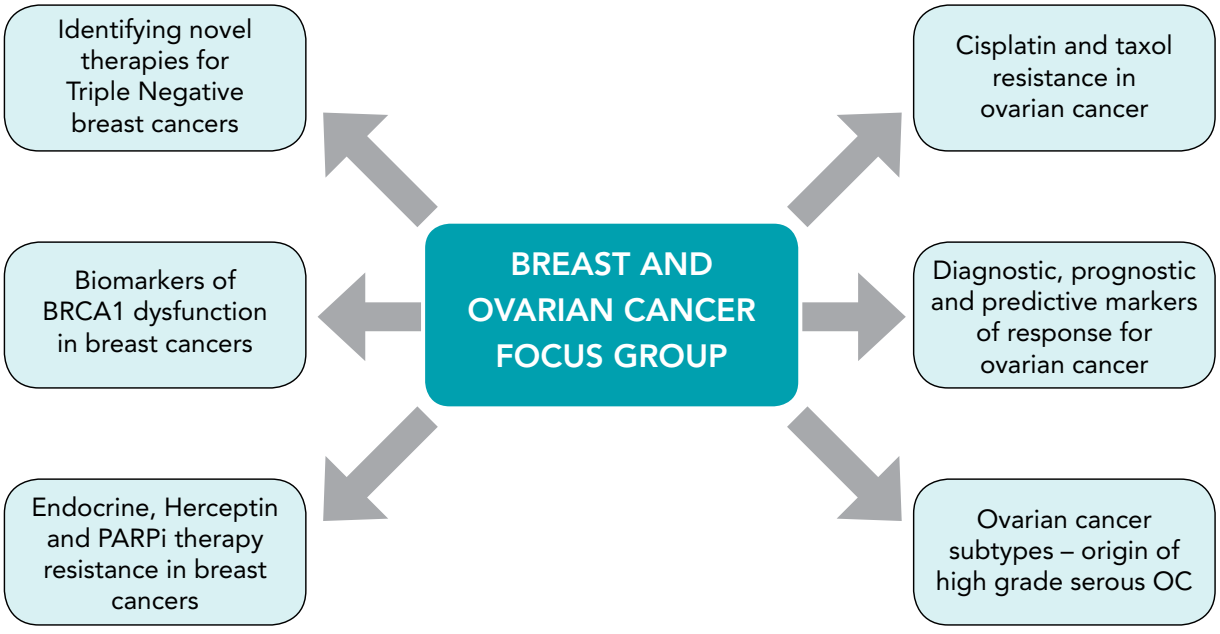
The Breast and Ovarian focus group has over twenty members covering disciplines ranging from basic science, medical oncology, surgery and pathology. The aim of the group is to identify specific clinical problems within the breast and ovarian cancer disease settings and to facilitate and drive translational research in these areas.

There are two collaborative projects already underway. The first project involves the identification of genes/pathways responsible for causing chemoresistance in triple-negative breast cancer (TNBC), a subtype which shows the highest relapse rates and lowest survival rates. The second project involves the investigation of the fallopian tube fimbriae as the source of high grade serous ovarian cancers (HGSOC). Both TNBC and HGSOC represent types of cancers with the highest death rates in their respective disease settings.

Other areas of focus include:

- Development of markers of pathogenesis in TNBCs;
- Resistance to endocrine therapies in ER positive breast cancers;
- The biology and treatment of high grade endometrial cancers;
- Identifying pathways aberrantly activated in BRCA1 mutant breast cancers;
- The identification of early warning blood-borne markers of breast and ovarian cancer;
- The identification of BRCA1/p63 co-regulated genes.

Ultimately this focus group aims to translate research findings such as the identification of novel biomarkers or the development of novel therapies and incorporate them into prospective clinical trials based in Belfast.



GASTRO-INTESTINAL

Sandra Van Schaeybroeck, Chairperson

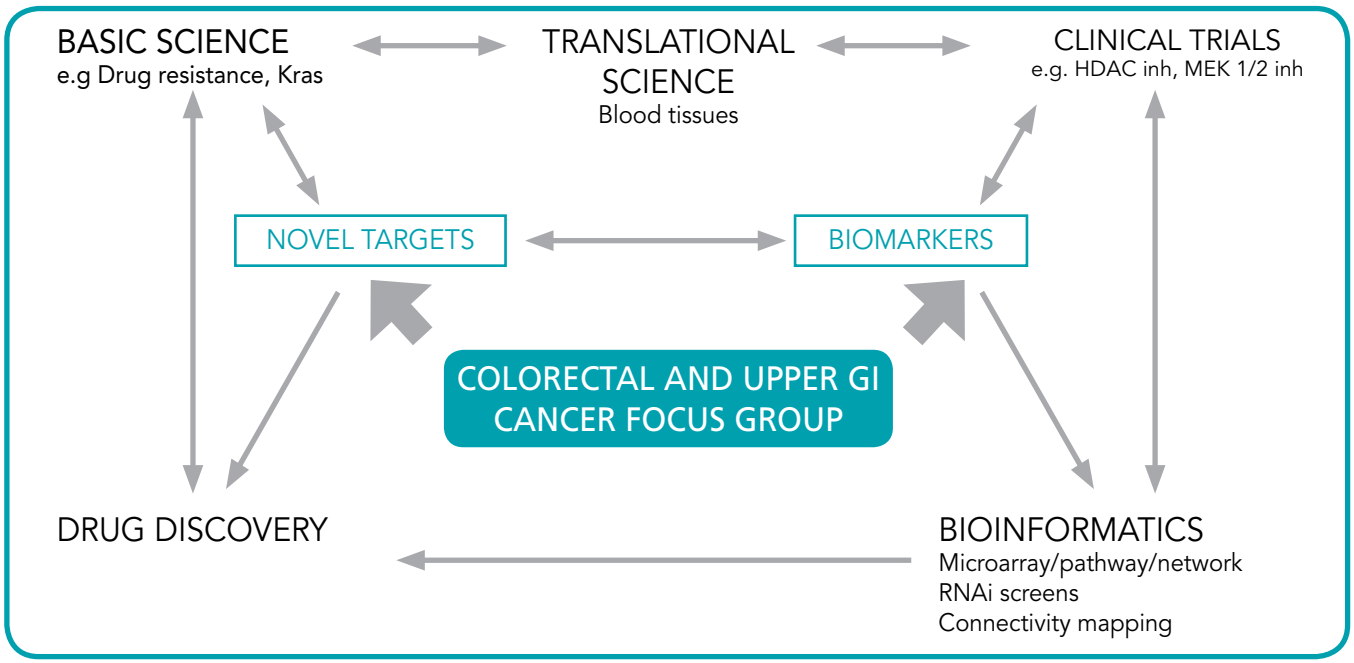
Focus Group Membership:		
Dr Wendy Allen	Dr Brian Johnston	Dr Colin Purcell
Dr Aidan Armstrong	Professor Patrick Johnston	Professor Manuel Salto-Tellez
Professor Charles Campbell	Dr Paul Kelly	Dr Richard Turkington
Dr Declan Carey	Dr Jack Lee	Dr David Waugh
Dr Mark Catherwood	Dr Dan Longley	Dr Richard Williams
Dr Vicky Coyle	Dr Maurice Loughrey	Dr Richard Wilson
Dr Martin Eatock	Professor Dennis McCance	Dr Shu-Dong Zhang
Dr Mohamed El-Tanani	Dr Damian McManus	
Professor David Haigh	Dr James Murray	

The Gastro-Intestinal focus group addresses a number of important clinical problems within the colorectal and gastro-oesophageal cancer early and advanced disease settings. The major goals of the focus group are the identification of novel targets, in particular for specific molecular subtypes (eg: mutant Kras and mutant Braf), the identification of biomarkers for response to chemotherapy and novel targeted agents and the implementation of both research approaches into novel adaptive clinical trial designs. The focus group involves basic scientists, clinician scientists, academic clinicians from CCRCB and the Belfast Health and Social Care Trust (BHSCT), pathologists, bio-informaticians and medicinal chemists. An example of the studies already underway in the Gastro-Intestinal focus group is the identification of novel targets and pathways involved in chemotherapy resistance in colorectal cancer.

Other areas of focus include:

- Identification and targeting of clinically relevant molecular and genetic subtypes in early stage colorectal cancer;
- Development of gene signatures to predict response to chemotherapy treatment in colorectal cancer and gastro-oesophageal cancer;
- Kras biology and identification of novel targets synthetic lethal for Kras mutant colorectal cancer tumours;
- FLIP as a target and prognostic/predictive biomarker;
- ADAM17 as a target and prognostic/predictive biomarker in KrasWT/MT colorectal cancer;
- Development of investigator initiated clinical studies (eg: MEK1/2 inhibitory agents, HDAC inhibitors in GI tumours).

Members of this group are also involved as clinical or scientific partners in several national and international phase I-III trials and are part of the NCRI colorectal/upper GI clinical studies groups and/or EORTC GI group.



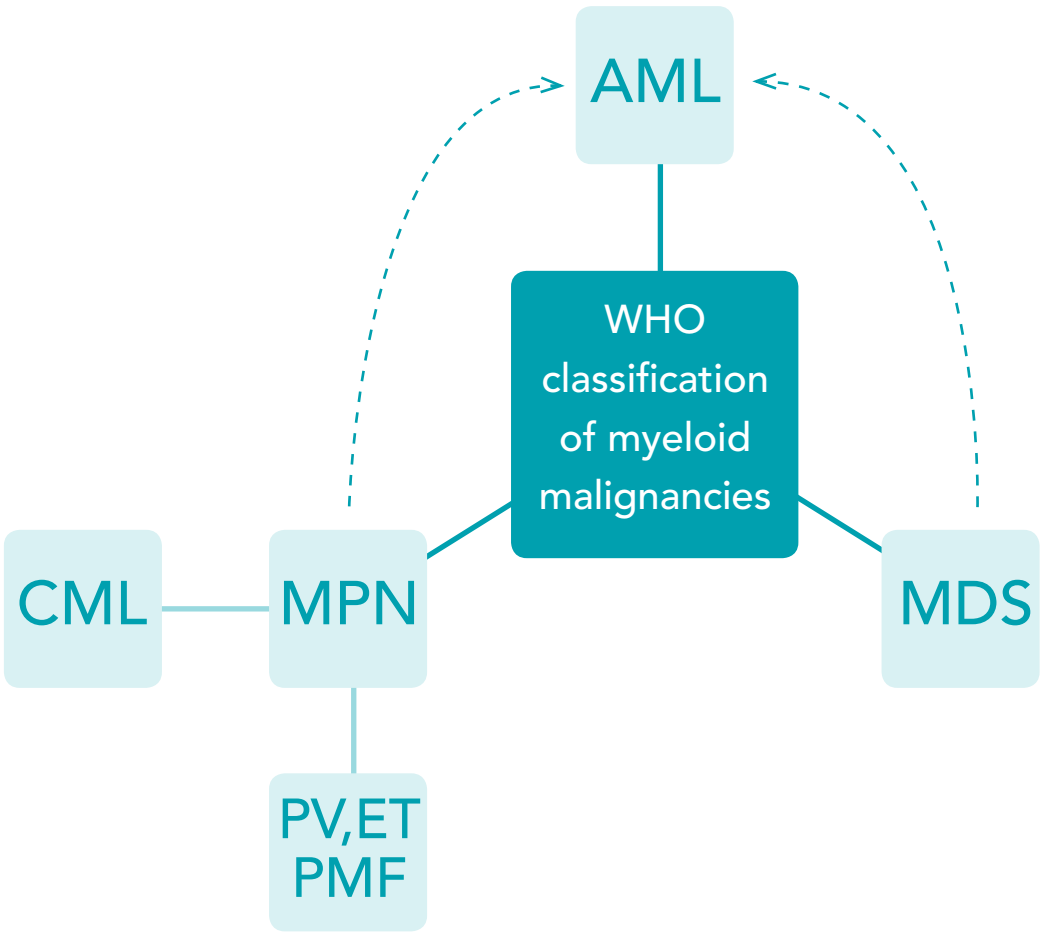
HAEMATOLOGICAL MALIGNANCIES

Ken Mills, Chairperson

Focus Group Membership:	
Dr Andreas Albrecht	Professor Mary Frances McMullin
Dr Mark Catherwood	Dr Melanie Percy
Dr Christine Macartney	Dr Alex Thompson
Dr Frank Emmert-Streib	Dr Lakshmi Venkatraman
Dr Sandra Irvine	Dr Shu-Dong Zhang

The Haematological Malignancies focus group is studying the Myeloid Malignancies spectrum of diseases which includes Myelodysplastic Syndromes (MDS), Acute Myeloid Leukaemia (AML), Myeloproliferative Neoplasms (MPN) and Chronic Myeloid Leukaemia (CML). A percentage of MDS, MPN and CML patients will evolve into an AML type disease. An increasing number of somatic and germ-line genetic mutations have now been described in these diseases however, intriguingly, the most of these are not restricted to one sub-type. This has enabled different research studies to be woven into one research focus group involving translational and clinical scientists, bio-informaticians, medicinal chemists, pathologists and academic clinicians from the CCRCB and the Belfast Trust.

The projects focused on Myeloid Malignancies include the in vivo models to assess the role of HOX genes in initiation versus maintenance; identifying biomarker of response to epigenetic, proteasome and other novel agents; using markers of disease progression to identify novel therapeutic agents and identifying molecular basis for rationale therapeutic combinations or priming strategies. These laboratory and bioinformatic approaches are complemented by national and international trials for CML, MPD and AML within the Experimental Cancer Medicine Centre and the Leukaemia and Lymphoma Research Therapy Acceleration Programme (TAP) portfolio.



PROSTATE AND BLADDER

David Waugh, Chairperson

Focus Group Membership:	
Dr Mark Catherwood	Dr Declan O'Rourke
Dr Shozeb Haider	Professor Joe O'Sullivan
Professor Peter Hamilton	Dr Kostantin Panov
Professor Richard Kennedy	Professor Kevin Prise
Dr Adrien Kissenpfennig	Professor Manuel Salto-Tellez
Dr Dan Longley	Dr Stephen Walker
Dr Karen McCloskey	Dr Richard Williams
Dr Paul Mullan	

Our major focus is to address areas of major clinical unmet need in each disease through inter-disciplinary, project-focused teams comprising cell biologists, radiation biologists, medicinal chemists, pathologists, clinical oncologists and urologists. The objective of the Group is to innovate clinical practice in Genito-Urinary Cancers by increasing the portfolio of trials-based and clinical research activity. Clinical activity is prioritized to projects where there is an unmet clinical need, where we can undertake a national leadership role and where biomarker development or validation is an integral component of the trial design. The clinically-relevant questions that we have adopted in these diseases are:

Prostate Cancer

- To promote molecularly-stratified approaches that identify high risk patients;
- To characterize novel therapeutic strategies and accompanying biomarkers for molecular stratified, high-risk groups;
- To identify increasingly effective treatments of advanced castrate-resistant prostate cancer, especially in the context of bone metastasis;
- To characterize novel therapeutic strategies and biomarkers of radio-resistant prostate cancers.

Bladder Cancer

- To characterize the mechanism of radiation-induced bystander responses in bladder transitional cell carcinoma and normal urothelium;
- To investigate the mechanisms underpinning toxicity in normal bladder post-irradiation;
- To characterize novel therapeutic strategies for treatment of radiation-induced bladder dysfunction.

RADIATION SCIENCES

Kevin Prise, Chairperson

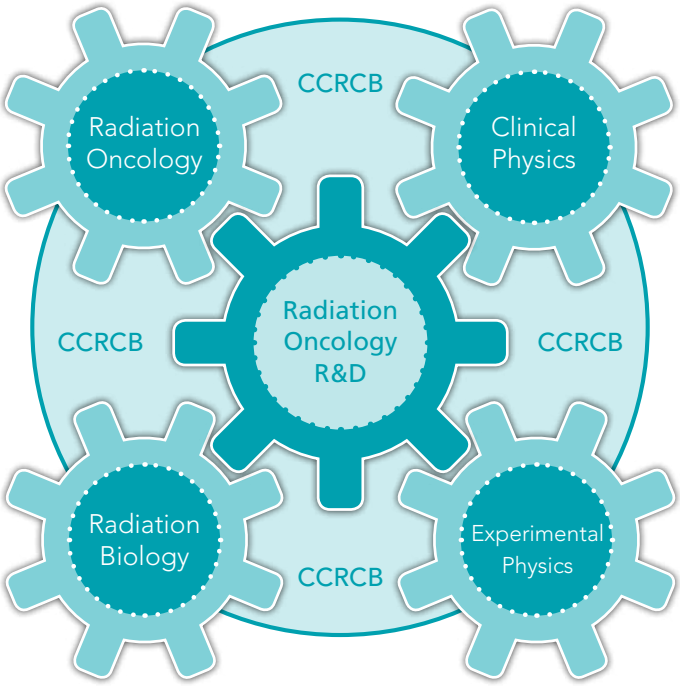
Focus Group Membership:	
Dr Darren Brady	Dr Karen McCloskey
Dr Aidan Cole	Mr Conor McGarry
Dr Fred Currell	Dr Marie Migaud
Dr Tom Flannery	Dr Michael Moran
Dr Tom Gardiner	Dr Joe O'Sullivan
Dr Gerry Hanna	Dr Daksha Patel
Dr Fionnula Houghton	Dr Giuseppe Schettino
Dr Alan Hounsell	Dr Chris Scott
Dr Jackie James	Dr Kate Williamson
Professor Dennis McCance	

The Radiation Sciences focus group is multidisciplinary having strengths in radiation physics, radiotherapy physics, cell biology, chemistry, radiation biology, neuro-oncology, bladder physiology, pathology, surgery, tissue research and radiation oncology and the membership includes basic scientists, clinical scientists and clinicians. Some aspects of the work are disease specific, particularly around prostate and more recently head and neck cancers with some members also contributing to other focus groups such as breast and thoracic oncology. The objectives of the Radiation Sciences focus group are to maximise our input into Radiation Oncology research and development by:

- Developing new collaborative research programmes in radiation science;
- Maximising the translational opportunities of our research;
- Inputting into new radiation-based clinical studies at the Northern Ireland Clinical Cancer Centre;
- Maximising training opportunities in radiation science;
- Initiating collaborative projects with other focus groups and external partners;
- Profiling radiation-based work at Queen's University, nationally and internationally.

Our research is focussed in three areas:

- Advanced radiotherapies where we are developing new biological-based models to increase their efficacy in tumours and protect surrounding normal tissues;
- Radiation-drug interactions studying interactions between various small molecule agents and radiotherapies and including new approaches with gold nanoparticles;
- A developing area around radionuclide therapy which includes new approaches targeting radionuclides with multicombinatorial approaches to bone metastasis.



THORACIC ONCOLOGY

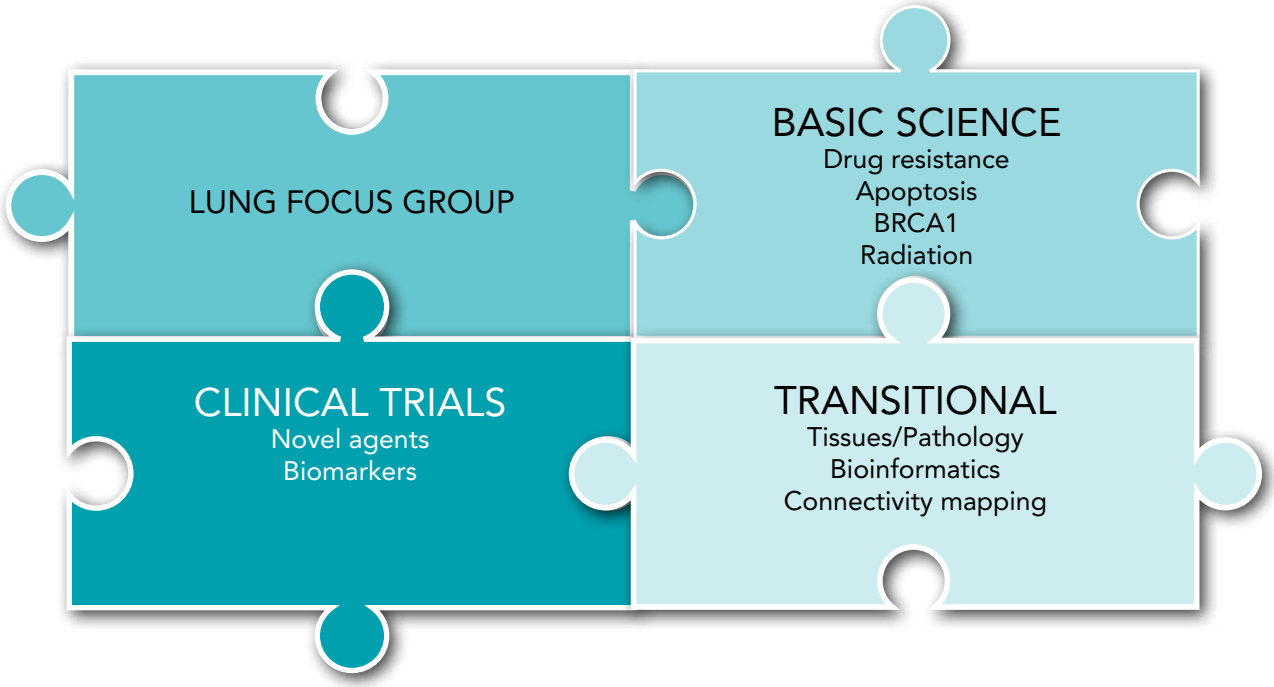
Dan Longley, Chairperson

Focus Group Membership:	
Dr Lynn Campbell	Dr Jonathon McAleese
Dr Mohamed El-Tanani	Dr Kieran McManus
Professor Dean Fennell	Dr Ian Paul
Dr Gerry Hanna	Professor Kevin Prise
Professor David Haigh	Dr Jennifer Quinn
Professor Peter Hamilton	Dr Paula Scullin
Dr Jane Hurwitz	Dr David Waugh
Dr Jackie James	Dr Shu-Dong Zhang

The Thoracic Oncology focus group brings together experienced researchers from complementary scientific and medical disciplines working in the area of thoracic oncology, particularly non-small cell lung cancer (NSCLC) and malignant pleural mesothelioma. The ultimate goal of the focus group is to translate basic research into novel clinical trials in lung cancer. At the heart of the group are several molecular biologists, who underpin the basic scientific research effort. However, the group not only facilitates basic research but also enables translational lung cancer research. This is achieved by the presence of medical oncologists and pathologists in the group. With regard to pathology, we have several lung cancer tissue microarrays and access to tissues from important ongoing clinical trials. Also embedded in the group are experts in bioinformatics, who provide critical support for the basic and translational research efforts. As radiation is an important therapeutic modality in NSCLC, the group contains individuals with expertise in the areas of basic and clinical radiation oncology. A particular strength of the group is its numerous external national and international collaborations and presence on the European Organisation for Research and Treatment of Cancer (EORTC) Lung group.

Areas of research include:

- Targeting drug resistance due to dysfunctional apoptosis signalling in NSCLC and mesothelioma (Dan Longley/Dean Fennell);
- BRCA1 as a determinant and biomarker of response to DNA damaging agents (including PARP inhibitors) and microtubule poisons in NSCLC and mesothelioma (Jennifer Quinn/Dean Fennell);
- The role of Ran-GTP as a therapeutic target and biomarker in NSCLC (Mohamed El-Tanani/Dean Fennell);
- Overcoming resistance to ionizing radiation in NSCLC (Kevin Prise/Dan Longley);
- Connectivity mapping to identify novel approaches to targeting clinically relevant genes and pathways (Shu-Dong Zhang).



ENABLING TECHNOLOGIES

BIOINFORMATICS AND IMAGING

Peter Hamilton, Lead Investigator

The Cancer Bioinformatics (CBI) group, established in 2009, forms part of the Experimental Cancer Medicine Research division. The group consists of scientists with expertise across a broad spectrum ranging from Computational Biology, Computer Vision and Machine Learning to Systems and Network Biology. In the era of high-throughput data, quantitative methods are key for elucidating biological processes. For complex diseases like cancer the deciphering of molecular signatures and networks for diagnostic and treatment modalities form major challenges for translational and experimental cancer research.
The aim of the group is to develop novel computational and statistical methods and to engage in interdisciplinary collaborative research by working closely together with biologists and clinicians across the CCRCB, providing the interface between data and understanding. Developing innovative research programmes in Cancer Bioinformatics is a priority of the team.

Key research areas include:

- Computational Biology and Biostatistics;
- Pathway analysis, causal inference of regulatory networks and integration of genetics and genomics data;
- Tissue Imaging, Analytics and Biomarker Discovery;
- High-throughput analysis of genomic and image data;
- Quantitative methods in disease-genes-drugs connection discovery;
- Biomolecular Structure Prediction;
- Data integration.

The research of the group spans a wide range from basic research and method development to their applications. The group has specific interests in drug resistance and various types of complex diseases like lung cancer, colorectal cancer, cervical cancer and haematological malignancies.

In addition, the group takes a leading role in the education and mentoring of students and scientists to provide them with a deeper knowledge and understanding of modern quantitative methods as needed to cope with the data revolution in biology and medicine. Furthermore, the group aims to generate a public awareness of the current exiting developments in quantitative cancer research.

NORTHERN IRELAND CANCER TRIALS CENTRE

Richard Wilson, Lead Investigator

Our mission at the Northern Ireland Cancer Trials Centre (NICTC) is to deliver the highest quality and standard of care to cancer patients through leading edge clinical and translational research.

The Northern Ireland Cancer Trials Centre (NICTC), formerly known as the Northern Ireland Cancer Clinical Trials Unit (NICCTU) was formally established in 1999 following the signing of the National Cancer Institute-Ireland-Northern Ireland Cancer Agreement. Our local Northern Ireland DHSSPS Research and Development Office (now the Health and Social Care (HSC) Research and Development (R&D) Division of the Public Health Agency of Northern Ireland) provided funding for the initial infrastructure to be put in place. Today the HSC R&D Division of the Public Health Agency of Northern Ireland provides core funding in support of the NICTC's continued expansion with significant additional funding being provided by several Cancer Research UK grants and from local charities such as the Friends of the Cancer Centre.

The role of the NICTC is:

- To co-ordinate and promote cancer clinical trials, and run the full range of first-in-human phase I to phase IV trials, along with genetic epidemiology, questionnaire, quality of life, translational and other high quality studies. Clinical trials can be designed locally (investigator-initiated) or adopted as part of a multi-centre study. Investigator initiated trials often involve collaboration with other academic groups within local universities or hospitals;
- To act as the co-ordinating centre for the Northern Ireland Cancer Trials Network (NICTN) responsible for the co-ordination of cancer clinical trial and translational research activity throughout Northern Ireland, particularly phase III trials and epidemiology studies;
- To manage an academic early clinical trials unit running a portfolio of Cancer Research UK, commercial and local investigator-initiated experimental cancer medicine studies including phase I, II and translational trials.
  In April 2007, the NICTC was awarded Experimental Cancer Medicine Centre (ECMC) status, one of 19 such centres appointed within the UK.

DRUG DISCOVERY

David Haigh, Lead Investigator

Despite over fifty years of research in the field of anticancer drug discovery, ranging from DNA modifying agents such as N-mustards and platinum cross-linking agents; anti-metabolite and natural products including Methatrexate and Paclitaxel to more recent anti-hormonal drugs such as Tamoxifen, the challenge of identifying clinically useful oncology medicines remains daunting. During the last twenty years, as knowledge of the heterogeneity of cancer as a disease has increased, greater emphasis has been placed on new molecularly-targeted drugs, designed to inhibit enzymes resulting from over-expression of aberrant genes, or that interfere with signalling pathways that are also related to aberrant gene expression. Some notable successes include Gleevec and Tykerb. As our understanding of the relationships between these genes and the biology of cancer continues to grow, new opportunities for targeted therapy will continue to emerge.

Working in synergy with members of both the Cancer Cell and Molecular Biology and the Experimental Cancer Medicine divisions, the remit of the Drug Discovery group is to pursue these emerging novel and innovative biological targets through the early stages of the drug discovery process. These stages define the transition from basic molecular biological understanding of disease targets towards the identification of appropriate small-molecule "tool" and "hit" compounds, capable of modulating the biological activities of those targets and the initiation of "hit-to-lead" and early "lead-optimisation" research programmes. Research is currently focussed on the discovery of inhibitors of protease enzymes and on disrupting protein-protein interactions, targets in several pathways associated with aberrant control of oncogenic activity, dysregulation of protein trafficking, control of nucleocytoplasmic transport or regulation of cellular apoptosis. Based on these initial drug discovery efforts, it is anticipated that molecules will emerge that may be developable into the next generation of clinical medicines. The multidisciplinary environment within CCRCB offers a significant opportunity for chemists, biologists and computer modellers to combine heir expertise in in-silico design, organic synthesis, bioassay design and screening, thus facilitating the drug discovery process.

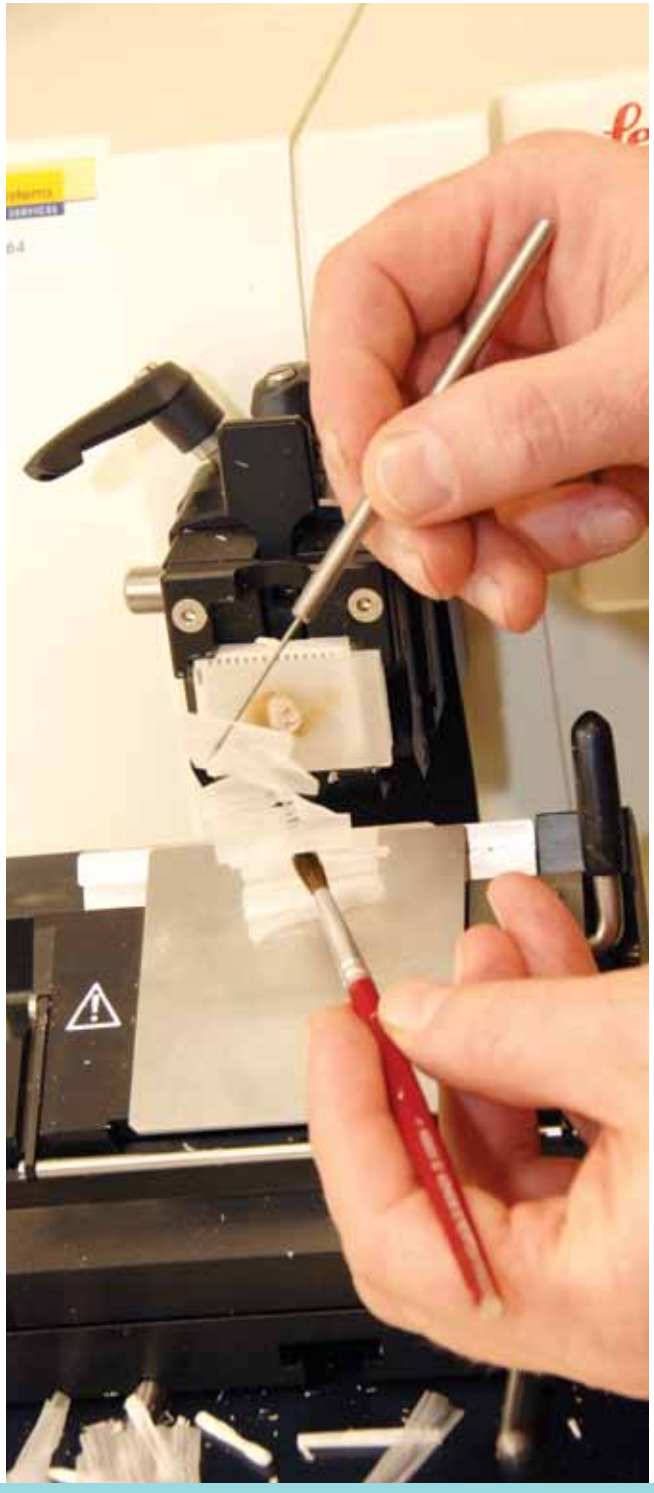
MOLECULAR PATHOLOGY AND BIOBANKING

Manuel Salto-Tellez and Jackie James, Lead Investigators

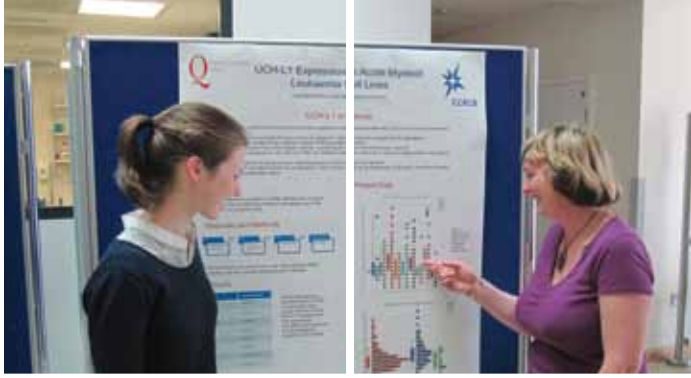
CCRCB has created a Molecular Pathology Hub in the basement of the CCRCB building. The refurbished laboratory has provided a self-contained, purpose-designed, internationally accreditable hybrid operation capable of performing molecular pathology translational research and molecular diagnostics of solid tumours. The molecular pathology diagnostic unit is a partnership between CCRCB and the Belfast Health and Social Care Trust (BHSCT).

The technologies available in the basement hub are tissue and nucleic acid based, and include: tissue processing and embedding, conventional HE, manual and automated immunohistochemistry, various automated in-situ hybridization techniques, tissue microarrays, gel and capillary electrophoresis, Q-PCR, Next Generation Sequencing, laser capture microdissection and tissue bioimaging. The laboratory environment ensures the proper SoPs, procedure manuals and QA/QC schemes to exercise its hybrid role. This laboratory is able to provide research support to basic scientists willing to understand the clinical relevance of their research findings, academic oncologists willing to have biomarker analysis or validation in the context of clinical trials, and all those in need of high-quality, affordable molecular diagnostic testing in oncology.

Molecular Pathology research in Belfast involves academics at QUB and clinicians within the BHSCT Tissue Pathology laboratories and is underpinned by the new Northern Ireland Biobank (NIB). The NIB is funded by the Health and Social Care (HSC) Research and Development (R&D) Division of the Public Health Agency of the Northern Ireland and a local charity, the Friends of the Cancer Centre; it is also supported through the CR-UK Centre grant. The NIB enhances translational cancer research associated with our phase I-III trials through the collection of tissues and blood samples linked to reliable clinical and pathological data sets. The Belfast ECMC previously had project-based but no systematic tumour tissue collection capabilities. The NIB complements current activities by establishing a unique targeted collection of tissues and bodily fluids, including normal and tumour tissues, for translational studies. The NIB has developed a secure, independent sophisticated information management system based on CaTISSUE suite from NCI/NIH, but modified to include the integration of whole slide imaging and tissue microarray management. There is a close working relationship between the NIB and the NI Cancer Registry to ensure all samples processed for the bank are linked with robust de-identified clinical and pathological information collected from state of the art data repositories.



EDUCATION AND TRAINING






POSTGRADUATE PROGRAMME

Karen McCloskey, Associate Director for Postgraduate Studies

An important aim of the CCRCB is to train research leaders of the future. The purpose of our clinician/graduate training programme is to give students and clinical fellows starting in research, an opportunity to work in state-of-the-art laboratories. The training of our postgraduate research students is achieved by offering both three and four year PhD studentships. Currently there are 64 postgraduate students within the Centre.

The postgraduate programme integrates training in cancer research with the transferable skills necessary for the communication of science and career development as an independent scientist. All students receive training in safe working practices, good laboratory practice, project report writing and communication/presentation skills. The Annual CCRCB Research Symposia for first, second and final year postgraduate students, in addition to forming part of the Annual Progress Assessment process, provides an appropriate scientific forum for conference presentation training. Students are given the opportunity to present poster/oral communication on their work at national and international conferences to enhance their network of scientific contacts. Where appropriate, students undertake short visits to collaborators' laboratories in the UK, Europe or the USA to work on unique sample sets or to access new methodologies.

Four-year PhD studentships are supported by the McClay Trust and CR-UK. These prestigious studentships enable students to take short rotations in a number of CCRCB laboratories during their first year and then to develop a project proposal within the laboratory of their choice. There are currently 5 McClay Trust and 4 CR-UK supported students within CCRCB.

CCRCB provides PhD opportunities for self-funding international students and there are 6 international students currently enrolled for PhD research commencing September 2012. Candidates are invited to discuss their research project preferences and supervisory team at the time of application to ensure that their research interests are best addressed.

A number of our postgraduate students have received awards during the period of this report:

- Ann-Christin Cichon, Katy Orr and Marta Crudden were all awarded prizes for their poster presentations at the Irish Association for Cancer Research (IACR) Conference on 2 March 2012;
- Susannah Gray was awarded a Travel Scholarship £200 from the Physiological Society to present at the VIIth International Symposium on ICC in Florence, September 2012;
- Conor Hanna, Laura Taggart, Colman Trainor and Malgorzata Bill were all awarded Scientists in Training Awards to attend and present their work at the annual meeting of the US Radiation Research Society being held in Puerto Rico in September 2012;
- Ryan Hutchinson has been awarded the Pathology Visions Travel Scholarship to give an oral presentation on "Novel method for the quantification of FLIP and Caspase 8 in NSCLC using Image Analysis Software" at the Pathology Visions 2012 Conference in Baltimore 28-30 October 2012;
- Fabio Liberante was awarded a €500 Travel Bursary and complimentary registration from the European Haematology Association on 23 April 2012 to attend their annual meeting in Amsterdam on 14-17 June 2012 as one of the best scoring abstracts by an early stage investigator;
- Ewelina Rozycka was a recipient of a British Society for Cell Biology Honour Fell Travel Award worth £400 to attend the 2012 EACR meeting in Barcelona.

A SUMMARY OF THE POSTGRADUATE DEGREES AWARDED DURING THIS PERIOD IS SHOWN BELOW

POSTGRADUATE SCIENTISTS:

Name	Degree Awarded	Date	Thesis Title
Acheva, Anna	PhD	July 2012	Mechanisms of response to targeted irradiation in organotypic 3D skin cultures (Supervisors: G Schettino/K Prise)
Bradley, Clare	PhD	July 2012	The effects of potential chemopreventive agents on colorectal cancer: a novel approach in a murine model (Supervisors: C Campbell/E Donnelly)
Breen, Marie	PhD	July 2012	The erythropoietin receptor in TEL-AML 1 positive acute lymphoblastic leukaemia (Supervisors: K Mills/T Lappin)
Carson, Robert	MPhil	July 2012	Oncogenic Kras in colorectal cancer: focus on detection and targeting (Supervisors: S Van Schaeybroeck/P Johnston)
Chaurasiya, Dipak	MPhil	December 2011	Investigations into the roles and applications of cathepsin propeptides (Supervisors: C Scott/J Johnston)
Colyer, Hilary	PhD	December 2011	Integrative analysis of modifying methylation status with gene expression in myeloid leukaemia cell lines (Supervisors: K Mills/S Irvine)
Cunningham, Rebecca	PhD	July 2012	Characterisation of the physiological properties of interstitial cells of cajal in normal bladder and their altered distribution in dysfunctional bladder (Supervisors: K McCloskey/T Gardiner)
Fatehullah, Aliya	PhD	July 2012	Molecular regulation of polarised growth in colorectal epithelium (Supervisors: C Campbell/K Dib)
Horn, Simon	PhD	July 2012	Protein biomarkers for human radiation exposure (Supervisors: K Prise/K Rothkamm/G Schettino)
Kavanagh, Joy	PhD	July 2012	DNA damage and biological effectiveness of antiprotons in relation to carbon ions and protons (Supervisors: G Schettino/F Currell/D Timson)
Kerr, Emma	PhD	July 2012	Characterisation of an acetylation-dependent FLIP/KU70 complex that regulates FLIP expression (Supervisors: D Longley/D Fennell)
Lawlor, Martin	PhD	July 2012	The role of radiation-induced cell death and resistance in Non Small Cell Lung Cancer (NSCLC) (Supervisors: K Prise/D Fennell)
McCavigan, Andrena	PhD	December 2011	Digital pathology, mathematical modelling and algorithm development to enhance tissue research in cancer diagnostics (Supervisors: P Hamilton/S O'Rourke)
McCourt, Clare	PhD	July 2012	Novel strategies to enhance androgen receptor-targeted therapy in prostate cancer – a molecular and pharmacological approach (Supervisors: D Waugh/D Longley)
Ramsey, Joanne	PhD	December 2011	Investigation of the hox code in haematopoiesis and leukaemia (Supervisors: A Thompson/T Lappin)
Watson, Maxwell	MPhil	July 2012	Studies in cancer anorexia cachexia syndrome (Supervisors: R Wilson/M Eatock/P Wilkinson)

CLINICAL RESEARCH FELLOWS:

Name	Degree Awarded	Date	Thesis Title
McGarry, Conor	PhD	July 2012	Biological implications of different planning and delivery techniques using advanced radiotherapy technologies (Supervisors: K Prise/A Hounsell)
Paul, Ian	PhD	July 2012	Overcoming mitochondrial apoptosis block in non small cell lung cancer for effective therapy (Supervisors: D Fennell/D Longley)
Turkington, Richard	PhD	July 2012	A systems biology approach to define pathways of oxaliplation and 5-Fluorouracil resistance in colorectal cancer (Supervisors: P Johnston/S Van Schaeybroeck)

SUMMER STUDENTSHIPS

The CCRCB Summer Research Programme has been running on a formal basis for 4 years and provides promising young students the opportunity to work in a research laboratory for 8 weeks over the summer period. Students from science, medical and computational biology backgrounds are assigned to a supervisor and an original research project. In addition to learning laboratory techniques, data analysis and interpretation, the participants also write a research report and present their work at a CCRCB symposium. In 2011, 23 students participated in our programme, funded by the School, Wellcome Trust, Learned Societies, NILRF and the Nuffield Foundation. There are currently 25 students enrolled on the 2012 programme from the UK, the Republic of Ireland and the USA. An indication of the success of the CCRCB Summer Research Programme is evidenced by a significant number of previous participants currently enrolled in PhD programmes.

CLINICAL ACADEMIC TRAINING PROGRAMME

The Clinical Academic Training Programme (CATP) at Queen's University Belfast was established in conjunction with the Northern Ireland Medical and Dental Agency (NIMDTA) and the Belfast Health and Social Care Trust in 2008 to provide a unique opportunity for highly motivated individuals who want to excel in both clinical and academic training. The three programmes available are: **Academic Foundation (AF2)** – a four month placement which enables the trainee to gain insights into clinical academic medicine at an early stage through regular interaction with academic clinical supervisors and scientific staff. The **Academic Clinical Fellow (ACF)** is targeted at doctors in the early years of specialty training. This is a two-year funded programme, attracts a National Training Number (academic), and allows the ACF to develop academic skills simultaneously with specialty clinical skills. This academic training environment is aimed at helping the ACF prepare a competitive application for a training fellowship to undertake a higher degree. The **Academic Clinical Lecturer (ACL)** post offers exciting opportunities for aspiring trainees who are considering a career in clinical academic medicine. These posts are designed for doctors who have already obtained a higher degree. Trainees will finish their clinical training while continuing academic development at post-doctoral level.

The CATP Committee oversees the academic progression of the trainee in ACL, ACF and AF2 programmes. The CATP Committee is comprised of members from the School of Medicine, Dentistry and Biomedical Sciences at Queen's University Belfast, NIMDTA and the Belfast Health and Social Care Trust. The Committee approves and appoints supervisors and allocates trainees to the appropriate Research or Education Centre within the School of Medicine, Dentistry and Biomedical Sciences. Progress is reviewed at the end of each AF2 placement and at six monthly intervals for the ACF and ACL trainees.

In CCRCB we have successfully had trainees on all levels of the Clinical Academic Training Programme and the current trainees within the Centre are listed in the table below.

For further information on the Clinical Academic Training Programme contact the Programme Administrator, Ms Valerie Reid (v.reid@qub.ac.uk), School of Medicine, Dentistry and Biomedical Sciences.

Programme	Name	Period
ACL	**Turkington, Richard** (Supervisors: P Johnston/S Van Schaeybroeck)	1 August 2011 – 31 July 2014
AF2	**Murray, James** (Supervisor: R Wilson)	4 April 2012 – 31 July 2012
ACF	**Campbell, Patrick** (Supervisors: K McCloskey/J Price)	1 August 2012 – 31 July 2014

POST DOCTORAL PROGRAMME

Kevin Prise, Associate Director for Post-Doctoral Studies

In addition to the training of PhD students, CCRCB is a major centre within the School of Medicine, Dentistry and Biomedical Sciences for further research training and career development. It attracts researchers from the UK, Ireland and across the world due to the breadth and quality of the research, and the emphasis on international and cross-disciplinary collaborations. Researchers at all steps of their career development benefit from the very active programme of seminars and internal research meetings, and the availability of courses to learn key scientific and complementary skills. Our aim is to continue to attract enthusiastic scientists and clinicians to work with our established staff and to draw on their experience but also to generate new ideas in a stimulating research environment.

Central to the post-doctoral programme within the centre, is a weekly seminar programme where post-docs present their work to their peers and colleagues and gain skills in introducing speakers and leading questioning.

As part of the career development for our post-doctorate we also run a mentoring scheme within the Centre which aims to take forward a small group of post-docs and assist them with preparing applications for fellowships to be held at CCRCB or elsewhere. Currently 7 post-docs are in the programme and several fellowship applications have been submitted to funders including CR-UK, the MRC and the Breast Cancer Campaign. This has now started to show significant success with two prestigious fellowships being awarded to post-docs on the mentoring programme. Dr Niamh O'Brian has been awarded a 5 year fellowship from the Breast Cancer Campaign on "The identification of a subgroup of breast cancers with combined BRCA1 dysfunction/NF B hyperactivity and the development of novel therapeutic strategy" valued at over £0.5M. Dr Kienan Savage has also been appointed to a 4 year fellowship from Cancer Focus Northern Ireland (previously the Ulster Cancer Foundation).

The Centre's post-doctorate continue to be major players in the School-wide Post-Doctoral Society, initially setup by members of CCRCB and currently represented on the Committee by Dr Simon McDade and Dr Kienan Savage. The Society acts as a forum to provide a voice for the postdoctoral community within the School and to promote opportunities for career advancement, personal development and social interaction. The annual symposium of the society was held at Riddel Hall on Friday, 18 May 2012 with a focus on Science and Technology and a Leadership workshop.

Throughout the period covered by this report a number of our postdoctoral fellows obtained awards for their achievements and some of these are highlighted below:

- Dr Karl Butterworth was elected Vice-Chair of the Scholars in Training Committee of the US Radiation Research Society and will serve as Chair from 2013;
- Dr Lisa Crawford was awarded a £6,750 British Society for Haematology Early Stage Research Start-Up grant in May 2012;
- Dr Lisa Crawford was awarded a Travel Award from the British Society for Haematology to allow her to present her work at the Keystone Symposium on Ubiquitin Signalling, Whistler, USA in March 2012;
- Dr Paula Hyland, the Northern Irish Cancer Prevention Fellow and Research Fellow in the Genetic Epidemiology Branch (GEB) at the National Cancer Institute (NCI), received the 2012 NCI Director's Innovation Intramural Award from Dr Harold E Varmus (Nobel Laureate in Medicine and NCI Director) for her project entitled "Global Chromatin Accessibility Patterns in Melanoma-prone Individuals with and without CDKN2A Mutations";
- Dr Pamela Maxwell was awarded a €850 Travel Award to attend and given an oral presentation at the 9th World Congress on Urological Research in Innsbruck, Austria on 15-17 September 2011;
- Dr Niamh O'Brien was awarded the European Associated Cancer Research (EACR) Young Scientist Award at the Irish Association for Cancer Research (IACR) Conference in March 2012;
- Dr Niamh O'Brien won the 2011 Roche Prize and was presented with a medal and a bursary of £400. Niamh was selected to represent CCRCB and gained second place at the Roche Researcher of the Year Award in Dublin on 8 November 2011 where the nominated candidates from other Irish universities presented their scientific work.

SEMINAR PROGRAMME

An important aspect of our work and success is the Centre's seminar programme which provides an opportunity to talk about our research and share ideas with colleagues. We have a post doctoral seminar programme where each week the post doctoral research fellows present and discuss their work with colleagues in other research groups within the Centre. In addition we have an external seminar programme (advertised on our website www.qub.ac.uk/ccrcb) in which we host guest speakers to encourage collaborations and interactions with other research institutions.

Our distinguished **Mitchell Lecture**, which was initiated in 2007 and is held annually to honour the previous Chancellor of Queen's University Belfast, Senator George Mitchell, for his enormous contributions to the University and the wider community, took place on 3 November 2011. The lecture was given by **Dr Joan Brugge**, from Harvard Medical School, Boston. Dr Brugge's talk was entitled "Modelling Cancer in Three-Dimensional Cultures and Mouse Models".

Two prestigious **CR-UK Lectures** were held during the past year as part of the Belfast Cancer Research UK Centre initiative. On 20 October 2011, **Professor Steve Jackson** from the Gurdon Institute, University of Cambridge gave a talk entitled "Cellular Responses to DNA Damage: from Molecular Insights to New Approaches for Cancer Therapy" and on 23 June 2012 **Dr Jason Carroll**, from the Cambridge Research Institute, presented a talk entitled "Understanding Estrogen Receptor Transcription in Breast Cancer ".

The following external seminars were held during the period of this annual report:

Dr Sam Bunting, *National Cancer Institute*
"DNA Repair Pathway Choice and the Origin of Cancer";

Dr Mickey Williams, *Molecular Characterization and Clinical Assay Development Laboratory, SAIC-Frederick, Inc. Washington*
"Molecular Characterization and Clinical Assay Development in Lymphoma and other Cancers";

Professor David Neal, *University of Cambridge*
"Recent Discoveries about Androgen Receptor Function in Prostate Cancer";

Professor Mark Sansom, *University of Oxford*
"Protein/Lipid Interactions in Membranes via Multiscale Simulations";

Dr Roger Barraclough, *University of Liverpool*
"Proteins Associated with Cancer Metastasis";

Professor Andy Hall, *University of Newcastle*
"Darwinian Fitness in Acute Leukaemia";

Dr Tim Wilson, *Genentech, San Francisco*
"Non-Mutational RTK Activation – Implications for Therapeutic Development and Resistance to Anti-Cancer Kinase Inhibitors";

Dr Pete Bond, *University of Cambridge*
"Multiscale Simulation Approaches to Biomolecular Assembly";

Professor Kum Kum Khanna, *Queensland Institute of Medical Research, Brisbane Australia*
"Defective DNA Damage Repair as a Cause and Cure for Cancer";

Dr Kai Rothkamm, *Health Protection Agency (HPA) United Kingdom*
"DNA and Chromosome Damage as Biomarkers for Radiation Exposure and Effect";

Professor Norman J Maitland, *University of York*
"Prostate Cancer Stem Cells: A Source of Novel Therapeutic Targets";

Professor Marco Durante, *Biophysics Division of GSI (Germany)*
"Translational Research in Charged Particle Radiobiology";

P**rofessor Carlos Caldas,** *Cancer Research UK, Cambridge Research Institute*
"Genomics of Breast Cancer – What Have We Learned?";

Dr Lukas Kenner, *Ludwig Boltzman Institute for Cancer research, Medical University Vienna*
"News from Stat3 in Prostate Cancer and AP-1 in NPM-ALK associated Lymphomagenesis";

Dr Eric Miska, *University of Cambridge*
"Small RNAs: from Genome Maintenance to Innate Immunity";

Professor Guido Hildebrandt, *University of Rostock*
"Modulation of Inflammatory Responses by Ionizing Radiation";

Dr Nick Orr, *Institute of Cancer Research, London*
"Genetic Susceptibility to Breast Cancer";

Dr Patrice Codogno, *University of Paris*
"Autophagy: Self-eating is Good for You";

Professor Nicola Perrotti, *University of Catanzaro Italy*
"SGK1 in Metabolic Syndrome and Cancer";

Dr Lawrence Banks, I*nternational Centre for Genetic Engineering and Biotechnology, Italy*
"Human Papillomaviruses: From Infection to Cancer";

Professor James O'Donnell, *Trinity College Dublin*,
"Cross-Talk between Malignancy and Coagulation Serine Proteases-Novel Therapeutic Opportunities";

Professor Modesto Orozco, *IRB Barcelona*
"Dynamic Simulations of Proteins in the Postgenomic Era".

PUBLIC ENGAGEMENT ACTIVITIES

PUBLIC ENGAGEMENT ACTIVITIES

Here at CCRCB we are proud of the pioneering research taking place and want people across Northern Ireland to share this pride – and understand the real impact it could have on cancer detection and care in the future. CCRCB is part of the Belfast Cancer Research UK Centre – one of 17 Cancer Research UK (CR-UK) designated Centres of Excellence across the UK. This virtual Centre encompasses a network of scientists, doctors and nurses based at the Northern Ireland Clinical Trials Centre and the five Cancer Units located in hospitals across the region, as well as the CCRCB. The Centre brings doctors, scientists and nurses closer together so that developments in cancer research can be taken swiftly from the bench to the bedside.

Public engagement is central to the Belfast CR-UK Centre strategy – bringing to life the ground-breaking research taking place at CCRCB to build support for this work within the local community. Our researchers are key to this engagement work, regularly giving talks to people about their research, as well as hosting interactive tours of the laboratories. Launched in 2009, when the CCRCB was awarded Cancer Research UK Centre status, our public engagement programme continues to demonstrate the impact of local research to people across the region. Here we highlight our successes for the year.

Other charities which provide funding to the Centre also contribute to the public engagement activities and outreach programmes. For example, CCRCB regularly welcomes supporters and volunteers of local charities such as the Northern Ireland Leukaemia Research Fund, Friends of the Cancer Centre, Cancer Focus NI, Brainwaves NI and many other national charities.

Bringing local research to life

Messages about the research taking place at the Belfast CR-UK Centre reached over 6,893 people across the region during the year. People interested in local cancer research are invited to the CCRCB to hear about our work from the researchers themselves. Our researchers also guide groups through interactive tours of the laboratories – bringing local research to life and explaining the impact their work could have on cancer detection and care in the future. This year 159 people took part in these tours.

Our researchers also take time out of their work to attend community events where they talk to people about local cancer research. Our researchers volunteered at over 68 events this year, including the CR-UK Race for Life at Stormont and Banbridge CR-UK Relay for Life – reaching over 5,300 people at these events alone. Dr Jules Gorski and PhD student Philip Burn gave speeches at these two events, to great applause from event goers.

Inspiring the next generation of cancer researchers

CCRCB is committed to inspiring the next generation of cancer researchers and hosts an annual programme of events for schools. Every June our researchers attend the Sentinus Young Innovators event, a flagship science fair for students aged between 9 and 19. This year our popular stand was busy all day with students learning about DNA by building a double helix using jelly babies and extracting DNA from strawberries.

CCRCB also wants to support teachers by bringing them into contact with the most recent cancer research developments and techniques. In June we also hosted our annual Information Day for teachers. The event was highly praised by the 39 teachers who attended. During the day Professor Dennis McCance and Professor Patrick Morrison gave excellent talks on gene technology and DNA testing. The teachers also had the opportunity to work alongside our researchers in the labs during an afternoon of practical demonstrations.

As well as showcasing our research, the day showed teachers how the syllabus content they teach is applied in cancer research here in Belfast and gave them practical ideas they can take back to the classroom, to inspire their students into a career in cancer research. "Great to find out about the research and how things we teach, e.g. PCR, Human Genome etc, are relevant to medical research. I had no idea so much was happening at QUB and CCRCB" (comment made by one of the teachers that attended).

Cancer awareness and prevention

Our engagement programme also has a public health focus. The CR-UK Senior Research Nurse, based at the Northern Ireland Clinical Cancer Centre, attends community events to raise awareness of the signs and symptoms of cancer, talk to people about how to reduce their risk of the disease and gives healthy living advice. Over the past year 27 events have been attended and the Senior Research Nurse has conducted Body Mass Index (BMI) health checks with members of the public, helping to reduce the number of deaths from cancer in the future.

Building high profile support

The Belfast CR-UK Centre was delighted to receive a visit from the new Lord Mayor of Belfast. During his visit the Lord Mayor, who has an active interest in men's health issues, met with members of our prostate cancer focus group to find out about the translational prostate cancer research taking place here at the Centre and the impact it is already having on men affected by the disease. We are looking forward to working with the Lord Mayor to raise awareness of cancer amongst men in Belfast, as well as the profile of the Centre and its partners.

About the Belfast Cancer Research UK Centre

The Belfast CR-UK Centre is a partnership between Cancer Research UK, Queen's University Belfast, the Health and Social Care Research and Development Division of the Public Health Agency of Northern Ireland and the Belfast Health and Social Care Trust.

The Centre's public engagement strategy is delivered by Katie Scott, Cancer Research UK's Research Engagement Manager. Based in the CCRCB, Katie works closely with our researchers to identify opportunities to take information about our research out into the community.

To find out more about our public engagement programme email katie.scott@cancer.org.uk or call 07795 290 122.












STAFF LISTING

NEW APPOINTMENTS

Joe O'Sullivan
Professor in Radiation Oncology

Joe O'Sullivan was appointed Professor of Radiation Oncology at Queen's University Belfast in October 2011 having initially joined the staff at Queen's in 2004 as Senior Lecturer in Clinical Oncology. Originally from Wexford, Professor O'Sullivan graduated from University College Dublin Medical School in 1993. He joined the Radiation Oncology training scheme in St. Luke's Hospital, Dublin in 1995 and on completion of specialist training, commenced a clinical research fellowship at the Academic Urology Unit of the Royal Marsden Hospital in 2000. It was at the Marsden that Joe developed his interest in prostate cancer clinical research and bone-seeking radionuclide therapy. He completed his MD on the subject of radionuclide therapy in metastatic prostate cancer at the University of London in 2003.

Over the past 8 years Professor O'Sullivan has established and led a clinical research programme in radiation and prostate cancer at the Clinical Cancer Centre at Belfast City Hospital supported by a team of research radiographers, nurses and clinical research fellows. Professor O'Sullivan states: "I believe passionately in the importance of clinical research as part of comprehensive cancer care and really enjoy the challenge of helping men with prostate cancer. I think one of the key roles of clinical academics is to help steer clinical research in a scientifically valid direction while at the same time helping to steer scientific endeavour to answer clinically relevant questions. My clinical practice is very important to me and seeing the devastation that prostate cancer can inflict on men and their families is a huge motivation for me to continue my work".

Joe is married to Dara and has four children, Lucy, Anna, Leo and Oisín. He is a keen runner and off-road cyclist and also finds time to play in a rock band, The Icemen.

Katie Scott
Research Engagement Manager

There is a change of name for Katie Scott, who was recently appointed as Cancer Research UK's (CR-UK) Local Engagement and Development Manager. Whilst her role will remain unchanged her job title has changed to Research Engagement Manager. This move is being made to make the function of her role clearer to the public. Cancer Research UK has 12 Research Engagement Managers working across the UK who engage local communities in research near them and the impact it is having on cancer detection and care.

As the Belfast Research Engagement Manager, Katie's role is to bring local cancer research to life – to engage people in Belfast and across Northern Ireland in the research taking place in their community. This involves arranging visits and tours of the CCRCB and Northern Ireland Cancer Trials Centre for people affected by cancer and others who want to know more about the research taking place at the Belfast CR-UK Centre. Research engagement is also about finding opportunities for researchers to go out and speak about their work at community events, to reach more people and build greater support for the pioneering research taking place at the Centre.

Katie also works closely with the press teams at CR-UK and the other Belfast CR-UK Centre partners to ensure that exciting new research developments make the news and raise the profile of the Centre.

Teachers and students are also a vital audience for the Centre, which has a clear commitment to holding events and activities that will inspire the next generation of cancer researchers. As part of this, Katie will continue to work with colleagues in the CCRCB to deliver the annual teachers' and schools' days, which have already become key features in the CCRCB's events calendar.

Katie joined CCRCB in March 2012 from Prostate Cancer UK where she led the charity's Policy and Campaigns team, leading campaigns for better follow up care for men with prostate cancer and routine access to abiraterone on the NHS for men in the later stages of the disease.

To contact Katie or find out more about her role email: katie.scott@cancer.org.uk or call: 028 9097 2715.

CURRENT STAFF (as at 31 July 2012)

Academic Staff

Professors:

Professor Charles Campbell
Professor David Haigh
Professor Karl Hale
Professor Peter Hamilton
Professor Paul Harkin
Professor Patrick Johnston
Professor Richard Kennedy (Visiting McClay Professor)
Professor Dennis McCance
Professor Mary Frances McMullin
Professor Ken Mills
Professor Joe O'Sullivan
Professor Kevin Prise
Professor Manuel Salto-Tellez

Readers:

Dr Andreas Albrecht
Dr Fred Currell
Dr Karen McCloskey
Dr Marie Migaud
Dr Chris Scott
Dr David Waugh
Dr Richard Wilson

Senior Lecturers:

Dr Mohamed El-Tanani
Dr Tom Flannery
Dr Shozeb Haider
Dr Jackie James
Dr Dan Longley
Dr Paul Mullan
Dr Sandra Van Schaeybroeck (CR-UK Clinician Scientist Fellowship)
Dr Kate Williamson

Lecturers:

Dr Frank Emmert-Streib
Dr James Murray
Dr Kostantin Panov
Dr Daksha Patel
Dr Giuseppe Schettino
Dr Alex Thompson
Dr Richard Williams
Dr Shu-Dong Zhang

Honorary Staff

Ms Ruth Boyd
Dr Mark Catherwood
Dr Alison Clayton
Dr Glenn Dickson
Dr Brian Duggan
Dr Martin Eatock
Professor Dean Fennell
Dr Gerry Hanna
Dr Alan Hounsell
Dr Sandra Irvine
Dr Iain James
Professor Terry Lappin
Dr Maurice Loughrey
Dr Tom Lynch
Dr Perry Maxwell
Dr Melanie Morris
Professor Patrick Morrison
Dr Glenn McCluggage
Dr Stephen McQuaid
Dr Melanie Percy

Scientific Fellows

Dr Paula Hyland (NCI Cancer Prevention)
Dr Jennifer Quinn (Breast Cancer Campaign)

Clinical Research Fellows

David Boyle (CR-UK)
Darren Brady (Friends of the Cancer Centre)
Aidan Cole (CR-UK)
Sonali Dasgupta (CR-UK)
Gareth Irwin (HSC R&D Division)
Conor McGarry (HSC R&D Division)
Michael Moran (HSC R&D Division)

Research Staff

Wendy Allen (CR-UK)
Shahnaz Al Rashid (Brainwaves/QUB)
Jaine Blayney (McClay Foundation/Invest NI)
Karl Butterworth (CR-UK)
Ka Kui Chan (CR-UK)
Pankaj Chaudhary (MRC)
Lisa Crawford (QUB)
Nyree Crawford (Breast Cancer Campaign)
Zenobia D'Costa (Breast Cancer Campaign)
Ricardo de Matos Simoes (Randox)
Sarah Dolan (CR-UK)
Philip Dunne (CR-UK)
Rebecca Gallagher (CR-UK and HSC R&D Division)
Mihaela Ghita (CR-UK)
Mary Harte (McClay Foundation/Invest NI)
Catherine Higgins (Invest NI)
Caitriona Holohan (CR-UK)
Simon Horn (UK Home Office, Health Protection Agency)
Louise Johnston (EU)
Murigan Kalimutho (CR-UK)
Joy Kavanagh (EU)
Chang Sik Kim (BBSRC)
Kyle Matchett (EU)
Pamela Maxwell (CR-UK)
Darragh McArt (QUB)
Clare McCourt (QUB)
Simon McDade (MRC)
Cheryl McFarlane (McClay Foundation/Invest NI)
Suzanne McFarlane (Invest NI)
Stephen McMahon (CR-UK)
Julia Miskelly (CR-UK)
Niamh O'Brien (Breast Cancer Campaign)
Deepu Oommen (CR-UK)
Gaurang Patel (CR-UK)
Adam Pickard (MRC)
Keara Redmond (British Lung Foundation)
Kelly Redmond (Breast Cancer Campaign)
Kienan Savage (CR-UK)
Miriam Sgobba (Invest NI)
Danny Sharpe (QUB)
Izabela Stasik (British Lung Foundation)
Leanne Stevenson (HSC R&D Division)
Yinhai Wang (EU)

Technical Staff

Conal Askin (CR-UK and HSC R&D Division)
Victoria Bingham (CR-UK)
Anne Carson (HSC R&D Division)
Gail Carson (CR-UK)
Alan Coffey
Josephine Dutton
Cathy Fenning (CR-UK)
Paula Haddock (Breast Cancer Campaign)
Anne Jordan (NILRF)
Claire Kitson (NILRF)
John McCotter
David McGibbon
Kirsty McLaughlin (CR-UK)
Sara McQuillan (McClay Foundation/Invest NI)
Maria Rea

Administrative Staff

Priscilla Clark (NI Biobank Administrator)
Sharon Dunwoody (CR-UK Centre Administrator)
Beryl Graham (Centre Manager)
Julie Hunter (Clinical Trials Administrator, HaBio)
Katie Scott (CR-UK Research Engagement Manager)

Clerical Staff

Ruth Beattie
Caroline Crothers (NILRF)
Frances McCormick
Linda Megrath
Margaret-Rose Mervyn
Katie Orr (part funded NILRF)
Noreen Rafferty

DOCTOR OF SCIENCE

Doctor of Science – Professor Patrick Morrison

Patrick Morrison, a Consultant in Clinical Genetics at the Belfast Health and Social Care Trust and an Honorary Professor of Human Genetics within the Centre for Cancer Research and Cell Biology at Queen's University Belfast, received a Doctor of Science (DSc) degree from Queen's in July 2012. The DSc – a higher doctorate, is the highest level of degree that can be obtained. Professor Morrison's thesis on "Recognition and delineation of new phenotypes in human genetic disorders", was praised by his two external examiners Professor Bruce Chabner from Harvard, USA and Professor Paula Ryan from Philadelphia, USA.

Professor Chabner, Professor of Oncology at Harvard University, commented: "the doctorate is unquestionably deserved. Professor Morrison contributes to many multi-authored papers and is guardian of exceedingly valuable research databases – his projects are large, multi-institutional and multi-authored. He has made many very important contributions of his own, but as a collaborator, is an outstanding contributor to groundbreaking studies. The content easily meets the requirements for this degree, and in fact surpasses this threshold in its breadth and value to the field. I wholeheartedly endorse his graduation". The Centre congratulates Professor Morrison, who is an expert on hereditary cancers and neurological disorders, on this achievement.

MAJOR SOURCES OF FUNDING

FUNDING BODIES

The work of our research groups would not be possible without the substantial grant funding from our sponsors and from generous donations. Our major sources of funding include:

Research Councils

Biotechnology and Biological Sciences Research Council (BBSRC)
Engineering and Physical Sciences Research Council (EPSRC)
Medical Research Council (MRC)

Charities

Action Cancer
Association for International Cancer Research (AICR)
Brainwaves Northern Ireland
Breast Cancer Campaign
British Heart Foundation
British Lung Foundation
Cancer Focus Northern Ireland (formerly Ulster Cancer Foundation)
Cancer Research UK (CR-UK)
Friends of the Cancer Centre
Leukaemia and Lymphoma Research
Northern Ireland Leukaemia Research Fund (NILRF)
Nuffield Foundation
Wellcome Trust

Companies

Almac Diagnostics
Almac Discovery
Amgen
Astellas Pharma
Astra Zeneca
Boehringer Ingelheim Ltd
Bristol-Myers Squibb
Celgene
i-Path XL
Pfizer Ltd
PharmaMar
Pierre Fabre
Randox
Roche

Government

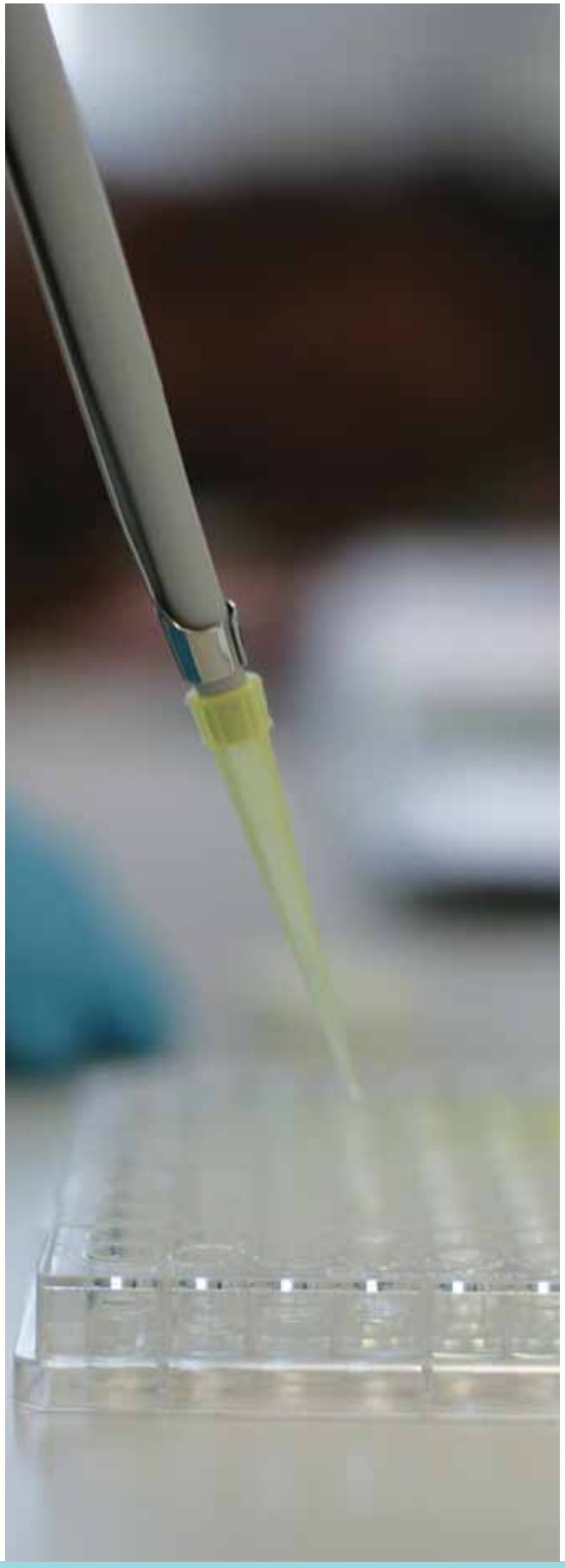
British Council
Health and Social Care (HSC) Research and Development (R&D) Division of the Public Health Agency of Northern Ireland
Belfast Health and Social Care Trust (BHSCT)
EU Framework 7
EU Marie Curie Scheme
National Institutes of Health (NIH)
UK Home Office

Societies

Biochemical Society
Pathological Society
Royal Society

Agencies

Invest Northern Ireland



NEW RESEARCH GRANTS AWARDED

(from 1 August 2011 – 31 July 2012)

Investigator(s)	Sponsor	Title of Project	Amount	Period
Campbell, Charles	Friends of the Cancer Centre	Studies on bowel cancer glands	£5,000	01/01/12 – 31/12/13
Campbell, Charles Wilson, Richard Emmert-Streib, Frank Loughrey, Maurice	Cancer Research UK	Vitamin D regulation of growth control biomarkers in human colon and colorectal cancer (CRC)	£242,469	01/10/12 – 30/09/15
El-Tanani, Mohamed	Invest NI	Validation of a biomarker blood assay in lung cancer patients	£48,738	01/07/12 – 31/03/13
Fennell, Dean	Astellas Pharma	Molecular determinants of sensitivity and resistance to the small molecule surviving antagonist YM155	$25,000	01/11/11 – 30/04/12
Flannery, Tom	Brainwaves NI	Biology of cathepsin S in malignant gliomas	£38,000	01/02/12 – 31/01/14
Flannery, Tom	Neurosurgery Charitable Funds	Brain tumour (glioma) tissue bank	£17,160	01/03/12 – 31/05/15
Haigh, David Longley, Dan	Invest NI	Establishing an early stage cancer drug discovery project	£45,164	01/10/11 – 31/03/12
Haigh, David	Invest NI	Establishing a Northern Ireland drug discovery facility	£48,085	01/03/12 – 31/08/12
Hamilton, Peter	EC FP7 – Marie Curie	FAST PATH: High throughput tissue imaging for biomarker discovery and tissue analysis in prostate cancer	£177,627	01/01/12 – 31/12/14
Held, Kathryn Prise, Kevin	MGH Federal Share Proton Beam Program	Spatial and temporal dependence of intercellular communication stimulated by passive and actively scanned proton beams with conventional and hypofractionated regimens	$200,000	01/01/12 – 31/12/12
Johnston, Patrick	Cancer Research UK	Identification and targeting of clinically relevant molecular and genetic subtypes in colorectal cancer	£995,104	01/08/12 – 31/07/17
McCance, Dennis	BHSCT Charitable Funds	MD – Lynsey Hinds	£20,000	01/02/12 – 31/01/13

Investigator(s)	Sponsor	Title of Project	Amount	Period
McCance, Dennis Johnston, Patrick	Cancer Research UKI	Belfast CR-UK Centre renewal	£901,655	01/06/12 – 31/05/13
McCloskey, Karen	University College London	The mechanism of action of botulinum toxin in the treatment of the overactive bladder	£20,000	01/06/12 – 31/12/12
McMullin, Mary Frances Mills, Ken Wilson, Richard	Leukaemia & Lymphoma Research	Therapy Acceleration Programme (TAP)	£73,802	01/04/12 – 31/03/14
Mills, Ken	Northern Ireland Leukaemia Research Fund	Summer Studentships	£6,000	01/07/12 – 31/08/12
Mills, Ken	Northern Ireland Leukaemia Research Fund	Core funding	£150,753	01/08/11 – 30/09/12
Mills, Ken	Celgene	An in vitro and molecular study of possible combination therapies involving azacytidine and romidepsin for Myelodysplastic Syndrome (MDS) – PhD Studentship	£120,047	01/10/12 – 30/09/15
Mills, Ken Wilson, Richard	Cancer Research UK HSC R&D Division	Experimental Cancer Medicine Centre renewal	£400,000	01/04/12 – 31/03/14
O'Brien, Niamh	Breast Cancer Campaign	Identification of a subgroup of breast cancers with combined BRCA1 dysfunction/NFkB hyperactivity and the development of novel therapeutic strategy (Fellowship)	£546,352	01/02/13 – 31/01/18
Prise, Kevin Schettino, Giuseppe	Engineering and Physical Sciences Research Council	Pilot project for the development of glass monocapillary optics for sub-micron focusing of high energy X-rays	£54,882	01/10/11 – 31/03/12
Prise, Kevin Schettino, Giuseppe	UK Department of Health – Policy Research Programme on Radiation Protection Research	A spatial study of the mechanisms of low dose carcinogenesis using targeted irradiation	£386,606	01/12/12 – 30/11/15
Salto-Tellez, Manuel	Pathological Society	Completion of the molecular pathology of the runt family of genes in breast cancer (David Boyle)	£9,900	01/01/12 – 31/12/14
Salto-Tellez, Manuel	Pathological Society	Mapping of treatable targets in the progression of pathological changes leading to adenocarcinoma of the lung (Clinton Boyd)	£10,000	01/01/12 – 31/12/14
Savage, Kienan	Cancer Focus NI (formerly Ulster Cancer Foundation)	Research Fellowship	£400,000	01/11/12 – 31/10/16

Investigator(s)	Sponsor	Title of Project	Amount	Period
Waugh, David Wilson, Richard	Invest NI	Validation of novel biomarker defining colorectal cancer patients sensitive to EGFR-targeted therapeutics	£46,228	01/11/11 – 30/04/12
Waugh, David Longley, Dan Fennell, Dean	British Lung Foundation	Rational targeting of Inhibitor of Apoptosis Proteins (IAPs) for effective therapy of malignant pleural mesothelioma	£188,020	01/01/12 – 30/06/14
Waugh, David	Medical Research Council	The central importance of CXCL8 signalling to inflammatory-based tumour initiator and invasive prostate carcinoma	£652,060	01/04/12 – 31/02/16
Waugh, David Salto-Tellez, Manuel	Friends of the Cancer Centre	Discovery and clinical characterization of predictive biomarkers of response to treatment in aggressive prostate cancer (PhD Stipend)	£48,000	01/10/12 – 30/09/15
Williams, Rich Haider, Shozeb	Invest NI	The development of small molecule legumain inhibitors for the treatment of poor prognosis cancers	£94,367	01/04/12 – 30/09/12
Williamson, Kate	Randox	Haematuria Biomarker Study (Research Fellow)	£17,665	01/07/12 – 30/11/12
Williamson, Kate	Randox	Haematuria Biomarker Study (Technician)	£77,787	01/08/12 – 31/07/15

PUBLICATIONS

PUBLICATIONS

The following publications were published within the period of this report:

ADAMS, R., MEADE, A.M., SEYMOUR, M.T., WILSON, R.H., MADI, A., FISHER, D., KENNY, S.L., KAY, E., HODGKINSON, E., POPE, M., ROGERS, P., WASAN, H., FALK, S., GOLLINS, S., HICKISH, T., BESSELL, E.M., PROPPER, D., KENNEDY, M.J., KAPLAN, R. and MAUGHAN, T.S. (2011) Intermittent versus continuous oxaliplatin and fluoropyrimidine combination chemotherapy for first-line treatment of advanced colorectal cancer: results of the randomised phase 3 MRC COIN trial, *Lancet Oncology*, 12 (7), p642-653.

ALLEN, W.L., STEVENSON, L., COYLE, V.M., JITHESH, P.V., PROUTSKI, I., CARSON, G., GORDON, M.A., LENZ, H.J., VAN SCHAEYBROECK, S., LONGLEY, D.B. and JOHNSTON, P.G. (2012) A systems biology approach identifies SART1 as a novel determinant of both 5-fluorouracil and SN38 drug resistance in colorectal cancer, *Mol Cancer Ther*, 11(1), p119-31.

ALLEN, W.L., TURKINGTON, R.C., STEVENSON, L., CARSON, G., COYLE, V.M., HECTOR, S., DUNNE, P., VAN SCHAEYBROECK, S., LONGLEY, D.B. and JOHNSTON, P.G. (2012) Pharmacogenomic profiling and pathway analyses identify MAPK-dependent migration as an acute response to SN38 in p53 null and mutant colorectal cancer cells, *Mol Cancer Ther*, 4 June 2012 (Epub ahead of print).

ARMSTRONG, R.N., COLYER, H.A. and MILLS, K.I. (2012) Screening for miRNA expression changes using Quantitative PCR (Q-PCR), *Methods Mol Biol*, 863, p293-302.

BARBUI, T., BAROSI, G., CERVANTES, F., FINAZZI, G., GREISSHAMMER, M., HARRISON, C., HASSELBALCH, H.C., HEHLMANN, R., HOFFMAN, R., KILADJIAN, J-J., KROEGER, N., MESA, R., McMULLIN, M.F., PARDANI, A., PASSAMONTI, F., VANNUCCHI, S., REITER, A., SILVER, R.T., VERSTOVSEK, S. and TEFFERI, A. (2011) Philadelphia-negative classical myeloproliferative neoplasma: Critical concepts and management recommendations from European LeukemiaNet, *Journal of Clinical Oncology*, 29(6), p761-70.

BOU, S.E., MOREAUX, J., VACHERET, F., MILLS, K., RUFFLE, F., CHIESA, J., PIQUEMAL, D., BOUREUX, A., LAVABRE-BERTRAND, T., JOURDAN, E. and COMMES, T. (2012) New prognostic markers, determined using gene expression analyses, reveal two distinct subtypes of chronic myelomonocytic leukaemia patients, *Br J Haematol*, 157(3), p347-356.

BUCKLEY, N.E. and MULLAN, P.B. (2012) BRCA1 – Conductor of the breast stem cell orchestra: The role of BRCA1 in mammary gland development and identification of cell of origin of BRCA1 mutant breast cancer, *Stem Cell Rev*, 17 March 2012 (Epub ahead of print).

BURN, J., GERDES, A.M., MACRAE, F., MECKLIN, J.P., MOESLEIN, G., OLSCHWANG, S., ECCLES, D., EVANS, G., MAHER, E., BERTARIO, L., BISGAARD, M.L., DUNLOP, M., HO, J.W.C., HODGSON, S., LINDBLOM, A., LUBINSKI, J., MORRISON, P.J., MURDAY, V., RAMESAR, R., SIDE, L., SCOTT, R.J., THOMAS, H.W.J., VASEN, H., BARKER, G., ELLIOTT, F., PYLVANAINEN, K., WIJNEN, J., FODDE, R., LYNCH, L., MATHERS, J.C. and BISHOP, D.T. (2011) Long-term effect of aspirin on cancer risk in carriers of hereditary colorectal cancer: an analysis from the CAPP2 randomised controlled trial, *Lancet*, 378, p2081-7.

BURNETT, A.K., HILLS, R.K., HUNTER, A., MILLIGAN, D., KELL, J., WHEATLEY, K., YIN J, McMULLIN, M.F., CAHALIN, P., CRAIG, J., BOWEN, D. and RUSSELL, N. (2011) The addition of arsenic trioxide to low-dose Ara-C in older patients with AML does not improve outcome, *Leukemia*, 25(7), p1122-7.

BUTTERWORTH, K.T., McGARRY, C.K., TRAINOR, C., McMAHON, S.J., O'SULLIVAN, J.M., SCHETTINO, G., HOUNSELL, A.R. and PRISE, K.M. (2012) Dose, dose-rate and field size effects on cell survival following exposure to non-uniform radiation fields, *Physics in Medicine and Biology*, 57, p3197-3206.

CAMERON, D., STEAD, M., LESTER, N., PARMAR, M., HAWARD, R., MAUGHAN, T., WILSON, R., SPAULL, A., CAMPBELL, H., HAMILTON, R., STEWART, D., O'TOOLE, L., KERR, D., POTTS, V., MOSER, R., COOPER, M., POOLE, K., DARBYSHIRE, J., KAPLAN, R., SEYMOUR, M. and SELBY, P. (2011) Research-intensive cancer care in the NHS in the UK, *Annals of Oncology*, 22 (7), p29-35.

CHACKO, A.D., McDADE, S.S., CHANDULOY, S., CHURCH, S.W., KENNEDY, R., PRICE, J., HALL, P.A. and RUSSELL, S.E. (2012) Expression of the SEPT9_i4 isoform confers resistance to microtubule-interacting drugs, *Cell Oncol* (Dordr), 35(2), p85-93.

CHAN, J.Y., ONG, C.W. and SALTO-TELLEZ, M. (2011) Overexpression of neurone glial-related cell adhesion molecule is an independent predictor of poor prognosis in advanced colorectal cancer, *Cancer Sci*, 102(10), p1855-61.

CHOONG, L.Y., LIM, S.K., CHEN, Y., LOH, M.C., TOY, W., WONG, C.Y., SALTO-TELLEZ, M., SHAH, N. and LIM, Y.P. (2011) Elevated NRD1 metalloprotease expression plays a role in breast cancer growth and proliferation, *Genes Chromosomes Cancer*, 50(10), p837-47.

CHUAH, B.Y., PUTTI, T., SALTO-TELLEZ, M., CHARLTON, A., IAU, P., BUHARI, S.A., WONG, C.I., TAN, S.H., WONG, A.L., CHAN, C.W., GOH, B.C., and LEE, S.C. (2011) Serial changes in the expression of breast cancer-related proteins in response to neoadjuvant chemotherapy, *Ann Oncol*, 22(8), p1748-54.

COLYER, H.A., ARMSTRONG, R.N. and MILLS, K.I. (2012) Microarray for epigenetic changes: gene expression arrays, *Methods Mol Biol*, 863, p319-328.

COLYER, H.A., ARMSTRONG, R.N., SHARPE, D.J. and MILLS, K.I. (2012) Detection and analysis of DNA methylation by pyrosequencing, *Methods Mol Biol*, 863, p281-292.

COLYER, H.A., DELLETT, M. and MILLS, K.I. (2012) Detecting DNA methylation using the methylated CpG island amplification and microarray technique, *Methods Mol Biol*, 863, p329-339.

COULTER, J.A., JAIN, S., BUTTERWORTH, K.T., TAGGART, L.E., DICKSON, G.R., MCMAHON, S.J., HYLAND, W.B., MUIR, M.F., TRAINOR, C., HOUNSELL, A.R., O'SULLIVAN, J.M., SCHETTINO, G., CURRELL, F.J., HIRST, D.G. and PRISE, K,M. (2012) Cell type-dependent uptake, localization, and cytotoxicity of 1.9 nm gold nanoparticles, *International Journal of Nanomedicine*, 7, p2673-85.

CRAWFORD, L. and IRVINE, A.E. (2012) Proteasome Inhibitors in the Treatment of Multiple Myeloma In: Multiple Myeloma: An Overview, Ed A Gupta, Pub In *Tech* 2012: p3-32.

DE MATOS SIMOES, R. and EMMERT-STREIB, F. (2011) Influence of statistical estimators of mutual information and data heterogeneity on the inference of gene regulatory networks, *PLoS One*, 29 December 2011;6(12):e29279 (Epub ahead of print).

DE MATOS SIMOES, R. and EMMERT-STREIB, F. (2012) Bagging statistical network inference from large-scale gene expression data, *PLoS One*, 30 March 2012;7(3):e33624 (Epub ahead of print).

DE MATOS SIMOES, R., TRIPATHI, S. and EMMERT-STREIB, F. (2012) Organizational structure and the periphery of the gene regulatory network in B-cell lymphoma, *BMC Syst Biol*, 14 May 2012;6(1):38 (Epub ahead of print).

DEEVI, R., FATEHULLAH, A., JAGAN, I., NAGARAJU, M., BINGHAM, V. and CAMPBELL, F.C. (2011) PTEN regulates colorectal epithelial apoptosis through Cdc42 signalling, *Br J Cancer*, 105, p1313-1321.

DORIA, D., KAKOLEE, K.F., KAR, S., LITT, S.K., FIORINI, F., AHMED, H., GREEN, S., JEYNES, J.C.G., KAVANAGH, J.N., KIRKBY, D., KIRKBY, K.J., LEWIS, C.L., MERCHANT, M.J., NERSISYAN, G., PRASAD, R., PRISE, K.M., SCHETTINO, G., ZEPF, M. and BORGHESI, M. (2012) Biological effectiveness on live cells of laser driven protons at dose rates exceeding 10^9 Gy/s, *AIP Advances*, 2(1), p011209-011215.

EMMERT-STREIB, F. (2011) Parametric construction of episode networks from pseudoperiodic time series based on mutual information, *PLoS One*, 22 December 2011;6(12):e27733 (Epub ahead of print).

EMMERT-STREIB, F. (2012) Limitations of gene duplication models: Evolution of modules in protein interaction networks, *PLoS One*, 18 April 2012;7(4):e35531 (Epub ahead of print).

EMMERT-STREIB, F. (2012) Correction: Limitations of gene duplication models: Evolution of modules in protein interaction networks, *PLoS One*, 7 June 2012;7(6) (Epub ahead of print).

EMMERT-STREIB, F. and DEHMER, M. (2012) Exploring statistical and population aspects of network complexity, *PLoS One*, 8 May 2012;7(5):e34523 (Epub ahead of print).

EMMERT-STREIB, F., DE MATOS SIMOES, R., TRIPATHI, S., GLAZKO, G.V. and DEHMER, M. (2012) A Bayesian analysis of the chromosome architecture of human disorders by integrating reductionist data, *Sci Rep*, 20 July 2012;2:513 (Epub ahead of print).

EMMERT-STREIB, F., GLAZKO, G.V., ALTAY, G. and DE MATOS SIMOES, R. (2012) Statistical inference and reverse engineering of gene regulatory networks from observational expression data, *Front Genet*, 3 February 2012;3:8 (Epub ahead of print).

EMMERT-STREIB, F., HAKKINEN, A. and RIBEIRO, A.S. (2012) Detecting sequence dependent transcriptional pauses from RNA and protein number time series, *BMC Bioinformatics*, 28 June 2012;13(1):152 (Epub ahead of print).

FORMENTI, F., BEER, P.A., CROFT, Q.P., DORRINGTON, K.L., GALE, D.P., LAPPIN, T.R., LUCAS, G.S., MAHER, E.R., MAXWELL, P.H., McMULLIN, M.F., O'CONNER, D.F., PERCY, M.J., PUGH, C.W., RADCLIFFE, P.J., SMITH, T.G., TALBOT, N.P. and ROBBINS, P.A. (2011) Cardiovascular function in two human disorders of the hypoxia-inducible factor (HIF) pathway: von Hippel-Lindau disease and HIF-2{alpha} gain-of-function mutation, *FASEB J*, 25(6), p2001-11.

GALE, R.P., BAROSI, G., BARBUI, T., CERVANTES, F., DOHNER, K., DUPRIEZ, B., GUPTA, V., HARRISON, C., HOFFMAN, R., KILADJIAN, J.J., MESA, R., McMULLIN, M.F., PASSAMONTI, F., RIBRAG, V., ROBOZ, G., SAGLIO, G., VANNUCCHI, A. and VERSTOVSAK, S. (2012) RBC-transfusion guidelines update, *Leukemia Research* (Epub ahead of print).

GOODYER, M.J., ELHASSADI, E.I., PERCY, M.J. and McMULLIN, M.F. (2011) A Novel base Change Leading to Hb Vanderbilt {b89(F5)Ser->Arg, AGT>AGA}, *Hemoglobin*, 35(4), p428-9.

GORMLEY, J.A., HEGARTY, S.M., O'GRADY, T., STEVENSON, M.R., BURDEN, R., BARRETT, H., SCOTT, C.J., JOHNSTON, J.A., WILSON, R.H., KAY, E., JOHNSTON, P.G., and OLWILL, S. (2011) The role of Cathepsin S as a marker of prognosis and predictor of chemotherapy benefit in adjuvant CRC: a pilot study, *British Journal of Cancer*, 105(10), p1487-1494.

GORSKI, J.J., SAVAGE, K.I., MULLIGAN, J.M., McDADE, S.S., BLAYNEY, J.K., GE, Z. and HARKIN, D.P. (2011) Profiling of the BRCA1 transcriptome through microarray and ChIP-chip analysis, *Nucleic Acids Res*, 31 August 2012 (Epub ahead of print).

GRONBAEK, K., MULLER-TIDOW, C., PERINI, G., LEHMANN, S., BACH, T.M., MILLS, K., PLASS, C. and SCHLEGELBERGER, B. (2012) A critical appraisal of tools available for monitoring epigenetic changes in clinical samples from patients with myeloid malignancies, *Haematologica* 97, 4 April 2012 (Epub ahead of print).

HAMILTON, P.W., WANG, Y and McCULLOUGH, S.J. (2012) Virtual microscopy in digital pathology training and education, *APMIS*, 120, p305-315.

HANNA, G.G., VAN SÖRNSEN DE KOSTE, J.R., DAHELE, M.R., CARSON, K.J., HAASBEEK, C.J.A., MIGCHIELSEN, R., HOUNSELL, A.R. and SENAN, S. (2012) Defining target volumes for stereotactic ablative radiotherapy of early-stage lung tumours: A comparison of three-dimensional 18F-fluorodeoxyglucose oositron emission tomography and four-dimensional computed tomography, *Clinical Oncology*, 24(6), p71–80.

HARRISON, C., VERSTOVEK, S., McMULLIN, M.F. and MESA, R. (2012) Janus kinase inhibition and its effect upon the therapeutic landscape for myelofibrosis: from palliation to cure? *British Journal of Haematology*, 157, p426-437.

HUANG, B., QU, Z., ONG, C.W., TSANG, Y.H., XIAO, G., SHAPIRO, D., SALTO-TELLEZ, M., ITO, K., ITO, Y. and CHEN, L.F. (2012) RUNX3 acts as a tumor suppressor in breast cancer by targeting estrogen receptor α, *Oncogene*, 31(4), p527-34.

HURWITZ, J.L., STASIK, I., KERR, E.M., HOLOHAN, C., REDMOND, K.M., McLAUGHLIN, K.M., BUSACCA, S., BARBONE, D., BROADDUS, V.C., GRAY, S.G., O'BYRNE, K.J., JOHNSTON, P.G., FENNELL, D.A. and LONGLEY, D.B. (2012) Vorinostat/SAHA-induced apoptosis in malignant mesothelioma is FLIP/caspase 8-dependent and HR23B-independent, *Eur J Cancer*, 48(7), p1096-107.

HYLAND, P.L., McDADE, S.S., McCLOSKEY, R., DICKSON, G.J., ARTHUR, K., McCANCE, D.J. and PATEL, D. (2011) Evidence for Alteration of EZH2, BMI1 and KDM6A and Epigenetic Reprogramming in Human Papillomavirus Type-16 E6/E7 Expressing Keratinocytes, *J Virol*, 85, p10999-11006.

IM, K.M., KIRCHHOFF, T., WANG, X., GREEN, T., CHOW, C.Y., VIJAI, J., KORN, J., GAUDET, M.M., FREDERICKSEN, Z., SHANE PANKRATZ, V., GUIDUCCI, C., CRENSHAW, A., McGUFFOG, L., KARTSONAKI, C., MORRISON, J., HEALEY, S., SINILNIKOVA, O.M., MAI, P.L., GREENE, M.H., PIEDMONTE, M., RUBINSTEIN, W.S., HEBON, HOGERVORST, F.B., ROOKUS, M.A., COLLÉE, J.M., HOOGERBRUGGE, N., VAN ASPEREN, C.J., MEIJERS-HEIJBOER, H.E., VAN ROOZENDAAL, C.E., CALDES, T., PEREZ-SEGURA, P., JAKUBOWSKA, A., LUBINSKI, J., HUZARSKI, T., BLECHARZ, P., NEVANLINNA, H., AITTOMÄKI, K., LAZARO, C., BLANCO, I., BARKARDOTTIR, R.B., MONTAGNA, M., D'ANDREA, E., KCONFAB, DEVILEE, P., OLOPADE, O.I., NEUHAUSEN, S.L., PEISSEL, B., BONANNI, B., PETERLONGO, P., SINGER, C.F., RENNERT, G., LEJBKOWICZ, F., ANDRULIS, I.L., GLENDON, G., OZCELIK, H., ONTARIO CANCER GENETICS NETWORK, TOLAND, A.E., CALIGO, M.A., SWE-BRCA, BEATTIE, M.S., CHAN, S., UKFOCR, DOMCHEK, S.M., NATHANSON, K.L., REBBECK, T.R., PHELAN, C., NAROD, S., JOHN, E.M., HOPPER, J.L., BUYS, S.S., DALY, M.B., SOUTHEY, M.C., TERRY, M.B., TUNG, N., HANSEN, T.V., OSORIO, A., BENITEZ, J., DURÁN, M., WEITZEL, J.N., GARBER, J., HAMANN, U., EMBRACE, PEOCK, S., COOK, M., OLIVER, C.T., FROST, D., PLATTE, R., EVANS, D.G., EELES, R., IZATT, L., PATERSON, J., BREWER, C., HODGSON, S., MORRISON, P.J., PORTEOUS, M., WALKER, L., ROGERS MT, SIDE LE, GODWIN AK, SCHMUTZLER RK, WAPPENSCHMIDT B, LAITMAN Y, MEINDL, A., DEISSLER, H., VARON-MATEEVA, R., PREISLER-ADAMS, S., KAST, K., VENAT-BOUVET, L., STOPPA-LYONNET, D., CHENEVIX-TRENCH, G., EASTON, D.F., KLEIN, R.J., DALY, M.J., FRIEDMAN, E., DEAN, M., CLARK, A.G., ALTSHULER, D.M., ANTONIOU, A.C., COUCH, F.J., OFFIT, K., and GOLD, B. (2011) Haplotype structure in Ashkenazi Jewish BRCA1 and BRCA2 mutation carriers, *Hum Genet*, 130(5), p685-99.

JAGAN, I., FATEHULLAH, A., DEEVI, R.K., BINGHAM, V. and CAMPBELL, F.C. (2012) Rescue of glandular dysmorphogenesis in PTEN-deficient colorectal cancer epithelium by PPARgamma-targeted therapy, *Oncogene*, 30 April 2012 (Epub ahead of print).

JOHNSTON, L., CUNNINGHAM, R.M., YOUNG, J.S., FRY, C.H., McMURRAY, G., ECCLES, R. and McCLOSKEY, K.D. (2012) Altered distribution of interstitial cells and innervation in the rat urinary bladder following spinal cord injury, *J Cell Mol Med*, 16(7), p1533-43.

KENNEDY, R.D., DAVISON, T., KERR, P., BLACK, J.M., BYLESJO, M., KAY, E., AHDESMAKI, M., FARZTDINOV, V., GOFFARD, N., HEY, P., HOLT, R.J., MCDYER, F., MULLIGAN, K., MUSSEN, J., O'BRIEN, E., OLIVER, G., PROUTSKI, V., WALKER, S.M., WILSON, C., WINTER, A., O'DONOGHUE, D., MULCAHY, H., O'SULLIVAN, J., SHEAHAN, K., HYLAND, J., DHIR, R., BATHE, O., WINQVIST, O., MANNE, U., RAMASWAMY, S., SMITH, W., MCDERMOTT, U., WILSON, R.H., LONGLEY, D., MARSHALL, J., CUMMINS, R., SARGENT, D.J., JOHNSTON, P.G., and HARKIN, D.P. (2011) Development and Independent Validation of a Prognostic Assay for Stage II Colon Cancer using Formalin Fixed Paraffin Embedded Tissue, *Journal of Clinical Oncology*, 29(35), p4620-4626.

KERR, E., HOLOHAN, C., McLAUGHLIN, K.M., MAJKUT, J., DOLAN, S., REDMOND, K., RILEY, J., McLAUGHLIN, K., STASIK, I., CRUDDEN, M., VAN SCHAEYBROECK, S., FENNING, C., O'CONNOR, R., KIELY, P., SGOBBA, M., HAIGH, D., JOHNSTON, P.G. and LONGLEY, D.B. (2012) Identification of an acetylation-dependant Ku70/FLIP complex that regulates FLIP expression and HDAC inhibitor-induced apoptosis, *Cell Death Differ*, 19(8), p1317-27.

KHOO, S.G., AL-ALAWI, M., WALSH, M.T., HANNIGAN, K., GLYNN, S., THORNTON, M., McQUAID, S., WANG, Y., HAMILTON, P.W., VERRIERE, V., GLEICH, G.J., HARVEY, B.J., COSTELLO, R.W. and McGARVEY, L. (2012) Eosinophil peroxidase induces the expression and function of acid-sensing ion channel-3 in allergic rhinitis: in vitro evidence in cultured epithelial cells, *Clinical & Experimental Allergy*, p1365-2222.

KOO, C.X., FANG, W., SALTO-TELLEZ, M. and LEONG, D.T. (2012) Coespressing shRNA with fluorescence tags for qualification of cell migration studies, *Mol Biol Rep*, 39(7), p7695-703.

LEE, C.W., CHUANG, L.S., KIMURA, S., LAI, S.K., ONG, C.W., YAN, B., SALTO-TELLEZ, M., CHOOLANI, M. and ITO, Y. (2011) RUNX3 functions as an oncogene in ovarian cancer, *Gynecol Oncol*, 122(2), p410-7.

LEE, Y.F., MILLER, L.D., CHAN, X.B., BLACK, M.A., PANG, B., ONG, C.W., SALTO-TELLEZ, M., LIU, E.T. and DESAI, K.V. (2012) JMJD6 is a driver of cellular proliferation and motility and a marker of poor prognosis in breast cancer, *Breast Cancer Res*, 14(3), R85.

MANTI, L., CAMPAJOLA, L., PEROZZIELLO, F.M., KAVANAGH, J.N. and SCHETTINO, G. (2012) Development of a low-energy particle irradiation facility for the study of the biological effectiveness of the ion track end, *Journal of Physics: Conference Series* 373(1), (http://iopscience.iop.org/1742-6596/373/1).

MARTRAT, G., MAXWELL, C.A., TOMINAGA, E., PORTA, M., BONIFACI, N., GOMEZ-BALDO, L., BOGLIOLO, M., LAZARO, C., BLANCO, I., BRUNET, J., AGUILAR, H., FERNANDEZ-RODRIGUEZ, J., SEAL, S., RENWICK, A., RAHMAN, N., KUHL, J., NEVELING, K., SCHINDLER, D., RAMIREZ, M.J., CASTELLA, M., HERNANDEZ, G., EMBRACE, E.S., EASTON, D.F., PEOCK, S., COOK, M., OLIVER, C.T., FROST, D., PLATTE R, EVANS DG, LALLOO F, EELES R, IZATT L, CHU C, DAVIDSON R, ONG KR, COOK, J., DOUGLAS, F., HODGSON, S., BREWER, C., MORRISON, P.J., PORTEOUS, M., PETERLONGO, P., MANOUKIAN, S., PEISSEL, B., ZAFFARONI, D., ROVERSI, G., BARILE, M., VIEL, A., PASINI, B., OTTINI, L., PUTIGNANO, A.L., SAVARESE, A., BERNARD, L., RADICE, P., HEALEY, S., SPURDLE, A., CHEN, X., BEESLEY, J., KCONFAB, K.C., ROOKUS, M.A., VERHOEF, S., TILANUS-LINTHORST, M.A., VREESWIJK, M.P., ASPEREN, C.J., BODMER, D., AUSEMS, M.G., VAN OS, T.A., BLOK, M.J., MEIJERS-HEIJBOER, H.E., HOGERVORST, F.B., HEBON, H.B., GOLDGAR, D.E., BUYS, S.,

JOHN, E.M., MIRON, A., SOUTHEY, M., DALY, M.B., BCFR, B.C., SWE-BRCA, S.B., HARBST, K., BORG, A., RANTALA, J., BARBANY-BUSTINZA, G., EHRENCRONA, H., STENMARK-ASKMALM, M., KAUFMAN, B., LAITMAN, Y., MILGROM, R., FRIEDMAN, E., DOMCHEK, S.M., NATHANSON, K.L., REBBECK, T.R., JOHANNSSON, O.T., COUCH, F.J., WANG, X., FREDERICKSEN, Z., CUADRAS, D., MORENO, V., PIENTKA, F.K., DEPPING, R., CALDES, T., OSORIO, A., BENITEZ, J., BUEREN, J., HEIKKINEN, T., NEVANLINNA, H., HAMANN, U., TORRES, D., CALIGO, M.A., GODWIN, A.K., IMYANITOV, E.N., JANAVICIUS, R., GEMO, G.G., SINILNIKOVA, O.M., STOPPA-LYONNET, D., MAZOYER, S., VERNY-PIERRE, C., CASTERA, L., DE PAUW, A., BIGNON, Y.J., UHRHAMMER, N., PEYRAT, J.P., VENNIN, P., FERT FERRER, S., COLLONGE-RAME, M.A., MORTEMOUSQUE, I., MCGUFFOG, L., CHENEVIX-TRENCH, G., PEREIRA-SMITH, O.M., ANTONIOU, A.C., CERON, J., TOMINAGA, K., SURRALLES, J. and PUJANA, M.A. (2011) Exploring the link between MORF4L1 and risk of breast cancer, *Breast Cancer Res*, 13(2), R40.

MAUGHAN, T.S., ADAMS, R.A., SMITH, C., MEADE, A., SEYMOUR, M., WILSON, R.H., IDZIASZCZYK, S., HARRIS, R., FISHER, D., KENNY, S., KAY, E., MITCHELL, J., MADI, A., JASANI, B., JAMES, M., BRIDGEWATER, J., KENNEDY, M.J., CLAES, B., LAMBRECHTS, D., KAPLAN, R. and CHEADLE, J. on behalf of the MRC COIN Trial Investigators. (2011) Addition of cetuximab to oxaliplatin-based first-line combination chemotherapy for treatment of advanced colorectal cancer: results of the randomised phase 3 MRC COIN trial, *Lancet*, 377(9783), p2103-2114.

MAXWELL, C.A., BENÍTEZ, J., GÓMEZ-BALDÓ, L., OSORIO, A., BONIFACI, N., FERNÁNDEZ-RAMIRES, R., COSTES, S.V., GUINÓ, E., CHEN, H., EVANS, G.J., MOHAN, P., CATALÀ, I., PETIT, A., AGUILAR, H., VILLANUEVA, A., AYTES, A., SERRA-MUSACH, J., RENNERT, G., LEJBKOWICZ, F., PETERLONGO, P., MANOUKIAN, S., PEISSEL, B., RIPAMONTI, C.B., BONANNI, B., VIEL, A., ALLAVENA, A., BERNARD, L., RADICE, P., FRIEDMAN, E., KAUFMAN, B., LAITMAN, Y., DUBROVSKY, M., MILGROM, R., JAKUBOWSKA, A., CYBULSKI, C., GORSKI, B., JAWORSKA, K., DURDA, K., SUKIENNICKI, G., LUBI SKI, J., SHUGART, Y.Y., DOMCHEK, S.M., LETRERO, R., WEBER, B.L., HOGERVORST, F.B., ROOKUS, M.A., COLLEE, J.M., DEVILEE, P., LIGTENBERG, M.J., VAN DER LUIJT, R.B., AALFS, C.M., WAISFISZ, Q., WIJNEN, J., VAN ROOZENDAAL, C.E., HEBON, EMBRACE, EASTON, D.F., PEOCK, S., COOK, M., OLIVER, C., FROST, D., HARRINGTON, P., EVANS, D.G., LALLOO, F., EELES, R., IZATT, L., CHU, C., ECCLES, D., DOUGLAS, F., BREWER, C., NEVANLINNA, H., HEIKKINEN, T., COUCH, F.J., LINDOR, N.M., WANG, X., GODWIN, A.K., CALIGO, M.A., LOMBARDI, G., LOMAN, N., KARLSSON, P., EHRENCRONA, H., VON WACHENFELDT, A., SWE-BRCA, BJORK BARKARDOTTIR, R., HAMANN, U., RASHID, M.U., LASA, A., CALDÉS, T., ANDRÉS, R., SCHMITT, M., ASSMANN, V., STEVENS, K., OFFIT, K., CURADO, J., TILGNER, H., GUIGÓ, R., AIZA, G., BRUNET, J., CASTELLSAGUÉ, J., MARTRAT, G., URRUTICOECHEA, A., BLANCO, I., TIHOMIROVA, L., GOLDGAR, D.E., BUYS, S., JOHN, E.M., MIRON, A., SOUTHEY, M., DALY, M.B., BCFR, SCHMUTZLER, R.K., WAPPENSCHMIDT B, MEINDL A, ARNOLD N, DEISSLER H, VARON-MATEEVA R, SUTTER, C., NIEDERACHER, D., IMYAMITOV, E., SINILNIKOVA, O.M., STOPPA-LYONNE, D., MAZOYER, S., VERNY-PIERRE, C., CASTERA, L., DE PAUW, A., BIGNON, Y.J., UHRHAMMER, N., PEYRAT, J.P., VENNIN, P., FERT FERRER, S., COLLONGE-RAME, M.A., MORTEMOUSQUE, I., GEMO STUDY COLLABORATORS, SPURDLE, A.B., BEESLEY, J., CHEN, X., HEALEY, S., KCONFAB, BARCELLOS-HOFF, M.H., VIDAL, M., GRUBER, S.B., LÁZARO, C., CAPELLÁ, G., McGUFFOG, L., NATHANSON, K.L., ANTONIOU, A.C., CHENEVIX-TRENCH, G., FLEISCH, M.C., MORENO, V. and PUJANA, M.A. (2011) Interplay between BRCA1 and RHAMM regulates apicobasal epithelial polarization and may influence risk of breast cancer, *PloS Biology*, 9(11):e1001199.

McCALLUM, L., LU, W., LAZAR, N., PERBAL, B. and IRVINE, A.E. (2012) CCN3 suppresses mitogenic signalling and reinstates growth control mechanisms in Chronic Myeloid Leukaemia, *J Cell Commun Signal*, 6, p27-35.

McCOURT, C., MAXWELL, P., MAZZUCCHELLI, R., MONTIRONI, R., SCARPELLI, M., SALTO-TELLEZ, M., O'SULLIVAN, J.M., LONGLEY, D.B. and WAUGH, D.J. (2012) Elevation of c-FLIP in castrate-resistant prostate cancer antagonizes therapeutic response to androgen receptor-targeted therapy, *Clinical Cancer Research*, 18(14), p3822-33.

McDADE, S.S., HENRY, A., PIVATO, G.P., FENWICK, K., ASSIOTIS, I., KOZAREWA, I., MITSOPOULOS, C., HAKAS, J., ZVELEBIL, M., ORR, N., LORD, C.J., ASHWORTH, A., PATEL, D. and McCANCE, D.J. (2012) Genome-wide analysis of p63 binding sites identifies AP-2 factors as co-regulators of epidermal differentiation, *Nucleic Acid Res*, 9 May 2012 (Epub ahead of print).

McGLADE, K., CARGO, C., FOGARTY, D., BOOHAN, M. and McMULLIN, M.F. (2012) Handwritten undergraduate case reports, *Clinical Teacher*, 9(2), p112-8.

McMAHON, S.J., HYLAND, W.B., MUIR, M.F., COULTER, J.A., JAIN, S., BUTTERWORTH, K.T., SCHETTINO, G., DICKSON, G.R., HOUNSELL, A.R., O'SULLIVAN, J.M., PRISE, K.M., HIRST, D.G. and CURRELL, F.J. (2011) Nanodosimetric effects of gold nanoparticles in megavoltage radiation therapy, *Radiotherapy and Oncology*, 100(3), p412-416.

McMAHON, S.J., PRISE, K.M. and CURRELL, F.J. (2012) Comment on "Implications of clinical scenario of gold nanoparticle radiosensitisation in regard to photon energy, nanoparticle size, concentration and location", *Physics in Medicine and Biology*, 57, p287-290.

McMAHON, S.J., HYLAND, W.B., MUIR, M.F., COULTER, J.A., JAIN, S., BUTTERWORTH, K.T., SCHETTINO, G., DICKSON, G.R., HOUNSELL, A.R., O'SULLIVAN, J.M., PRISE, K.M., HIRST, D.G. and CURRELL, F.J. (2011) Biological consequences of nanoscale energy deposition near irradiated heavy atom nanoparticles, *Nature Scientific Reports*, 1(1), p8.

McMULLIN, M.F. (2012) Clinical Case Study: Commentary, *Clinical Chemistry*, 58(2), p335.

McMULLIN, M.F, WU, C., PERCY, M.J. and TONG, W. (2011) A nonsynonymous LNK polymorphism associated with idiopathic erythrocytosis, *American Journal of Hematology*, 86(11), p962-964.

MONAGHAN, K.P., JOHNSTON, L. and McCLOSKEY, K.D. (2012) Identification of PDGFR Positive Populations of Interstitial Cells in Human and Guinea Pig Bladders, *J Urol*, 188(2), p639-47.

MUELLAR, L.A., KUGLER, K.G., GRABER, A., EMMERT-STREIB, F. and DEHMER, M. (2011) Structural measures for network biology using QuACN, *BMC Bioinformatics*, 24 December 2011;12:492.

MULLIGAN, A.M., COUCH, F.J., BARROWDALE, D., DOMCHEK, S.M., ECCLES, D., NEVANLINNA, H., RAMUS, S.J., ROBSON, M.,

SHERMAN, M., SPURDLE, A.B., WAPPENSCHMIDT, B., LEE, A., McGUFFOG, L., HEALEY, S., SINILNIKOVA, O.M., JANAVICIUS, R., HANSEN, T.V., NIELSEN, F.C., EJLERTSEN, B., OSORIO, A., MUNOZ-REPETO, I., DURAN, M., GODINO, J., PERTESI, M., BENITEZ, J., PETERLONGO, P., MANOUKIAN, S., PEISSEL, B., ZAFFARONI, D., CATTANEO, E., BONANNI, B., VIEL, A., PASINI, B., PAPI, L., OTTINI, L., SAVARESE, A., BERNARD, L., RADICE, P., HAMANN, U., VERHEUS, M., MEIJERS-HEIJBOER, H.E., WIJNEN, J., GOMEZ GARCIA, E.B., NELEN, M.R., KETS, C.M., SEYNAEVE, C., TILANUS-LINTHORST, M.M., VAN DER LUIJT, R.B., VAN OS, T., ROOKUS, M., FROST, D., JONES, J.L., EVANS, D.G., LALLOO, F., EELES, R., IZATT, L., ADLARD, J., DAVIDSON, R., COOK, J., DONALDSON, A., DORKINS, H., GREGORY, H., EASON, J., HOUGHTON, C., BARWELL, J., SIDE, L.E., McCANN, E., MURRAY, A., PEOCK, S., GODWIN, A., SCHMUTZLER, R.K., RHIEM, K., ENGEL, C., MEINDL, A., RUEHL, I., ARNOLD, N., NIEDERACHER, D., SUTTER, C., DEISSLER, H., GADZICKI, D., KAST, K., PREISLER-ADAMS, S., VARON-MATEEVA R, SCHOENBUCHNER, I., FIEBIG, B., HEINRITZ, W., SCHAFER, D., GEVENSLEBEN, H., CAUX-MONCOUTIER, V., FASSY-COLCOMBET, M., CORNELIS, F., MAZOYER, S., LEONE, M., BOUTRY-KRYZA, N., HARDOUIN, A., BERTHET, P., MULLER, D., FRICKER, J.P., MORTEMOUSQUE, I., PUJOL, P., COUPIER, I., LEBRUN, M., KIENTZ, C., LONGY, M., SEVENET, N., STOPPA-LYONNET, D., ISAACS, C., CALDES, T., DE AL HOYA, M., HEIKKINEN, T., AITTOMAKI, K., BLANCO, I., LAZARO, C., BARKARDOTTIR, R.B., SOUCY, P., DUMONT, M., SIMARD, J., MONTAGNA, M., TOGNAZZO, S., D'ANDREA, E., FOX, S., YAN, M., REBBECK, T.R., OLOPADE, O.I., WEITZEL, J.N., LYNCH, H.T., GANZ, P.A., TOMLINSON, G.E., WANG, X., FREDERICKSEN, Z., PANKRATZ, V.S., LINDOR, N.M., SZABO, C., OFFIT, K., SAKR, R., GAUDET, M., BHATIA, J., KAUFF, N., SINGER, C.F., TEA, M.K., GSCHWANTLER-KAULICH, D., FINK-RETTER, A., MAI, P.L., GREENE, M.H., IMYANITOV, E., O'MALLEY, F.P., OZCELIK, H., GLENDON, G., TOLAND, A.E., GERDES, A.M., THOMASSEN, M., KRUSE, T.A., BIRK JENSEN, U., SKYTTE, A.B., CALIGO, M.A., SOLLERM M., HENRIKSSON, K., VON WACHENFELDT, A., ARVER, B., STENMARK-ASKMALM, M., KARLSSON, P., DING, Y.C., NEUHAUSEN, S.L., BEATTIE, M., PHAROAH, P.D., MOYSICH, K.B., NATHANSON, K.L., KARLAN, B.Y., GROSS, J., JOHN, E.M., DALY, M.B., BUYS, S.M., SOUTHEY, M.C., HOPPER, J.L., TERRY, M.B., CHUNG, W., MIRON, A.F., GOLDGAR, D., CHENEVIX-TRENCH, G., EASTON, D.F., ANDRULIS, I.L., ANTONIOU, A.C., FAMILY REGISTRY BC, EMBRACE COLLABORATORS, HEBON, NETWORK OC, SWE-BRCA, and CIMBA (2011) Common breast cancer susceptibility alleles are associated with tumor subtypes in BRCA1 and BRCA2 mutation carriers: results from the Consortium of Investigators of Modifiers of BRCA1/2, *Br Cancer Res*, 13(6): R110.

NATRAJAN, R., MACKAY, A., LAMBROS, M.B., WEIGELT, B., WILKERSON, P.M., MANIE, E., GRIGORIADIS, A., A'HERN, R., VAN DER GROEP, P., KOZAREWA, I., POPOVA, T., MARIANI, O., TURAJLIC, S., FURNEY, S.J., MARAIS, R., RODRUIGUES, D.N., FLORA, A.C., WAI, P., PAWAR, V., McDADE, S., CARROLL, J., STOPPA-LYONNET, D., GREEN, A.R., ELLIS, I.O., SWANTON, C., VAN DIEST, P., DELATTRE, O., LORD, C.J., FOULKES, W.D., VINCENT-SALOMON, A., ASHWORTH, A., HENRI STERN, M. and REIS-FILHO, J.S. (2012) A whole-genome massively parallel sequencing analysis of BRCA1 mutant oestrogen receptor-negative and -positive breast cancers, *J Pathol*, 227(1), p29-41.

NICOLE TSANG, Y.H., WU, X.W., LIM, J.S., WEE ONG, C., SALTO-TELLEZ, M., ITO, K., ITO, Y. and CHEN, L.F. (2012) Prolyl isomerase Pin1 downregulates tumor suppressor RUNX3 in breast cancer, *Oncogene*, 14 May 2012 (Epub ahead of print).

OMAR, M.F., ITO, K., NGA, M.E., SOO, R., PEH, B.K., ISMAIL, T.M., THAKKAR, B., SOONG, R., ITO, Y. and SALTO-TELLEZ, M. (2012) RUNX3 downregulation in human lung adenocarcinoma is independent of p53,EGFR or KRAS status, *Pathol Oncol Res*, 24 June 2012 (Epub ahead of print).

OOMMEN, D. and PRISE, K.M. (2012) KNK437, abrogates hypoxia-induced radioresistance by dual targeting of the AKT and HIF-1α survival pathways, *Biochemical and Biophysical Research Communications*, 421, p538-43.

OSORIO, A., MILNE, R.L., ALONSO, R., PITA, G., PETERLONGO, P., TEULÉ, A., NATHANSON, K.L., DOMCHEK, S.M., REBBECK, T., LASA, A., KONSTANTOPOULOU, I., HOGERVORST, F.B., VERHOEF, S., VAN DOOREN, M.F., JAGER, A., AUSEMS, M.G., AALFS, C.M., VAN ASPEREN, C.J., VREESWIJK, M., WAISFISZ, Q., VAN ROOZENDAAL, C.E., LIGTENBERG, M.J. HEBON, E., EASTON, D.F., PEOCK, S., COOK, M., OLIVER, C.T., FROST, D., CURZON, B., EVANS, D.G., LALLOO, F., EELES, R., IZATT, L., DAVIDSON R, ADLARD J, ECCLES D, ONG KR, DOUGLAS F, DOWNING S, BREWER C, WALKER, L., NEVANLINNA, H., AITTOMÄKI, K., COUCH, F.J., FREDERICKSEN, Z., LINDOR, N.M., GODWIN, A., ISAACS, C., CALIGO, M.A., LOMAN, N., JERNSTRÖM, H., BARBANY-BUSTINZA, G., LILJEGREN, A., EHRENCRONA, H., STENMARK-ASKMALM, M., SW E-BRCA FELIUBADALÓ, L., MANOUKIAN, S., PEISSEL, B., ZAFFARONI, D., BONANNI, B., FORTUZZI, S., JOHANNSSON, O.T., CHENEVIX-TRENCH, G., CHEN, X.C., BEESLEY, J., SPURDLE, A.B., KCONFAB SINILNIKOVA, O.M., HEALEY, S., McGUFFOG, L., ANTONIOU, A.C., BRUNET, J., RADICE, P., BENÍTEZ, J. and on behalf of CIMBA. (2011) Evaluation of the XRCC1 gene as a phenotypic modifier in BRCA1/2 mutation carriers. Results from the consortium of investigators of modifiers of BRCA1/BRCA2, *Br J Cancer*, 104(8), p1356-1361.

PANG, B., MATTHIAS, D., ONG, C.W., DHEWAR, A.N., GUPTA, S., LIM, G.L., NGA, M.E., SEET, J.E., QASIM, A., CHIN, T.M., SOO, R., SOONG, R. and SALTO-TELLEZ, M. (2012) The positive impact of cytological specimens for EGFR mutation testing in non-small cell lung cancer: a single South East Asian laboratory's analysis of 670 cases, *Cytopathology*, 23(4), p229-236.

PANG, N.K., NGA, M.E., CHIN, S.Y., ISMAIL, T.M., LIM, G.L., SOONG, R. and SALTO-TELLEZ, M. (2011) KRAS and BRAF mutation analysis can be reliably performed on aspirated cytological specimens of metastatic colorectal carcinoma, *Cytopathology*, 22(6), p358-64.

PERCY, M.J., LAPPIN, T.R., McMULLIN, M.F. and LEE, F. (2012) Two new mutations in the HIF2A gene associated with erythrocytosis, *American Journal of Hematology*, 87(4), p439-442.

PETTIGREW, K.A., ARMSTRONG, R.N., COLYER, H.A.A., ZHANG, S-D., REA, I.M., JONES, R.E., BAIRD, D.M., and MILLS, K.I. (2012) Differential hTERT promoter methylation and response to 5-aza-2 -deoxycytidine in acute myeloid leukaemia cell lines: hTERT expression, telomerase activity, telomere length and cell death, Genes, *Chromosomes and Cancer*, 51(8), p786-780.

PICKARD, A., CICHON, A-C., BARRY, A., KIERAN, D., PATEL, D., HAMILTON, P., SALTO-TELLEZ, M., JAMES, J. and McCANCE, D.J. (2012) Inactivation of Rb in stromal fibroblasts promotes epithelial cell invasion, *EMBO Journal*, 31(14), p3092-103.

PICKARD, A., CICHON, A-C., MENGES, C., PATEL, D. and McCANCE, D.J. (2012) Regulation of epithelial differentiation and proliferation by the stroma – a role for the retinoblastoma protein, *J Invest, Dermatol*, 14 June 2012 (Epub ahead of print).

PRISE, K.M. and SCHETTINO, G. (2012) Spatial and temporal aspects of radiation response in cell and tissue models, In Radiation Damage in Biomolecular Systems (Eds, G.G. Gómez-Tejedir and M.C. Fuss), Springer, Dodrecht, p385-396.

PRISE, K.M. and SCHETTINO, G. (2012) Microbeams as tools for low-dose radiation studies, In "A New Challenge of Radiation Health Risk Management" (Eds. M. Naskashima, N. Takamura, K. Suzuki and S. Yamashita) *Nagasaki Newspaper Publish*, Nagasaki University, p47–58.

PRISE, K.M. and SARAN, A. (2011) Stem cell effects in radiation risk, *Stem Cells*, 29, p1315- 21.

RAVINDRANATH, A., YUEN, H.F., CHAN, K.K., GRILLS, C., FENNELL, D.A., LAPPIN, T.R. and El-TANANI, M. (2011) Wnt-β-catenin- Tcf-4 signalling-modulated invasiveness is dependent on osteopontin expression in breast cancer, *British Journal of Cancer*, 105(4), p542-51.

REILLY, J.T., McMULLIN, M.F., BEER, P.A., BUTT, N., CONNEALLY, E., DUNCOMBE, A., GREEN, A.R., MICHAEEL, N.G., GILLEECE, M.H., HALL, G.W., KNAPPER, S., MEAD, A., MESA, R.A., SEKHAR, M., WILKINS, B. and HARRISON, C.N. (2012) Writing group: British Committee for Standards in Haematology, Guideline for the diagnosis and management of myelofibrosis, *British Journal of Haematology*, 158(4), p453-71.

SALTO-TELLEZ, M., TSAO, M.S., SHIH, J.Y., THONGPRASERT, S., LU, S., CHANG, G.C., AU, J.S., CHOU, T.Y., LEE, J.S., SHI, Y.K., RADZI, A., KANG, J.H., KIM, S.W., TAN, S.Y. and YANG, J.C. (2011) Clinical and testing protocols for the analysis of epidermal growth factor receptor mutations in East Asian patients with non-small cell lung cancer: a combined clinical-molecular pathological approach, *J Thorac Oncol*, 6(10), p1663-9.

SCHENK, T., CHEN, W.C., GOLLNER, S., HOWELL, L., JIN, L., HEBESTREIT, K., KLEIN, H.U., POPESCU, A.C., BURNETT, A., MILLS, K., CASERO, R.A., Jr., MARTON, L., WOSTER, P., MINDEN, M.D., DUGAS, M., WANG, J.C., DICK, J.E., MULLER-TIDOW, C., PETRIE, K. and ZELENT, A. (2012) Inhibition of the LSD1 (KDM1A) demethylase reactivates the all-trans-retinoic acid differentiation pathway in acute myeloid leukemia, *Nature Medicine*, 18(4), p605-611.

SGOBBA, M., OLUBIYI, O., KE, S. and HAIDER, S. (2012) Molecular dynamics of HIV1-Integrase in complex with 93del – A structural perspective on the mechanism of inhibition, *Journal of BioMolecular Structure and Dynamics*, 29(5), p863-877.

SOON, W.W., MILLER, L.D., BLACK, M.A., DALMASSO, C., CHAN, X.B., PANG, B., ONG, C.W., SALTO-TELLEZ, M., DESAI, K.V. and LIU, E.T. (2011) Combined genomic and phenotype screening reveals secretory factor SPINK1 as an invasion and survival factor associated with patient prognosis in breast cancer, *EMBO Mol Med*, 3(8), p451-64.

SRIVASTAVA, S., WONG, K.F., ONG, C.W., HUAK, C.Y., YEOH, K.G., THE, M., LUK, J.M. and SALTO-TELLEZ, M. (2012) A morpho-molecular prognostic model for hepatocellular carcinoma, *Br J Cancer*, 107(2), p334-9.

SRIVASTAVA, S., YAN, B., CHIN, S.Y., MULIANA, T., SALTO-TELLEZ, M. and THE, M. (2012) Nuclear p53 expression is associated with allelic imbalance (TP53) in glandular dysplasia and typical cystitis glandularis: a LCM-based molecular analysis, *Clin Genitourin Cancer*, 10(1), p57-9.

SURESH, S., McCALLUM, L., LU, W., LAZAR, N., PERBAL, B. and IRVINE, A.E. (2011) MicroRNAs 130a/b are regulated by BCR-ABL and downregulate expression of CCN3 in CML, *J Cell Commun Signal*, 5, p183-191.

TAN, I.B., IVANOVA, T., LIM, K.H., ONG, C.W., DENG, N., LEE, J., TAN, S.H., WU, J., LEE, M.H., OOI, C.H., RHA, S.Y., WONG, W.K., BOUSSIOUTAS, A., YEOH, K.G., SO, J., YONG, W.P., TSUBURAYA, A., GRABSCH, H., TOH, H.C., ROZEN, S., CHEONG, J.H., NOH, S.H., WAN, W.K., AJANI, J.A., LEE, J.S., SALTO-TELLEZ, M. and TAN, P. (2011) Intrinsic subtypes of gastric cancer, based on gene expression pattern, predict survival and respond differently to chemotherapy, *Gastroenterology*, 141(2), p476-85.

TAN, H.T., WU, W., NG, Y.Z., ZHANG, X., YAN, B., ONG, C.W., TAN, S., SALTO-TELLEZ, M., HOOI, S.C. and CHUNG, M.C. (2012) Proteomic analysis of colorectal cancer metastasis: stathmin-1 revealed as a player in cancer cell migration and prognostic marker, *J Proteome Res*, 11(2), p1433-45.

THOL, F., YUN, H., SONNTAG, A.K., DAMM, F., WEISSINGER, E.M., KRAUTER, J., WAGNER, K., MORGAN, M., WICHMANN, M., GOHRING, G., BUG, G., OTTMANN, O., HOFMANN, W.K., SCHAMBACH, A., SCHLEGELBERGER, B., HAFERLACH, T., BOWEN, D., MILLS, K., GANSER, A. and HEUSER, M. (2012) Prognostic significance of combined MN1, ERG, BAALC, and EVI1 (MEBE) expression in patients with myelodysplastic syndromes, *Ann Hematol*, 91(8), p1221-33.

TKOCZ, D., CRAWFORD, N.T., BUCKLEY, N.E., BERRY, F.B., KENNEDY, R.D., GORSKI, J.J., HARKIN, D.P. and MULLAN, P.B. (2011) BRCA1 and GATA3 corepress FOXC1 to inhibit the pathogenesis of basal-like breast cancers, *Oncogene*, 28 November 2011 (Epub ahead of print).

TRAINOR, C., BUTTERWORTH, K.T., McGARRY, C.K., LIBERANTE, F., O'SULLIVAN, J.M., HOUNSELL, A.R. and PRISE, K.M. (2012) Cell survival responses following exposure to modulated radiation fields, *Radiation Research* 177, p44-51.

TRIPATHI, S. and EMMERT-STREIB, F. (2012) Assessment method for a power analysis to identify differentially expressed pathways, *PLoS One*, 18 May 2012;7(5):e37510 (Epub ahead of print).

VAN DODEWAARD-DE JONG, J.M., DE KLERK, J.M., WILSON, R.H., VAN BEZOOIJEN, B.P.J., DE HAAS, M.J., BLOEMENDAL, H.J., and O'SULLIVAN, J.M. (2011) A phase I study of combined docetaxel and repeated high activity Rhenium-186- HEDP in castration resistant prostate cancer metastatic to bone (the TAXIUM trial), *European Journal of Nuclear Medicine and Molecular Imaging*, 38(11), p1990-1998.

WANG, Y., LEDGERWOOD, C., GRILLS, C., FITZGERALD, D.C. and HAMILTON, P.W. (2012) A Robust Co-Localisation Measurement Utilising Z-Stack Image Intensity Similarities for Biological Studies, *PLoS One*, 7, e30632 (Epub ahead of print).

WANG, T., ONG, C.W., SHI, J., SRIVASTAVA, S., YAN, B., CHENG, C.L., YONG, W.P., CHAN, S.L., YEOH, K.G., IACOPETTA, B. and SALTO-TELLEZ, M. (2011) Sequential expression of putative stem cell markers in gastric carcinogenesis, *Br J Cancer,* 105(5), p658-65.

WANG, Y., SAVAGE, K., GRILLS, C., McCAVIGAN, A., JAMES, J.A., FENNELL, D.A. and HAMILTON, P.W. (2011) A TMA de-arraying method for high throughput biomarker discovery in tissue research, *PLoS ONE*, 6(10), e26007 (Epub ahead of print).

WANG, Y., WILLIAMSON, K.E., KELLY, P.J., JAMES, J.A. and HAMILTON, P.W. (2012) SurfaceSlide: A multitouch digital pathology platform, *PLoS ONE*, 7, e30783 (Epub ahead of print).

WANG, T., YEOH, K.G. and SALTO-TELLEZ, M. (2012) Lgr5 expression is absent in human premalignant lesions of the stomach, *Gut*, 22 March 2012 (Epub ahead of print).

WANG, T., YEOH, K.G. and SALTO-TELLEZ, M. (2012) Stem cell markers characterize familial adenomatous polyposis, *Gut*, 61(5), p785-6.

WATSON, C.J., O'KANE, H., MAXWELL, P., SHARAF, O., PETAK, I., HYLAND, P.L., O'ROUKE, D., McKNIGHT, J., CANNING, P. and WILLIAMSON, K. (2012) Identification of a methylation hotspot in the death receptor Fas/CD95 in bladder cancer, *Int J Oncol*, 40(3), p645-54.

YAN, B., CHIN, S.Y., ISMAIL, T.M. and SALTO-TELLEZ, M. (2011) KRAS mutation analysis as a diagnostic tool, *Int J Colorectal Dis*, 26(8), p1083-4.

YAN, B., CHOO, S.N., MULYADI, P., SRIVASTAVA, S., ONG, C.W., YONG, K.J., PUTTI, T., SALTO-TELLEZ, M. and LIM G.S. (2011) Dual-colour HER2/chromosome 17 chromogenic in situ hybridization enables accurate assessment of HER2 genomic status in ovarian tumours, *J Clin Pathol*, 64(12), p1097-101.

YAN, B., YAU, E.X., CHOO, S.N., ONG, C.W., YONG, K.J., PANG, B. and SALTO-TELLEZ, M. (2011) Dual-colour HER2/chromosome 17 chromogenic in situ hybridization assay enables accurate assessment of HER2 genomic status in gastric cancer and has potential utility in HER2 testing of biopsy samples, *J Clin Pathol*, 64(10), p880-3.

YAN, B., YAU, E.X., SAMANTA, S., ONG, C.W., YONG, K.J., NG, L.K., BHATTACHARYA, B., LIM, K.H., SOONG, R., YEOH, K.G., DENG, N., TAN, P., LAM, Y. and SALTO-TELLEZ, M., Singapore Gastric Cancer Consortium (2012) Clinical and therapeutic relevance of PIM1 kinase in gastric cancer, *Gastric Cancer*, 15(2), p188-97.

YOUNG, J.S., JOHNSTON, L., SOUBRANE, C., McCLOSKEY, K.D., McMURRAY, G., ECCLES, R. and FRY, C.H. (2012) The passive and active contractile properties of the neurogenic, underactive bladder, *BJU Int*, 19 June 2012, (Epub ahead of print).

YUEN, H-F., CHAN, K.K., GRILLS, C., MURRAY, J.T., PLATT-HIGGINS, A., SHARAF EIDIN, O., JANNE, P., FENNELL, D.A., JOHNSTON, P.G., RUDLAND, P.S. and EL-TANANI, M. (2012) Cancers with activated PI3K/Akt/mTORC1 and Ras/MEK/ERK pathways depend on Ran GTPase for survival, *Clinical Cancer Research*, 18(2), p380-91.

YUEN, H.F., McCRUDDEN, C.M., CHAN, K.K., CHAN, Y.P., WONG, M.L., CHAN, K.Y., KHOO, U.S., LAW, S., SRIVASTAVA, G., LAPPIN, T.R., CHAN, K.W. and El-TANANI, M. (2011) The role of Pea3 group transcription factors in esophageal squamous cell carcinoma, *American Journal of Pathology*, 179(2), p992-1003.

YUEN, H-F., ZHANG, S-D., WONG, A.S-Y., McCRUDDEN, C.M., HUANG, Y-H., CHAN, K.Y-K., EL-TANANI, M.K. and KHOO, U-S. (2012) Co-expression of SNAIL and TWIST determines prognosis in estrogen receptor-positive early breast cancer patients, *Breast Cancer Research and Treatment*, 131(1), p351-2.

ZANG, Z.J., CUTCUTACHE, I., POON, S.L., ZHANG, S.L., McPHERSON, J.R., TAO, J., RAJASEGARAN, V., HENG, H.L., DENG, N., GAN, A., LIM, K.H., ONG, C.K., HUANG, D., CHIN, S.Y., TAN, I.B., NG, C.C., YU, W., WU, Y., LEE, M., WU, J., POH, D., WAN, W.K., RHA, S.Y., SO, J., SALTO-TELLEZ. M., YEOH, K.G., WONG, W.K., ZHU, Y.J., FUTREAL, P.A., PANG, B., RUAN, Y., HILLMER, A.M., BERTRAND, D., NAGARAJAN, N., ROZEN, S., THE, B.T. and TAN, P. (2012) Exome sequencing of gastric adenocarcinoma identifies recurrent somatic mutations in cell adhesion and chromatin remodeling genes, *Nat Genet*, 44(5), p570-574.

ACKNOWLEDGEMENTS

We are grateful to everyone who provided information for this Annual Report, everyone who supplied images or gave us permission for their images to be used, and the CCRCB staff who helped to produce this report.

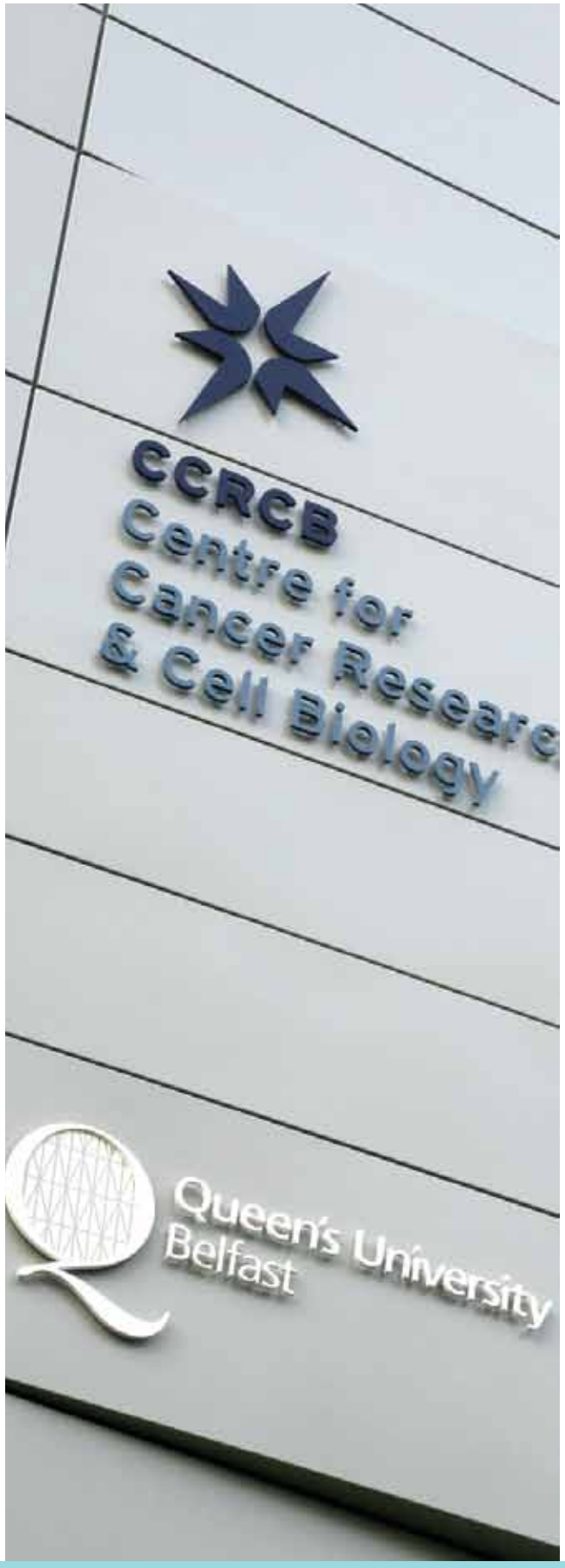
Design:
www.darraghneely.com

Printed by:
Corporate Document Services (CDS)

Comments on the CCRCB Annual Report are welcomed and should be sent to:

Beryl Graham
Centre for Cancer Research and Cell Biology
School of Medicine, Dentistry and Biomedical Sciences
Queen's University Belfast
97 Lisburn Road
Belfast, BT9 7BL

E: ccrcb@qub.ac.uk



Centre for Cancer Research and Cell Biology
School of Medicine, Dentistry and Biomedical Sciences
Queen's University Belfast
97 Lisburn Road
Belfast, BT9 7BL

T: +44 (028) 9097 2760
F: +44 (028) 9097 2776

www.qub.ac.uk/ccrcb