Welcome to Spotlight, a publication that highlights various aspects of health and medical research within the Faculty of Medicine, Nursing and Health Sciences at Monash University.

In this issue the focus is on the bench-to-bedside approach to cancer research within the faculty. By understanding cancer biology, developing new therapies and identifying environmental and social factors that improve clinical care, Monash cancer researchers aim to improve the lives of cancer sufferers in Australia and throughout the world.

Fast facts: cancer in the spotlight

- On average, one in three men and one in four women will develop a form of cancer before the age of 75 (other than non-melanocytic skin cancer)¹.
- Cancer affects people of all ages. Around 35,000 people are succumbing to the disease each year and this year, an estimated 88,000 new cases of cancer will be diagnosed².
- Even though almost half of all cancers in Australia are successfully treated, cancer is still the number one cause of death and the second highest total burden of disease³.
- Cancer is a major financial burden, costing the community an estimated $2.7 billion per year⁴.
- In 2000–01 $215 million was spent on cancer research across Australia⁵.
- As part of the national research effort, the National Health and Medical Research Council (peak government medical research funding body) contributed $37 million to new projects beginning in 2006⁶.

Sources: †, Dept Health and Aging, Australian government website; ‡, Australian Cancer Research Foundation; ‡, NHMRC, ††, Cancer in Australia 2001 (AIHW and AACR 2004).

For further general information on cancer see www.healthinsite.gov.au/topics/cancer.

New senior appointments boost cancer research

Since joining MIMR in January 2006, Professor Williams has been appointed to the Victorian Ministerial Taskforce for the Cancer Research Working Group. He is also a member of the Southern Health Integrated Cancer Service and chair of its Research Advisory Group.

Professor Christina Mitchell

The new Head of the School of Biomedical Sciences, Professor Christina Mitchell, has been leading research into the role of lipid signalling molecules in the regulation of cancer cell growth, cell death and differentiation. Understanding these signalling processes is an important step in discovering how cancer cells grow within tumours and spread throughout the body.

Professor Mitchell is a member of the scientific committee for the Anti-Cancer Council of Victoria (2001–2006), the NHMRC Research Fellowship Committee (2005–2006) and a member of the Victorian State Government Science and Biotechnology Advisory Committee.
Cancer: one word, many diseases

- Normally, cells grow and multiply in an orderly way to form organs that have a specific function in the body.
- All cancers are characterised by the presence of “rogue” cells that multiply and grow abnormally so that they invade and destroy surrounding tissue (a growth or tumour).
- There are many different types of cancer. The different organs and tissues in our bodies are made up of different types of cells and cancer can develop from most types of cells.
- Different types of cancer behave in individual ways, differing in rate of growth and spread.
- Cancerous tumours may spread by cells breaking away from the initial tumour and travelling to other parts of the body where they form new tumours (metastasis) in distant organs. Most deaths from cancer result from spread to vital organs like the lungs, liver and brain.
- Most cancers appear to have a unique set of factors causing them to occur, although some causative factors are common to a variety of cancers (risk factors).
- Damage to genes by environmental carcinogens causes the majority of cancers. A small portion of the total number of cancer cases are the result of inheritance of a damaged gene.
- Medical treatment aims to destroy cancer cells and stop them from returning. This can be done by surgical removal of the growth or by destroying the cancer with drugs (chemotherapy) or radiation therapy. Some cancers may be treated with new antibody-based therapeutics or controlled through hormone therapy.
- Treatment is more likely to be successful if the cancer is detected early.

Source: Cancer in Australia 2001 (AIHW and AACR 2004).

Developing new technologies: knowledge leads to therapy

Professor Bryan Williams’s research team at MIMR is exploiting a natural process called small interfering RNA (siRNA) to target invading viruses or cancerous cells.

Viruses activate genes in order to replicate and cells may become cancerous due to errant expression of some genes. The MIMR group has discovered that siRNA structure plays a key role in selectively targeting and silencing such unwanted gene expression. Human trials using siRNA are currently underway, and Professor Williams believes his research will have a significant impact on how siRNA is used to develop anti-cancer and anti-viral drugs.

Associate Professor Tony Tiganis’s research team is focusing on enzymes known as protein-tyrosine-phosphatases (PTPs).

These enzymes control normal cell growth, production, movement and survival. The research group is working to understand how PTPs are affected by cancer, and to develop a strategy to control these enzymes for the suppression of tumour progression.

Professor Christina Mitchell’s research team is striving to understand the abnormal cell signalling that leads to cancer.

The group has recently isolated three new molecules (enzymes) that play important roles in different aspects of cancer biology. Understanding how these enzymes function will help establish the mechanisms by which cancer cells may proliferate. Such knowledge lays the foundation for new therapies that halt the development of cancer.

Associate Professor Martin Lackmann’s research team’s principle aim is to unravel mechanisms underlying cancer growth (metastasis) and invasion into surrounding tissue.

Their research focuses on a family of cell surface proteins, called Eph-receptors, which act to determine the location of tumour cells within the body. The group is part of a national and international collaborative effort aimed at translating the findings into therapeutics. The anti-cancer agents they are developing are expected to commence clinical trials in 2008.
New technologies advance research into prostate disease

Discovering how normal prostate tissue changes to become diseased is a challenging problem for researchers. Prostate tissue specimens are hard to obtain and those that are available are typically from men where the disease may be well established.

Now, using state-of-the-art stem cell technologies, scientists at MIMR have developed a process to grow prostate tissue in the laboratory.

The factors that cause stem cells to develop into prostate tissue were identified by Professor Gail Risbridger’s research group at MIMR. Using a commercially available line of stem cells, they are now able to develop these cells into prostate tissue in just 12 weeks. This advance by Professor Risbridger and PhD student Prue Cowin (pictured above) will have a significant impact on prostate disease research and opens the door to identifying processes that lead to prostate disease.

Prostate disease facts

Up to 90 per cent of Australian men will be affected by a form of prostate disease, the occurrence increasing with age. There are two forms – benign prostate hypertrophy (BPH) and prostate cancer.

BPH

- Cellular changes within the prostate tissue lead to it becoming enlarged; this is known as BPH.
- In 90 per cent of cases, when prostate problems are experienced, it is because the enlarged prostate restricts urinary flow.
- BPH will affect nearly every Australian male; up to 90 per cent of men will have BPH by 80 years of age. It affects about half of all men over 50.
- Although not cancer, untreated BPH can cause serious bladder and kidney problems.

Prostate cancer

- Prostate cancer is the most common cancer in men. In Australia, it is estimated the lifetime risk of contracting prostate cancer is 1 in 11.
- Many prostate cancers grow slowly and are not life-threatening. In contrast to faster growing cases, slow-growing tumours may never present any clinical symptoms or be life threatening.
- Unfortunately, current screening and diagnostic measures are unable to differentiate between slow-growing and other types of more dangerous prostate cancers.

Sources: Prostatehealth website; Cancer in Australia 2001 (AIHW and AACR 2004).

Understanding how prostate cancer spreads

Dr Elizabeth Williams, a prostate and bladder cancer expert, has recently been appointed to MIMR. Dr Williams’s research primarily focuses on how cancer metastasises (spreads) throughout the body. Her team is looking at the molecules which play a role in the metastasis of prostate and bladder cancer, with a view to developing new therapies. Dr Williams is also researching the link between type-2 diabetes and cancer, since diabetic patients have an increased risk of developing prostate or breast cancer.
Breast cancer is the most common cancer affecting women in Australia. It may occur at any age, but one-third of women diagnosed with breast cancer are younger than 50 years. The average age of diagnosis is 58 years. Over 11,000 women are diagnosed with breast cancer each year in Australia, around 3000 in Victoria. Despite the large number of women diagnosed each year, few studies have determined the physical and emotional impact of breast cancer.

Now for the first time these issues are being examined. Researchers at Professor Susan Davis’s Centre of Clinical Research Excellence in the Study of Women’s Health are conducting a study that tracks women in the first five years following their diagnosis. To date, more than 1800 women have joined the “health and wellbeing after breast cancer study”, making it the largest study of its kind ever undertaken. Professor Davis (pictured) is Chair of Women’s Health and Director of the Women’s Health Programme at the Department of Medicine, Central and Eastern Clinical School.

Stress and fatigue are major issues for women facing breast cancer and their families. With this in mind, the centre has released a DVD resource for patients and their families. The DVD, So I have breast cancer, what now?, will be widely available through Amcal and Guardian pharmacies across Australia or may be purchased online (http://womenshealth.med.monash.edu.au/dvd-order.html).

How to best support cancer sufferers and their families

Dr Sue Burney’s psycho-oncology research group in the School of Psychology, Psychiatry and Psychological Medicine, is investigating the psychological, social, and behavioural aspects of cancer. The group is researching psychological responses of patients, their families and caretakers.

At present, two large prospective studies are being undertaken into the impact of treatment types on quality of life. One study is examining patients with acoustic neuroma, one of the most common types of benign brain tumours – it grows in the middle ear commonly causing hearing loss and tinnitus (ringing in the ears). The other study examines the impact of sexual dysfunction among men with prostate cancer and their partners. The psycho-oncology research group is part of a larger, international research effort seeking to identify information needs of patients with localised prostate cancer.

Next issue

The next issue of Spotlight will focus on social and public health research being undertaken in the Faculty of Medicine, Nursing and Health Sciences.