VICTORIAN RESEARCHERS

Professor Magdalena Plebanski, Director of Biomedical and Health Innovation Enabling Capability Platform, and Head of Translational Immunology and Nanotechnology Program, School of Health and Biomedical Sciences, RMIT University. Professor Plebanski is also a member of OCRF's Scientific Advisory Committee.

Professor Plebanski is working on various ovarian cancer research projects, including:

- A combined research project with the Australia New Zealand Gynaecological Oncology Group and Astra-Zeneca to test biological markers for personalising drug treatments for women with ovarian cancer. This four-year project will involve 114 women and 15 hospitals around Australia, and is aiming to provide a pathway to specifically tailor drug treatments for individual women.
- A research project with the Royal Women's Hospital involves taking many samples (over a two-year period) from women with ovarian cancer, from diagnosis and through their treatment to map their immune systems while they're undergoing treatment. The research is in its early stages but this work could lead to developing a simple blood test to diagnose ovarian cancer, which would be particularly helpful for regional areas where advancing scanning such as MRIs is not readily available.
- Analysing samples from human trials to determine how immune systems are attacking cancers and give them a helping hand. It's like personalised vaccines and is about boosting the immune system very specifically so it can better tackle tumours.
- Working with nanoengineers at RMIT University to detect single changes in sequences in a DNA molecule, using a couple of droplets of blood. They are working to develop devices to test for changes that researchers believe are associated with ovarian cancer. Long-term, this could lead to screening tests, and eventually maybe developing a vaccine.

Dr Andrew N Stephens, Research Group Head, Ovarian Cancer Biomarkers, Hudson Institute of Medical Research

Dr Stephens' ovarian cancer research projects include:

- His team is aiming to offer women better treatment alternatives that are designed specifically for them. The team is working with doctors to test all available drugs against a patient's cancer, measuring both cancer response and patient effect. This will help to chart a specific, targeted treatment plan that will predict the changing nature of the disease to stay one step ahead of drug resistance. The two-year project will enable doctors working with women today to collaborate with researchers working for the future of medicine, collecting patient samples that will lay the foundations for the future of personalised treatment.
- Dr Stephens is investigating an early detection test for one of the most serious forms of ovarian cancer. Based on a protein produced very early on in the cancer's progression, the 'Active Ratio Test' is being developed as a cervical swab and potentially also a blood-based test. The goal for this is to be able to use it as an early stage screening test, and identify women who have a very small early stage tumour confined to the ovary. If you can detect it early, it's a 90% cure rate. The three-year project is in its second year.

Dr Maree Bilandzic, Research Scientist, Ovarian Cancer Biomarkers, Hudson Institute of Medical Research

Dr Bilandzic has identified a small population of the deadliest ovarian cancer cells, called 'leader cells'. These cells lead the cancer attack on healthy tissue and have developed ways to survive and even thrive in response to cancer treatment. Her project is investigating ways to destroy these ovarian cancer leader cells. This includes screening thousands of FDA-approved drugs not currently used to treat ovarian cancer to determine those that specifically target leader cells. The project is funded for 3 years and so far they have screened more than 2500 drugs (including heart medications and drugs used for depressive disorders). They have identified about 26 potential drugs, which are applicable across the various types of ovarian cancer. Researchers are investigating how these drugs work with current chemotherapy. Dr Bilandzic said the leader cells, which usually comprise about 2-5% of ovarian cancer cells, were resistant to treatment and eventually "switch back on and start spreading". Dr Bilandzic said some of the drugs might allow significantly lower doses of chemotherapy to be administered.

Dr Simon Chu, Research Group Head, Hormone Cancer Therapeutics, Hudson Institute of Medical Research

Dr Chu's team is working with collaborators to improve outcomes for women with hormonally active granulosa cell tumours (GCT) – a rare ovarian cancer. Most women with GCT are diagnosed with Stage 1 so survival rate is really good. But 30-40% have a recurrence and have a propensity for late recurrence (sometimes 30 years later). When it does recur it's aggressive and untreatable so they are looking for better treatments. The research work is to look at the genomic landscape and the mutations that are causing a tumour to become more aggressive. Their work has identified a protein they feel they can target as part of a combination therapy.

NEW SOUTH WALES RESEARCHERS

Associate Professor Pradeep Tanwar, NHMRC Career Development Fellow, School of Biomedical Sciences and Pharmacy, The University of Newcastle

Associate Professor Pradeep Tanwar is investigating if a hormonal pill, similar to the contraceptive pill, might be developed to prevent ovarian cancer. His work has established a link between hormones and ovarian cancer – women who haven't had children or breastfed are at increased risk of developing ovarian cancer while oral contraceptive use lowers the risk of ovarian cancer by 50 per cent. The protective effects of oral contraceptive use and pregnancy against ovarian cancer are due to high levels of progesterone hormone, which inhibits oestrogen. The project will define the role of ovarian hormones in the initiation, progression and spread of ovarian cancer, and determine the effectiveness of drugs that mimic the anti-cancer activity of formulations contained in oral contraceptives. The aim is to develop an ovarian cancer prevention pill but differentiate it from birth control. The project is funded for 3 years. Association Professor Tanwar said people with a family history or predisposition could benefit most from the research, but it would not be limited to them.

Dr Kristina Warton is a postdoc research fellow at UNSW.

Dr Warton is investigating a blood test for ovarian cancer based on circulating tumour DNA. Like other cancerous tumours, ovarian cancer tumours shed DNA which spills over into the bloodstream. The DNA is different to healthy DNA because it has mutations; however, it is difficult to detect because it is so fragmented. In addition, every patient has different mutations, making it challenging to identify a common thread behind the disease. Methylation is a change that happens in cancer that seems to be quite consistent. Dr Warton is now using a cutting-edge scientific technique to amplify this circulating tumour DNA to detect methylation, and developing this in a way so it is a sensitive enough test to be detected in blood. Her research will compare blood samples of women with and without ovarian cancer. This is a three-year project.

Dr Ying Zhu is an early career postdoc fellow in UNSW Australia. She is working with Associate Professor Yong Li, Director of Cancer Research Laboratory and Principal Scientific Office, UNSW.

This project aims to develop an early detection test that women could either receive at their medical clinic or complete at home, made possible by a combination of new nanotechnology and artificial intelligence. Importantly, it addresses a common concern in ovarian cancer research—finding reliable 'biomarkers' or indicators of disease—in a new and promising way. The researchers have developed a small and highly sensitive chip that can detect exosomes, which are tiny fragments released by cancer cells. A multi-disciplinary team will then work together to determine presence and severity of ovarian cancer cells before using a new artificial intelligence computer system to quickly and precisely process the data for the test result. Dr Zhu said this project was about "translating new technology into technical settings".

QUEENSLAND RESEARCHERS

Associate Professor Michelle Hill, Group Leader, Precision and Systems Biomedicine, QIMR Berghofer Medical Research Institute

Associate Professor Hill is investigating an early detection test for ovarian cancer by searching for proteins in the blood which could be identified as 'biomarkers' of disease, and therefore translated into a clinical test. Her approach involves identifying proteins in the blood with sugars attached, called glycoproteins. Changes in these proteins have been implicated in cancer, including ovarian. Associate Professor Hill used a similar method in lab research to detect oesophageal cancer, with promising results. She is optimistic her ovarian cancer investigations will lead to findings that can be used as the basis for a blood test to detect the disease. This is a two-year project, which will continue until mid-2021.

Professor John Hooper is a Senior Research Fellow at Mater Research, and leads the Cancer Cell Biology Research Group.

Professor Hooper's project has only received funding through the Federal Government's Medical Research Future Fund in the last month or so, and kicks off on September 1. They have four years' funding and it will involve 15 women with Stage 3 and 4 ovarian cancer. He describes the project as a clinical trial to test an agent they've developed. It involves injecting a type of "radioactive sugar" into the bloodstream, which sticks to the tumour and makes it easier for the tumours to be detected by a scan. The researchers' technique is to differentiate a benign from a cancerous growth and to accurately define where in the body it is. Professor Hooper said ovarian cancer often formed "lots of little cancers throughout the abdominal cavity" and this would help pinpoint exactly where it had metastasised. He said their development aimed to lead to better detection and more targeted treatments.

Dr Sherry Wu, Senior Lecturer, School of Biomedical Sciences, The University of Queensland

Dr Sherry Wu is investigating a novel treatment for ovarian cancer. Her approach is investigating the ability of the body's own immune system to recognise and attack cancer cells. By comparing ovarian cancer tumour cells containing high levels of t-cells—the immune system's defence army—with those with low levels, Dr Wu identified it could be non-coding RNAs (molecules that don't code for any proteins) playing a role in regulating t-cell activity. Dr Wu is investigating whether combining this novel therapy of non-coding RNAs with existing immune therapies boosts the ability of t-cells to infiltrate and attack cancer tumour cells. The three-year project will finish at the end of 2020.

SOUTH AUSTRALIA

Professor Martin Oehler is Director of Gynaecological Oncology at the Royal Adelaide Hospital and a Clinical Professor of Obstetrics and Gynaecology at the University of Adelaide.

Professor Oehler's research focuses on the development of an early detection test for ovarian cancer based on patients' immune responses. Professor Oehler has identified several autoantibodies—antibodies produced in response to the body's own cancerous tissue—and developed a blood test to detect these. His research will now look to validate these results in a large group of patients. As part of the research they've taken blood from the ovaries of ovarian cancer patients and identified a new marker that may be suitable for a screening test. This has to be validated in hundreds of samples, and will take at least two years.

He is also working on another project to develop new therapies, immunotherapies where the body produces antibodies to try to kill off the cancer. They are trying to train t-cells to hunt down the cancer and kill it.