



# CHEMICAL ATTRACTION

*Associate Professor Hans  
Schneider: box seat position*

PHOTO CREDIT: EAMON GALLAGHER

THEY MIGHT WORK IN THE LAB, BUT CHEMICAL PATHOLOGISTS ARE AT THE HUB OF PATIENT CARE. TONY JAMES REPORTS.

**N**ext time the dinner party conversation turns to cholesterol levels and you proudly claim that yours is 3.5 mmol/L, or are worried because it's 6.5 mmol/L, thank a chemical pathologist for the information.

Chemical pathology is based on analysing substances, numbering

thousands, in blood and other fluids such as urine or saliva. These substances range from electrolytes like potassium and sodium to a very wide range of normal and abnormal biological products such as enzymes, lipids (blood fats including cholesterol and triglycerides), hormones, tumour products and the constituents of genes.

Chemical pathologists also examine toxins, therapeutic medications, illicit drugs, and legal drugs such as alcohol – perhaps at the order of police after driving home from that dinner.

Sometimes known as clinical biochemists or laboratory medicine specialists, they take responsibility for the



PHOTO CREDIT: IAN BARNES

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– Dr Amanda Caswell

only apparent adverse effect of the mutation is some accumulation of fat in the liver, but this seems to cause few problems.

Understanding these naturally occurring low-cholesterol states is one approach that might ultimately provide new treatments for lipid disorders – whether new medications or perhaps even gene therapy.

“This type of project requires clinical, biochemical, cellular and molecular skills and experience,” Professor Burnett says.

“As a chemical pathologist, I’m able to be involved in most aspects of the study.”

Chemical pathologists also work collaboratively with scientific and technical staff in the laboratory.

High-technology laboratories conduct large numbers of routine tests, with a minority having results well outside the normal range that are flagged for attention. Rare or unusual tests often require close supervision, interpretation and follow-up with the referring doctor, but routine tests often also need input from specialist pathologists.

“In a patient with something that seems relatively straightforward such as a high cholesterol level, we need to check that hypothyroidism, diabetes, liver or kidney disease, or an inherited problem is not the cause,” Professor Burnett says.

“In a patient with abnormal liver function tests, we might need to guide the treating doctor on the next options, which could include testing for hepatitis antigens, haemochromatosis, or less common conditions such as alpha-1-antitrypsin deficiency or a copper storage disorder.”

quality of the laboratory services that conduct the tests, interpreting the results in light of the patient’s history and illness, and communicating with other doctors about the next steps in diagnosis and treatment.

Their other responsibilities include technical guidance and recommendations on when and how to introduce new tests, and guiding colleagues about appropriate testing.

### Rich vein of enquiry

Professor John Burnett is one chemical pathologist with a special interest in that dinner conversation about cholesterol.

Head of the Department of Core Clinical Pathology and Biochemistry at PathWest and Clinical Professor in the School of Medicine and Pharmacology at the University of Western Australia,

Professor Burnett also works with patients in a lipid disorders clinic and is currently investigating healthy individuals with a genetic mutation that alters the metabolism of lipoprotein – the compounds of protein that carry fats in the blood.

“Apolipoprotein B – apoB – is the main protein component of LDL cholesterol,” he says. “One in every 3000 to 5000 people has a mutation of the [relevant] APOB gene, which results in abnormally low total and LDL cholesterol levels – as low as if they were taking cholesterol-lowering medication.”

On average, people with the gene mutation generally live about 10 years longer than unaffected members of their families, even though they might still develop other cardiovascular risk factors like obesity, diabetes or hypertension. The

Professor Burnett was attracted to chemical pathology early in his medical career, intrigued by the biochemistry and physiology that can explain the mechanisms of health and disease. There is strong demand for the 106 chemical pathologists in Australasia, providing a chance to shape career opportunities in the public or private sector.

“The lifestyle is better than many other medical specialities,” Professor Burnett says. “We work regular hours, and can get the right balance between work and the rest of life.”

## Where art meets science

Dr Amanda Caswell is a late convert to the appeals of the discipline.

Initially a hospital intern and resident, she then shifted direction by completing a one-year qualification in journalism. For seven years she worked as a medical writer and editor for GP newspaper Australian Doctor and was recruited by MIMS Australia (an independent company that produces medication reference guides), where she was managing editor for nine years.

After all that experience in publishing, another career change beckoned, and this time it was chemical pathology that drew her attention.

She is now a second-year biochemistry registrar – a chemical pathology trainee – at Sydney’s Royal North Shore Hospital.

“I felt at home in medical publishing but wanted to be closer to the coalface and provide something of more direct value to other doctors and patients,” Dr Caswell says.

“I had developed a lot of experience in working with large amounts of information and pulling it together to produce something useful. Chemical pathology is similar, working with a patient’s history, information from the treating clinician and the laboratory results, to produce a diagnosis, guide the treatment, and help the patient. I am still in the business of communicating with other doctors to provide information and education, but now it has a direct effect on patient care.”

Dr Caswell is impressed by the variety and unpredictability of her current role. She provides information and advice to the entire hierarchy of hospital medical staff, never knowing what the next query will be.

# Becoming a chemical pathologist

Chemical pathology is a distinct discipline requiring Fellowship of the Royal College of Pathologists of Australasia. Five years of supervised training in an accredited post as a registrar includes an initial basic pathological sciences examination, ‘Part 1’ examinations after a minimum of three years, and a ‘Part 2’ examinations usually taken in the fifth year of training.

Training usually involves intensive exposure to the laboratory environment in the first year, to ensure that candidates understand the technical and scientific aspects of the discipline. Clinical, administrative and interdisciplinary responsibilities develop throughout the training program.

There is also a combined training stream with the Royal Australasian College of Physicians. Trainees typically complete general physician training and the physician Part 1 examination, then enter a combined endocrinology/chemical pathology training program for four years.

“I have been amazed at the very broad spectrum of medical knowledge that’s needed,” she says.

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## Breaking new ground

Like about half of Australasia’s chemical pathologists, Associate Professor Hans Schneider is also a physician. He is Director of Pathology Services at The Alfred Hospital in Melbourne, as well as head of the biochemistry laboratory.

His involvement in patient care includes detailed discussion with other clinicians about the appropriate use of

chemical pathology tests. The services of each laboratory depend partly on local circumstances and the special needs of the hospital, and it requires careful analysis to ensure that investment in new technology will directly influence decisions about patient management.

Professor Schneider’s box-seat position also incorporates valuable chemical pathology research.

He and his colleagues recently investigated the use of B-type natriuretic peptide (BNP) in patients presenting to the hospital emergency department with shortness of breath.

The test has the potential to quickly identify patients in whom breathlessness is caused by heart failure, allowing rapid and specific treatment for their underlying disease. If heart failure is not the cause, then the search can continue for other diseases.

Results from the study are expected shortly.

Last year, Professor Schneider and colleagues also reported on possible links between high-sensitivity C-reactive protein (hsCRP) – a marker of chronic inflammatory diseases – and fracture risk in elderly women.

Using data from participants in the Geelong Osteoporosis Study, they found that increasing levels of hsCRP predicted fractures independent of well-recognised risk factors such as bone mineral density, history of previous fractures, bone turnover, diet, lifestyle, medications and other illnesses. The research exemplifies the links that can exist between laboratory science, clinical practice and population health.

Professor Schneider has also been closely involved in discussions about new methods for measuring and reporting glycosylated haemoglobin (HbA1c), a marker of long-term glucose control in people with diabetes.

New laboratory assays mean that results are more accurate and reliable, but the normal values will change and treatment targets will change, with substantial implications for patients and diabetes nurses as well as doctors.

“One of the attractions of chemical pathology is that you are often at the ‘sharp edge’ of medicine,” he says.

“We have the chance to provide leadership in science, technology and clinical services. The work is varied, and we make a real difference to patient care.” 🔥