

Briefing

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“In any crime scene with complex evidence and/or a great number of samples, its use is absolutely warranted.”

(Rotorua Crown Solicitor
Fletcher Pilditch)

The Rotorua court presentation was part of a two-year ESR Capability Fund research project evaluating the use of photographic and laser-scanning systems in recording evidence at crime scenes.

Project leader Björn Sutherland said the work involved many hours of testing different techniques, equipment and computer options, and researching international best practice.

“Our aim is to continually improve ESR’s crime scene capabilities, identifying technologies that assist with the detection, collection, recording and presentation of crime scene evidence.”

ESR was looking at working with New Zealand companies with expertise in 3D graphics and digital rendering to develop the application of the technologies further, he said.



A screen shot of the virtual tour used in the trial showing the way evidence is overlaid on to crime scene photographs.

Crime scene virtual tour a success in court

Jurors at a recent Rotorua homicide trial took a virtual walk through the crime scene in a presentation used to explain the forensic evidence associated with the case.

The 2007 homicide case was the first time panoramic photography and virtual tour technology had been used to support the delivery of ESR forensic evidence in a New Zealand court.

Rotorua Crown Solicitor Fletcher Pilditch is very enthusiastic about the new technology and its benefits to the court. He hopes its use will become routine at major crime scenes.

“Delivering evidence this way had significant benefits for the judge and jury in understanding the evidence, and the case. It meant the jury was provided with a full multimedia experience that seemed to make it easier for them to comprehend the evidence. They could listen to the forensic scientists give evidence in court at the same time as being taken on a virtual walk through the crime scene, ‘stopping’ to look at specific evidence and DNA results.

“It was significantly better than working just through a photo book, which doesn’t give the same sense of orientation. It also reduced the time required for the presentation of the forensic evidence in the court,” he said.

The use of virtual tours could also alleviate the need for court and jury members to visit the actual scene of a major crime.

New ESR CEO announced

ESR Board chair, Dr Susan Macken recently announced the appointment of Graham Smith as ESR's new CEO. He replaces Dr John Hay who stepped down after 11 years in the role.

Currently, Graham is CEO of ITEK, the technology transfer arm of the University of South Australia. Prior to ITEK Mr Smith spent four years as CEO of the Waikato regional economic development group Katolyst, and three years with AgResearch as GM Marketing. He also spent considerable time in various roles with the food companies CSR and Dairy Vale in Australia.

Dr Macken said Mr Smith had broad experience in working with the state sector (in NZ and Australia), including supporting scientists to undertake excellent fundamental and applied science and its translation into commercial returns.

"Mr Smith's strengths in business development and credibility and leadership through working in the science and research environment,

are well proven over numerous years and roles. The Board feels he has the skills, experience and presence to lead ESR into what may be a significantly-changed environment."

"ESR is a science-based organisation, and nurturing and maintaining the highest quality science is the key to both increased public good and commercial success. The board is aware that in the current CRI environment it is necessary for ESR to seek a greater transfer of scientific expertise and knowhow to the community through commercial partnerships, not only to fulfil its Statement of Core Purpose, but also to increase research revenue," Dr Macken said.

Mr Smith has a degree in economics from Adelaide University and an MBA from the University of South Australia.

Dr Fiona Thomson-Carter is acting CEO until Mr Smith takes up his position in August.

International collaboration on environmental contamination



Within the framework of the European Union-funded food safety MoniQA project, scientists from the United Kingdom and New Zealand are studying the impacts of climate change on the formation, distribution and uptake of these contaminants.

Environmental contaminants occur through weathering of the Earth's crust, combustion or industrial uses or as unwanted by-products of manufacturing processes.

In an article published in the *Journal of Quality Assurance and Safety of Crops and Foods*, ESR food safety scientist Dr Barbara Thomson and co-author Martin Rose, of the UK Food and Environment Research Agency, said some contaminants might increase in foods as a result of climate change.

Broadly speaking, climate change is likely to increase human exposure to arsenic, cadmium, lead, mercury, dioxins, PAHs and PCBs, because food and feed may be contaminated by forest fires (which will increase owing to climate change), re-used water (owing to droughts) and increased methylation (mercury only).

Conversely, climate change policies to reduce carbon emissions could result in increased energy efficiency, which leads to a reduction in the emissions of dioxins, PAH and heavy metals.

"A change in climate over time may potentially alter the release, distribution and/or uptake of environmental contaminants into the food chain in a number of ways. Evidence of impacts is an emerging area and data is limited. The full extent of the impacts of climate change on environmental contaminants, and human exposure to them, has yet to be quantified," Dr Thomson said.



New ways of testing allergens in food

New laboratory methods for detecting allergens in foods are being developed at ESR.

Until now, testing allergens in foods has relied on labour-intensive analysis kits. The new method utilises a machine called an LCMS (liquid chromatography–mass spectrometry), which can quickly analyse a large number of samples and has very high sensitivity, including in highly processed and manufactured foods. It means that laboratory testing of allergens in foods should become faster and cheaper.

ESR is currently developing methods for detecting wheat allergens (gluten). Through the European Union-funded food safety MoniQA network, ESR is collaborating with other laboratories that are working on similar methods for peanut, dairy and egg allergen detection. The methods will be shared internationally.

Dr Roland Poms, Secretary General, International Association for Cereal Science and Technology, has been working with ESR food scientists at the Christchurch Science Centre for the past few months, developing new allergen-detection methods for routine analysis.

“LCMS will provide sensitive detection of allergenic source proteins or marker proteins and also identify key peptide fragments implicated in the allergic response or unique to the offending food commodity.”

Dr Poms worked with ESR staff to optimise and improve a published analysis method using LCMS. The sensitivity and specificity of the method were then tested by analysing bread and food products. The method will be validated at ESR in-house with the aim of having a routine laboratory analysis available for use in New Zealand by early 2012.

These developments will be of interest to food manufacturers and commercial laboratories.



Principal Scientists retire

Two of New Zealand’s top scientists have retired. ESR Principal Scientists Dr Tom Speir, a soil scientist, and Dr Diana Martin, infectious disease microbiologist, recently retired from ESR leaving very big shoes to fill. The pair had more than 70 years of scientific knowledge and expertise between them.

Dr Diana Martin

Dr Diana Martin led ESR’s scientific work on the meningococcal vaccine programme. She dedicated more than 30 years to investigating meningococcal disease and researching how to reduce its impacts. It was the work of Dr Martin and her staff that led to the identification of the specific New Zealand meningococcal B strain epidemic. Dr Martin was also involved in the scientific work related to the school-based ‘sore throat’ treatment programme, which reduced the cases of rheumatic fever in school children caused by group A streptococcus.

She was made an Officer of the New Zealand Order of Merit (ONZM) for services to microbiology in the 2008 Queen’s Birthday Honours.

Dr Martin’s work was based on the diagnosis and investigation of bacterial pathogens causing invasive disease.

She developed particular expertise in characterising strains to determine origins and routes of transmission associated with outbreaks, and understanding virulence.

In recent years Dr Martin and her staff undertook the monitoring of pneumococcal strains from disease cases. This provided the scientific data that helped health officials in their decision-making in relation to the introduction of the pneumococcal vaccine.

Dr Martin is an elected Fellow of the Royal Society of New Zealand, a former member of the Health Research Council Biomedical Research Committee and a former President of the New Zealand Microbiological Society. She served on a number of international scientific committees. She authored, or co-authored, more than 120 scientific journal papers and publications.



High drug levels found in 'P' lab children

Hair testing of children exposed to 'P' labs has found they have similar drug levels to adult users.

ESR toxicologist Dr Tom Bassindale said that nearly 90 percent of children found in 'P' labs had hair samples that tested positive to methamphetamine (or 'P'). The tests also indicated the children had been exposed to methamphetamine for a much longer period of time than previously thought. The youngest child tested was two months old and the oldest 16 years.

Testing hair is often the only way to prove methamphetamine exposure. The illegal drug can only be detected in blood or urine for 12-24 hours after exposure. But it shows up in hair for months, or even years.

"For example, in one case when a suspected lab was raided, 16-month-old twins were removed from the scene. Blood and urine samples from the children did not find any evidence of drugs, but both hair samples tested positive for methamphetamine," Dr Bassindale said.

"We often analyse six months of hair growth and find methamphetamine in all of the hair, meaning these kids had been continually exposed to the drug for a significant period of time. I was surprised at the high positive rate, I didn't think they'd been exposed for as long a period as the testing suggested."

The mean reading from the children's samples was the same as those from adult users tested in the 2009-10 period. This means they may have also experienced the same negative effects, such as paranoia and



insomnia, as well as other short- and long-term health issues.

The highest reading for methamphetamine that ESR has found in a hair sample was from a child. More than 60 children associated with illegal 'P' labs have had their hair tested in the past couple of years.

ESR has also been able to use hair testing to identify drug poisoning among children

in cases such as 'Munchausen's by proxy'. It is also used for the investigation of drug-facilitated sexual assaults, by the Family Court and lawyers in relation to custody cases, and within workplace drug-testing programmes.

ESR is the only laboratory in Australasia that offers a commercial hair-testing service.



Dr Tom Speir

Dr Tom Speir spent 40 years as a soil scientist, developing specific expertise in soil chemistry and biochemistry. He focused his research particularly on identifying, understanding and mitigating the risks to sensitive soil properties arising from the application of sewage sludge and other wastes to land.

Dr Speir's recent work primarily focused on heavy metals in biosolids (sewage sludge). He was heavily involved in the development of a national environmental standard for the land application of biosolids.

His knowledge of soil biochemistry was virtually unrivalled and with more than 100 publications his expertise was recognised both nationally and internationally. He mentored many young scientists, who attest that he was always willing to share his vast knowledge and experience and gave them confidence through continued encouragement and support.

In 2000 he was made a fellow of the New Zealand Society of Soil Science. This year he will receive the prestigious Lifetime Achievement Award in Terrestrial Enzymology, to be presented at the Fourth International Enzymes in the Environment Conference in Germany in July.

Environmental Health General Manager Dr Fiona Thomson-Carter said both Dr Martin and Dr Speir had made enormous contributions to the international and New Zealand scientific and medical fields, and also to the organisation and staff of ESR.

"Their involvement in funding processes and mentoring of postgraduate students and post-docs were direct and much-respected results of their deep and unswerving

commitment to their respective scientific fields. Tom will be particularly remembered by a raft of scientists for helping them to realise their potential. He was the central rock of ESR's biosolids team. He built an important research community through his willingness to share knowledge with and encourage other scientists.

"Diana always lived life on the run. She led by example with hard work, more hard work

then even more hard work. Her energy and enthusiasm were infectious. Colleagues talk about a fun-loving, widely respected scientist who they will miss terribly, whose energy knew no bounds and who would turn up to work after a long-haul flight as fresh as a daisy."

We will miss them both and wish them well in their retirements.

Microbe hunters collaborate

New ways of detecting new microbes are being established at ESR, with the world's leading 'microbe-hunters' helping to develop the capability in New Zealand.

Pathogen discovery or 'microbe hunting' has recently discovered several new viruses and bacteria, including a previously unknown third species of the common cold. New viruses can emerge from animals and cross into humans, or cause unusual illnesses in humans that have not previously been recognised.



Dr Richard Hall at work on a microarray at Columbia University, New York

Detection methods were originally developed at Columbia University, New York. ESR is collaborating with virologists at Columbia to establish the techniques at ESR's National Centre for Biosecurity and Infectious Disease's (NCBID's) laboratory.

Associate Professor Thomas Briese from Columbia University, an internationally recognised 'microbe hunter' and a 2011 ESR International Fellow, recently spent time at ESR's NCBID providing guidance and advice to Dr Richard Hall and Dr Matthew Peacey. Dr Hall had previously spent a month at Columbia learning about the methods.

Dr Hall said the new techniques detect DNA (or RNA) using microarray, specialised PCR and adaptations of next-generation sequencing. Overseas researchers have used them to discover new viruses and bacteria, including Lujo virus, the first hemorrhagic fever-associated arenavirus from Africa to be identified in 30 years, as well as the third species of the common cold (human rhinovirus C).

"We are fortunate to be collaborating with Professor Ian Lipkin and Associate Professor Thomas Briese. Columbia has provided support and guidance to ESR in the use of these novel methods," Dr Hall said.

Dr Briese is also the Associate Director of the Center for Infection and Immunity at the Mailman School of Public Health, and the Associate Director of the World Health Organization Collaborating Centre on Diagnostics, Surveillance and Immunotherapeutics for Emerging Infectious and Zoonotic Diseases.

What unknown bacteria and viruses are causing stomach illness in New Zealanders? That's what Dr Richard Hall is hoping to discover in a new HRC funded study.

Dr Hall says most people don't visit their doctor for stomach upsets, or diarrhoea.

"Even for people that do go to the doctor only 20% are ever diagnosed in routine testing, for the other 80% the cause remains unidentified and the cause of stomach bug outbreaks is often never found. But DNA technologies and increased computing power are enabling us to start identifying unknown viruses and bacteria."

The results will be used by public health agencies to prevent or contain outbreaks through a better knowledge of these 'mystery' microbes causing such common illnesses.

The ESR pathogen-discovery work is presently funded by the ESR Capability Fund and has been in progress for 18 months. It will enable ESR to collaborate with other agencies involved in human and animal health, assisting them to solve problems where an infectious disease is present but the causative agent has not been identified.

Clinical advisory panel appointed

An external advisory panel is helping ESR to continue to achieve excellence in national reference laboratory services and surveillance of infectious diseases.

The panel will provide advice on a range of issues related to laboratory testing and microbiology, including clinical microbiology advice on laboratory testing, outbreak response and infectious disease emergencies and the implementation and monitoring of standards of performance and quality improvements.

Panel members are:

Dr David Smith, clinical microbiologist, Site Director, and head of the National Influenza Centre, PathWest Laboratory Medicine, Western Australia

Professor Lyn Gilbert, Director, Centre for Infectious Diseases and Microbiology Laboratory Services, Institute of Clinical Pathology and Medical Research, New South Wales and Clinical Professor in Infectious Diseases and Medicine, University of Sydney



From left: Dr Virginia Hope (ESR), Dr David Smith, Professor Lyn Gilbert, Dr Sally Roberts and Dr Phil Carter (ESR).

Dr Sally Roberts, Clinical Head, Department of Microbiology, and clinical microbiologist and infectious diseases physician, Auckland District Health Board, and Senior Clinical Lecturer, Faculty of Medical and Health Sciences, University of Auckland.



Photo courtesy DomPost

Responding to the quake

Much of New Zealand’s scientific community has responded to the Christchurch earthquakes in some way. Like other Crown research institutes, ESR has applied its particular areas of expertise to issues associated with the quake. Here is a sample of the work in which we have been involved.

Health survey

The Health Intelligence Team co-ordinated a phone survey assessing the health needs of Christchurch residents following the February quake.

On behalf of the Canterbury District Health Board, 500 Christchurch residents, chosen at random, were contacted each week for four weeks to gather feedback on health issues and access to services. The board used the survey to find out whether residents had access to essential health services, such as GPs and pharmacies, and whether they were following advice to boil or treat water.

For example, at the beginning of the survey period some residents were without basic services such as sewerage, power and clean drinking water, and therefore at greater risk of illness. The health board wanted to get a better picture of the health risks they faced. The feedback helped with the board’s planning for additional health services and support.

Disaster victim identification

ESR forensic staff were involved in the disaster-victim identifications related to the Christchurch earthquake. Staff teams worked with a number of other agencies under the direction of the Christchurch Coroner and Police at Burnham Military Camp.

Post-quake workshop for responders

ESR and GNS Science social scientists hosted a learning workshop, ‘Supporting communication around the Canterbury earthquake and other risks’.

Attended by 40 people, this workshop looked at current experiences in risk communication around the Canterbury earthquakes and what could be learnt for improving communication for future hazardous events.

Dr Karen Cronin, Science leader, Social Systems said the aim of the workshop was to create a supportive space for communication practitioners working on the ground in the response and recovery phases of the Canterbury earthquake to share experiences and learning with researchers in risk communication. An information page has been set up under the social system section of ESR’s website.

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