



Dr Mark Hurst gets a closer look at grass grub larva infected with an AgResearch-discovered bacterium that could protect New Zealand's organic pipfruit industry from the destructive bronze beetle.

Research battles bronze beetle

An AgResearch discovered biocontrol may soon prove its worth to New Zealand's pipfruit industry as an organic management solution to the destructive bronze beetle.

The bronze beetle is a major pest for our organic pipfruit growers, nibbling at fruit and causing scarring that makes the fruit unmarketable. It is one of the biggest production issues facing the sector, estimated to have caused \$12 to \$15M of damage to the industry in 2006 alone.

Until now, there hasn't been an effective organic control method for killing this destructive pest, but AgResearch and Plant & Food scientists may just have the answer.

Plant & Food Research Scientist Dave Rogers approached AgResearch about the possibility of testing a novel insecticidal bacterium for control of the bronze beetle. AgResearch

Molecular Biologist Dr Mark Hurst had discovered the bacterium in 1996.

The bacterial strain, known as *Yersinia entomophaga* MH96, has generated worldwide interest since its discovery, proving an effective biocontrol against a wide range of damaging and persistent insect pests, including grass grub, black beetle, Tasmanian beetle, Australian pasture scarab, and some weevils and caterpillars. Brassica pests such as the white cabbage butterfly and diamondback moth also don't stand a chance against this bacterium.

And now a pilot trial has shown *Y. entomophaga* MH96 to be successful in killing adult bronze beetles.

The bacterium starts killing insects within 24-72 hours of infection, and because it only lives for a short time in soil, it's undetectable after just 20-30 days – critical when used on edible plants. And although it can kill a wide range of insects, it has shown itself to be safe for use around non-target species, such as honeybees and worms.

Should further field testing reflect the success of the pilot trial, the bacterium could soon be put to use as an organic solution to this aggressor threatening our multimillion dollar pipfruit industry.

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Quadruple honours for AgResearch scientist

Dr Jolon Dyer's 2010 calendar is filling up fast, as a string of awards come his way that will see him sharing his protein expertise in Canterbury and abroad.

The Leader of AgResearch's Protein and Structure Team has recently been appointed Adjunct Senior Fellow at the University of Canterbury, within the newly opened Biomolecular Interaction Centre (BIC), and also Adjunct Associate Professor in the Wine, Food and Molecular Biosciences Department at Lincoln University.

Nominated by Professors from within the Universities, the three-year positions will involve supervising PhD, Honours and Masters students, developing research collaborations and lecturing. As a former school teacher turned scientist, Jolon says he's looking forward to bringing his teaching skills

together with his love of science.

Jolon's also a Primary Investigator at the BIC, where he will bring his knowledge of protein chemistry and proteomics to the mix of researchers at the Centre working in biomolecules. This role will involve putting together collaborative programmes in protein research. Proteins are key biomolecules, and a better understanding of proteins has applications in everything from meat, dairy and wool research to human health and personal care products.

"AgResearch has very good connections with a number of universities, and working with the team at BIC will

provide many more opportunities to collaborate with the University of Canterbury and other research institutes involved in the Centre," Jolon says.

"We will be more involved in a broader range of projects, and have the ability to put together strong collaborative bids that we would not have had access to before."

And Jolon's capabilities have been recognised further afield, taking a prestigious American Society for Photobiology New Investigator Award for his research breakthroughs in the area of protein damage. This includes advancements in wool photo-yellowing, meat protein oxidation, and dairy protein damage. Jolon will travel to Brown University in Rhode Island in June to accept the award, prize money of US \$1,500, and give an award lecture.

To add to the accolades, Jolon has been selected by Ministry of Research, Science and Technology (MoRST) as a New Zealand representative at 2010 Bio International Convention – the world's largest biotechnology conference, with speakers including Al Gore. Jolon will be part of a MoRST-funded New Zealand delegation to attend the event in Chicago in May.

"It's a great honour to be selected to represent New Zealand, and AgResearch. The convention will provide a unique opportunity to network with people from leading research institutes and major biotechnology companies," he says.

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Dr Jolon Dyer's expertise in protein research has seen him recognised with four prestigious honours – from here and overseas.

AgResearch hosts its Irish equivalent

Areas of mutual interest in agricultural research and development were on the table when a delegation from AgResearch's Irish equivalent visited last month.

Senior staff from Teagasc - the Irish Agriculture and Food Development Authority - visited each of AgResearch's campuses on their trip, led by the Institute's Director Professor Gerry Boyle, accompanied by Director of Research Dr Frank O'Mara and Head of Foresight and Strategy Development Dr Lance O'Brien.

Teagasc is the national body providing integrated research, advisory and training services to the agriculture and food industry and rural communities throughout Ireland, employing 1,300 staff at 80 locations. The institute has developed close alliances with research, advisory and training agencies throughout the world and is continuously seeking to expand their international contacts - as it has with the AgResearch visit.

At Ruakura, the delegates met with AgResearch Chief Executive Dr Andrew West, who detailed the role of AgResearch, its corporate strategy, and research programme.

They also travelled out to The Tokanui Dairy Research Farm, where they were run through the conversion of the property to dairy, and the research and development the farm will facilitate.

Dr Wayne Hein, Animal Health Section Manager, hosted the delegation at the Hopkirk Research Institute, outlining AgResearch's work in diseases common to both agricultural sectors, including mastitis, Johne's Disease, TB and parasite issues.

The delegation was particularly interested in The Hopkirk's management systems and model, given they would



AgResearch Farm Operations Manager Dean Bailey (on right) and Ag Systems Scientist Dr Warren King (centre) hosted the recent Teagasc delegation on a tour of The Tokanui Dairy Research Farm.

like to found a similar facility in Ireland as an industry partnership co-located with a University.

On their visit to the Grasslands campus, the delegation heard presentations from AgResearch scientists on research and development in forages, ruminant nutrition, and greenhouse gases. They also met with Agriculture & Environment Group General Manager Peter Benfell and Dr Harry Clark, Director of the newly opened New Zealand Centre for Agricultural Greenhouse Gas Research, discussing the Centre, and how it is likely to link to the proposed Global Research Alliance, of which the Irish will also be a part.

The group met with some of AgResearch's industry partners, including Innovation Waikato and Fonterra.

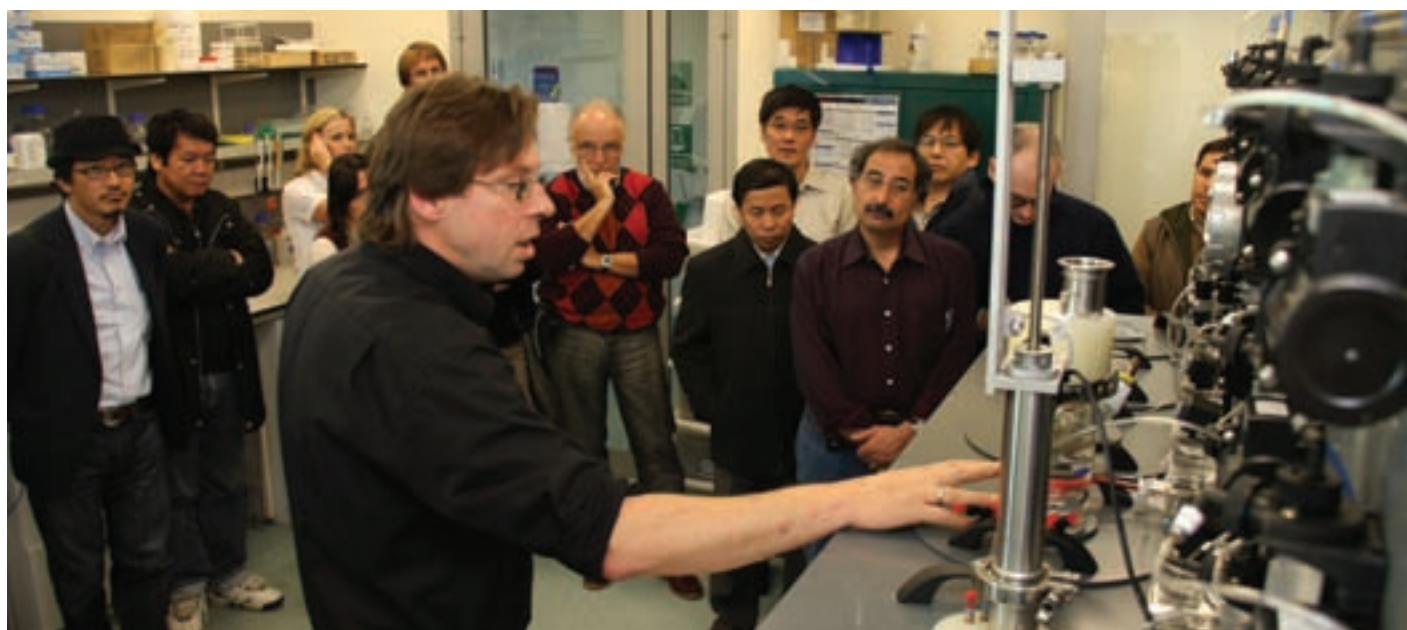
Down south, visits to Lincoln and Invermay included meeting AgResearch's Dr Glyn Francis, Section Manager, Biocontrol, Biosecurity & Bioprocessing, and hearing presentations from senior research staff on Forage Master and lamb finishing, animal genomics, biological control of pasture insect pests and weed ecology research.

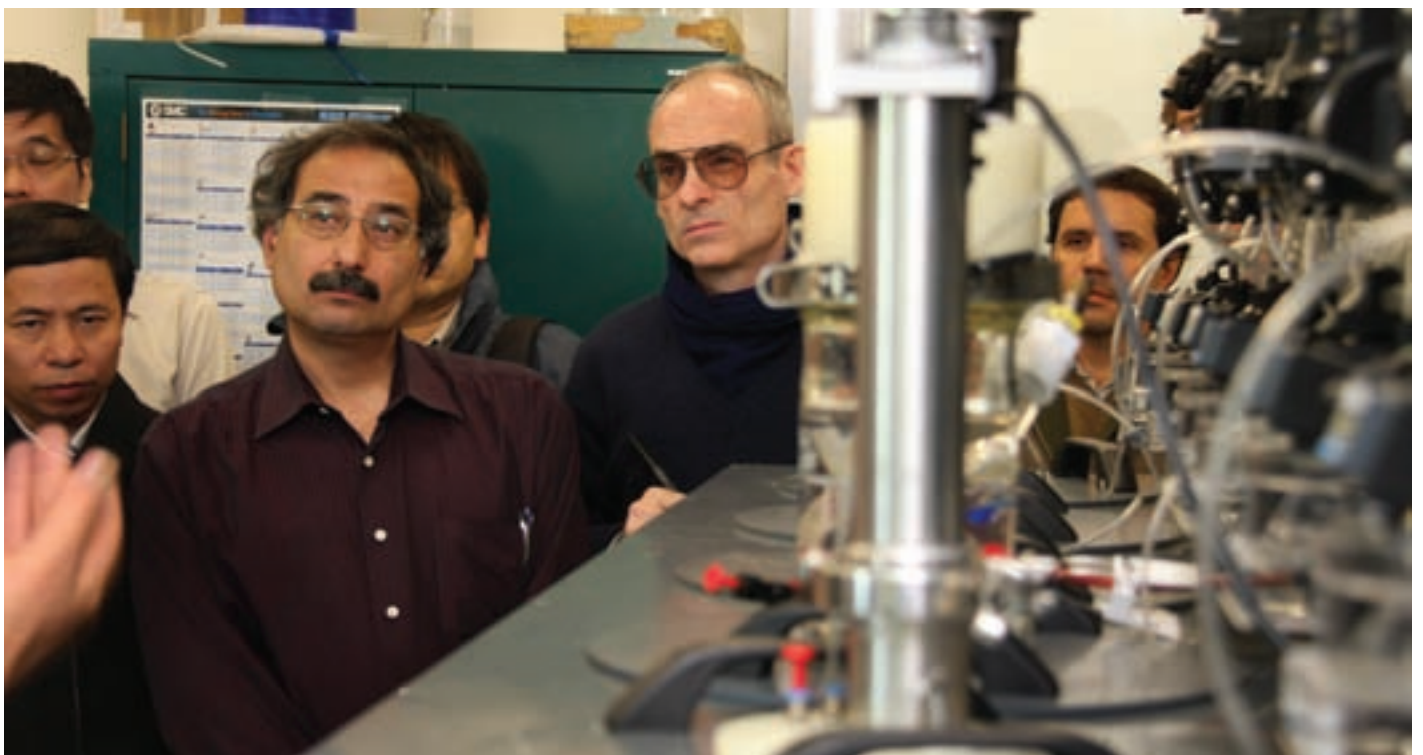
"The visit has opened up discussions for further communications between the two organisations, with the possibility of interactive communications, and opportunities for exchanges of staff and joint ventures in the future," Wayne Hein says.

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Global Research Alliance visits New Zealand Agricultural Greenhouse Gas Research Centre

The New Zealand Agricultural Greenhouse Gas Research Centre, launched in March by Prime Minister John Key, hosted a visit of officials from the Global Research Alliance this month. Director Dr Harry Clark says this is a busy time as the Centre makes links and works with representatives of all the countries involved in the Alliance.





Teaching farming at Tokanui

It will be far from your typical classroom environment at the country's first dedicated agritechnology educational centre, opened last month at AgResearch's Tokanui Dairy Research Farm.

The Wintec Agritec Centre will see secondary and tertiary students from across New Zealand, as well as farmers and agricultural workers, experience the latest in agritechnology using innovative learning technologies.

Established by Waikato Institute of Technology (Wintec) in partnership with AgResearch, Innovation Waikato, Agriculture ITO and the Coalition for 21st Century Schools, with establishment funding from the Tertiary Education Commission, the Centre will use rich media resources and data from Tokanui Farm to deliver science, technology, environmental and farming education.

Wintec Chief Executive Mark Flowers says The Centre aims to help showcase possibilities within the agricultural sector to encourage students to choose science, engineering or technology degree programmes, and reduce the risk of New Zealand losing important research and engineering capability in the land-based industries.

"The really exciting part is being able to convert current data from AgResearch's farm into resources for students throughout the country and using the internet and technology, such as PDAs, to make learning the scientific and technological aspects of farming fun and relevant."

AgResearch Chief Executive Dr Andrew West says the Wintec Agritec Centre will provide a window into the Tokanui research farm that can be used to train students, farmers and other personnel across the agriculture sector.

"Student and industry engagement with



AgResearch's Chief Financial Officer Geoff Balme (left) with Wintec Chief Executive Mark Flowers at the opening of The Wintec Agritec Centre at AgResearch's Tokanui Dairy Research Farm.

new technologies, farm systems and environmental practices is essential in keeping New Zealand at the forefront of global agriculture. We're pleased that Tokanui, a high quality and commercially relevant research farm, is part of making this possible."

Experienced scientist, farmer and dairy industry consultant Dr Debbie Care has been appointed the Centre's lead educator. She'll develop a range of courses and resources to deliver to students in the Agritec Centre, as well as online resources for trainers, teachers and tutors. Farmers and other industry professionals will be offered 'smart classes' and resources on relevant topics and, over time, the website will offer self-directed learning.

She says it's far from your typical

classroom environment.

"From taking soil samples, to engaging with an industry expert via the web or working alongside a scientist on a current project, students will get a taste of what the industry has to offer and they will benefit from engaging with real people in real careers."

Speaking at the opening, AgResearch's Chief Financial Officer Geoff Balme said AgResearch recognised early that the Tokanui Farm could provide learning in addition to research.

"And so we are delighted that Wintec has taken the opportunity to partner with us and establish this Agritec Centre."

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Scientist gives expert advice on cluster flies invasion

AgResearch entomologist Dr Scott Hardwick's phone has been ringing hot lately, as a wave of cluster flies hit the country, some invading houses in their tens of thousands.

Cluster flies are so named because they congregate in large groups, summoning each other using the scent of aggregation pheromones. The invasive pests have been very active in some parts of the country in recent weeks with householders in the Wairarapa, Manawatu and Horowhenua being hit particularly hard.

After first being observed in Auckland in 1984, cluster flies have moved through the country and were discovered as far south as Central Otago by 2003.

The larvae of the fly feed on earthworms in pasture or lawns through spring and summer. In autumn the emerging adult flies then look for a warm, dry place to hibernate over the winter.

"If your house happens to be a spot where they want to be over winter it can be quite dramatic, and really distressing," Scott says. "It's very difficult to stop the flies gaining entry to the house and once they gain entry and find a secluded spot that is warm and dry, such as an attic or disused room, they will stay there all winter."

Scott says rain and humid conditions experienced in parts of the lower North Island this summer may have provided perfect breeding conditions for the flies because moist conditions mean earthworms survive well – so a combination of earthworm and fly survival is likely to have contributed to the cluster fly problem this season.

The really frustrating thing for anyone who suffers an infestation is the fact that the pheromone will linger on even after all the flies have been destroyed and

removed, continuing to attract cluster flies to the site. So while exterminators in affected areas have been run off their feet, any pest-control treatment is only a temporary measure.

"You can kill them, but the problem is that they mark where they congregate with the pheromone, so there is the potential for them to come back. Even using a residual insecticide, they're eventually going to be back, and multiple applications of insecticide in the general environs around the house are not healthy for a householder or environmentally sustainable either," Scott says.

"However, affected householders need not despair as the current invasion will decline and eventually end with the onset of cool winter conditions."

As well as being a nuisance, the buzzing pests may also have implications for public health. In 2002 cluster flies were thought to be behind the contamination and subsequent closure of the Martinborough water supply after cluster flies got into a wooden water tank.

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AgResearch entomologist Dr Scott Hardwick studies a sample of cluster flies – his expertise has been sought after a wave of the pests hit various parts of the country recently.

Joining scientific forces through Japan journey

What do ostriches on Japanese farms have in common with animals from our farms here in New Zealand? Bacteria in their digestive systems that could help boost productivity.

An AgResearch scientist will soon travel to Japan on a grant to share knowledge on bacteria involved in digestion that could contribute to greater productivity in animals.

Dr Graeme Attwood has been awarded a Japan Society for the Promotion of Science Invitation Fellowship, an award aimed at encouraging scientific exchange between Japan and New Zealand.

Graeme will travel to Japan in August for two weeks, where he will work alongside Hiroki Matsui, an Associate Professor at Mie University, near Nagoya. The pair first met many years ago when Hiroki visited AgResearch as part of his PhD studies.

Hiroki is interested in characterising the microbes involved in the digestion process of ostriches, as part of research into increasing production in ostrich farms in Japan.

It's work with many commonalities to Graeme's area of expertise – the microbes in the rumen of our farm animals. The grant will fund the travel to help with the initial characterisation of the

microbes in the ostrich digestion process.

Graeme will work with Hiroki to take DNA samples from the bacteria that reside within part of the large intestine of ostriches. On return to New Zealand, libraries of the DNA fragments will be constructed and screened for enzymatic activities involved in breaking down plant material. These studies will uncover more about how these enzymes, genes and bacteria can be used to boost animal productivity.

"The Invitation Fellowship allows us to establish a collaboration with the specific aim of gaining a better understanding of lignocellulose degradation by bacteria in the gut of farmed animals," Graeme says.

"The anatomies of the ostrich and ruminant digestive systems are quite different but they both perform the function of digesting plant material using a resident microbial community. By comparing the results from ostriches with our data from ruminants we hope to identify common features of these digestive systems that may give us important clues as to how gut bacteria



Dr Graeme Attwood is Japan bound to share his knowledge on bacteria that could lead to greater animal productivity.

go about the process of attaching to plant material and breaking it down."

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