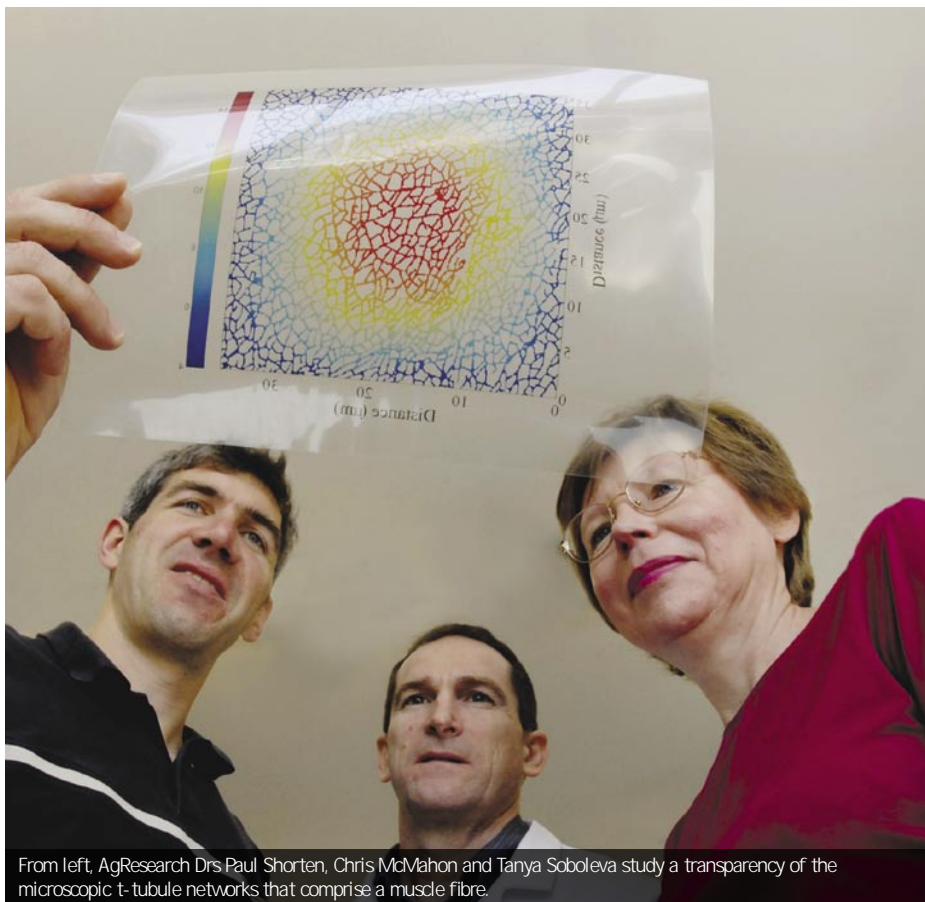


New mathematical model aiding insulin research

Scientists trying to understand why people develop insulin resistance are excited by a new mathematical model developed by AgResearch that may explain the hormone's normal slow transport through skeletal muscle.



From left, AgResearch Drs Paul Shorten, Chris McMahon and Tanya Soboleva study a transparency of the microscopic t-tubule networks that comprise a muscle fibre.

Insulin is an important hormone that controls glucose transport in the body. It takes about ten minutes to transport into muscle and the reasons for this slow transport are unknown. Resistance to insulin increases when people become obese, so insulin transport is becoming a hot topic.

Ruakura-based scientist Dr Paul Shorten has developed a mathematical model to explain the reason for the slow insulin transport within skeletal muscle fibres. Each muscle fibre consists of microscopic t-tubule networks that resemble a city roadmap. The majority of insulin receptors are located within these t-tubules

“With my co-authors Drs Tanya Soboleva and Chris McMahon, we used this model to identify the mechanisms responsible for the slow insulin transport process. The model points to two main reasons for the slow transport of insulin — insulin binding to insulin receptors and the twisted nature of the t-tubule network within muscle.”

As a member of AgResearch's Bioinformatics, Mathematics & Statistics Section, Paul's role is to use mathematics to study complex biological and physical systems using modelling and computer simulation.

“In this case we obtained unexpected new knowledge by linking our muscle modelling

Morgan scoops AgResearch Science Writers' award

For the third time in four years, Dominion Post farming editor Jon Morgan has won the AgResearch Science Writers' prize at the annual Guild of Agricultural Journalists' and Communicators' Awards.

AgResearch Chairman Rick Christie presented Jon with his award and a cheque for \$1000 for his winning entries, Battle of the Dags and Marbles of Gold.

Battle of the Dags outlines AgResearch scientist Dr David Scobie's work on developing low-cost, easy-care sheep — those that have a genetically short tail and no wool on the head, legs, belly or breech. Three farmers who are using low-cost, easy-care sheep on their farms spoke to Jon about their reasons for doing so.

Marbles of Gold was about breeding sheep that are resistant to internal parasites.

work to recent experimental measurements of insulin transport in muscle.”

Bioinformatics, Mathematics & Statistics Section Manager Dr Anette Becher says Paul's discovery has led to a better understanding of the role of muscle in insulin absorption and has enabled biologists to propose new hypotheses of biological function that can then be tested in the laboratory.

This work is part of a Foundation for Research, Science & Technology muscle programme entitled Modelling Skeletal Muscle Responses to Applied Electrical Stimulation. The study brings a new perspective to insulin resistance and suggests the t-tubule network potentially links diabetes to muscle wasting.

Society to blame for agricultural emissions?

Are farmers to blame for agricultural greenhouse gas emissions —or do we all have to take responsibility?

This was raised for discussion by AgResearch's Dr Harry Clark, a panel guest in one of a series of public lectures organised by AgResearch to stimulate public discussion around the impact of livestock on the environment.

The lecture series also featured Dr Henning Steinfeld, author and principal scientist with the Food and Agriculture Organisation of the United Nations in Italy. With sponsorship from AgResearch, Henning came to New Zealand to attend the Greenhouse Gases and Animal Agriculture Conference which AgResearch also sponsors.

Henning has co-authored a recently-released report entitled "Livestock's Long Shadow" that aims to assess the full impact of the livestock sector on environmental problems, along with potential technical and policy approaches to mitigation.

The report says the livestock sector is one of the most significant contributors to the most serious environmental problems.

Harry, AgResearch's Climate, Land & Environment Section Manager, says the problem is ultimately being caused by society as a whole as it increasingly demands more livestock products.

"Countries like New Zealand are meeting that demand and farmers are not the ones to blame. Farmers can do something about the problem and AgResearch needs to ask, as a science organisation, what we can do to help."



AgResearch does extensive research around the mitigation of agricultural greenhouse gas emissions in New Zealand, while simultaneously helping farmers increase production levels to meet demand.

"If New Zealand can stay at the forefront of such research, our farmers may well have a global marketing advantage as consumers become increasingly conscious of environmental problems."

The Ministry of Agriculture and Forestry also supported the forums that were held in Christchurch, Wellington and Hamilton and each of them respectively received advertising support from The Press, the Dominion Post and

the Waikato Times. Other sponsors included Environment Canterbury and Waikato University.

- Hear podcasts from the events by visiting <http://www.agresearch.co.nz/events/steinfeldlectures.asp>

AgResearch also had a strong presence at the 2020 Primary Industries Summit at the end of November, held in Christchurch. Along with MAF, AgResearch co-ordinated a Crown Research Institute (CRI) showcase at the summit. The open plan booths were themed around the capacity, capability, collaboration and commercialisation of all New Zealand CRIs.

Agriculture must lift game —AgResearch Chairman

Without innovative science, New Zealand's agricultural sector would not be half as successful as it is, says AgResearch Chairman Rick Christie.

This was one of his key messages at the recent Grasslands Association Conference in Taupo of which AgResearch is a premier sponsor.

New Zealand's international excellence in agriculture is the result of backbreaking work on farms and groundbreaking advances in science and technology, he says.

"This is exactly the wrong time to rest on our laurels. Now more than ever, the agriculture sector must lift its game —and now more than ever, the sector is looking to science to lead the way.

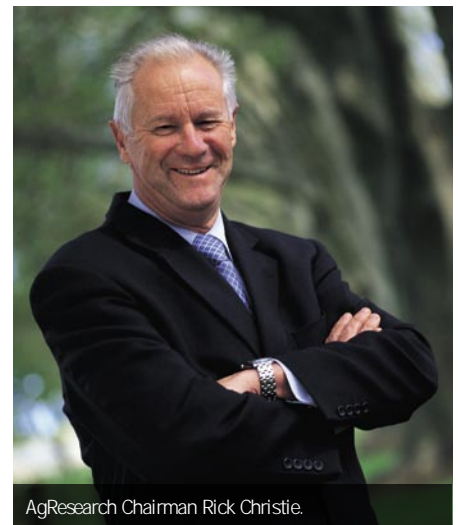
"If we value knowledge as a mainstay of economic competitiveness and environmental sustainability, as a nation we must invest

more in science and technology, and the Government can lead by example.

"The sad story is that the reverse is happening. In recent years, investment in scientific research as a percentage of gross domestic product has steadily fallen —and the Government's share hasn't even kept up with inflation."

To read the full speech by Chairman Rick Christie, go to <http://www.agresearch.co.nz/news/speeches.asp>

AgResearch scientists presented about half of the conference's 45 papers. With the theme, Future Proofing Profitable Farming, hot topics included sustainability, water quality, alternate land use and the impact of high sugar grasses on animal production.



AgResearch Chairman Rick Christie.

World's best white clover genome map

The world's first and only comprehensive map of the white clover genome has been developed by AgResearch scientists and will accelerate the development of new forage cultivars.

The new roadmap of white clover chromosomes is the result of scientists blending two separate genetic linkage maps developed independently by AgResearch and Pastoral Genomics researchers. It is already being used in AgResearch forage breeding programmes and takes the total number of mapped genetic markers to more than 1000. Each marker is a potential tool for identifying genes to accelerate improvements in forage productivity and performance.

"We now have an estimated 97% coverage of the genome. The next highest published coverage is 87%," says project leader Dr Andrew Griffiths who is a member of the Forage Biotechnology Section based at AgResearch Grasslands. He worked closely with Brent Barrett of Forage Improvement, and

Deborah Simon of the Mathematics, Statistics & Bioinformatics Section, to refine the map.

It will benefit farmers by providing them with access to forages developed using an extremely concise plant breeding system called Marker Assisted Selection that increases the rate of genetic improvement.

Selecting for traits traditionally requires repeatedly testing crops each season and even then some traits are not expressed consistently or until the plant is mature.

"Marker-assisted selection will fix that —using this map we can create trait-specific genetic tests to screen parent plants before the trials even begin, and know we have selected parents with superior genes," says Andrew

The new map's use for genetic testing is at the proof-of-concept stage and is currently being validated for the selection of seed yield traits during the development of new commercial varieties. This and ongoing research is being carried out under the umbrella of the Markers 2 Market Programme —a collaboration between Grasslands Innovation and Pastoral Genomics.

Pastoral Genomics is a research consortium jointly funded by Fonterra, Meat & Wool New Zealand, AgResearch, Deer Industry New Zealand, Dairy InSight and the Foundation for Research Science and Technology (FRST). Grasslands Innovation is a joint venture between Grasslanz Technology and PGG Wrightson.

Focus on carbon footprint research for agriculture

AgResearch scientists are making a significant contribution to understanding the total environmental footprint for different agricultural products and farm systems.

The importance of this Life Cycle Assessment methodology for agriculture was explained by AgResearch Board Director Dick Davison who spoke at a media briefing at the Royal New Zealand Show in Christchurch in mid-November.

“Such an approach is vital in light of recent findings that show that, for most environmental indices, the on-farm stage is the main contributor to an agricultural product’s total environmental footprint,” he says.

“For example, it’s estimated at 70 to 85 percent for the carbon footprint of dairy products,” he says.

A carbon footprint is the total greenhouse gas emissions over the full life cycle of a product. With agriculture comprising almost 50 percent of these emissions in New Zealand, there is increasing pressure on farmers to improve farm practices or plan intensification options to reduce their footprint.

AgResearch’s stand at the show enjoyed its fair share of attention, thanks to groundbreaking scientific developments over recent times. It was a collaborative effort with Meat & Wool New Zealand and Catapult Genetics, and scientists from all three organisations were on hand to talk to visitors.

AgResearch scientist Mark Hurst discussed a discovery that is an important step forward in the control of insects.

“It’s a new strain of bacteria in insects known as *Yersinia entomophaga* MH96 that will kill many insects within three days,” he says.

Also highlighted was the development of a promising new therapeutic treatment for muscular dystrophy and other debilitating muscle wasting diseases. Dunedin-based biotechnology company Orico Limited, jointly owned by AgResearch and Wool Equities Limited, presented at the show its research into the development of the new therapy.

AgResearch’s stand profiled research that aims to fight drench resistance and mastitis, and

featured the Food & Textiles Group’s stab-resistant vest. AgResearch Education Officer Colin Nicol, taught visitors how to extract their own DNA, while AgResearch’s Grant Shackell invited visitors to match meat to its DNA profile —represented by a rainbow-coloured stick.

Meat & Wool New Zealand highlighted its Monitor Farm Programme with a large map featuring flashing lights that indicated the location of its 28 farms throughout New Zealand.

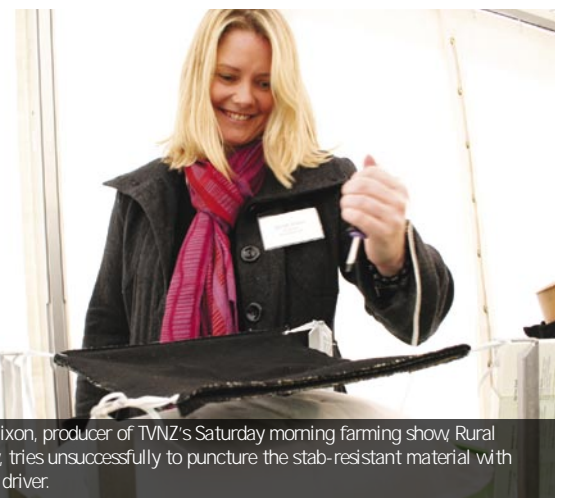
“Our Monitor Farms are developed in conjunction with communities to ensure local issues are dealt with,” says Meat & Wool New Zealand’s Jo Jensen.

“A farm is selected, problems highlighted, then a facilitator works with the respective farmers to offer practical help and advice on how to improve the business and achieve desired results”

Catapult Genetics, a company that focuses on DNA technologies for sheep and cattle, used an interactive display to show visitors how DNA markers move through sheep populations. The display also explained DNA genotypes —the unique image that each person’s DNA makes when it is analysed.



AgResearch scientist Dr Bryce Buddle helps visitors extract their own DNA.



Sarah Nixon, producer of TVNZ’s Saturday morning farming show Rural Delivery, tries unsuccessfully to puncture the stab-resistant material with a screw driver.



Minister for Agriculture and Biosecurity the Hon Jim Anderton helps a young charge with an interactive screen display on mastitis.

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Intouch is produced by AgResearch Corporate Affairs

Best microscopes in New Zealand looking for work

When a meat processing company wanted to find out precisely what was in the meat patties it was producing, it gave AgResearch a call.

AgResearch's Protein & Structure Team uses state-of-the-art microscopes to analyse everything from meat patties and fibres, to brain tissue and spiders. Its Microscopy Unit includes the most powerful Transmission Electron Microscope in New Zealand — capable of 3D imaging.

Microscopy covers a range of techniques that are used to magnify the surface of a specimen, or to provide internal structural information down to a nanometre scale.

"Not only do we have some of New Zealand's best microscopy capabilities, we also apply world-leading scientific expertise to your research — all at competitive prices," says team leader Dr Jolon Dyer.

"It's a great research tool, enabling scientists to measure the physical details of extremely small structures and relate that to physical properties such as how it feels and strength. Once we understand the structure, we can relate it to the physical properties and we can improve product quality."



Left: An African jumping spider viewed through a Scanning Electron Microscope. Right: AgResearch Lincoln's Richard Walls at the 300,000 volt Transmission Electron Microscope.

While most of the team's external work is for other research organisations, it also gets approached by private companies

"The meat processing company was exporting to Asia and wanted us to identify exactly what fibres were in the patties — for quality control purposes.

"Our microscopy facilities generate visually stunning images that are excellent for the presentation of results."

- For microscopy services contact Jolon.Dyer@agresearch.co.nz
Or Duane.Harland@agresearch.co.nz

Developing unique solutions for Māori landowners

AgResearch is keen to work with Māori landowners to develop unique science and technology solutions that maximise pastoral assets while maintaining cultural integrity.

"I'd like to re-emphasise AgResearch's commitment to a working relationship with Māori," said AgResearch Director Graham Fraser at the Federation of Māori Authorities Conference earlier this month. AgResearch annually sponsors the conference because it is a chance to inform Māori businesses how it can help with their growth strategies and innovations

"We have much to learn from your philosophies and we are keen to work with Māori to explore the value of science in maintaining these concepts"

To read the full speech of Director Graham Fraser, go to <http://www.agresearch.co.nz/news/speeches.asp>

FoMA is New Zealand's largest Māori business network, with its annual conference attracting the cream of Māori businesses

AgResearch's attendance at the conference not only fits with its Māori strategy but is also in keeping with the Māori belief that there are huge opportunities to create sustainable wealth by utilising science research.