



Dr Mike North, Food Engineer in AgResearch's Food, Metabolism and Microbiology section, testing the pH of 'dark-cutting' meat - just one of a raft of AgResearch projects to help grow New Zealand's meat industry.

Meat colour matters

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Consumers choose red meat primarily on colour - so AgResearch scientists are looking at ways to maintain the desired shade of red in our export lamb, while retaining critical tenderness.

To achieve this, the Meat Science and Food Safety teams within AgResearch's Food, Metabolism and Microbiology section are delving into the various practices and mechanisms that affect meat colour in the chain from paddock to retail store.

Chilled New Zealand lamb spends several weeks in transit before reaching supermarket shelves abroad. While vacuum packaging and refrigerated transport limits microbial spoilage, the meat has time to age and tender. So our export lamb already has a competitive edge in tenderness. Now the teams are seeking to ensure that the meat's colour display life rivals competitor's products, generally aged for a much shorter period.

Research has shown the genetics, diet, nutritional status and stress levels of the animal can all affect the final pH and oxidative status of the meat, causing variations in meat colour and colour stability.

Processing variables that can be influenced, such as the rate of chilling, the rate of pH decline and packaging are also factors in determining meat colour stability.

The teams have discovered that maintenance of the cool chain is crucial to retain meat colour, reduce spoilage, and keep a consistent retail shelf life.

With funding from MIRINZ Inc, the Foundation for Research, Science and Technology and the CRI Capability Fund, the teams have developed a substantial knowledge base on factors affecting meat colour. They now aim to pull their findings together into best practice guidelines for New Zealand's meat industry, and overseas retail clients, to uphold the premium reputation of our export lamb.

For more information contact mike.north@agresearch.co.nz

Bolstering our red meat industry with science

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Pastoral foods have been New Zealand's most important export for many years, and red meat holds its place as a product that is valuable to our economy.



The future growth of our red meat sector is dependent on science. AgResearch scientific teams have many previous research successes, along with current projects, that support the growth of New Zealand's red meat industry. Some of these projects are featured in this issue of Intouch.

Applying science to New Zealand's meat products starts on-farm with research and development in animal genetics, welfare, production and environmental issues, to ensure our meat matches consumer expectations of quality and sustainability.

AgResearch scientific teams are also developing technologies and models to address food safety and marketability of

chilled and frozen meat products, to get them to consumers in optimum condition.

Nutrigenomics New Zealand, an AgResearch, Plant and Food Research and University of Auckland collaboration, focuses on one area of exciting future opportunity. The group aims to determine how foods and food components affect health at the molecular genetic level. Growing this understanding will ultimately lead to the development of new, added-value, gene-specific foods that deliver health benefits to consumers.

"As the world's most integrated pastoral food's research institute, AgResearch supports our red meat industry through a comprehensive overview of the meat

value chain, from soils and forages through livestock, farm management and processing, through point of sale and plate to consumer health and well-being," says AgResearch Chief Executive Dr Andrew West.

"AgResearch is committed to working with Meat & Wool New Zealand, Deer Industry New Zealand, sheep, beef and deer farmers, meat processors and supermarkets to grow New Zealand's red meat industry, through continually building knowledge and technology to help ensure our meat commands a solid market share and decent price."

Stem cells hold potential for future sector growth

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Stem cell research sits at the cutting edge of science – offering significant possibilities for New Zealand's agricultural sector – from boosting the rate of genetic gain in livestock to growing animals packed with high value traits.

AgResearch has been at the forefront of animal stem cell research in New Zealand for nearly two decades, with work on embryonic and adult stem cells.

Embryonic stem cells have a capacity for self-renewal and can differentiate into other cell types to form almost all tissue and cell types. These capabilities mean embryonic stem cells form the basic building components of an entire animal, offering powerful reproductive tools, and a starting material for a wide variety of other genetic applications, including genetic modification.

Current genomic selection requires a large number of cells, usually obtainable only from an animal after birth or later in its life. AgResearch's work in this area aims to eventually lead to genomic selection in-vitro, trimming costs, and significantly reducing wait times to offer speedy genetic gain.

Adult stem cells aid tissue development and act as a repair system for the body through regeneration. AgResearch has been looking at activating or redirecting these cells to improve desirable production traits in animals, including the formation of more muscle mass, wool follicles producing high-value fine wool or increased lactational yield.

AgResearch scientists have also delved into the adult stem cells that regulate antler development to understand the unique regenerative properties of deer velvet. These properties stimulate wound healing, and perhaps even one day, will unlock the key to limb regeneration.

AgResearch teams are looking at whether on-farm dietary interventions can encourage these cells to proliferate, and



AgResearch Scientist Dr Chunyi Li is looking into the stem cells that regulate antler development to understand deer velvet's regenerative properties.

thereby enhance the productive value of a flock or herd.

Reproductive Technologies Section Leader Dr Vish Vishwanath says AgResearch's well developed capability in stem cell research, and its history of collaboration and national and international linkages means the organisation is well placed to take the next steps in this crucial scientific area.

"We are already setting up capabilities for new areas of stem cell research that have strong applications designed specifically

to grow the New Zealand agricultural industry, to generate value right across the value chain."

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Boosting breeding and genetics through stem cells

Pluripotent stem cells – they sound complex, and they are, as the potential key to a new era in livestock genetics and breeding.

A team of AgResearch scientists led by Senior Scientists Drs Björn Oback and Dave Wells hopes to unravel the mysteries of bovine pluripotent stem cells to boost New Zealand's cattle and dairy industries through producing superior animals, quicker.

Pluripotent stem cells can divide indefinitely, and are capable of giving rise to all cell types of an adult animal. These cells are either derived from early pre-implantation embryos (embryonic stem or ES cells) or from implanting genes into adult stem cells to become induced pluripotent stem cells, or iPS cells.

While the breakthrough discovery of pluripotent cells plays a key role in mammalian genetics and medical therapy developments, to date, pluripotent cell types have only been generated in mice and humans. Despite many years of trying, all attempts to derive them from livestock cells and embryos have failed, delaying a raft of critical research initiatives.

Animal breeding and genetic modification are the two major applications for pluripotent cells. Pluripotent cells can facilitate the precise genetic engineering of livestock for improved production traits and products, disease resistance and biopharming.

These cells are also powerful reproductive tools. Giving the potential to select from embryos, ES cell technology could significantly speed up the breeding process. The technology could provide an alternative to cloning for producing superior animals.

For human genetic diseases and cell transplantation therapies, pluripotent cells



AgResearch Senior Scientist Dr Björn Oback and his team hope to understand bovine embryonic stem cells to help our cattle and dairy industries produce superior animals, quicker.

could provide large animal models.

Dr Oback and the team hope to first find the culture conditions under which bovine iPS cells grow, then use these to grow the vital ES cells. Ultimately, these differences in growth conditions may reveal fundamental biological differences between humans, mice, and livestock and establish why it is so difficult to derive the pluripotent cells in livestock.

"Research into pluripotent stem cells represents the next major frontier of reproductive technologies in livestock, for agriculture and biotechnology applications. New Zealand has carved out a niche in this field, where we can be truly world-leading," Dr Oback says.

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Communicating science through song

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A passionate AgResearch scientist has developed a novel way to spread the word about his research – through his other passion, music.

Dr Matthew Barnett – Senior Scientist in AgResearch's Food, Metabolism & Microbiology Section and a part-time member of a rock band – has written and recorded a music video about his research in nutritional epigenetics – the relationship between food and our genes.

Dr Barnett was inspired to produce 'The Epigenome Song' as his entry in this year's MacDiarmid Young Scientists of the Year Awards. While he wasn't successful in the competition, he's enjoyed the opportunity to combine his two loves, and introduce people to the concepts of his research through song.

His nutritional epigenetic research sits under the umbrella of Nutrigenomics New Zealand, a collaboration between AgResearch, Plant and Food Research and the University of Auckland. Funded by the Foundation for Research, Science and Technology through a New Economy Research Fund Grant, the group aims to determine how foods and food components affect health at the molecular genetic level.

Dr Barnett's research looks specifically at gut health – to understand the genetic and epigenetic mechanisms behind gut function, the role food plays in turning key genes on or off, and to establish which foods might have a positive effect on gut health. Ultimately, it's hoped Nutrigenomics New Zealand research will lead to the development of foods that can be matched to individual's genotypes, to offer them specific health benefits, as well as added-value opportunities for producers.

"Most people find music fairly accessible and they enjoy listening to it, so if I can use music to give people a glimpse of this fairly complicated area of science, and show the enjoyment you can get out of science at the same time," he says.

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To see Matt's Epigenomic Music video visit
http://www.youtube.com/watch?v=D_YKiXI7l9c.



Combining science and singing – AgResearch Senior Scientist Dr Matthew Barnett has brought his love of science and music together to write a song about his research.

Deciding a path for the future of fashion

AgResearch recently contributed its wool technology expertise to an assembly of New Zealand fashion industry players looking at what's ahead for our fashion and apparel sectors.



Fashion leaders and tertiary educators from around the country gathered in Christchurch earlier this month for the Fashion Industry New Zealand (FINZ) Education Conference: The Future of Fashion II.

The conference aimed to offer perspectives on how the New Zealand fashion industry is currently positioned in a rapidly changing global environment, and to develop common goals for future directions.

AgResearch's Apparel and Textile Manager Dr Surinder Tandon joined a group of fashion entrepreneurs and researchers as a conference speaker, discussing 'Wool Innovations for High Fashion & Functionality.'

AgResearch's innovations in wool apparel include new spinning technologies to produce yarns that are finer, stronger or bulkier, new fabric constructions and the development of new environmentally friendly chemical treatments and colouration techniques to enhance functionality and appearance. A number of AgResearch's clever fabrics were featured in its runway show at Air New Zealand Fashion Week last year.

Textile innovations are aimed at meeting consumer needs of both fashion and functionality, Dr Tandon says.

"Wool is a natural, highly technical and functional fibre, with recent research opening up opportunities for wool in diverse new areas of apparel to help wool sustain its fibre market share," he says.

The future line of new wool products from AgResearch will include high drape women's wear, travel suits, colour and texture effects, new generation next-to-skin active wear, high performance sportswear and outdoor clothing with multiple functionalities and a range of technical and smart textiles.

For more information contact surinder.tandon@agresearch.co.nz

A garment designed by Jimmy D and made from AgResearch Textiles' revolutionary new 'next to skin' fabric created from New Zealand Merino wool. It featured in the AgResearch runway show, The Science of Fashion, at Air New Zealand Fashion Week last year.

Mahe the lamb has been recoloured green using Photoshop.

Big Science – Big Results

AgResearch science recognised for making a difference

AgResearch Textile Science & Technology Section Manager Dr Peter Ingham and his team, Dr Surinder Tandon, Steve McNeil, Maree Hamilton-Chisholm, Larissa Zaitseva and Carolyn Piper, received a Travel Award from the Royal Society of New Zealand and the Japan Society for the Promotion of Science (JSPS) to participate in a one week workshop on 'Development and Evaluation of High Performance Wool Fabrics', hosted by Professor Takako Fujimoto and her team at the Hokkaido University of Education in Japan this month. A number of papers on the current joint and new research projects will be presented.

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AgResearch Textile Science & Technology Section Manager Dr Peter Ingham (left) and his team, Dr Surinder Tandon, Carolyn Piper, Maree Hamilton-Chisholm, Steve McNeil and Larissa Zaitseva received a travel award to contribute to a recent workshop in Japan on high performance wool fabrics.

Recent achievements

AgResearch Scientists Dr Graeme Attwood, Dr Christina Moon, Dr Bill Kelly, Dr Eric Altermann, Dr Sinead Leahy and Dr Dragana Gagic have been successful in their application to the US Department of Energy's Joint Genome Institute (JGI) to have the DNA from microbes within the forestomach (rumen) of ruminant

animals sequenced. Set to begin after September, the sequencing will help pave the way for biofuel production from agricultural wastes and producing more food from ruminant animals with lower environmental impacts.

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