DODD-WALLS CENTRE COLLABORATION
GAME CHANGER FOR NZ'S MEAT INDUSTRY

A new platform of meat quality sensors being developed by an unlikely collaboration of scientists could add $200 million to the annual profit of New Zealand's meat industry by sixteen years after launch. This project alone would deliver a 500% return on the government's investment in the Dodd Walls Centre and gives a taste of the kind of industry collaborations made possible by the Centre of Research Excellence.

The project was awarded a five year MBIE bid to develop a prototype device that uses laser light to non-invasively test the quality of meat. The team works closely with the meat industry and combines meat scientists from AgResearch with laser specialists from the Dodd Walls Centre.

Surprisingly, the story began with a phone call from a geneticist to a low temperature quantum field theorist. John McEwen, a senior scientist from AgResearch rang fellow Dunedinite and DWC physicist Blair Blaikie who passed him onto DWC Director David Hutchinson. At the pub that evening David bumped into DWC spectroscopy expert Keith Gordon who turned out to be working on a meat quality proposal already with DWC Principal Investigator Frederique Vanholsbeeck from Auckland University. Frederique already had research projects with the meat industry and was co-supervising a student with Keith looking into meat quality. It was a perfect opportunity to further the collaboration. With a flurry of phone calls across the country the team came together and the grant-writing began.

Measuring the quality of cuts is a major limitation for the New Zealand meat industry. Although we sell to markets where consumers will pay premium for high quality, there is currently no way to accurately and objectively measure and grade the quality of cuts. For over twenty years meat industry scientists, both here and overseas, have been trying to develop non-invasive sensors to solve this problem but with little commercial outcome.

Up till now the industry has focused on a technique called hyperspectral imaging, which provides some information but doesn't give a complete picture. The Dodd Walls Centre researchers have added a range of new techniques for using laser light to interrogate the structure and composition of meat.

> "WITHOUT THE CENTRE OF RESEARCH EXCELLENCE IT WOULD NEVER HAVE BEEN POSSIBLE TO PULL SUCH A DIVERSE TEAM TOGETHER, TO FUND THEIR TIME AND TO CONNECT ACROSS INSTITUTIONS, DISCIPLINES AND SECTORS."

"From our perspective, working with the Dodd Walls Centre is a complete game-changer," says Cameron Craigie, project leader from AgResearch. "Our hypothesis was that there has been a lack of fundamental research. Everyone has been focused on the quick and dirty point and

shoot. When my colleagues and I came across these new techniques we thought "Wow! how did we not know this?!"

Through Frederique and her team at Auckland University they have been introduced to Fluorescence Spectroscopy and Optical Coherence Tomography (OCT) which reveal the structure of the sample. Keith and his team at Otago University bring expertise in Raman Spectroscopy and Near Infrared Spectroscopy, which tell you about the chemical composition.

The plan is to test each technique on a standard set of meat samples and combine their strengths in a prototype device. The team will focus on three parameters of meat quality - texture, pH and fat composition. Meat scientists at AgResearch will prepare the samples and DWC researchers will test them and correlate results. With the help of collaborators at Callaghan Innovation and laser experts within the Dodd Walls Centre they will then develop a sensor prototype.

The new techniques could help to realise Cameron's ultimate vision of tracking the journey of each cut of meat back to the farm. This would enable feedback loops to inform farm conditions, animal health and genetics. It could also enable consumers to know the exact origin of their meal.

"A meat processing plant is like a car wreckers," Cameron explains. "You start off with one entity and end up with so many different cuts. Traceability of those cuts is a big challenge."

Current sensors only work on cut samples of meat, which are difficult to trace. But using OCT, which penetrates beneath the surface of the sample, it may be possible to test meat quality when the carcass is still whole and easily traceable.

The project is a win-win for all concerned.

For the meat industry, it offers a risk-free way of testing a range of new techniques that would otherwise be unavailable. It is rare in an industry context to find a group of scientists who will give you an honest answer without trying to sell you something - a huge advantage for making decisions. Having access to expertise for prototype development also reduces the barrier to commercialisation.

For Frederique and Keith, the project is an exciting opportunity to correlate their techniques and push the limits each technique. The results could have applications in many fields including new medical imaging techniques and devices. Their students are excited to be part of a real-world project that will add value to New Zealand and to their qualification. This kind of collaboration gives them a sense of how everything connects together and often leads into a career.

As Keith Gordon said: "I hope this grant is a signal to people across the primary sector, that there is a bunch of people here that could help with their problem"

The beauty of laser spectroscopy is that it applies to almost any material. DWC scientists are already working with the dairy, fruit and chocolate industries. This project has begun to spur further collaborations with the New Zealand Salmon Industry and possibly the Australian Meat Industry who could fund future research.