

CONSUMED

June 2019 | Issue 05



New Zealand
**FOOD SAFETY SCIENCE
& RESEARCH CENTRE**

IN THIS ISSUE

**ANNUAL SYMPOSIUM, CHRISTCHURCH,
1ST JULY**

**THE PACKAGING DILEMMA: SAFE AND
SECURE FOOD OR ECO-TOXIC RUBBISH**

**FAREWELL TO OUR INAUGURAL
DIRECTOR**

**TRACEABILITY, TRUST AND
STORYTELLING** *Dr Anne Astin*

**SMART PACKAGING FOR CHINESE
CONSUMERS** *Erin Young*

**CHINA WORKSHOP ON PESTICIDE
RESIDUES IN TROPICAL FRUITS**

LIVING THE DREAM *Sam Murray*

WHY IS YERSINIOSIS ON THE RISE?

MID-TERM REVIEW



Start the day with an inspirational women's breakfast, hearing from experienced and successful women scientists and educators.

It may be fully booked by now, but if you wish to attend, email Centre administrator Michal Dunn, at M.J.Dunn@massey.ac.nz.

WHERE: Golden Fleece Room, Crowne Plaza Hotel, 764 Colombo Street, Christchurch

WHEN: Monday 1 July

TIME: 7:15am - 8.45am

ENTRY: Free



Annual Symposium, Christchurch, July 1st

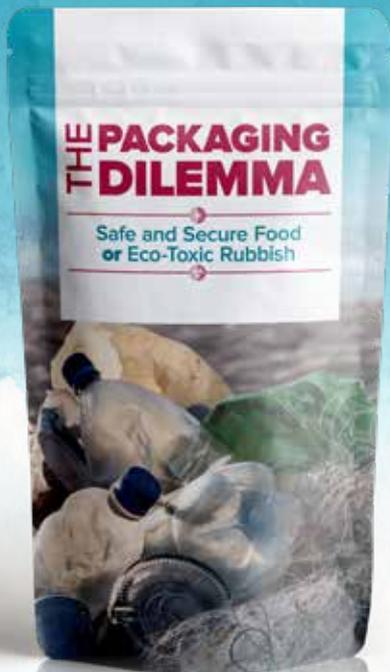
A TASTE OF FOOD SAFETY SCIENCE

The Centre's annual symposium in Christchurch is just weeks away, and promises to be the most efficient and stimulating way anyone professionally concerned with food safety science can get up to speed with the latest research and consumer trends - in JUST ONE DAY.

For women participants, the day will start with an inspirational breakfast, hearing from experienced and successful women scientists and educators, including Professor Juliet Gerrard, the PM's Chief Science Advisor, and Ms Nori Parata, Principal of Tolaga Bay Area School. Thanks to Zespri, the breakfast is complimentary. The breakfast is at the Crowne Plaza Hotel, starting at 7.15am. It will be well worth getting up early for!

For everyone, the day will end with companionable drinks and nibbles, and an on-the-edge-of-your-seat discussion about plastic packaging and alternatives, chaired by Kim Hill, and recorded for broadcast by RNZ. Panel members had better have their facts at their fingertips. You can be sure that Kim will have done her research.

During the day, you'll hear from a number of international speakers: Professor Martyn Kirk (ANU); Gale Prince (SAGE Food Safety Consultants USA); and Alison Turnbull (SafeFish Australia). See the full programme and impressive line-up of local speakers: <https://www.nzfsrc.org.nz/node/134>. It's not too late to register!



THE PACKAGING DILEMMA

Safe and Secure Food or Eco-Toxic Rubbish

A highlight of last year's annual symposium was an entertaining panel discussion on the Future of Food, led by broadcaster Kim Hill. It was recorded by RNZ and broadcast to a national audience, twice. You can still hear it at <https://www.rnz.co.nz/stories/2018652340/the-future-of-food-more-plants-and-our-meat-and-milk-artificial>.

It augured the development of alternative proteins and changing diets as the world starts responding to the urgent need to reduce carbon emissions, and pollution of waterways. The call by activists for people to give up or drastically cut down on meat and dairy has become louder in the last year.

Is eating synthetic meat "the vaping of the smoking world?" asked Kim Hill. Chef and culinary writer Ray McVinnie imagined a future in which synthetic meat might be the choice of those who have no alternative because

they're poor, while rich people will continue to eat real meat despite the greater cost.

Now, another huge and disruptive revolution is underway as consumers and governments reject plastic and other packaging. The global pollution problem has been horribly highlighted by the collapse of an old West Coast landfill into the Fox River, and the dispersal of ugly plastic and other waste for nearly 100 kilometres along the beautiful coastline. Now that China has stopped taking our recycling, many more of our plastics are ending up in landfills as local governments can't deal with it.

The Centre has convened an expert panel to discuss this 'wicked problem' at the end of its annual symposium on 1 July. How quickly can we develop alternative sustainable packaging that assures food safety and prevents food damage and waste?

CHAIR: Kim Hill and recorded by broadcast by RNZ

WHERE: Avon Room, Christchurch Town Hall, 86 Kilmore Street, Christchurch

WHEN: Monday 1 July

TIME: 6.00pm to 7.15pm

Annual symposium participants are invited to attend and will be treated to complimentary drinks and food before the event begins.

PANEL MEMBERS ARE:

- **Sharon Humphreys**, Executive Director, Packaging New Zealand
- **Dr Elspeth MacRae**, Chief Innovation and Science Officer, Scion
- **Mike Sammons**, Sustainability Manager, Foodstuffs
- **Xiaomeng Wu**, Associate Professor of Food Safety and Packaging, China Agricultural University, Beijing, China



This event will be recorded for broadcast by RNZ National. No admission after 5.55pm. If you are not attending the annual symposium, but would like to go to this event, email Centre administrator Michal Dunn at M.J.Dunn@massey.ac.nz

FAREWELL TO OUR INAUGURAL DIRECTOR

by Giselle Byrnes

It will be with great sadness that we will farewell Distinguished Professor Nigel French, the inaugural Director of the NZFSSRC, at the end of July. Nigel has been involved with the Centre since well before its formal establishment in 2016, when he was recruited to the role of Director.

Alongside his Director role, Nigel has maintained an active research career. He is leaving the Centre to advance on a full-time basis his research commitments on the control of infectious diseases in New Zealand, with a focus on human-animal diseases and reducing the public health impact of food- and water-borne pathogens.

Nigel will retain an association with the Centre and we will particularly draw on his expertise in progressing the outcomes of the recent mid-term review and maintaining his leadership of the NZ-China Food Protection Network. Nigel has made - and will continue to make - significant contributions to the Centre and to food safety research both here in New Zealand and internationally. In 2014 Nigel was elected a Fellow of the Royal Society of New Zealand, in recognition of his contribution to the control of food-borne disease, both in New Zealand and overseas, and in 2018, he was made a



Distinguished Professor by Massey University, the highest academic accolade given to a serving academic staff member. We have benefited enormously from Nigel's exemplary leadership, his widely acknowledged expertise and his tireless advocacy on behalf of the Centre and wish him well for his future research adventures.

Dr Anne Astin

TRACEABILITY, TRUST AND STORYTELLING

The Centre held a workshop in Nelson (17 April) on the traceability of food. While food safety is the most important imperative for improving traceability, there are many other qualitative marketing reasons for wanting to be able to identify and validate the provenance of foods. More and more, consumers are demanding to know where their food comes from to be assured of its authenticity, quality, animal welfare standards, and so on.



Consumers of premium quality meat may even want to identify an individual animal, and see the place where it spent a short but happy life roaming a sunny, sheltered paddock with a view of the Pacific. More prosaically, *Mycoplasma bovis* has proven the point of keeping detailed animal movement records, and ensuring oversight of the system. These and other systems are only as good as your weakest link, observed one participant.

International Science Advisory Panel member, Dr Anne Astin, who advised on the establishment of NZFSSRC, facilitated the well-attended meeting, drawing on her vast experience in the Australian food sector. It addressed some big questions: what protocols exist now, what else do we need to know in order to improve food safety, what do consumers want to know, what is possible with new technologies, what are the common and different challenges each sector faces, what role could the Centre play in supporting the development of the food production sector and national measures and methodologies and what role should the government play?

Fast-tracking the origin of foods to the country, region, farm, animal, orchard, processor, distributor and retailer, is obviously vital to dealing with food safety events. It also protects the reputation of innocent suppliers and foodstuffs. New Zealand is a brand rather than a country, one attendee remarked, so there is a collective responsibility and benefit to upholding its reputation, and telling product stories that

are consistent and founded in reality, not the copywriter's imagination.

In the case of wine, provenance resolution can come right down to which side of a particular hill grapes were picked. Soils leave their unique signatures on food as well as wine - different complements and ratios of minerals and isotopes.

A representative from Fonterra explained the changes Fonterra have made since the false botulism scare to put traceability front and centre of their protocols. They have established a Traceability Centre of Excellence, and constantly reinforce the messages and systems with staff, new and old.

A key question is whether we can and should have a national traceability system. Or are the requirements of food producing sectors so different that they are better to develop and regulate their own, albeit with some kind of independent government oversight? What databases exist that could be used or linked, e.g. maps of soil type, NZ Customs records? Each sector is likely to have different priorities and market access conditions beyond food safety

assurances: chemical residues, use of antibiotics, animal ethics, conditions of workers, guarantees of purity (honey) and geographical origin. A Zespri representative made the point that it is difficult to control the food chain once the kiwifruit is out of the box.

Different countries care about different things. There is tension between anti-packaging consumers and the requirement for tamper-proof packaging and brand identification. Some consumers care more about animal and people welfare, and take safety for granted. Country of origin is very important and happily in New Zealand's case, gives a lot of confidence to many overseas consumers.

It was generally agreed that the Centre could play a lead role in taking the discussion further, framing and initiating research, and coordinating action. It could also help overcome competitive data sensitivities and IP issues. A good place to start might be a stock-take of available tracing technologies. And it will be important to develop a value proposition for traceability to engage industry. The workshop was just the beginning.



Erin Young, University of Otago

SMART PACKAGING FOR CHINESE CONSUMERS

Erin Young's PhD research on packaging coincides with an enormous spike in public demand to reduce or get rid of it - plastic in particular. Almost overnight, it seems, single use plastic bags disappeared. Under relentless consumer pressure, supermarkets are challenging all their suppliers to fundamentally re-think their packaging. Erin says that the life cycle of packaging has always been on the agenda, but the importance and visibility of it has shot up. Plastics are so embedded in manufacturing processes; it's not an easy fix, she says.



Supermarkets and other major companies have signed the Plastic Packaging Declaration committing to 100% reusable, recyclable or compostable packaging by 2025. Erin says "The most heartening part of this declaration is that Amcor (one of the key flexible plastic packaging suppliers in NZ) is part of it. This suggests that there is a move from at least this packaging supplier to drive R&D from the bottom up rather than simply responding to customer demands in terms of the commitments made in the declaration. The flow on effect should be an uptake into many other companies that use Amcor as their supplier, rather than just the food manufacturers listed in the declaration." Adding to the pressure, China suddenly stopped accepting recycled material from other countries. A lot of our recyclable materials are now going to landfill because New Zealand simply doesn't have the capacity to deal with them.

Erin is excited to be part of this dynamic change, drawing on her years of solid and varied industry experience at Sealord, Cerebos Greggs and Cadbury. She understands the diverse challenges of separating frozen fish fillets and expelling the last bit of cold tomato sauce from the bottle. One of her first jobs was in the seafood unit of Crop & Food, Nelson, where she researched mathematical modelling of hoki chilling, and how to prevent browning from enzyme reactions in mussels.

Last year, Erin decided it was time for a new challenge and a step up. She applied to do a PhD in the food science department at University of Otago; Associate Professor Miranda Miroso and Professor Phil Bremer are her main supervisors. Her PhD is funded by the Centre, and builds on her Bachelor of Technology (1st class honours) and postgrad qualification from Massey in packaging technology. Erin's doctoral research will concentrate on the packaging and presentation of NZ food exports to China. Their imperatives are different from ours. They are understandably a lot less complacent and trusting than we are about food safety, food fraud, and tampering, so packaging is not so easily done away with. For many, it is intrinsic to the perceived value of the product. Packaging for these markets is becoming more sophisticated.

In November Erin went to Beijing, with Phil Bremer and Miranda Miroso, to help conduct focus groups on 'smart packaging' - a collective term for both active and intelligent packaging technologies. Building the reputation of the NZ brand, and increasing the value and reputation of food exports to our biggest market, is of some importance.

A common technique in many smart packaging ideas is using the reaction of volatiles from fruit, say, to change the colour of a chemically sensitive material in the pack. So, for example, when it



shows a certain colour you know it's fully ripe. (It might also stop damage from customers squeezing them!) The same idea can be used with seafoods, where freshness, and careful handling and storage are vital. A time-temperature indicator might record the temperature history of seafood, so you know your mussels haven't been stewing on a hot tarmac in Singapore, waiting to be unloaded. The warmer and older it becomes, the more volatiles are released. Another idea is to incorporate anti-microbial substances - harmless to humans - in packs. These would significantly reduce spoiling. Importantly, the focus groups probed how much consumers would be prepared to pay for these quality assurances.

Erin is now processing these results, doing a literature review, and interviewing NZ exporters. Attendees at the Centre's annual symposium on 1 July can look forward to hearing more about Erin's research in her three-minute thesis.



CHINA WORKSHOP ON PESTICIDE RESIDUES IN TROPICAL FRUITS

Centre director, Distinguished Professor Nigel French, led a delegation of New Zealand scientists to attend a workshop and field trips in Hainan and Nanning, China, 12-15 March, 2019: Thiagarajah Ramilan, Yun Duan, Dr Melanie Davidson, and Centre Manager, Wendy Newport-Smith.



New Zealand | China
FOOD PROTECTION NETWORK
新西兰中国食品保护交流网

The purpose of this workshop, organised by the NZ-China Food Protection Network, was to encourage the development and use of Integrated Pest Management (IPM) tools and measures to reduce or eliminate insecticide residues. It is one of the Network's initiatives to collaborate with China on food safety science and research for mutual benefit.

The workshop explored the causes behind the evidence for the identified chemical residues and ways of reducing this risk. High-end consumers are demanding minimal residue levels, though it is consumer demand for perfect looking fruits that has led to high and indiscriminate use of pesticides.

For example, in the current market for mango in China, consumers favour large and spotless mangoes. This requires high pesticide dosages. Growers have different levels of education and awareness of the safety issues around pesticide use. Growers may be more concerned with appearance and yield than safety for obvious economic reasons.

The task of educating growers, who are spread across huge areas and used to doing things a certain way, is not easy. Pest scouting and surveillance has been talked about but seldom put into practice. As most of the fruit crops in China are small scale (< 2 ha) and scattered, it is suggested that the scouting should be initiated by the local government during the high pest incidence season of lychee borers. Early warning systems could be employed to inform growers.

Local pesticide retailers are not helping by promoting indiscriminate usage of pesticides instead of safe and selective use of chemicals or bio-control.



From the field trip in the Zhanjiang region, it was found that growers choose their pesticides by smell. Growers believe the stronger smelling pesticides would be more effective.

IPM is becoming established in fruit orchards in China. Pruning is necessary to reduce the density of tree leaves and leave space for airflow to eliminate the occurrence of disease. Growing grass in orchards is another effective way to prevent the source of specific pests, which tend to lay eggs in the ground during winter and then hatch into adults in spring. Crop hygiene, however, is logistically challenging. It includes removing all of the leaf litter shed by the trees, which can be the host for fungal or insect pests.

IPM strategies require more effort from growers in the short-term than resorting to pesticides. However, the long term benefits gained through reduced risk to growers, consumers and the environment are known to outweigh the short term gains of relying on pesticides, as clearly demonstrated in New Zealand fruit and vegetable case studies. Farmers need to adapt and therefore be educated. Appropriate national and regional level policy will help to achieve this goal. Applying lessons learned from the NZ horticultural sector could help to facilitate the uptake of IPM in China.



Mango seed weevil

Sam Murray, Cawthron

LIVING THE DREAM

Sam Murray now has “the perfect life”, but it hasn’t just landed in his lap. He has worked hard towards this ideal situation for the last fifteen years. An employee of the Cawthron Institute for over 10 years, Sam has now embarked on his ultimate goal - a PhD in analytical chemistry, funded by the NZFSSRC. His research will contribute directly to the Seafood Safety Research Programme led by Cawthron.

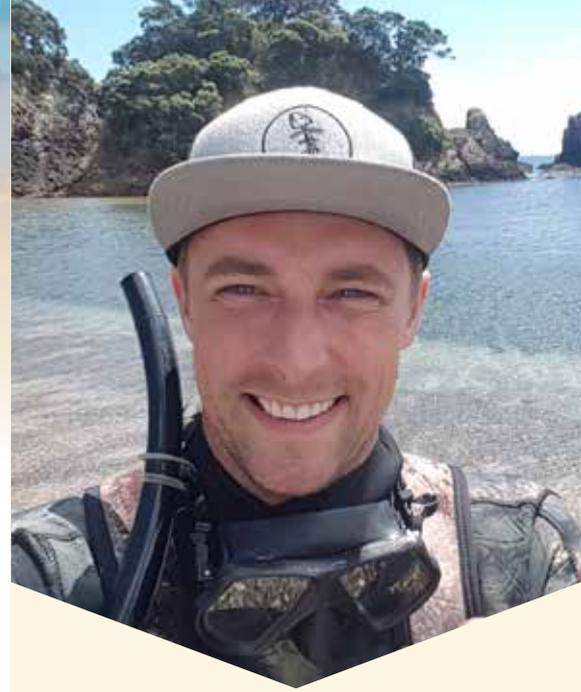
A decade and a half of solid lab work, and experience in marine chemistry at Cawthron, have crystallised his research topic. He specialises in the analysis of marine biotoxins, especially ciguatoxins, which come from microalgae that may well migrate to NZ waters as the oceans warm. When consumed by fish, these toxins accumulate and transform in their tissues and organs to become even more poisonous to humans. The MBIE-funded Seafood Safety Programme is keeping a careful watch on our northern coasts.

The microalgae in question are epiphytic, meaning that they must adhere to something. So the question is how do they get around the ocean? On pumice, perhaps? They have been living in north-eastern Australian waters for centuries, and recently spreading south along the coast of New South Wales to a latitude equivalent to Northland. Sam is monitoring likely seaweed substrates in Northland on a regular basis. Dr Lesley Rhodes at Cawthron cultures the microalgae back in the Nelson lab. Sam is also looking to discover and characterise other compounds produced by the microalgae, good and bad.

So far, the only instances of human ciguatoxin poisoning in New Zealand have come from imported fish. Symptoms include tingling in the fingers and feet, and a reversal of temperature - hot feels cold and vice versa.

There is a lot of international collaboration on this widespread food safety problem. Sam’s PhD supervisor, Centre Deputy Director Dr Tim Harwood, was recently invited to attend a workshop in Rome, dedicated to unifying ciguatera research. Australia is developing a national strategy, and Sam attended a workshop with the aim of developing one for New Zealand. Learning from their experience and management protocols will help New Zealand “hit the ground running” if the microalgae arrive here.

Sam says it’s a real risk to Pacific Islanders feeding off residential reef fish. They’re “playing Russian Roulette” but don’t have much choice. Part of Sam’s PhD research will involve collaboration with people in the Solomon Islands, Federated States of Micronesia, and the Cook Islands. He will also fill the gap in research on depth profiling and gain a better understanding of the microalgae’s distribution.



ABOUT SAM MURRAY

Sam is from Dunedin, and did a Bachelor of Applied Science to start off with, and got some good practical lab experience with Citilab as a water microbiologist, identifying *E.coli* and other enteric bacteria. While working for his keep, Sam then did a graduate diploma in chemistry, and a BSc (1st class honours) in analytical chemistry from University of Waikato. He always had a goal to do a PhD in marine chemistry. Sam moved to Cawthron in Blenheim in 2008, as a lab supervisor, aged just 23. He designed and built a wine lab for Cawthron, which was later sold to Hill Laboratories. The lab carried out wine batch validation for the Ministry for Primary Industries. After the sale, Sam went to Cawthron Head Office in Nelson, first as section head of the dairy lab, and now Senior Pacific Consultant and Analytical Chemist.

For recreation, Sam runs one of the biggest spearfishing competitions in the country. “I can combine my love of the marine world with my sport as a spear fisherman, my ‘job’, and learning more about the marine environment. This is my dream job. I love my life.”



WHY IS YERSINIOSIS ON THE RISE?



Infections from *Yersinia* have been steadily increasing over the last 10 years, and more so since 2015. It is now the third most prevalent food-borne bacterial infection after *Campylobacter* and *Salmonella*, with 1200 cases reported last year. A memorable outbreak in 2014 made 220 people sick and sent 70 to hospital. Victims were predominantly female - particularly young women, 30-39 - with a cluster in central Christchurch, indicating a point source. The common link seemed to be lettuce and carrots, but this was never confirmed. Salad supply chains are complex - a mixed salad might contain ingredients from several different growers and processors.

In late March, NZFSSRC, ESR and MPI convened a meeting to survey what is known and what research needs to be carried out to learn more about the sources and pathways of this disease. MPI are particularly interested in the most important emerging species that cause enteric disease, *Y. enterocolitica* (Ye) and *Y. pseudotuberculosis* (Yps). They want to identify the skills and technical resources available in New Zealand and develop a *Yersinia* action plan.

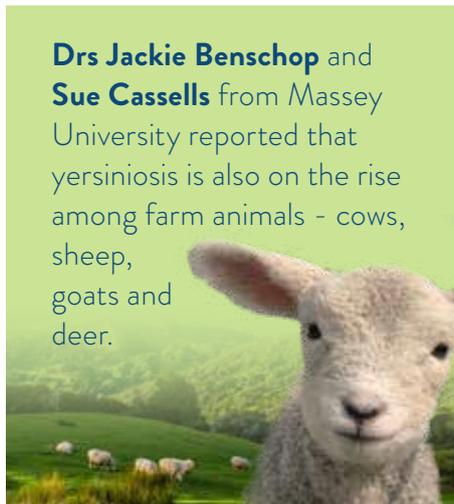
What are the main risk factors associated with these bacteria? What foods are important? Can *Yersinia* migrate or be carried with water inside fresh produce as some other bacteria can?

It is suspected that a common food source is involved, perhaps something we are eating more of as our population and dietary habits change. Dr Brent Gilpin from ESR noted that the highest rates of infection of the emerging biotype 2/3 are in the Asian and MELAA groups in New Zealand, which could be due to a particular food preference. It's too early to point the finger at any one possibility.

Drs Jackie Benschop and Sue Cassells from Massey University reported that yersiniosis is also on the rise among farm animals - cows, sheep, goats and deer. It can cost farmers about \$25K to treat an average-size dairy herd, with a total estimated financial burden to the New Zealand dairy sector of between \$4.7M and \$7.4M per year.

Yersiniosis causes sheep to abort and commonly affects young deer. Disease is more likely to occur where animals are under stress brought on by insufficient feed, crowding, transport, cold weather, separation from their mothers, and co-morbidities. *Yersinia* live quite companionably with pigs, concentrating around their tonsils.

Drs Jackie Benschop and Sue Cassells from Massey University reported that yersiniosis is also on the rise among farm animals - cows, sheep, goats and deer.

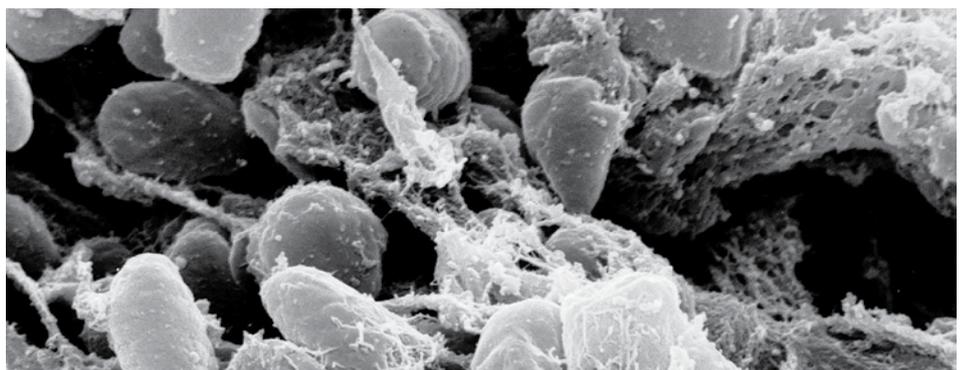


Yersinia are tricky to isolate and culture. MPI is currently working to improve detection methodology with a focus on recovering *Yersinia* from foods. They are often present in low numbers and enrichment is needed, but *Yersinia* grow poorly amongst background microflora. Their ability to grow in cold conditions means cold enrichment has

often been used to encourage *Yersinia* to grow while discouraging growth of other microflora. However, this can take weeks, which makes the approach unsuitable in an outbreak situation.

Whole genome sequencing (WGS) will be brought into play to build a picture of the relationships among animal and human samples from different locations. Traditional typing does not discriminate strains sufficiently. The current New Zealand bank of *Yersinia* isolates numbers over 6000. ESR has fully sequenced approximately 300 isolates. Professor Nigel French proposes that a bank of WGS data be established and further sequencing undertaken, prioritising isolates that could provide reference genomes.

The Centre, and colleagues at MPI and ESR, recognise that this is not just a food issue. There is a need to join human health and animal health with epidemiologic data, and data from food, water and the environment in a One Health approach.



Scanning electron micrograph depicting a mass of *Yersinia* bacteria, Credit: Rocky Mountain Laboratories, NIAID, NIH

MBIE and MPI

RESULT OF CENTRE'S MID-TERM REVIEW

The Ministry of Business, Innovation and Employment (MBIE) and Ministry for Primary Industries (MPI) commissioned an independent mid-term review of the Centre in 2018, approximately halfway through the contract.



The Review found that the Centre has:

- Created a critical mass of science excellence within New Zealand by driving collaboration and coordination across the system, and gained good international visibility, particularly in China
- Developed collegial relationships amongst researchers; and
- Made significant efforts to bring researchers, government and industry together to identify and support critical food safety research for New Zealand

The upshot is that the funding model will change from 1 July. The government will now underwrite all the Centre's administration costs, but overall the contribution by industry to the total budget must be 50%.

The Government wants the Centre to be an industry/government/research partnership that works effectively, is simpler than the current model, and provides strong incentives for primary sector organisations of all sizes to invest in food safety science and research.



To do this, government, the Centre and industry will work together to:

- Identify the key expertise required on a refreshed, skills-based Board; and
- Develop an easier way for small and large food industries to engage with the Centre and support its operation

The Centre staff and Board members will be engaging with industry over the coming weeks in order to talk about what they see as priorities for the NZFSSRC, what their research needs are and how we might best address those.

The implications of these changes will be discussed in more detail at the Centre's Annual Symposium on 1 July.

A VIRTUAL CENTRE

The NZFSSRC pools the existing resources of partner organisations from across New Zealand. Current NZFSSRC partners are:

FUNDERS:



**MINISTRY OF BUSINESS,
INNOVATION & EMPLOYMENT**
HĪKINA WHAKATUTUKI

Ministry for Primary Industries
Manatū Ahu Matua



COLLABORATING PARTNERS:



New Zealand
**FOOD SAFETY SCIENCE
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