

# CONSUMED

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**FOOD SAFETY SCIENCE  
& RESEARCH CENTRE**

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## A KNOWLEDGE FEAST

### Uawanui Kai-blitz

This was just part of the menu after a hard day's hunting and gathering, discussion and learning in Uawa/Tolaga Bay on 7 March. The menu of species to collect was set following research and interviews with the pakeke (elders) by students from Kahukuranui, the Maori language immersion unit at Tolaga Bay Area School.

The Kai-blitz masterclass was part of a shared project between NZFSSRC and Plant and Food Research, and Te Aitanga-a-Hauiti. The aim is to learn from each other and look at how to ensure that traditional food sources are safe, and kept safe, in the changing environment. The project is funded by Vision Mātauranga and led by NZFSSRC Manager, Wendy Newport-Smith, who has worked together with this community for a few years now.

Twelve scientists from NZFSSRC, Plant and Food Research, Massey and Otago Universities (listed below), 17 students and teachers, Richard Tuhaka and Pele Kupenga-Keefe from Kahukuranui,

and members of Te Aitanga-a-Hauiti iwi, all got together for the Kai-blitz.

It was a knowledge feast for all concerned, ending in an impressive array of locally sourced wild food.

Centrally involved in the day's programme was Peter Handford from private ecological restoration consultancy Groundtruth, which was originally engaged by the Allan Wilson Centre to help the community set out and realise its vision for land and sea restoration. This work is ongoing through Te Aitanga-a-Hauiti, Tolaga Bay Area School, the Uawa-Tolaga Bay community, Hauiti Incorporation, Mangaheia Incorporation and many others. Current funding support is provided from the Te Mana o Te Wai Fund, administered by the Ministry for the Environment, and is supplemented by DOC, MPI and others. Discussions around the field trips to various sites in the Uawa catchment and coast traversed collection and harvest practices, site conditions, land use impacts, as well as local stories, history and philosophy. When Captain Cook first arrived in 1769, he and his men were impressed by the thriving community and their productive gardens. Food preparation and safety issues were discussed as the food they had gathered was being prepared and cooked. The common language of all cultures and the way to mutual understanding is to sit down together for a meal. And what a meal.



## Uawanui Kai-blitz - Continued



## HERE'S WHAT SOME OF THE PARTICIPANTS HAD TO SAY ABOUT THIS SPECIAL DAY:

### PELE KUPENGA-KEEFE AND RICHARD TUHAKA (TEACHERS AT TOLAGA BAY AREA SCHOOL)

*Kātahi te hui whakahirahira ko tēnei. I kitea e ngā ākonga te hiranga o ngā pūkenga me ngā mātauranga a o mātou mātua tipuna mo te mahinga kai. Ka mutu pea te kitenga miharo mo ngā ākonga te kite atu i te hākoakoa kei runga i ngā mata o ngā kaipūtaiao me ngā mātanga kaihaumarū, ka tau mai te mōhio, ahakoa he kai noa ēnei no roto o o mātou whare, he āhuatanga hou ki ētahi atu, ā he rongomaiwhiti hoki. Mai i te akuaku korokoro kawakawa me te miere, ki te mātotoru o te puha e hora ana i raro tonu i ngā whatu matapō, tae rawa ake ki te pāua kirimi waitī. I te mutunga iho, huahua te putunga mai o te kai a te rangatira, he kai e tipu matoro ana i te pātaka kai o Hauiti. He manaakitanga, he mātauranga mai i te awa ki te tēpu, me te hinengaro ki te waha. He wā hira, he hākari i e ki ana i te mātāu me te hokinga mahara.”*

“The Kai-blitz was a valuable experience for our students. It enabled them to see the value in their own skills and knowledge and that of their tipuna around mahinga kai. It was an experience for them to witness the elation shown on the faces of the scientists and food safety experts, and realise that what is normal to us is quite unique and special to others. From the kawakawa and honey palate cleansers to the plethora of puha so abundant beneath our untrained eyes, to the delectable creamed pāua. It was a feast fit for kings, found within arms-reach, growing wild and free in the pataka of Te Aitanga a Hauiti. The Kai-blitz was traditional in the manaaki and knowledge sharing, from creek to the table, from minds to the mouth. Momentous in moments, a visceral banquet of insight and remembrance.”

**NORI PARATA, PRINCIPAL,**

### DR RUSSELL DEATH, MASSEY UNIVERSITY

As a freshwater ecologist I am used to looking at a waterway for its ecological health so it was enjoyable and enlightening to focus my view through the different lens of food safety. I have done considerable research on how the health of a waterway affects the types and abundance of animals living in them. However, although I am aware that those animals and plants represent a food resource for many people, including tangata whenua, I have never really given that much consideration before.

As an important food basket for many, this is a glaring oversight and has given me much to contemplate. We need to dedicate far more research and attention to the effects of land management on waterway health and the flow-on implications for the health of food resources coming from those waterways. The trip to Uawanui to focus on the food safety of mahinga kai was a great first step to introduce me to the variety of foods available in and around waterways. We now need to develop ways for people to use indicators of waterway health that we have been using in freshwater biomonitoring to help discern if the food resources in those waterways are safe to eat.



### TOLAGA BAY AREA SCHOOL

The Mahinga Kai project has been a great example of planned collaboration leading to successful learning outcomes for students and our community/iwi. We feel so fortunate to have such a rich localised curriculum, a catchment as our classroom, and be supported by a wide range of scientists.

With some interest we have followed the students and their whanau engagement in this project from late last year. Their enthusiasm was infectious. Some of the students' digital recordings of the pakeke (older people) in our community are gems that contain rich cultural practices on the harvesting and preservation of indigenous foods that have been handed down through successive generations. We've learned a lot. The kai 'blitz' or harvesting enabled us to showcase some of these tikanga and associated mātauranga, and brought scientific knowledge alongside it to deepen our understanding of the importance of 'clean' environments – 'He manawa whenua, he oranga tangata'. On many levels this has been a model of how curriculum should be designed and taught. It has also raised more food for thought about the sustainability of indigenous and wild foods within our catchment.

The hakari was all that a hakari should be - not only the food but the conversations and discussion about our native foods and how we'd prepared them, the manaaki, the reciprocity, and waiata. *Ka nui nga mihi ki wa tatau manuhiri nga kaiputaiao o nga whare wananga horapa I te motu. Nei ano te tai-o-mihi ki a koutou.*

## KAI-BLITZ PARTICIPANTS FROM MASSEY AND OTAGO UNIVERSITIES, AND PLANT & FOOD RESEARCH

- **Nigel French** (Massey University) – Professor of Food Safety & Veterinary Public Health, Director New Zealand Food Safety Science & Research Centre
- **Russell Death** (Massey University) – freshwater ecology
- **Hamish Spencer** (University of Otago) – biology, fish, mollusc

- **Dawn Shaw** (Plant & Food Research (PFR)) – food safety risk management, food processing
- **Sravani Gupta** (PFR) – food safety, microbiology
- **Carolyn Lister** (PFR) – food composition, nutrition and health
- **John van Klink** (PFR) – chemistry, bioactives

- **Jocelyn Eason** (PFR) – postharvest quality storage and handling
- **Stacey Whitiora** (PFR) – fisheries management, Māori agribusiness and regional development
- **Jenny Green** (PFR) – forest ecology, supporting rangatahi Māori in science

- **Pete Handford** (Ground Truth) – Sustainable Land Management and Conservation, Forestry
- **Wendy Newport-Smith** (Massey University) – Scientific network management, leadership and co-ordination of projects with iwi, outreach



Dr Jeremy Hill, Fonterra's Chief Scientist

## INDUSTRY PROFILE: FONTERRA'S CHIEF SCIENTIST

Dr Jeremy Hill has a big job as Fonterra's Chief Scientist. So many family fortunes, as well as NZ Inc.'s, depend on the Company's performance. Fonterra collects and processes about 80% of the milk we produce. As former President of the International Dairy Federation, and a very successful one at that, Jeremy is well qualified for his responsible role.

Jeremy is a Yorkshireman by birth – barely detectable in his voice now after 30 years in New Zealand. He studied for his PhD at Hull University, famous as the intellectual home of poet Philip Larkin. His introduction to the New Zealand dairy scene was in the UK, where he carried out some research for the former NZ Dairy Board (1986-88). After the move South, and three years at Massey University, Jeremy joined the NZ Dairy Institute as a scientist in 1991. It became the Fonterra Research Centre in 2003, when he became General Manager.

Jeremy is a mine of impressive national and global dairy facts and figures. An astonishing 1 billion people in the world are directly supported by income from the dairy industry. There are 150 million farms and smallholdings. Whereas the world is already producing enough meat (if it were shared equitably) to provide everyone with the recommended amount, we are 500 billion litres short of the volume of milk required to meet dietary guidelines. Total production is around 800 billion litres a year – 21 billion litres from New Zealand.

In a very short time, we expect the population to grow from 7 to 10 billion. The drive to increase efficiency in the food chain is urgent. How can we increase our production while reducing environmental impacts? Jeremy says that if all the other dairy producers were as efficient as New Zealand, the global carbon footprint from dairy would be more than halved.

Focussing on food safety, Jeremy emphasises that “food safety must be an enabler and not an inhibitor of global food security”. For example, 30% of food purchased by NZ households (an estimated \$870M) is going to landfills. To what extent is that waste a result of uncertainty about whether food is still fit to eat? Do we need to educate our consumers better about food storage, “best by” and “use by” dates?

*Focussing on food safety, Jeremy emphasises that “food safety must be an enabler and not an inhibitor of global food security”. For example, 30% of food purchased by NZ households (an estimated \$870M) is going to landfills. To what extent is that waste a result of uncertainty about whether food is still fit to eat?*

Globally, food waste is the third biggest source of greenhouse gases after the USA and China.

One issue that is cropping up all the time is the safety of raw milk. Fonterra pasteurises all of its milk to kill any spoilage organisms and pathogens that may be present. Jeremy points to the incidence of hospitalisation due to raw milk and raw milk cheese, and rests his case. The US Centres for Disease Control agrees with this position, as published in the journal “Foodborne Pathogens and Disease” in 2014. NZFSSRC advises New Zealanders not to risk their health unnecessarily. There is no evidence that pasteurisation destroys the nutritional value of milk.

There is contradictory tension between the desire for more natural, unprocessed food, and safe food. Irradiation is an effective way of killing pathogens but the word radiation scares people. Consumer perception must be taken into account, even if ill-founded. Some misconceptions are hard to budge.

There are difficult to quantify, but significant, risks to the company such as social media that reacts at “the speed of light”, far ahead of any measured, accurate responses companies can put out. Regulatory responses are necessarily slow because they have to follow due process.

A paper co-authored by Jeremy (Food safety for food security: Relationship between global megatrends and developments in food safety) looks at all the many new technologies, environmental issues, and threats faced by food producers: climate change, an aging population with aging immune systems, urbanisation, changing consumer preferences, and increased affluence. These present opportunities as well as challenges.

Advances in science and technology such as whole genome sequencing, active packaging (for example where the packaging changes colour when the product inside goes off), developments in tracing and tracking technologies, information computing technology and big data analysis have the potential to mitigate the challenges and meet demands, but will also create new challenges in turn.

For example, increasingly sensitive analytical technologies can identify ever smaller levels of contaminants, which are far too small to have any adverse health affect, but alarm consumers. It is hard for the public to assess risk levels appropriately, and even harder for scientists and health professionals to communicate risk and probabilities effectively. We have to be able to trust our scientists.

Jeremy is very glad to have the support of the Centre, as well as Fonterra's own external food safety science advisory committee – both giving access to the best local and international expertise. New Zealand is now much better equipped to deal with a food safety scare. Lessons have been learnt and there is much more coordination and collaboration among key players - industry, research organisations and government - and a more robust approach to the evidence required to make decisions.



Photo by Elise Strachan

# EMERGENCE OF FOOD SCARES IN CHINA

Associate Professor Eddy Fang, from Xi'an Jiaotong-Liverpool University, Suzhou, came to New Zealand in January, courtesy of the NZ-China Food Protection Network, to give a presentation about the diffusion of information through social media in relation to the emergence of food scares. He uses computational modelling to anticipate and think about various scenarios.

Eddy gave presentations to AUT, Massey University (Palmerston North), Ministry for Primary Industries, Price Waterhouse Cooper, Victoria University of Wellington, ESR (Christchurch), and University of Otago.

Eddy is Chinese by descent, but was born and raised in Belgium where his grandfather studied in the 1920s. He later settled there. Eddy's father is in the food business in Brussels, including the production of bean sprouts. Coincidentally, in 2011, E.coli contaminated bean sprouts – not from his father's supply line – were responsible for over 53 deaths, mainly in Germany. So Eddy and his family have had close experience with a major incident and its regulatory aftermath.

Eddy's dual cultural heritage and fluency in Mandarin, Cantonese, French and English are extremely useful for his international role. He has an MA in International Political Economy

from the University of Warwick and studied for his PhD at the University of Cambridge. His years in the UK added another formative cultural dimension. He took up his position in the Economics Division of Xi'an Jiaotong-Liverpool University in 2012. The University is in the ancient City of Suzhou (popn 4.5M), described as the "Venice of the East" on account of its canals. It is 75kms from Shanghai. English is the teaching medium at the University, which recently signed an MoU with the University of Otago for research collaboration.

Eddy's recent research focuses on consumer behaviour before and during the onset of food scares in the Chinese market. This topic is a complex one as Chinese consumers are highly segmented, with different socio-demographic groups characterised by markedly different levels of trust in suppliers and institutions.

This area of study is yet to attract more attention from researchers, especially in emerging markets, where the fast developing regulatory upgrades often do not translate into consumer trust. A case in point is the melamine scandal (2008-2010) when infant formula was tainted with melamine, resulting in serious health consequences. Almost a decade after the scandal, consumers still have a preference for imported dairy products when affordable.

Eddy's research aims to bring additional insights on the market mechanisms and social phenomena behind the development of food scares in contemporary China. He hopes that this will contribute to the development of policies to reduce the negative consequences of market panics.



Associate Professor Eddy Fang, from Xi'an Jiaotong-Liverpool University, Suzhou.



David Wilkinson

# THE BEST BRAINS STAY AHEAD

UK-born David Wilkinson has found himself in the best place in the world to study *Campylobacter*. Massey University, with good support from the Ministry of Primary Industries (MPI) and Ministry of Health, has been centrally involved in surveillance of this, our most prevalent food safety threat, for many years.

Although the rate of infection has halved since it peaked in 2006, it is still too high – over 6000 reported cases a year. Interventions in the poultry industry reduced the number of cases substantially and work is ongoing to determine the current sources of infection.

The New Zealand *Campylobacter* family tree is well developed and developing as new genome sequence data become available.

David and colleagues were well positioned to react quickly when over 5500 residents of Havelock North became very sick after drinking contaminated water in August 2016. The Massey Lab had a lot of reference samples of *Campylobacter* from various hosts to compare the Havelock North samples against.

David analysed human and animal samples, in parallel with ESR, which helped to identify the Havelock North source as ruminant, in this case sheep which were grazing in paddocks around the aquifer bore head. Although David felt personal sympathy for the suffering of Havelock North residents, the outbreak presented an exciting and unusual professional opportunity to study an outbreak trajectory.

The pressure was on to identify the source. It takes a while – 2 days – for *Campylobacter* to grow, even under the best possible lab conditions. Then, once the culture is ready, it takes another 3 days to do the DNA sequencing and analysis. Although it took time to generate such data, the application of genome sequencing and modelling provided much greater insight

into the source of infection in the interim.

David said it was good to have Massey's accumulated data and expertise used in such a crisis, and to be able to support Centre colleagues at ESR. Certainty about the source was important for all concerned.

David grew up in Kent, and studied molecular and cellular biochemistry at Oxford University, the third generation in his family to merit a place there. He spent ten years at Oxford, including one year as a post-doc. After that, he worked for five years at the Centre for research and surveillance of emerging infectious disease on Réunion Island, in the Indian Ocean – a French Department about a third the size of the North Island, with a population of 850,000 – a rich blend of French, Indian and Chinese cultures with delicious food to match. He married his wife Audrey there.

David is doing research on a number of fronts, including work for the Centre on *Campylobacter*. The main challenge common to all his various projects is the development of more systematic use of whole genome sequencing to fine-tune identification of the sources of various pathogens, including *Leptospira*, which are on the rise. *Leptospirosis* typically affects farmers and meatworkers exposed to cattle, but is now cropping up in urban populations. They don't yet understand where they are getting it from, but suspect wild sources such as rats and mice. *Leptospira* thrive in animal urine and stagnant water.

David and Centre Director Nigel French have been synthesising information on *Campylobacter hyointestinalis*, which can cause gastroenteritis and diarrhoea in humans. This is an atypical infecting agent in people, which will often go un- or mis-diagnosed. However, their research has demonstrated its presence in New Zealand and shown it to be commonly associated with ruminant livestock across the globe.

In the UK and US, whole genome sequencing is applied to all reported enteric disease, and is the way of the future.

There are lots of questions to answer: how do bacteria evolve in an epidemic and what are the genetic determinants that affect virulence and confer antibiotic resistance?

The problem of antibiotic resistance is another focus of David's work. David is assessing the incidence and prevalence of an antibiotic-resistant form of *Staphylococcus pseudintermedius* – a bacterium that is typically present in dogs and cats.

The goal is to understand the complete roadmap of infection, how microbes co-evolve with their hosts and how all these pathogens, animals and humans interact within complex disease landscapes. David is a big fan of the One Health approach which combines research from different topics and scales, including human behaviour.

The changing climate adds another dimension to these studies. The targets are always moving. We need the best brains to stay ahead.



# VISITING SCHOLAR, YUN DUAN



Dr Yun Duan applied to spend a year at NZFSSRC following his meeting with director, Nigel French, at the Chinese Academy of Tropical Agricultural Sciences in 2016. This is Yun's first time abroad, and he is excited by the opportunity and radical change of scene.

Yun comes from Hubei Province in Central China, the location of the Three Gorges Dam on the Yangtse River. It has four very contrasting seasons – hot humid summers through to dry cold and snow in winter. Yun gained his PhD in Physical Chemistry at Wuhan University. Wuhan is the provincial Capital city.

At the Academy, he works on risk assessment of fruits and vegetables grown in tropical and sub-tropical regions. The focus is on hazard identification and exposure assessment. There can be several pesticide residues in a product, which individually do not exceed Maximum Residue Limits, but collectively could pose health risks where the toxic mode of action is the same.

During his year in Professor French's group, from February 2018, Yun is collecting and reviewing current methodologies on combined risk assessment of multiple chemicals, with a view to developing the best approach for the Chinese situation with tropical products. His findings will help to set food standards on co-occurrence of pesticide residues and determine the underlying health risk in food. His conclusions will be of vital interest to food producers, marketers and consumers.

But this Easter weekend, he's having a break and going on the road with friends to explore the New Zealand countryside.

## A VIRTUAL CENTRE

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

### FUNDERS:



Ministry for Primary Industries  
Manatū Ahu Matua



### COLLABORATING PARTNERS:



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**FOOD SAFETY SCIENCE  
& RESEARCH CENTRE**

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