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EMERGING RISK IDENTIFICATION SYSTEM (ERIS)
Report from the third Emerging Risk Identification Panel Meeting
November 2022

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The voluntary participants in the Emerging Risk Identification Panel Meeting were acting in their capacity as independent experts and not as representatives of their employers or in the interests of the organisations funding ERIS.

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Abbreviations

ERIS	Emerging Risk Identification System
NZFSSRC	New Zealand Food Safety Science & Research Centre
MPI	Ministry for Primary Industries
NZFS	New Zealand Food Safety
ESR	Institute of Environmental Science and Research

Acknowledgements

We are very grateful to those who volunteered their time to join the Identification Panel's third meeting, and for their valuable contributions during and after this meeting.

We also wish to thank the project funders: The New Zealand Food Safety Science and Research Centre, the Poultry Industry Association of New Zealand, the Meat Industry Association, Oceania Dairy and Westland Milk Products, Fonterra, United Fresh, Horticulture New Zealand, Zespri, AsureQuality Kaitiaki Kai and New Zealand Food Safety (Ministry for Primary Industries).

1. INTRODUCTION

New Zealand's food industry is not just focussed on research that improves food safety now, but also research that will improve their ability to reduce or avoid future food safety risks. Horizon scanning is needed to identify these emerging food safety risks. While many individual food companies carry out some form of horizon scanning, only a few companies have systematic processes in place that link their scanning efforts to research planning. A review undertaken during 2017/18 identified the need for a systematic horizon scanning system that could identify emerging food safety risks, and then support the food industry to take action.[1]

Consequently, nine food industry organisations and New Zealand Food Safety (NZFS), through the New Zealand Food Safety Science & Research Centre (NZFSSRC), agreed to fund the establishment and implementation of a food safety horizon scanning system. The system is called the Emerging Risk Identification System (ERIS) and is funded for two years until April 2023.

ERIS has the goal of identifying both acute emerging food safety risks and those which may potentially pose a challenge to the New Zealand food industry sometime in the future. The core purpose of ERIS is to provide information which will help the food industry prioritise their food safety research, but the design also helps the food industry respond quickly to acute issues.

The structure of ERIS has two pillars:

1. Gathering intelligence on emerging food safety issues and risks.
2. Supporting decision-making over future research.

This ensures that intelligence is turned into action.

The 2017/18 research, which included investigating existing food safety horizon scanning systems in other countries, identified people as the best source of intelligence on emerging food safety risks. ERIS has been designed as an expert centred system, with intelligence from people complemented by information gathered from other sources. Human networks are at the core.

The Emerging Risk Identification Panel is a key part of intelligence gathering (Figure 1). The intent of this Panel is to bring people together from different expertise areas, allowing them to combine their observations and ideas towards the common goal of identifying emerging food safety risks. Those in the Panel are from a range of disciplines, many only loosely connected to food safety (Appendix A). This allows us to consider changes happening outside the food safety space that might introduce new food safety risks: If you mix people with similar expertise you will get similar views. When you mix people from different disciplines together you can get a much richer picture.

The goal of this Panel is:

> *To improve New Zealand's ability to proactively identify and manage food safety risks by combining intelligence and identifying emerging food safety risks, as part of the NZFSSRC Emerging Risk Identification System (ERIS).*

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[1] King N, Martin-Neuninger R, Ho H and Brightwell G (2018) Dynamic scanning for emerging food safety risks and opportunities for the food industry: Learning from established horizon scanning systems and proposing a way forward for New Zealand. New Zealand Food Safety Science & Research Centre. https://www.nzfssrc.org.nz/assets/Project-Reports/Dynamic-scanning-for-emerging-food-safety-risks-and-opportunities-for-the-food-industry_final-report.pdf

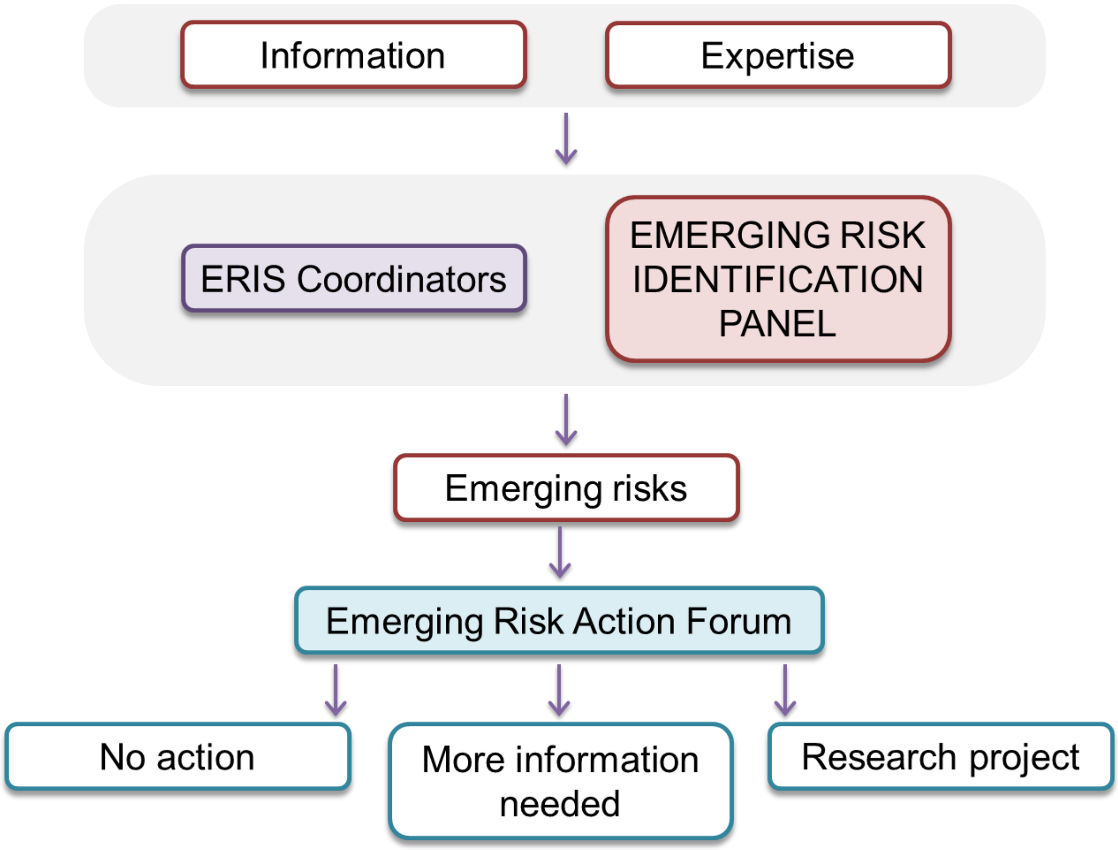

Figure 1. The core structure of ERIS

Information from people and other sources is gathered by the ERIS Coordinators. The Emerging Risk Identification Panel draws from their own networks and observations to bring information into ERIS. Identified emerging risks are assessed by the Emerging Risk Action Forum, which is formed from the ERIS funders and is the primary decision-making group. Information on emerging risks is also made available to other NZFSSRC members as needed, and those in the Emerging Risk Identification Panel.

The Emerging Risk Identification Panel also offers a forum to discuss emerging risks identified by the project team. The meeting provides an opportunity to sense check current views, gather related observations and generate research ideas. This was a focus for the third meeting.

2. MEETING SUMMARY

The two-hour meeting was held through video conferencing on 15 November 2022. Thirteen people attended alongside six people associated with ERIS operations. Cath McLeod (Chair) opened the meeting with a karakia. Three topic-based sessions followed, each including short introductory talks from scientists and open discussion (Section 3). The meeting concluded with Nicola King (ERIS project lead) explaining upcoming changes to the ERIS project and how this affects the Emerging Risk Identification Panel. The meeting closed with a karakia.

3. DISCUSSION ON THREE EMERGING RISKS

The ERIS Coordinators and Panel Chair selected three emerging risks identified through the ERIS project. These three emerging risks each affect multiple food sectors but have different profiles. One considers an emerging chemical hazard (cyanobacteria toxins), another considers an emerging food technology (manufactured nanomaterials) and the third considers variants of a known hazard (*Salmonella* spp.).

3.1 Cyanobacteria toxins in food

What are these and are there risks for seafood?

Key points from presentation by Laura Biessy, Cawthron

- Cyanobacteria are common in marine and freshwater and many produce cyanotoxins. There is a range of toxin types, each having different health effects (acute and chronic).
- The presence of cyanotoxins in water, including in NZ, has caused humans and animals to become ill, and prompted warnings to not collect shellfish or other aquatic foods. Exposure happens through contaminated food, physical contact (e.g. contact with toxin in the water) and inhalation of airborne particles.
- Warm temperatures and nutrient rich waters encourage cyanobacteria blooms. As climate change brings increasingly warm conditions it is expected that bloom events will become more frequent and prolonged. Increasing pressure on water resources means that it might not be possible for water users to switch to non-contaminated sources during bloom events.
- In NZ, microcystins are the most frequently detected freshwater cyanotoxins. These are particularly toxic to liver cells, causing acute illness. Lower level, prolonged (chronic) exposure promotes liver tumours. Microcystins accumulate in freshwater and marine animals including kōura (freshwater crayfish), tuna (freshwater eels) and kaimoana (seafood, particularly shellfish). These food animals might not show signs of intoxication.
- There are important data gaps, including the cyanobacteria diversity and toxin types present in NZ, toxin accumulation and depuration rates in aquatic organisms (and any health effects on these species), toxin dispersal in the environment, and the risks to human health associated with chronic exposure. This makes it difficult to establish safety limits for aquatic foods. Work is also needed to establish suitable laboratory detection methods for different sample types and different toxins.

Are there risks for horticulture and animal production?

Key points from presentation by Seamus Watson, ESR

- There is a risk that fresh produce could expose consumers to cyanotoxins if the irrigation water is contaminated.
- Research has shown that microcystins can accumulate in fresh produce repeatedly irrigated with contaminated water. The highest concentrations were often detected in the roots of plants, but not always. Under test conditions, the concentrations in some edible portions were above the maximum recommended exposure level. With a switch to clean water, the concentrations decreased but the rate of depuration was variable. New fresh

produce research is underway in Belgium, also studying microcystins. There are some reports of cyanotoxins being detected on fresh produce under normal growing conditions but no reports of human illness as a result of eating contaminated fruit or vegetables.

- Livestock animals could be exposed to cyanotoxins via drinking water. Acute exposure will cause illness but lower level exposure may not. Data on toxin metabolism in livestock is lacking. There are few studies of cyanotoxin levels in meat or milk from animals that have ingested these toxins. The available data are insufficient to assess human health risk.

Discussion

It was acknowledged that this is a One Health issue involving the interaction between environment, humans and animals.

Participants noted the scarcity of important information that would allow risks in NZ to be better understood and managed. The data gaps are significant, e.g. whether some of the currently undiagnosed livestock illnesses were due to cyanotoxins, whether sublethal exposure was occurring in food animals and humans and whether this had a role in chronic disease, the extent of illness or distress of mahinga kai species exposed to the toxins, the effectiveness of water treatments in reducing exposure (e.g. chlorine), and the lack of data to indicate whether these toxins are in the NZ food supply.

It is not yet clear if this will become a minor or major problem for NZ. Concerns were expressed that this issue was likely to become very important for some regions of NZ, e.g. farming areas in Northland, whānau who rely on kaimoana. Regarding the latter, the concern is whether these toxins impact people's ability to consume kaimoana safely or provide safe food for others.

Participants also shared knowledge of some specific projects. The NZFSSRC's partnership with Whakaki Lake Trust included a project focused on cyanotoxin in tuna (eel). The drive behind the Belgian project, described during Seamus' presentation, is the need for information as a step toward developing EU standards for irrigation water.

There was general agreement that it was important to better understand human health impacts, and the toxin levels that caused adverse health effects. In particular, it is important to understand the health effects of subacute exposure (repeat, low dose exposure and chronic health effects). This information will help identify when foodborne exposure presents an unacceptable risk and will direct future research needs.

3.2 Manufactured nanomaterials in food

What are these and what are the main concerns?

Key points from presentation by Kate Thomas, New Zealand Food Safety

- Particles of 1-100 nanometres (nm) are nanoparticles. Some food ingredients are deliberately manufactured as nanoparticles because this provides a functional benefit. Examples of these nanomaterials are calcium phosphate (an anticaking agent and nutritional supplement), calcium carbonate (used to increase the calcium content of infant formula), titanium dioxide (a colourant), and various lipids (fats) and proteins with the intent of imparting specific health benefits.

- Nanomaterials might be added into food as nanoscale structures (nanostructures), nanoscale capsules (nanoencapsulation, e.g. to ensure probiotics reach the intestine intact) or nanoemulsions (nanoscale mixtures of two or more substances that would ordinarily separate, e.g. oil and water).
- Because of their small size, nanomaterials ingested with food could be absorbed into the body differently compared with larger particles, although this depends on their characteristics. This means their bioavailability and the way they interact with the human body could be different. They might have different toxicological effects.

How are regulatory authorities responding?

Key points from presentation by Karen Lau, New Zealand Food Safety

- Under the Australia New Zealand Food Standards Code, manufactured nanomaterials are considered to be novel foods, novel food additives or novel nutritive substances, depending on the use of the substance. Manufacturers applying for permission to use these nanomaterials in food must provide evidence that they are safe (as per the updated Application Handbook). This is assessed within an existing risk assessment process for novel foods.
- Food Standards Australia New Zealand (FSANZ) has formed a Scientific Nanotechnology Advisory Group (SNAG), a group of independent experts to contribute to guidance on nanomaterials in food and to monitor trends.
- MPI can prevent selling of products containing nanotechnology that has not gone through the approval process, however the question is how would MPI know if these products were being used?

Discussion

Participants discussed that the topic of nanoparticles is wide and includes micro- and nanoplastics, which potentially cause a range of health effects. A distinction was made between nanomaterials that are purposefully added to food and nanoparticles that can end up in food, such as nanoplastics.

It was noted that the size of the particles is not necessarily the issue. Rather, it comes down to whether the smaller sized particles behave differently.

It was agreed that, at this point in time, nanomaterials generally represent an emerging risk perception issue rather than an emerging human health issue. At a recent NZFSSRC Futures Forum participants from the food industry expressed concerns that nanomaterials could become the next ‘GM’, referring to consumers and the public negatively viewing the use of genetic modification in food production. It was thought that public perception of nanomaterials might become negative through fear of the unknown and the current alarming media narrative on nanoplastics. If the EU or another one of NZ’s important trading partners were to react negatively to nanomaterials in food in response to consumer pressure, despite there being no risk to human health, problems may follow for NZ food exporters. It was noted that the US Food and Drug Administration is already being petitioned by non-profit public interest organisations to take action on nanomaterials in infant formula.

It was suggested that industry could front-foot this issue by talking to consumers about where manufactured nanomaterials are providing benefit to food and food production, including being honest about what is known and where the knowledge gaps are. There might also be a need to gather empirical data to better understand the types of manufactured nanomaterials in NZ foods and their prevalence.

3.3 Emerging *Salmonella* serotypes in food

Examples from a One Health perspective

Key points from presentation by Jackie Wright, ESR

- The closure of NZ's borders in response to the covid-19 outbreak provided a unique opportunity to see which *Salmonella* serotypes (serovars) were circulating and causing illness among people residing in NZ. This provides a useful baseline to indicate when serotypes are emerging. For example, during the first nine months of 2022, overseas acquired serotypes such as Paratyphi A and Typhi emerged as NZ borders again opened to travellers.
- An example of a foodborne salmonellosis outbreak was provided to show how an imported food product introduced a new serotype into NZ. During 2022 *Salmonella* Kintambo was detected among sick people, some of whom were hospitalised. Investigations linked the cases to consumption of food containing imported sesame-based products, and further investigations showed that cases had also been reported in Europe, also linked to the sesame-based foods. *Salmonella* Kintambo was isolated from the foods. Interestingly, several other *Salmonella* serotypes were also isolated from the foods. Despite this, only serotype Kintambo was isolated from NZ clinical cases, suggesting that this serotype had some characteristics that increased the chances of infection and/or severe disease.
- Examples of zoonotic *Salmonella* serotypes were also shared. Two new serotypes have emerged in farm animal populations in the last 10 years, these being *Salmonella* Bovismorbificans (2015) and *Salmonella* Give (2019). These caused disease in animals. Human infections, then infections in domestic pets (companion animals) followed. Initially, human cases had been in contact with infected animals and their products. Over time, transmission routes become complex and food is one possible vehicle of infection.
- The above observations stress that ongoing surveillance of animal and human *Salmonella* strains is essential for identifying emerging types and their potential for causing disease. Further, it is important to understand infection pathways in order to limit onward transmission.

Discussion

It was emphasised that *Salmonella* is not a new hazard and the higher risk foods are well recognised, so this topic might not be viewed as an emerging risk. However, the food industry is questioning whether those working in the emerging risk area might be able to monitor the 'rise and fall' of variants of known hazards, particularly if new serotypes appear in NZ that might cause more severe illness (in humans or animals). A new serotype emerging in NZ could be considered an emerging risk.

The poultry industry is aware that the public often associate *Salmonella* with chicken, despite the prevalence being low. The poultry industry test for *Salmonella* as part of the National Microbiological Database (NMD) monitoring. NMD is not designed as an extensive surveillance tool, e.g. it may be the case that some flocks miss testing. Thus, as a baseline it is quite weak, but it is possible emerging serotypes could be picked up. As part of the response to the recent incursion of *Salmonella* Enteritidis, all poultry flocks will be tested for *Salmonella* prior to processing. If positive, the serotype is identified to determine if it is Enteritidis. Neither of these testing regimes are designed to detect emerging *Salmonella* serotypes but these data could be useful for this purpose.

Participants felt that there was a fairly good understanding of which foods were more likely to introduce new *Salmonella* serotypes into NZ, but questioned whether imported animal feed was the source for new serotypes appearing among farm animals. Enhanced surveillance would provide a better understanding of the sources of new-to-NZ *Salmonella* serotypes and the transmission pathways to humans. There was also curiosity to know more about the characteristics of serotypes that appear to be able to cause disease in humans more readily.

4. CONCLUDING REMARKS

During the two-year ERIS project, which finishes in April 2023, three meetings of the Emerging Risk Identification Panel were planned. This November 2022 meeting concludes the third meeting. Activities are underway to secure funding for an extension to the ERIS project and there is intent for the Panel to remain in place, although the structure and activities of the Panel might change. Both the Panel members and ERIS project team have expressed support for this forum to continue. At its core, it provides as a mutually beneficial platform to exchange information and reality check signals of emerging risks.

Across the three meetings, participants have identified (i) actual and potential emerging food safety risks, (ii) ideas for how we might better monitor whether a risk is emerging, and (iii) important data gaps. These will be reviewed by the ERIS team to identify which research concepts should be developed further. Research concepts will be taken forward through the NZFSSRC. There are also important messages arising from these meetings that do not lead to research. The team will identify how these might be shared with appropriate people.

APPENDIX. MEMBERS OF THE EMERGING RISK IDENTIFICATION PANEL

Name	Organisation
Cath McLeod (CHAIR)	Cawthron Institute
Brent Kleiss	New Zealand Pork
Gale Brightwell	AgResearch
Dianne Schumacher	Dairy Companies Association of NZ
Roy Biggs	Biggs Food Consultancy Ltd. & Poultry Industry Association of NZ
Graham Fletcher	Plant & Food Research
Tim Harwood	Cawthron (also National Emerging Organic Contaminants Panel)
Siew-Young Quek	Auckland University
Stephen On	Lincoln University
Karen Lau	New Zealand Food Safety (MPI)
Tim Blackmore	Capital & Coast DHB
Shevaun Paine	Institute of Environmental Science and Research
Tom Kiedrzynski	Ministry of Health
Jonathan Watts	Ministry for Primary Industries
Jackie Benschop	Massey University EpiLab
Peter Cressey	Institute of Environmental Science and Research
Phil Bremer	Otago University (also NZFSSRC)
Ivy Gan	Plant & Food Research
Raniera Bassett	New Zealand Food Safety (MPI)
Kevin Taukiri	AgResearch
Jack Keeys	KPMG
Jackie Wright	Institute of Environmental Science and Research
Matthew O'Mullane	Food Standards Australia New Zealand
Roger Cook	New Zealand Food Safety (MPI)
Nigel French	Massey University
Ian Shaw	University of Canterbury
Nicholas Cradock-Henry	Landcare Research
Alison Stewart	Foundation for Arable Research
Grant Verry	The FoodBowl, NZ Food Innovation Network