



THE FOOD CHAIN

THE **safe food** KNOWLEDGE NETWORK NEWSLETTER

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TACKLING THE THREAT OF ANTIMICROBIAL RESISTANCE

Inter-disciplinary work underway at the Northern Ireland Antimicrobial Resistance Network is ensuring joined up thinking on this important issue.



The threat of antimicrobial resistance (AMR) is an increasingly serious global public health issue which jeopardises the effective prevention and treatment of infections. From a food safety perspective, antibiotics are used in food animals not only for treatment, but also for disease prevention and growth promotion in some non-EU countries. The World Health Organisation and other international bodies have recognised that antimicrobial use in animals contributes to resistance problems in human health. Foodborne infections caused by resistant bacteria, such as *Salmonella* and *Campylobacter spp.*, pose a particular risk to human beings because of possible treatment failure. Resistant commensal bacteria, such as *Escherichia coli* and *Enterococcus spp.*, also pose a risk, as they can

carry resistance genes that can be further transferred to human pathogens.

As Dr Patrick Dunlop – Chair of the Northern Ireland Antimicrobial Resistance Network – explains, it is a ‘One Health’ issue. “This big problem of antimicrobial resistance joins everyone together. It links human health, animal health and the environment because our ecosystem is one continuous circle.”

Patrick, a lecturer at the School of Engineering in Ulster University, says: “Antibiotics were developed and commercialised back in the 1940s and 1950s very successfully. As new compounds were introduced, people stopped using the old ones and we were able to keep one step ahead of the bugs. However, this pipeline dried up



Patrick Dunlop

and there have been no new classes of antibiotics in 30 years. This is a big problem.

Bacteria have developed resistance against low levels of antibiotics used in human medicine – and in many cases they can share their resistance traits. Bacteria sitting beside each other ‘shake hands’ and physically exchange genetic elements encoding resistance – referred to as horizontal gene transfer. These natural exchanges, along with random mutations, can develop quickly due to the speed that bacterial organisms replicate. This advantageous trait is carried on as well – it’s natural selection.” Patrick highlights that antibiotic development has gone out of fashion in the pharmaceutical industry: there is not enough return on antibiotics to develop new

compounds.

In addition, he says, an increase in the use of growth promoters in human and animal systems in other nations is contributing to this problem, “and with Brexit we may not have the protection we currently have with imports.”

The Northern Ireland Antimicrobial Resistance Network started as an unsuccessful grant proposal – “I had applied for a multidisciplinary grant. It wasn’t successful but then I realised that I had a group of people gathered together from government departments, academia and industry who were keen to address AMR issues so we decided to meet up anyway.” The first meeting was in April 2015. Patrick anticipated 20 people turning up and 50 arrived. “There turned out to be a real appetite for a cross

disciplinary approach to tackle AMR. Getting people from all areas – medical, veterinary, academics, industry – meant that we could address the real problems on the ground. It was also a great way to meet people working in different fields. The island of Ireland is a small place and these connections are a big strength for the network's aims. We are all working under the same 'one health' banner and meetings allow for opportunities to learn and share collective thoughts and expertise.

“THIS BIG PROBLEM OF ANTIMICROBIAL RESISTANCE JOINS EVERYONE TOGETHER”

“From an academic point of view, it is really interesting for me. There is really good crossover between the sectors, which helps me to expand out different applications of technology,” he continues.

The Network has grown since that first meeting, from 50 to 200 members. The aim of the network is to address the threat of AMR and allow for joined up thinking which is mostly achieved through formal workshops, meetings and via social media. “The interdisciplinary approach is at the heart of what we do. We have representatives from a range of organisations who are heavily involved. On the clinical side, the network includes lab scientists, doctors, nurses and the whole sphere of people working in infection control.” Vets and veterinary consultants, pharmacists and health care workers who look after medical management are also involved and the Network looks to address common

issues between human and animal medicine.

For industry, some of the largest food companies on the island of Ireland are members, while academics in every shape and form are involved from both Northern Ireland institutions, including chemical engineers, microbiologists, environmental scientists and psychologists. “On the computer side of things, storing information, examining animal and human health care data and predicting where problems might arise in order

to come up with solutions is also key to addressing AMR.”

Patrick points out some of the progress that has been made by the network. “Firstly, we’ve identified commonality between companies and organisations that may have appeared to be in competition before. Now they are working together towards a common goal. We have actively encouraged companies to work together on early research at competence centres funded by Invest NI, such as AgriFood Quest. Projects have come out of the Network into funded structures such as these, while from an academic point of view, the Network has been indirectly involved in bringing in €50m of EU funded projects and £15m from UK Research Councils, where we can act as a route for dissemination for these proposals. We try to have funding at the heart of our agenda and encourage companies to become involved in R&D.”

ABOUT PATRICK

Hobbies/Interests: If I’m not looking after my kids, it’s rugby – I’ve had to stop touring around Europe following Ulster rugby but I still make it to Ravenhill for the home games.

POULTRY DECONTAMINATION METHODS ON THE ISLAND OF IRELAND

C*ampylobacter* is the leading cause of bacterial food poisoning on the island of Ireland (IOI) with 3,772 cases reported in 2015 (Health Protection Surveillance Centre 2016, Public Health Agency 2016). Poultry is the main food associated with *Campylobacter* food poisoning.

Reducing levels of *Campylobacter* on poultry products by 1 log has been estimated to decrease human risk by between 50% and 90% (European Food Safety Authority, 2011). There are a number of processing methods that can be applied to poultry to reduce the overall level of *Campylobacter* contamination, however, the consumer acceptability of these methods is unknown.

Hence, **safe food** commissioned a research project to investigate the consumer acceptance of poultry decontamination methods on the IOI. The research project was led by University College Dublin and aimed to gain an understanding of the acceptability of new and existing decontamination methods in poultry processing. These included methods currently in use and authorised for use in the European Union. The reported efficacy of the decontamination methods was also looked at, through data gathering in focus groups with industry stakeholders and in scientific literature.

To ascertain consumers’ understanding of the problem of *Campylobacter* contamination in poultry, both focus groups and telephone surveys were conducted to determine attitudes to present and potential interventions, and identify barriers to consumer acceptance of interventions and how acceptability might be improved.

The final results should help to inform policy makers of the challenges faced by industry and consumers. The key findings of this project were:

- There is little awareness of *Campylobacter* among consumers.
- Consumers have no knowledge of how bacteria enter the poultry supply chain, or of potential interventions to control bacteria.
- Consumers on the IOI place their trust in retailers to sell them safe food.
- A consumer’s reaction to any decontamination process is strongly influenced by the vocabulary used to describe it.
- Consumers from the IOI show a preference for what they perceive as “natural” and non-invasive decontamination processes.
- Irradiation and organic and chemical washes are considered invasive.
- Forced air chilling ranks is the most acceptable intervention followed by crust freezing, steam ultrasound and cold plasma.
- Chemical washes are the least acceptable decontamination method.
- 67% of respondents would like to see information on the product label about treatments used in the processing plant to kill bacteria.

You can see the full report on safe food.eu.

THE IMPORTANCE OF WHOLE GENOME SEQUENCING

Investigation and teamwork are key to determining the source of microbial contamination in a food product, says Dr Brian Byrne of the Dairy Science Laboratory within the Department of Agriculture, Food and the Marine, in Backweston, Co Kildare.

Dr Brian Byrne is dealing with the bacteria that can cause severe illness on a daily basis.

As well as a background in farming, Brian holds a BSc in Industrial Biology and a PhD in Food Safety Microbiology. He previously worked in Kerry Foods PLC and has been involved in numerous research projects with Teagasc and University College Dublin. He is now an Assistant Agriculture Inspector for the Dairy Science Laboratory (DSL).

Specifically, he operates within the National Reference Laboratory strand of the organisation which focuses on *Listeria monocytogenes* and coagulase positive *Staphylococci* in food products.

He explains: "The DSL has three sections – the first section being the microbiology section, the second being the chemistry side and then we are the National Reference Laboratory. Basically, if a private or public laboratory



Brian Byrne

"IT'S LIKE TRYING TO GET THE BLUEPRINT WHICH TELLS YOU ALL ABOUT THE BACTERIA"

recovers the bacteria mentioned above, then they send it onto us to determine what type it is.

"Think about it like a car. *Listeria* is a Ford and we have to find out what kind of Ford it is. This is called molecular characterisation and there are two reasons for this: firstly it's an area that is legislated and secondly it also enables traceability, so if there's microbial contamination, we can identify where it may have come from."

This requires deeper probing as Brian describes: "I look for the car registration essentially; the very blueprint of the bacteria. So we get isolates in and we do molecular analyses on those. This is called serotyping. Essentially, we break it down further using a method called Pulsed-field Gel Electrophoresis (PFGE) and this basically produces a genetic fingerprint for each isolate.

"At the moment though we're moving from using PFGE as a typing tool to Whole Genome Sequencing (WGS). It's like



trying to get the blueprint which tells you everything about the bacteria. The idea is that once we have that information, we can report back to the private and public laboratories. We also work with other state bodies on investigations and food microbiology relating to our two target bacteria."

Brian continues: "If a food company has environmental sampling done and they know there's contamination somewhere, we'll help them find the source of the contamination.

Delving deeper into what WGS entails, Brian explains: "We extract the DNA from the bacteria, chop it up into fragments and tag it. That's called the library preparation, so we make our DNA libraries. We have our library prepped and load the samples into a machine that sequences it. At the end of it all, we have the DNA code of the bacteria (a profile showing the characteristics of the microorganism).

"We're trying to implement this as a reference method so that, if there is microbial contamination of a food product in Ireland, America or the UK for example, we can compare it. If all three are using different methods, you can't compare."

Brian says that testing "ensures that high standards of the Irish dairy industry are maintained." In fact, it's the thing he enjoys most about what he does: "With a farming background, I have a huge interest in Irish food and I take pride in being a part of the system that protects its reputation for safety and quality both nationally and internationally."

WHAT IS WHOLE GENOME SEQUENCING?

Whole-genome sequencing (WGS) is a molecular technology that determines the complete DNA sequence of an organism. Sequencing the complete DNA of a food-borne pathogen, such as *Salmonella*, *Listeria*, *E. coli*, etc., plays an important role in public health protection.

ABOUT BRIAN

Hobbies/Interests: I like travelling and sports – football, hurling, golf, rugby and soccer.

Favourite Food: I pretty much like everything. I suppose Italian and French food is quite nice but I also like trying new recipes and foods.

IRELAND EXCELLING AT SHELLFISH MONITORING

Dr Bill Doré, of the Marine Institute, Galway, talks about the productive work being done to tackle the issue of shellfish contamination.



Shellfish is a popular choice for restaurant-goers, particularly in seaside towns and villages, but it can be one of the more high-risk food items. Thankfully, in the Republic of Ireland (ROI), there is an organisation dedicated to testing shellfish for viruses.

“WE PROVIDE SUPPORT FOR THE INDUSTRY IN TERMS OF TESTING FOR VIRUSES IN SHELLFISH”

Dr Bill Doré is the Team Leader of the National Reference Laboratory in the Marine Institute in Galway, which focuses on the microbiological monitoring of shellfish. He moved to ROI from the UK in 2004 and has almost 30 years of experience in this field.

He explains: “We provide support for the industry in terms of testing for viruses in shellfish. We’re also

involved in running the programme for *E. coli* testing in shellfish, which is used to classify shellfish production areas, and environmental monitoring for bacteria. Furthermore, we provide advice to the industry and



Dr Bill Doré

stress is that generally the shellfish that are produced in ROI are of a good standard; they’re pretty clean and most of the time don’t cause any problems. It’s not a big issue here,” Bill says. “However, the fact is that shellfish – and we’re talking about bivalve shellfish, so oysters and mussels – they filter feed, so they sit in the water and basically they filter anything in that water.

“The issue is then, like all countries around the world, we have a problem with what happens to human waste. Sewage does get discharged into the coast and while it’s usually treated, it is untreated at times (this usually happens when there’s excessive rainfall and there’s an overflow of the cisterns). Of course, sewage contains a lot of microbiological bacteria and viruses from

the human population. As a result, shellfish can become contaminated with what can be human pathogens.

“The main problem we see from time to time is contamination with viruses which can cause illnesses. In particular, the main virus is norovirus, which gives you vomiting and diarrhoea. It’s a gastrointestinal illness and it’s fairly mild but can last 48 hours or so. It’s not a particularly significant illness but it’s very common. We seem to have a particular problem with this virus because it binds specifically to the shellfish, and it tends to be a problem with oysters because they’re eaten raw.”

While contamination can and does happen, Bill acknowledges the fact that there is a greater risk in other countries: “Potentially any virus or bacteria that is in sewage can end up in shellfish and could potentially be a risk, but in general we don’t see illness. In other countries, where it’s endemic, hepatitis A virus is also seen, but we don’t see it here because it’s just not really present in the population.”

This practical issue is exacerbated by the fact that there is currently no regulation for viruses in shellfish, as Bill explains: “It’s been a sort of emerging issue over the past 10 years and until recently we haven’t had particularly good methods to detect viruses in shellfish. That’s why it’s still an area that isn’t very well controlled at a regulatory level, although in the EU there’s now quite a lot of progress being made towards trying

to implement a standard for shellfish. We are actually involved in a survey, along with lots of other countries in Europe, which looks at the prevalence of norovirus in shellfish across Europe and that's all being moved towards regulation.

"But in the absence of regulation, there's still a problem for quality control and quality assurance for producers. Obviously, from their own point of view, it's not good for business if they're making customers sick. They're keen to implement procedures and testing to ensure that they're producing a safe product and also because a lot of our shellfish is being exported to other countries. There's a lot of trade to the Far East, China and Hong Kong, where they have implemented testing and so there's always the risk that producers will send products, they'll get tested and rejected – that can be very costly. So we have been, and are, working with producers, doing testing for them for norovirus and that's



happening when they're getting ready to send them."

This testing process can also reveal trends and help shape processes to tackle the issues, says Bill: "For instance, norovirus is a particular problem in the

winter so, during that time, we've helped one producer in particular to select another, less contaminated site. Basically, he moves shellfish there during the winter so that they'll be less contaminated.

"There's also a process called depuration where shellfish are put into tanks of clean sea water onshore and allowed to purge themselves of contaminants. This doesn't work too well for viruses, but you can improve it by increasing the time and temperature of that process. It can help to reduce, to some extent, the level of virus."

Another piece of advice that Bill suggests is that food business operators introduce their own risk management procedures. "There's a bit of a grey area because, as I mentioned, there is no standard and there is no definite level that is considered a risk that's definitely going to make you sick. The test that we use is a molecular method and

when we detect the virus, we can't tell from that test whether it's infectious or not infectious, so technically the test can pick up 'dead virus' if you like."

Bill believes that the ROI is approaching the topic carefully and thoroughly: "I think, because we're exporting a lot and because we have this test available, there's probably more testing going on here than in many other countries. This extra quality control is a very positive thing.

"There's also close cooperation between ourselves, the FSAI, SFPA and industry. There's a body that meets quite regularly called the Molluscan Shellfish Safety Committee as well and what we do is advertised through it. More and more producers now are asking for testing."

While it is clear that more is needed in terms of official standards and regulations in this industry, it seems that working together is getting results.

"THE MAIN PROBLEM WE SEE FROM TIME TO TIME IS CONTAMINATION WITH VIRUSES WHICH CAN CAUSE ILLNESS"



SIMPLER FOOD SAFETY RULES FOR SMALL RETAILERS

Dr Declan Bolton, Principal Research Officer at Teagasc, member of the safefood Knowledge Network Expert Facilitation Group and Member of the EFSA Biohazard Panel, discusses the importance of new guidelines for small food retailers proposed by the European Food Safety Authority (EFSA).



It was recognised that the implementation of food safety management systems by small retailers can be very challenging, therefore EFSA has proposed a simplified approach. Lack of expertise and technical hurdles can mean that small businesses – such as grocery shops and butchers – cannot fully implement the current requirements under European hygiene legislation. In acknowledgement of this, the European Commission requested that EFSA develop simpler rules for five types of business – a bakery, a fishmonger, an ice cream shop, a butcher and a grocer. The result is a more streamlined system that can be easily managed by these types of businesses.

Dr Declan Bolton chaired a working group with the support of the EFSA secretariat, to address this mandate. As he explains: “I think there was a realisation that HACCP as legally mandated in EC 852/2004 presented real difficulties for small food retailers, not least because of lack of staff expertise, staff turnover, costs/limited resources, etc.” According to Declan, there are five key changes. Firstly, that the retailer need

only be aware that a hazard (biological, chemical, physical or allergen) may occur at a particular stage. Being aware of this hazard is sufficient, without having an in-depth knowledge of that hazard: “for example, knowing there may be a biological hazard associated with raw meat without knowing it is *Salmonella*.” Retailers also need to be aware that a failure to perform certain activities – separating raw from cooked meat – presents a hazard. In addition, allergens can be treated as a separate hazard, as opposed to a chemical hazard.

Declan also points out that controls may be based on pre-requisite programme (PRP) activities such as good hygiene practices (GHP) etc., thus recognising that there may not be a specific intervention that can be relied upon to reduce/eliminate a given hazard.

Finally, he notes that the draft legislation removes most of the requirements for validation and verification and minimizes the need for record keeping. “Most PRP activities are based on qualitative and not quantitative parameters



Dr Declan Bolton

and thus are evaluated as being ‘acceptable’ or ‘unacceptable’. Cleaning, for example, may be based on visual inspection. Other PRPs (e.g. cooking or chilling) are based on quantitative parameters (e.g. temperature) and their correct application may be assured by setting critical limits that must be achieved to ensure food safety. In

Commenting on the fact that the food retailer can only control one step in the chain, Declan states: “We must recognise that hazards often enter the chain during primary production and the key intervention, e.g. cooking, is at the other end of the chain. Thus processors, retailers, etc. must ensure they do everything to minimise any hazards through proper cleaning and hygiene procedures.”

“THE RESULT IS A MORE STREAMLINED SYSTEM THAT CAN BE EASILY MANAGED BY THESE TYPES OF BUSINESSES”

the simplified approach the former PRPs, based on qualitative parameters, do not require record keeping but for the latter, based on quantitative parameters, monitoring is required to ensure critical limits are achieved and records should be kept to demonstrate compliance.”

The new legislation, based on the EFSA Opinion, is still in the draft stage. When passed, Declan believes it should result in a more effective and user-friendly food safety system for small food retailers.

For further information, visit <https://www.efsa.europa.eu/en/press/news/170302>

ABOUT DECLAN

Hobbies/Interests: Coach/Member of Metro Saints Brigid's AC, Porterstown, Dublin.

Favourite ways to unwind: Running marathons, reading and watching movies.

RECENT EVENTS

14TH NORTHERN IRELAND FOOD AND DRINK AWARDS

safefood sponsored a new food safety category at the 14th Northern Ireland Food and Drink Awards which took place on Friday 24th March 2017 at the Crowne Plaza Hotel, Belfast. The **safefood** 'Best Innovation to Enhance Food Safety Award' went to Moy Park. Dr Gary A. Kearney (**safefood**) was on the judging panel. A total of 11 awards were presented at the event, which was attended by over 350 guests including retailers, government officials and industry leaders.



HYGIENE HYPOTHESIS MYTH EVENT

In July, the **safefood** Knowledge Network hosted an event 'Too clean or not clean enough: the hygiene hypothesis myth' in the Spencer Hotel, Dublin. The seminar debunked the 'hygiene hypothesis' which has led to confusion, with some consumers believing that excessive cleanliness is responsible for increasing the risk of developing allergies and other conditions. However, most experts agree that the hygiene hypothesis is a misleading term and undermines attitudes and approaches to good hygiene. The event brought together experts from the UK and Ireland in allergies, human and microbe interaction, environmental health and home hygiene to discuss the most recent research in the area and explored ways to explain these messages to consumers. The event was very successful with over 60 people from public bodies, food businesses and academia in attendance. There was interesting discussion and feedback throughout the day.



Speakers at the hygiene hypothesis myth event from left Prof Colin Hill (University College Cork), Ms Jenny Morris (Event Chair), Dr Audrey Dunn Galvin (University College Cork), Dr Lisa Ackerley (University of Salford), Prof Sally Bloomfield (International Scientific Forum on Home Hygiene), Mr Niall Roche (University College Dublin).

UPCOMING EVENTS

FOOD SAFETY WORKSHOPS FOR SMES

- **Navan:** 12th September, Bellinter House
 - **Cookstown:** 13th September, Innovation Centre, CAFRE
- Register for free at www.safefood.eu

INTERNAL QMS AUDITOR TRAINING COURSE

(Based on ISO 17025:2005)

- **Belfast** 11th & 12th September
- **Galway** 25th & 26th September
- **Cork** 2nd & 3rd October
- **Dublin** 4th & 5th October

These free training courses are open to all food testing laboratory staff on the island of Ireland. Participants are required to be familiar with ISO 17025. Places are limited. To register email: mmccann@safefood.eu

SAFEGUARDING THE FOOD CHAIN - PROTECTING AUTHENTICITY AND INTEGRITY

The Food Safety Authority of Ireland in partnership with **safefood**, is hosting a conference in Dublin Castle on the 5th and 6th October, 2017. The conference is an opportunity to bring together all stakeholders to examine current issues around the authenticity and integrity of our food, the public health implications and effective prevention control strategies. To register please visit www.fsai.ie

FOOD ALLERGEN VIDEOS



Earlier this year, **safefood** published a new video called 'Food Allergy & Food Intolerance – What's the difference?' In this video, Dr James McIntosh, answers some frequently asked questions on food allergy, food intolerance and coeliac disease. It also includes information on what people should do if they think they may have a suspect food allergy or intolerance. To view the video, visit our YouTube channel, safefoodTV.

PRIMARY HEALTH SCIENCE EVENT

The **safefood** Knowledge Network presented a hand washing demonstration at the Primary Health Science event at Queen's University Belfast on the 23rd May. The event was attended by over 250 school children from schools across Northern Ireland.



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Simply find the hidden word in the crossword, made up from the letters highlighted, and send the answer to knowledgeNetwork@safeFood.eu before 27th October 2017. This competition is open to Knowledge Network Members on the island of Ireland only.

The answer to the previous crossword was LISTERIA.



- 1 Breakfast staple (4)
- 2 Mass produced food served quickly (4, 4)
- 3 A common garden or house plant (8)
- 7 Expels air from lungs (7)
- 8 Crab's pincers (5)
- 10 A pause (5)
- 11 Bread producer (5)
- 16 Puts in danger (11)
- 18 Neither good nor bad / 'So, --' (2)
- 19 First rate (3)
- 20 To cut into portions (5)
- 21 Country in Northern Africa divided by the River Nile (5)

- 1 American term for aubergine (8)
- 2 Sparing or economical (6)
- 4 A party, in Spain (6)
- 5 A flat, shallow container for food (4)
- 6 Mottled appearance, horse's marking (7)
- 9 Torte or gateaux (4)
- 10 A cry of approval, hurrah! (5)
- 12 Italian pastries from Sicily (7)
- 13 Edible pods, coffee source (5)
- 14 Fundamental, the starting point (5)
- 15 To squabble or quarrel (6)
- 16 Precious stones (6)
- 17 An alcoholic beverage created by fermenting honey with water (4)

Get involved with THE FOOD CHAIN

We'd love to hear from you. Would you like us to feature your research or industry sector? What else would you like us to cover in the world of food safety? Send your article ideas, feedback and suggestions to knowledge@network@safefood.eu

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Get in touch via email: knowledgenetwork@safefood.eu