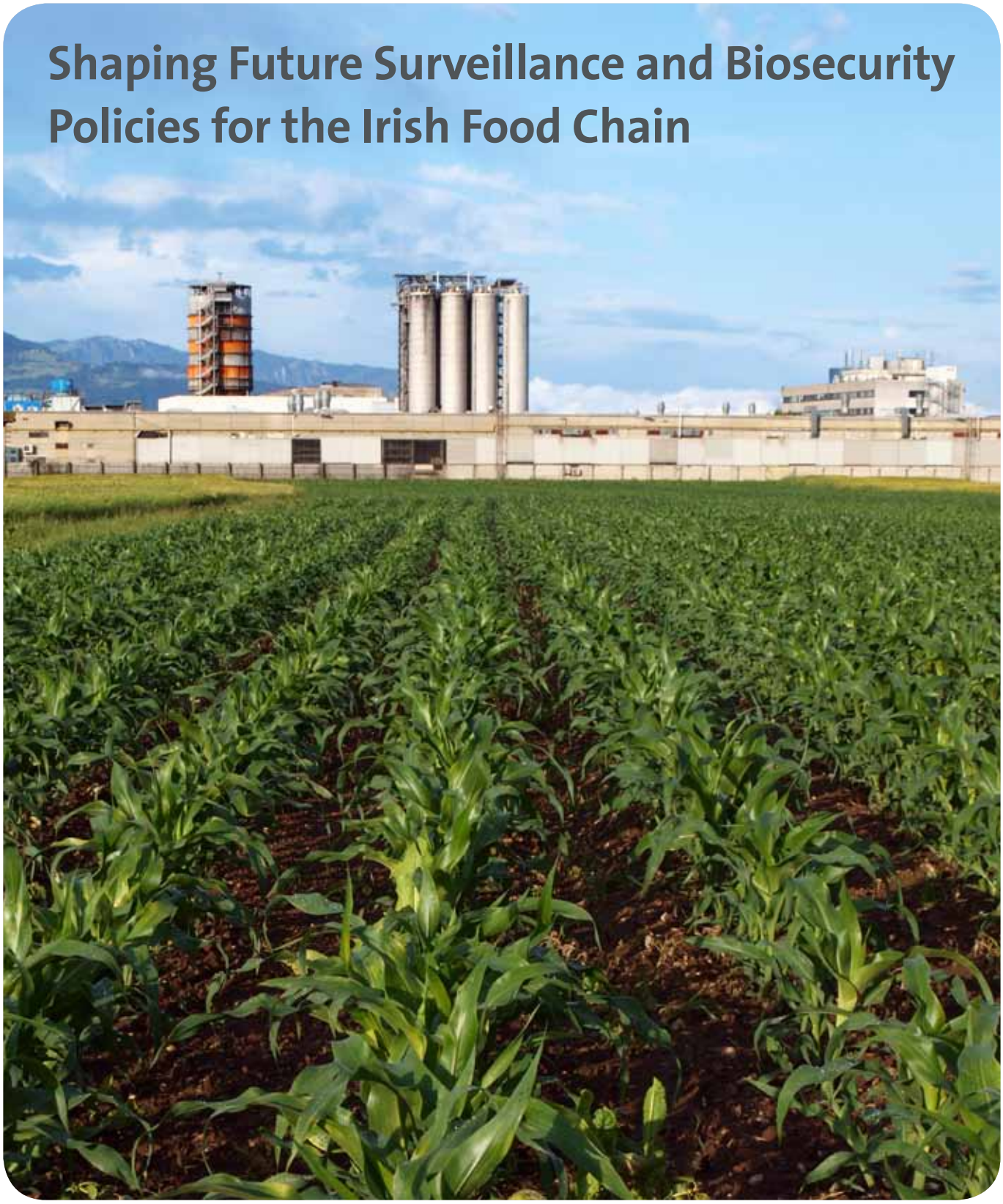
UCD Institute of Food and Health
Policy Seminar Series

MAPPING FOOD AND HEALTH TO THE PUBLIC POLICY LANDSCAPE

Shaping Future Surveillance and Biosecurity Policies for the Irish Food Chain



Foreword

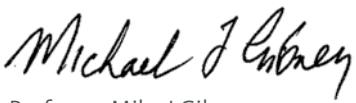
The UCD Institute of Food and Health intends to translate its research activity into both the economic and policy spheres of Irish Society. In order to advance issues of major public health significance, we have initiated a series of policy seminars in which we will bring together key international and Irish opinion formers.

In the second of our policy seminars some of the key elements required to improve the bio-security of the modern food chain were highlighted. The topics included in the seminar were selected to demonstrate how past food-borne outbreaks were managed, reflecting on the limitations encountered at that time and emphasising the improvements that can be made.

The importance of clear and unambiguous communication across the food chain is a critical element that several presenters stressed. A current food safety management model was also presented. This demonstrated the collaborative nature between the producer and those responsible for regulation, required to protect the consumer. Further more the role of the regulator was explored along with the technical capacity necessary to support legislative requirements. The importance of surveillance was discussed as an effective means of control linked to food regulation. Both of these systems may appear to exist in separate dimensions; however, if they are to function correctly in the protection of public health they require careful integration, a feature that remains to be achieved.

In summary the main take home message, emphasised the need to develop a new relationship between the food producer and the regulator allowing both to function in the modern production environment, whilst protecting the consumer.

In this report, the papers presented on the seminar day are summarised. A video cast of the talks can be viewed at the UCD Institute of Food and Health website (www.ucd.ie/foodandhealth). I would like to thank all our speakers, the Chairs, Dr Lisa O'Connor and Professor Patrick Wall, and the invited audience for their contributions to the seminar.



Professor Mike J Gibney
Director
UCD Institute of Food and Health

Key Recommendations

This short workshop set out to discuss the background to, and learning outcomes of, a number of well-publicised food-borne outbreaks. Speakers provided insights into the food industry and how these events were managed, and most importantly, translated into improvements in food safety and the protection of public health. Arising from discussions during the seminar a number of key recommendations on how bio-security along the food chain can be strengthened were highlighted:

- The standardisation of diagnostic methodologies used throughout the food industry should be addressed.
- The food industry should use the same diagnostic technologies as those used by the regulators to further improve food safety measures.
- Ecological surveillance of the production site is a key step towards controlling the dissemination of zoonotic and other food-borne pathogens throughout the production site.
- Cognizance should be given to the fact that the phenotype of pathogens in the production site may be very different when compared to data derived from laboratory experimentation.
- There needs to be an adequate balance between auditing and physical inspection of food production sites.
- The food industry should be judged on the importance it places in sound scientific principles.
- Communication across the food chain, including consumers, is essential.


CAUTION
RADIOACTIVE
MATERIAL

The Maple Leaf Foods Outbreak in Canada: Learning to Prevent Future Incidences

Dr Mansel W. Griffiths, Canadian Research Institute for Food Safety, University of Guelph

KEY POINTS

- The Canadian listeriosis outbreak in 2008 was primarily the result of inadequate sanitation in a Maple Leaf Foods plant leading to the contamination of ready-to-eat foods. As a consequence of the investigation into the outbreak, recommendations were made to improve food safety standards within the food industry and across regulatory agencies to protect public health in Canada. These recommendations are relevant globally.
- Food manufacturers should know and understand their customer base, and be cognizant of the potential health implications of the products they are supplying to customers.
- Senior management of all food manufacturers should inculcate amongst their staff the core principles of food safety and encourage a culture of active and transparent communication.
- Manufacturers of equipment used in the food industry should accept responsibility for how the design and operation of their equipment can impact on food safety.
- In the event of an outbreak, one agency should be appointed to lead the response.
- A communications strategy fully tried and tested and led by a designated co-ordinator with the appropriate skills, is critical to ensure that consumers, and particularly vulnerable groups, receive the correct information in a form that is understood by them.

Listeriosis is a serious infection caused by eating foods contaminated with the bacterium *Listeria monocytogenes*. It is a well-recognised and significant public health risk primarily affecting pregnant women, newborns and adults with weakened immune systems.

In early autumn 2008, a large outbreak of listeriosis was reported throughout Canada. Fifty-seven individuals became seriously ill with 24 deaths attributed to the outbreak. The source of the outbreak was the contamination of ready-to-eat (RTE) food from a plant belonging to the food manufacturer, Maple Leaf Foods. Coincidentally, at the same time there was a separate listeriosis outbreak confined to the Quebec region, arising from the consumption of contaminated raw milk cheese. There were 38 cases of illness, as a result of this outbreak including 13 pregnant women, 11 of whom gave birth prematurely. There were also five recorded deaths.

Following the Maple Leaf Foods outbreak a high-level independent investigation, led by Sheila Weatherill, was held. The subsequent report, published in July 2009, highlighted several key findings and made recommendations for the prevention of future similar outbreaks.[1]

The report initially looked at what went wrong at the Maple Leaf Foods production plant responsible for the contaminated foods. The source of the contamination was eventually identified as an electrical switch box in a meat slicer used in the preparation of the foods. The report noted that there were significant deficiencies in the plant surrounding its control of *L. monocytogenes* and also in its response to environmental tests. There had been reported *L. monocytogenes* positive environmental samples at the plant in 2007 and earlier in 2008, which had been inadequately treated with sanitation methods, but leading management to think that the problem was under control. The report also noted that there was a lack of communication between plant management and the regulatory agency.

One of the important issues to arise in the report was the relevance of food manufacturers knowing and understanding their customer base, and being cognizant of the potential health implications of the products they are supplying to those consumers. In the case of Maple Leaf Foods, it was selling large catering packs of RTE foods into residential care homes and hospitals

1 Report of the Independent Investigator into the 2008 Listeriosis Outbreak http://www.listeriosis-listeriose.investigation-enquete.gc.ca/index_e.php?s1=rpt&page=tab

where the majority of consumers were older and immuno-compromised. The company did not properly communicate to these institutions how to handle the products and the inherent risks associated with these foods. Having done so may have potentially reduced the associated illness.

Since the outbreak, Maple Leaf Foods has made significant changes to improve its food safety regimen. A chief food safety officer and several other technical personnel have been appointed within the organisation with the specific task of instilling a food safety culture throughout. The report recommended that senior management of all food manufacturers should inculcate amongst their staff the core principles of food safety; oversee the introduction and active promotion of a regularly updated effective food safety plan; ensure that new and existing equipment is appropriate for the intended use and that all sanitation methods be validated; and encourage a culture of active and transparent communication.

While Maple Leaf Foods admitted responsibility for the outbreak, it was noted in the report that there were also failures within the federal meat inspection service, which may have contributed to, though unlikely to have prevented, the outbreak. In spring 2008 a new inspection system was introduced. This system was based on an audit approach, whereas the previous one involved on-site physical inspections. The report noted that insufficient consideration was given to the training of inspectors and that there had been inadequate validation of the new system.

While inspection is critical in the food safety continuum, it alone is not the answer. To inspect every single food production plant is not only physically impossible, but is prohibitively expensive. Therefore, the solution must be risk-based inspections and this is where effort and resources should be directed.

In the Weatherill report, recommendations for improving inspections were tabled. These included an audit of resources and the number of inspectors within the system; training for all inspectors on current advances in science and technology in the processing of food, including compliance and verification processes; and ensuring that the inspectors have the necessary knowledge, resources and technologies available to them to conduct inspections.

Equipment manufacturers were also implicated in the report. Manufacturers must ensure that all processing equipment is fit for purpose and they should accept responsibility for how the design and operation of their equipment impacts on food safety. This should include ensuring that all equipment can be adequately sanitised, and the design is validated to limit pathogen growth and survival.

The importance of surveillance with an integrated communications plan across all relevant agencies was highlighted in the report. In the event of an outbreak, it was proposed that one agency should be appointed to lead the response and define the roles and responsibilities of each of the collaborating organizations clearly and concisely. While specific reference to the structures in Canada was documented in the report, these recommendations can be applied to many countries where there is more than one responsible agency for the protection of public health.

Other recommendations in the report included the need for improved procedures in laboratories so that the technical capacity is present in the event of a similar outbreak at a future date.

A communications strategy, fully tried and tested, and led by a designated co-ordinator with the appropriate skills, is critical to ensure that consumers, and particularly vulnerable groups, receive the correct information in a form that is understood by them.

Salmonella spp./ Enterohaemorrhagic *Escherichia coli* - Transmission, Diagnostics, Characterisation - Integrated Genomic Approach - Recent Cases

Mr James Buckley, Chief Veterinary Officer, Cork County Council

KEY POINTS

- Each outbreak is different but the fundamentals remain the same.
- Unification of methodologies and standards is essential.
- A co-ordinated surveillance system reflecting the farm-to-fork continuum must be supported by communication amongst all stakeholders involved.

There are many components to the food safety chain but perhaps the one which is most critical and less easily controlled is the environment. While Ireland as an island nation in a unique position to protect itself from many food scares, there is an urgent need for a co-ordinated surveillance system and central to this is communication. This co-ordinated system involves all those stakeholders along the food chain from production to public health, and includes regulators. As has been demonstrated on many occasions, one contaminated site has the potential to cause both national and international outbreaks.

Forensic discrimination of food-borne pathogens is essential. Interrogation of genotypic and phenotypic traits is important if outbreak sources are to be identified and eliminated. This analysis requires suitable diagnostic tools and standardised protocols enabling results to be communicated along the chain as quickly and efficiently as possible. This should effect quick mitigating actions in a timely manner.

Identifying the isolates from different sources (animal, food, environment and clinical) in real time and comparing them in a standardised way that is meaningful, accurate, sensitive and specific is at the core of success. Over 52 distinct *Salmonella* Agona PFGE sub-types and phage types have been identified in association with different outbreaks. One sub-type in particular, *Salmonella Agona* SAGOXB.0066 PT 39 was responsible for a large outbreak across Europe in 2006. This species can create biofilms making it even more difficult to eliminate from the food production environment. These features could not have been established without detailed forensic study of this bacterium.

Food production, from the farm forward, is not a sterile business. In fact during production the ideal conditions for bacterial growth can be created and this only serves to make the production of safe food even more challenging.

While advances in molecular methodologies have extended our understanding of these features, they come with limitations and caveats, particularly where legal interpretation is required. This once again underscores the importance of standardisation of methods and limits of safety used.

New methods such as MLVA (multi-locus variable number tandem repeat analysis) facilitate a rapid discrimination between sub-species. Computational methods are also being applied as tools of critical importance in the modern diagnostic laboratory.

For the Irish food industry to survive and continue to provide safe food to consumers it needs the support of all stakeholders who work together to ensure the integrity of the food chain.

Standardisation of methodologies is the key.

Managing Shellfish Food Safety: Hazards and Solutions

Mr Richie Flynn, Executive Secretary, IFA Aquaculture Committee

KEY POINTS

- The main food safety risks with respect to shellfish are biotoxins and viruses, both of which the producer has little control over.
- Biotoxin risk is managed in real time through the opening and closing of bays so that harvesting is stopped and the toxin prevented from entering the food chain.
- Routine water analysis for toxin producing plankton species is the first line of defence and the slow turnaround of laboratory results is a concern for producers.
- Viral contamination is usually the result of localised pollution from humans and animals.
- Legislation does not provide for real time monitoring of viruses and growing bays are classified on the basis of monthly samples assessed historically using *Escherichia coli* as an indicator organism.
- Improvements required in viral monitoring include reporting of illness in the local population; greater investment in pollution control; and the introduction of real-time risk management.

Shellfish production in Ireland is mainly comprised of oysters and mussels of which the majority of the harvest is for the export market (Table 1).

TABLE ONE: **Irish shellfish production**

	Oysters	Mussels
Total Irish Production per annum (tonnes)	7,500	42,000
Percentage of total EU production	6	16
Percentage Exported	90	70
Export destinations	Primarily France, Spain, the Netherlands	Processors or wholesalers for the fresh market across EU
Consumed	Mainly raw and live	Processed, cooked product (ready meal) or cooked from raw

The main food safety issues with respect to shellfish are biotoxins and viruses. These issues are not restricted to Ireland but are worldwide and have been widely researched with a strong level of awareness and understanding at producer level. The industry is highly managed by regulation and legislation.

Biotoxins

Twice daily a plankton field consisting of over 1,000 different species arrives with the tide on Irish shores (Figure 1). None of the plankton species is actually harmful to the shellfish themselves, in fact the shellfish use the plankton as a valuable food source. However, there are a number of species which can produce toxins of significant health risk to humans, depending on the toxin dose, the body weight and susceptibility of the individual.

FIGURE ONE: **Plankton field off the west coast of Ireland (Photo: Courtesy of the European Space Agency)**

Algal blooms are a natural food risk and there is no way to control these and the toxin producing plankton species present therein. The majority of the harmful species, however, is known and can be readily identified. Two of the most common marine toxin conditions are: Diarrhetic Shellfish Poisoning (DSP) and Azaspiracid Shellfish Poisoning (AZP).

Routine water analysis for harmful species by the Marine Institute is used as a first line of defence. Samples of shellfish species are also routinely analysed for the presence of biotoxins, such as DSP and AZP, by biological and chemical methods in accordance with Commission Regulation (EC) No. 1664/2006, Regulation (EC) No. 853/2004 and Regulation (EC) No. 2074/2005. Plankton monitoring as described above, is used as an early warning system and currently has no basis in legislation. In Ireland, as the export market is a significant part of the industry, samples are tested every week.

Biotoxin risk is managed in real time through the opening and closing of the bays that house the shellfish farms. Halting harvesting prevents toxins from entering the food chain.
Bay closures can have significant impact on the industry. In 2000-2001 closures cost the shellfish industry in excess of €80 million. A risk management group, known as the management cell, was set up to assess the balance between the food safety risk and industry sustainability of border line cases. In 2008, 23 out of 65 bays were closed. Most of these closures were concentrated in the south-west coast and at particular times of the year (June through September) thus indicating close monitoring of these areas during this period.

Currently the main issue for producers in the industry include is speed of turnaround time for laboratory results. While the use of LC-MS technology has greatly improved the speed and accuracy of results and will become the EU reference method for lipophilic toxins from July 2011, the biological method will still be in use by some Member States for a three-year transition period.

There have been significant improvements in the industry in relation to biotoxins since 2001. The industry works closely with the regulatory agencies such as the Food Safety Authority of Ireland (FSAI) and the Sea Fisheries Protection Authority (SFPA). The Molluscan Shellfish Safety Committee (MSSC) was established as a national forum to discuss the safety of the products and the management of the industry from a consumer protection perspective. Its membership includes the regulatory agencies and industry, and collaborates with the SFPA and the Marine Institute in relation to the monitoring of shellfish.

To maintain this improvement a number of factors are important: the continued support from the industry; the role of the FSAI as an independent arbiter; systematic sampling via a routine and agreed mechanism through which every stakeholder knows their role; the assessment by the management cell of borderline cases allowing flexibility; transparency along the information chain; and the central role of the MSSC providing an agreed position on legislation at EU level.

Viruses

As is the case with biotoxins, contamination of shellfish with virus is beyond the control of producers. Contamination is usually the result of localised pollution from humans and most likely from untreated sewage from various sources. Oysters are of particular concern as they are consumed raw.

Unlike biotoxins there is no real time monitoring. While many other countries adopt a risk management approach, in Ireland under EC 845/2005 growing bays are classified on the basis of monthly samples viewed over a three year period for trends using *Escherichia coli* as an

indicator organism. Reliance on this form of assessment is potentially problematic. While there has been considerable investment in this area and improvements have been seen, outbreaks continue to occur. Currently a draft code of practice based on the most probable numbers is used (Table 2).

TABLE TWO: **Criteria for the classification of bivalve mollusc harvesting areas under Regulation (EC) No 854/2004, Regulation (EC) 853/2004 and Regulation (EC) 2073/200**

Classification	Standard per 100g of LBM flesh and intra-valvular fluid	Treatment required
A	<230 *E. coli* per 100g of flesh and intra-valvular liquid[1]	None
B	LBMs must not exceed the limits of a five-tube, three dilution. Most Probable Number (MPN) test of 4,600 E. coli per 100g of flesh and intra-valvular liquid[2]	Purification, relaying in class A area or cooking by an approved method
C	LBMs must not exceed the limits of a five-tube, three dilution MPN test of 46,000 *E. coli* per 100g of flesh and intra-valvular liquid	Relaying for a long period or cooking by an approved method
Prohibited	>46,000 *E. coli* per 100g of flesh and intra-valvular fluid[3]	Harvesting nor permitted

1 By cross-reference from Regulation (EC) No 854/2004, via Regulation (EC) No 853/2004, to Regulation (EC) 2073/2005. Areas for which the limit of 230 *E. coli* per 100g are not exceeded in 90% of samples shall continue to be classified as Class A.

2 By way of derogation from Regulation (EC) No 854/2004, the competent authority may continue to classify as being of Class B areas for which the relevant limits of 4,600 *E. coli* per 100g are not exceeded in 90% of samples.

3 This level is not specifically given in the Regulation but does not comply with A, B or C.

Source: Code of Practice for the Microbiological Monitoring of Bivalve Mollusc Production Areas, May 2008. www.sfpa.ie

At EU level the use of bacteriophage monitoring has been proposed. However, this has been rejected by the industry as it would necessitate the cooking of the oysters to remove the phages before they could be released onto the market.

Viral contamination is the result of environmental pollution. Since the recent adoption by the Irish Government of the provisions of the 1979 Shellfish Waters Directive (79/923 EC), every bay with shellfish production must be designated and have a protection plan in place. The EPA is also now responsible for the issuing of discharge licences, whereby the licensee must take note of shellfish production areas within their locality. There is currently no standard for virus detection, use of *E. coli* provides an indicative measure only and there is no differentiation between animal and human sources. Other issues such as unprecedented weather conditions, causing large land run off can influence bay classification.

The solutions to some of the problems raised above are straightforward. There is a need for greater investment in pollution control; there should be more frequent monitoring conducted; and spikes in *E. coli* levels should be investigated to determine sources.

There are also lessons to be learnt from the biotoxin control regime, including the introduction of real-time risk management. This would include temporary closure of bays during outbreaks/ sickness in local area population or following heavy rain or flooding.

Food Surveillance and Regulation

Mr Micheál O'Mahony, Authority Board Member, Sea-Fisheries Protection Authority

KEY POINTS

- Surveillance can be described as monitoring with the intent to control. Food regulation is the promotion of, and enforcement of, compliance. Both are designed to ensure the safety of the food chain; however, they work better if separated from each other.
- The regulatory benefits of food safety surveillance are immense. To improve performance there should be clear pathways from surveillance to the regulatory framework; a safe environment for regulators and operators to facilitate surveillance should be created; the cost-benefit of surveillance calculated; and the role of surveillance communicated.

What is the relationship between food surveillance and regulation? Is there synergy or conflict? Or do they actually exist in the same sphere? Food surveillance can be described as measuring a hazard in the food chain as an overall part of reducing that hazard. It can also be described as monitoring with intent to control. Food regulation, on the other hand, involves the promotion of, and the enforcement of, compliance.

These two distinct activities are ultimately designed to achieve the same end, that is to keep food safe.

Regulatory and non-regulatory food surveillance

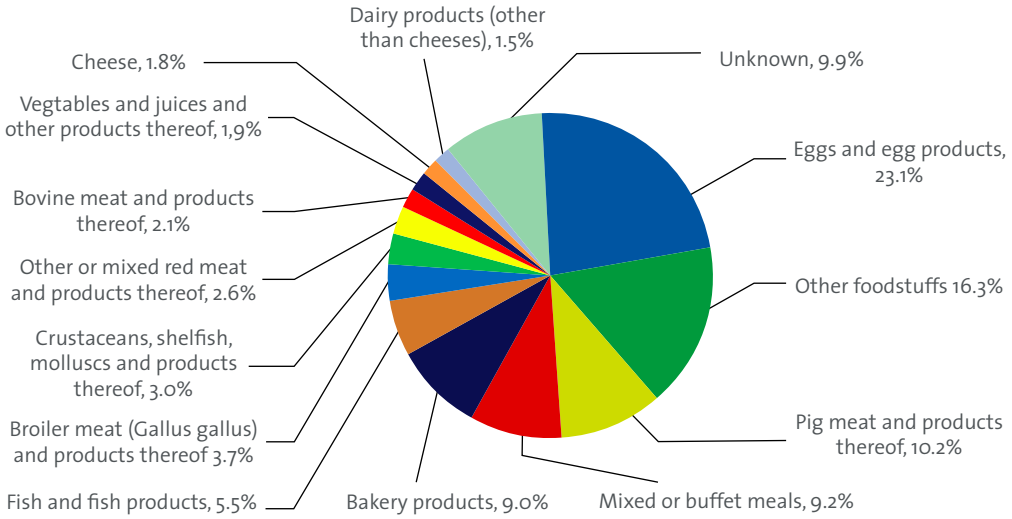
There is an extensive mandatory surveillance programme involving both chemical and microbiological contaminants. Chemical surveillance includes residue monitoring to identify contaminants such as persistent organic pollutants and biotoxins. Microbiological surveillance monitors for pathogens of animal origin. Other programmes include the monitoring of Transmissible Spongiform Encepholapathy (TSE). The cost-benefit derived from all of this monitoring must be of value to the protection of public health.

So how is the microbiological surveillance programmes working? The system has moved from monitoring sick animals to one which is more active and comprehensive and based on laboratory methodologies. However to underpin its efficacy, samples must be of sufficient size while the testing methods should be both harmonised and robust, and focus on those pathogens of greatest public health burden, such as Norovirus and *Campylobacter*.

The Zoonoses Directive (2003/99) mandates the monitoring of zoonotic agents and diseases in animals along with food of animal origin, the results of which each Member State (MS) must report. Antimicrobial resistance and food-borne outbreaks must also be recorded and reported. The reports are returned to the Commission and the European Food Safety Authority (EFSA), from which an annual report is collated. Reviewing these data it is clear that the organisms that are of most concern are *Campylobacter* and *Salmonella*; however, this message is not being properly communicated to the consumer.

In reports from the last three years, the foods of most concern by EFSA were eggs and egg based products (Figure 2).

FIGURE TWO: **Distribution of implicated foodstuffs in verified outbreaks in the EU, 2008 (Source: Trends and Sources of Zoonoses and Zoonotic Agents and Food-borne Outbreaks in the European Union in 2008, EFSA Community Summary Report, April 2010)**



Note: Data from 890 outbreaks are included: Austria (14), Belgium (15), Czech Republic (1), Denmark (16), Estonia (5), Finland (8), France (273), Germany (30), Greece (1), Hungary (35), Ireland (2), Latvia (10), Lithuania (12), Netherlands (35), Poland (155), Portugal (11), Romania (37), Spain (214), Slovakia (9), Slovenia (1), Sweeden (6).

Other foodstuffs (N=145) include: cereal products including rice and seeds/pulses/nuts/almonds (10), other or unsecified poultry meat and products thereof (4), turkey meat and products thereof (4), sweets and chocolate (4), milk (4), fruit, berries and juices and other products thereof (2), sheep meat and products thereof (2), herbs and spices (1) and other foods (114).

It is essential, from both regulatory and non-regulatory standpoints, that these data are carefully interpreted. It is also important that there is clarity in the risk message if the information contained in these reports is to be supported and acted upon at EU and MS level.

The regulatory benefits of food safety surveillance are immense. It provides detailed scientifically-valid information; it informs the risk basis used to frame official controls, thereby supporting the best use of limited resources; it characterises the magnitude of any problem identified; and it is effective in attributing the source of any outbreak that occurred.

It is therefore important that the concepts of risk assessment and risk management are separated. Surveillance should be a standalone activity, which collates information and guides subsequent actions. Regulation and control involves the steps taken to address the problem.

There are a number of suggestions that can be made to improve this situation:

- Have clear pathways from surveillance to the regulatory framework;
- Create a supportive environment for regulators and operators to facilitate surveillance;
- Calculate the cost-benefit of surveillance; and
- Communicate what surveillance implies and how it contributes to improvements in food safety.

Forum Discussion

Participants at the seminar were asked to consider a number of questions arising from the papers presented. The discussions are summarised as follows:

1. **Should companies be using the same tools as the regulators and forensic microbiologists e.g. DNA fingerprinting?**
   The use of genotyping techniques such as riboprinting currently being used by Maple Leaf Foods, has been shown to be extremely useful in identifying sources of contamination and supporting the establishment of effective control measures. However, such approaches are expensive and to ensure their most effective use a targeted approach should be adopted. It would be helpful if each food production plant had a "library" of the profiles of the organisms found on their premises to compare against new isolates found. However, it cannot be expected that SME type manufacturers would have these technologies and this should be borne in mind.

   While there are huge gains to be made in advances in technology, sometimes the problems can be much more fundamental e.g. at the initial sampling stage. An integrated approach is essential at this point. Sampling is currently written into legislation and standardised methods are used by accredited laboratories.

   The call for standardisation of methodologies must be reiterated.

2. **Are biofilm forming pathogens a real threat and are current cleaning regimens adequate?**
   Biofilm forming organisms are the norm in the food industry and within the biofilm the organism is in fact more resistance to sanitizers than in planktonic form. This is not necessarily a new threat, but we nonetheless need to understand this to deal with it effectively.

   The use of biomarkers is common as a validation tool to measure the efficacy of the cleaning regimen. However, if the biomarkers are not film formers their usefulness is redundant. The use of spore forming biomarkers may be of more benefit. While bacteriophages were proposed as an alternative strategy to destroying biofilm forming organisms.

   It is important that as part of its Food Safety Management Plant, each food production site knows how efficacious its cleaning regimen actually is, and if it is in fact appropriate for the environment it is being used in. Biocides may not behave in the same way in every plant thus surveillance is important. Each production plant should have a clear picture of the ecology of its own site and regularly check the efficaciousness of the regimen being used.

   A poor cleaning regimen can potentially exacerbate the problem, increasing the risk of resistance to biocides. It is currently difficult to get new cleaning products to market due to constraints arising from the biocides directive. We are potentially at a disadvantage in our knowledge in this area.

3. **Are regulator responses proportionate to the risks?**

Responses should always be in proportion to the risks. The closure of a food manufacturing site has widespread consequences both to the manufacturer and its staff as well as to the consumer.

In Europe In recent years there has been a move away from physical inspections of manufacturing sites with an emphasis now being placed on an audit based approach. In the Maple Leaf experience, a change from physical inspections to an audit based approach shortly before the outbreak, highlighted issues surrounding training of inspectors. With constraints on resources, audit would appear to make sense; however, it should be supported by inspections. A good HACCP programmes alone, is not sufficient.

Recent experience from the US indicates that auditing has become over onerous and that manufacturers would in fact like to see physical inspections reinstated.

It would be worthwhile to review experiences in other countries to see what the best system is.

4. **How can the relationship between regulators and regulated be improved and substandard operators and criminal activity be targeted to ensure consumer health and confidence is maintained?**

From a regulatory viewpoint, a change is needed as far as industry is concerned. Surveillance should be conducted by the industry with the support of the regulatory agencies – but who will bear the cost of this? Industry would be prepared to do so as they consider that this would add value to the chain but the cost should be spread across all manufacturers, irrespective of size.

10.00 am Policy Seminar

Chair: Dr Lisa O'Connor, Chief Specialist in Food Safety, the Food Safety Authority of Ireland

Opening Address: Professor Mike Gibney, Director, UCD Institute of Food and Health

10.10 am Case studies:

1. The Maple Leaf Foods Outbreak in Canada: learning to prevent future incidences
   Dr Mansel Griffiths, Senior Industrial Research Chair in Dairy Microbiology,
   University of Guelph; Director, Canadian Research Institute for Food Safety
2. *Salmonella* spp/Enterohaemorrhagic *E. coli* – Transmission, Diagnostics,
   Characterisation – An Integrated Genomic Approach – Recent Cases
   Mr James Buckley, Chief Veterinary Officer, Cork County Council
3. Managing shellfish food safety: hazards and solutions
   Mr Richie Flynn, Executive Secretary, IFA Aquaculture Sector

11.10 am Coffee and networking

11.30 am Keynote address: Encouraging a corporate food safety culture to protect food businesses
Dr Ann Marie McNamara, Division Vice President, Jack-in-the-Box Inc

12.00 pm Regulating food safety through the application of surveillance:
Role of Legislation to Support Surveillance.
Mr Micheál O'Mahony, Authority Member, Sea Fisheries Protection Authority

12.30 pm Forum Discussion:
Professor Patrick Wall, UCD School of Public Health, Physiotherapy and Population Science

Key Speakers

Dr Ann Marie McNamara

Dr Ann Marie McNamara is Division VP of Product Safety/Quality Excellence for Jack-in-the-Box where she ensures the safety of more than a million customers a day by managing industry leading food safety programmes. She previously served as VP, Food Safety, Silliker; VP, Food Safety and Technology, Sara Lee; and Director of Microbiology, USDA/FSIS.

She has developed food safety programmes widely recognised for their excellence, and has developed USA food safety policy, including co-author: USDA's Pathogen Reduction/HACCP Rule, President Clinton's Food Safety Initiative, FDA's Healthy People 2010, and advised USDA/FSIS on Listeria testing requirements in RTE meat and poultry plants. She was awarded the Secretary of Agriculture's Superior Service Award five times.

Richie Flynn

Richie Flynn is Executive Secretary of the Aquaculture Section of the Irish Farmers' Association where for 16 years he has represented salmon, shellfish and freshwater fish farmers. With a background in journalism and PR, Richie was also a member of the Irish Executive of the NUJ, secretary of ICTU's youth committee and a writer and publisher of music and sport magazines. Richie was elected for 10 consecutive years from 2000 as chairman of the European Commission's Advisory Committee on Aquaculture and was recently appointed as President of the European Shellfish Association. As an integral part of IFA's role in representing farmed seafood producers, Richie and colleagues were central to the formation of the Molluscan Shellfish Safety Committee in 2001, chaired by the FSAI and involving various state agencies concerned with consumer safety and seafood.

James F. Buckley
Chief Veterinary Officer, Cork County Council
Jim Buckley is the Chief Veterinary Officer with Cork County Council, where his main responsibilities include the enforcement of veterinary public health and food hygiene legislation, as part of a Service Contract with the Food Safety Authority of Ireland. He is involved with the following organisations and institutions.

- Honorary Associate of the Faculty of Veterinary Medicine, UCD
- Member of the safefood Scientific Advisory Committee 2006/2009
- Founder member of the Cork Zoonoses Committee
- Founder member of the National Zoonoses Committee
- Chairperson of the National Zoonoses Research Committee
- Member of the DAFF Artisan Industrial Committee.
- Member of a number of National Multi-Disciplinary "Outbreak" Working Committees.

He has a particular interest in collaborative veterinary surveillance and is currently responsible for developing and managing a number of multidisciplinary national/regional surveillance programmes on matters related to veterinary public health, food safety, diagnostics and ambient environmental quality.

Micheál O' Mahony
Micheál O' Mahony comes from a background in Veterinary Public Health, bringing a broad range of experience in food safety and food regulation. A veterinary graduate of UCD, Mr O' Mahony spent several years working in food animal clinical practice. He was then appointed as Lecturer in Veterinary Public Health & Food Safety at UCD, where, in direct conjunction with the UCD Centre for Food Safety, he participated in various projects in the teaching and research of Veterinary Public Health. In 2004 he was awarded an MVM degree for his research project on Irish organic dairy farming.

He was appointed as Chief Specialist in Veterinary Public Health with the Food Safety Authority of Ireland in 2005. This role involved a complex and varying blend of scientific risk assessment and regulatory risk management, along with the art of risk communication. In 2006, he achieved Diplomate status with the European College of Veterinary Public Health, to become a European Veterinary Specialist in Food Science. Since 2007 he has functioned as a national expert on several working groups of the European Food Safety Authority, examining the prevalence of zoonotic pathogens in the EU food-chain. Since 2008 Mr O' Mahony has worked as an Authority Member on the Executive Board of the Sea Fisheries Protection Agency. This is a wide-ranging role in the strategic oversight and day-to-day management of Ireland's Competent Authority for Sea-Fisheries Conservation Sea-food Safety legislation.

Dr Mansel W. Griffiths
Dr Griffiths obtained his BSc degree from North East London Polytechnic and his PhD from Leicester University. He joined the Hannah Research Institute, Ayr, Scotland in 1974. In 1990, Dr Griffiths was appointed to the Dairy Farmers of Ontario/NSERC Industrial Research Chair in Dairy Microbiology in the Food Science Department, University of Guelph. Dr Griffiths is also Program Chair for the MSc in Food Safety and Quality Assurance and is the Director of the Canadian Research Institute for Food Safety. In 2006 he was appointed Visiting Professor at Jinan University, China.

His current research interests include rapid detection of foodborne pathogens; factors controlling growth and survival of microorganisms in foods; and beneficial uses of microorganisms. Dr Griffiths has authored more than 250 peer-reviewed articles and appears on ISI HighlyCited.com

Dr Griffiths is an Editor of Applied and Environmental Microbiology, an Associate Scientific Editor of the Journal of Food Science, a member of the Executive Editorial Board of Journal of the Science of Food and Agriculture, and serves on the editorial boards of several leading food microbiology journals. He serves on the Expert Scientific Advisory Committee for Dairy Farmers of Canada and chairs the Canada IDF Coordinating Committee on Food Safety and the International Advisory Board of "Biotracer", an EU Project. He was the recipient of the International Association of Food Protection Maurice Weber Laboratorian of the Year for 2002. He served on the Ontario Meat Inspection Review, Expert Scientific Advisory Committee in 2004 and sat on the Expert Advisory Committee of the Listeriosis Investigative Review chaired by Sheila Weatherhill in 2009. He was recently appointed to the newly established Maple Leaf Foods Advisory Council.

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