Surveillance of Foodborne Pathogens on the island of Ireland

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Introduction

The collection of data for the purpose of managing food safety includes both monitoring and surveillance. Monitoring is a system of collecting, analysing and disseminating data. Surveillance is an extension of monitoring where the information collected is utilised for applying active control measures. Effective surveillance requires the timely collection, analysis, interpretation and feedback in order to take the appropriate action.

In recognition of the general function of *safe*food in the surveillance of foodborne disease, the *safe*food Scientific Advisory Committee established a working group on foodborne pathogen surveillance. The role of this group was to advise the Scientific Advisory Committee on the developments necessary to strengthen foodborne pathogen surveillance on the island of Ireland.

This report addresses foodborne pathogen surveillance on the island of Ireland in human, food and animal domains, in Chapters 2, 3 and 4, respectively. Each of these Chapters details responsibility for the current systems on the island of Ireland, describes recent advances, outlines ongoing developments, identifies opportunities for improvement and provides recommendations. Chapter 5 provides an overview of the role of research in the surveillance of microorganisms in the food chain and foodborne disease. The report presents a vision for surveillance on the island of Ireland in Chapter 6.

Chapter 2 Surveillance of human infectious intestinal disease

Because of the relatively short incubation period for infectious intestinal disease, optimal control is dependent on rapid availability of surveillance data. In relation to the surveillance of human infectious intestinal disease it is noted that the issues of data comparability, collation and timely dissemination are key. The developments in electronic reporting provide an opportunity for greater comparability of data whilst the provision of reference services on the island of Ireland is also underpinned by timely communication of good quality data. The quality and comparability of data from surveillance institutes on the island of Ireland is also highlighted. In addition it is noted that the capacity to assign cases of infectious intestinal disease to particular food vehicles responsible for disease is an essential element that would permit optimal allocation of resources to foodborne disease control and prevention. It would also feed in to a risk-based approach for the management of food pathogen risks throughout the food chain.

Recommendations

2.1. With the establishment of the new Public Health Agency in NI, the possibility of introducing case-based reporting and linking laboratory and clinical information at a central level should be investigated;

2.2. Periodic reporting on an all-island basis using standardised infectious intestinal disease data submitted to EU from NI and ROI should be performed by HPS NI and the HPSC in cooperation with ***safe***food;

2.3. The provision of a comprehensive human Enteric Reference Service should be pursued in ROI;

2.4. In each jurisdiction final reports on all general outbreaks[1] should be collated centrally. Key surveillance information and lessons learned should be formally disseminated within the system as appropriate with the aim of sharing best practice in the prevention and control of future outbreaks;

2.5. Funding agencies on a jurisdictional or ideally on an all-island basis, should consider commissioning source attribution studies to determine the proportion of infectious intestinal diseases that is foodborne on the island of Ireland;

2.6. NI and ROI should move towards operating with the same core surveillance data set.

Chapter 3 Microbiological food safety surveillance

Monitoring and surveillance activities along the food chain continuum enable the detection of hazards so that systematic control and intervention strategies can be adopted. Microbiological food safety surveillance data may be generated during official control activities conducted by the competent authorities or during testing conducted by food business operators. In each jurisdiction, National Control Plans outline the systems of official control measures and responsibilities to ensure the effective implementation of appropriate surveillance and monitoring activities covering all stages of production.

There are many examples of recent advancements in microbiological food safety surveillance in each jurisdiction which include the establishment of the Northern Ireland Strategic Committee on Food Surveillance and the recent availability of historical data from NI through the Food Surveillance System (UK) which enables risk-based sampling activities to be directed. There are, however, opportunities to enhance microbiological food safety surveillance on the island which include addressing the lack of uniformity in food coding systems used in each jurisdiction; the

[1] A general outbreak is one which involves two or more persons not residing in the same household.

coordination of priority food surveys on an all-island basis; and the current variability of electronic capture, analysis and dissemination of surveillance data.

Recommendations

3.1. Microbiological food safety surveillance and source attribution should be improved by establishing a process to improve data sharing and coordination of food monitoring, and risk assessment activities amongst appropriate stakeholders on the island of Ireland by:

a. Addressing diverse food coding systems;
b. Compatibility of sampling programmes;
c. Electronic data capture and analysis;
d. Feedback mechanisms to stakeholders;
e. Exploring the use of under-utilised data sources for example Food Business Operator (FBO) data.

Chapter 4 Surveillance of food animals

Animals may be exposed to pathogenic microorganisms of public health significance from a range of sources. Disease surveillance systems for food animals in both Republic of Ireland (ROI) and Northern Ireland (NI) are broadly similar in scope as they both comply with the same EU legislative framework. Various sources of information contribute to veterinary surveillance, ranging from clinical observations by farmers and veterinary surgeons, ante- and post-mortem observations at the abattoir or diagnostic facility, diagnostic test results from veterinary laboratories and international surveillance systems and alerts.

A number of baseline studies have been conducted or are underway which provide comparable data between EU Member States for the first time and provide a reference for the setting of pathogen reduction targets.

There are opportunities for enhancing the surveillance of foodborne pathogens through more systematic sharing of surveillance data between partners that would strengthen collaboration, provide better scope for directing work, reduce the potential for duplication, improve the ability to detect unforeseen gaps and optimise ability to identify new and emerging issues. Improved detection of the links between human and animal disease and the ability to use animal health data as an indicator of potential human health problems would better inform decisions about disease management and risk.

Recommendations

4.1. There needs to be more regular interactions between animal health agencies with those responsible for food safety and human health on the island of Ireland including more timely and effective sharing of data;

4.2. The National Zoonoses Committee (ROI) and Regional Zoonoses Group (NI) together should be supported and enabled to conduct an analysis of regular surveillance data on a shared basis;

4.3. Annual or more frequent meetings of the 2 committees (National Zoonoses Committee (ROI) and Regional Zoonoses Group (NI)), should be facilitated by ***safe*food**, to share experiences and surveillance data and to review current trends both in foodborne disease and surveillance methodologies, and to consider new approaches, as necessary;

4.4. The feasibility of enhancing the data collected in NI from any future EU baseline surveys should be considered to supplement the NI sample to provide representative information that would be compatible with that from ROI;

4.5. Detailed consideration should be given to the feasibility of making the NI submissions on surveillance to the UK bodies and to the European Commission available concurrently for consolidation with comparable data from the ROI with a view to providing a more extensive data base for risk assessment on an island of Ireland basis.

Chapter 5 Role of research in the surveillance of microorganisms in the food chain and foodborne disease

Considerable research activity that is relevant to foodborne pathogen surveillance is conducted on the island of Ireland by a range of stakeholders across human, food and animal domains. It was noted that access to research-derived information in a timely manner by policy makers, food and feed enforcement authorities and analytical laboratory staff may be hampered by the peer reviewed scientific dissemination channels commonly used. As a result there are a number of challenges to the use of research-derived data *viz.* its timeliness and the traditional dissemination channels and difficulties in deriving implications of findings for policy and food safety practice.

Recommendations

5.1 There is a need for the coordination of research relevant to foodborne pathogen surveillance on an island of Ireland basis where a clear all-island benefit is identified. The

potential for such a development should be discussed by organisations that publicly fund research on island of Ireland;

5.2 Broaden participation in *safe*food networks to include particularly stakeholders not involved in research and explore new mechanisms of information dissemination that allow early access to surveillance data by all interested parties.

Chapter 6 A vision for foodborne disease surveillance on the island of Ireland

The key themes that emerged from the review of microbiological food safety surveillance across the human, food and animal domains are linkages between key surveillance stakeholders; all-island considerations; comparability of data; data sharing; source attribution studies; and inter-disciplinary working. From this a clear vision for foodborne pathogen surveillance on the island of Ireland was established:

"Surveillance playing its full part in securing the safety of food"

In an island of Ireland context, the adoption of the measures recommended in this report on a jurisdictional basis, through regular meeting of all relevant stakeholders and structured sharing and interpretation of data, as well as meetings on an island of Ireland basis, will begin the journey to achieving the developed vision. Options for achieving the above should be considered including particularly developing the Regional Zoonoses Group in NI and the National Zoonoses Committee in ROI as a possible means of facilitating the achievement of this vision. The role for *safe*food in achieving the vision is also recommended.

Recommendations

6.1 *safe*food should conduct a targeted consultation exercise with key surveillance stakeholders on the island of Ireland on the recommendations and the vision presented here;

6.2 *safe*food should present to the NSMC a strategic proposal for enhancing foodborne pathogen surveillance both in each jurisdiction and on an island of Ireland basis.

List of abbreviations

AHCS	Animal Health Computer System
APHIS	Animal and Public Health Information System
BIP	Border Inspection Post
BSE	Bovine Spongiform Encephalopathy
vCJD	variant Creutzfeldt–Jakob disease
CDSC (NI)	Communicable Disease Surveillance Centre, Northern Ireland
CfI	Centre for Infection
CIDR	Computerised Infectious Disease Reporting
CJD	Creutzfeldt–Jakob disease
CMO	Chief Medical Officer
COP	Code of Practice
CPHL	Central Public Health Laboratory
CRL	Community Reference Laboratory
CVO	Chief Veterinary Officer
DAFF	Department of Agriculture, Fisheries and Food
DARD	Department of Agriculture and Rural Development
DEFRA	Department of Environment, Food and Rural Affairs
DH	Department of Health
DOHC	Department of Health and Children
DCs	District Councils
EC	European Community
ECDC	European Centre for Disease Prevention and Control
EEA	European Economic Areas
EFSA	European Food Safety Authority
EHOs	Environmental Health Officers
EHS	Environmental Health Service
EMI	Egg Marketing Inspectorate
EU	European Union
EWRS	Early Warning and Response System
FAO	Food and Agriculture Organization
FBO	Food Business Operator
FIRM	Food Institutional Research Measure
FSA	Food Standards Agency
FSA NI	Food Standards Agency Northern Ireland

FSAI	Food Safety Authority of Ireland
FSS	Food Surveillance System
GB	Great Britain
GP	General Practitioner
GPHIN	Global Public Health Information Network
HACCP	Hazard Analysis and Critical Control Point
HAIRS	Human Animal Infections and Risk Surveillance
HPA	Health Protection Agency
HPS	Health Protection Scotland
HPSC	Health Protection Surveillance Centre
HPS NI	Health Protection Service Northern Ireland
HSE	Health Service Executive
IHR	International Health Regulations
INFOSAN	The International Food Safety Authorities Network
LACORS	the Local Authorities Coordinators of Regulatory Services
LAVS	Local Authority Veterinary Service
LIMS	Laboratory Information Management System
MLST	Multi-Locus Sequence Typing
MLVA	Multi-locus variable-number tandem repeat analysis
MRS	Microbial Risk Assessments
MS	Member States
NCP	National Control Plan
NDSC	National Disease Surveillance Centre
NEPNEI	National Expert Panel on New and Emerging Infections
NI	Northern Ireland
NIFLG	Northern Ireland Food Liaison Group
NIPHL	Northern Ireland Public Health Laboratory
NSMC	North South Ministerial Council
NSRL	National Reference Laboratory for *Salmonella*
NVRL	National Virus Reference Laboratory
OFML	Official Food Microbiological Laboratories
OIE	The World Organisation for Animal Health
OV	Official Veterinarian
PFGE	Pulsed-Field Gel Electrophoresis
PHA	Public Health Agency
PHEIC	Public Health Emergency of International Concern

PHLS	Public Health Laboratory Service
POAO	Product of animal origin
PVP	Private veterinary practitioner
QAB	Quality Assurance Branch
QMRA	Quantitative Microbial Risk Assessment
RA	Risk Assessment
RASFF	Rapid Alert System for Feed and Food
RL	Regional Laboratory
ROI	Republic of Ireland
RVL	Regional Veterinary Laboratory
SAC	Scientific Advisory Committee
SFPA	Sea Fisheries Protection Authority
SGDIA	Surveillance Group on Diseases and Infections of Animals
SLA	Service Level Agreement
TESSy	The European Surveillance System
TTT/3T	Threat Tracking Tool
UCD	University College Dublin
UK	United Kingdom
UKAS	United Kingdom Accreditation Service
US	United States
vCJD	variant Creutzfeldt–Jakob disease
VIDA	Veterinary Investigation Diagnosis Analysis database
VLA	Veterinary Laboratory Agency
VS	Veterinary Service
VTEC	Verotoxin-producing *Escherichia coli*
VTEC O157	Verotoxin-producing *Escherichia coli* O157
WHO	World Health Organisation
ZNSG	Zoonoses Network Steering Group

Introduction

1.1 *safe*food, the Food Safety Promotion Board

***safe*food** is the North-South body[2] responsible for the promotion of food safety on the island of Ireland with a general responsibility to promote cross-border co-operation in the microbiological surveillance of foodborne diseases[3], including:

1. Identifying priorities for the development of surveillance;
2. Establishing a forum for the exchange of information between relevant interests;
3. Promoting collaboration in surveillance-related activity, where appropriate, including training and professional development;
4. Accessing and analysing surveillance data held by the appropriate Northern Ireland (NI) and Irish authorities;
5. Publishing surveillance information and analysis;
6. Promoting harmonisation, where appropriate, in the development of surveillance systems including methodologies, approaches to reporting and information technology systems.

Since its establishment, ***safe*food** has undertaken this responsibility by commissioning research, establishing and supporting research networks and working in partnership with other agencies involved in surveillance on the island of Ireland. Moreover, ***safe*food** has, in cooperation with these agencies, assisted in developing surveillance capacity through supporting laboratory linkages, enhancing information technology facilities and electronic reporting arrangements for laboratories on the island and has reviewed surveillance systems to promote harmonisation[4]. The list below details the specific activities that have been undertaken by ***safe*food** to support and enhance surveillance on the island of Ireland:

1. Commissioned research studies[5] to provide all-island population level incidence data on infectious intestinal disease and to acquire baseline zoonotic data;
2. Established an all-island infectious intestinal disease collaborative forum of the Health Protection Surveillance Centre (HPSC), Communicable Disease Surveillance Centre, Northern Ireland (CDSC (NI)) and ***safe*food**;

[2] ***safe*food** was established under the terms of the British-Irish Agreement Act 1999 and the North-South Co-operation (Implementation Bodies) Northern Ireland Order 1999. The Chief Executive reports directly to the North South Ministerial Council (NSMC) and is supported by an Advisory Board and a Scientific Advisory Committee (SAC).
[3] http://www.safefood.eu/Global/Publications/Corporate%20publications/BritishIrishAgreementAct1999.pdf
[4] Microbial food safety surveillance on the island of Ireland - current activities and opportunities for further surveys. 2002. ***safe*food**.
[5] Details of ***safe*food**-funded research projects including those specific to surveillance can be reviewed on www.safefood.eu/en/Professional/Research/

3. Organised two conferences focusing on infectious intestinal disease – Belfast (2006) and Dublin (2008);
4. Provided support to regional zoonoses committees in Republic of Ireland (ROI);
5. Participated in and supported the ROI National Zoonoses Committee and the NI Regional Zoonoses Group;
6. Published island of Ireland combined surveillance data in ***safe***food's Consumer Focused Reviews;
7. Established networks of professionals on the island with an interest in verotoxin-producing *Escherichia coli* (VTEC), *Cryptosporidium* and foodborne viruses, respectively;
8. Used surveillance information for action in the promotion of hygiene messages through a number of campaigns targeted at the consumer and other points within the food supply chain.

1.2 The working group on surveillance and its remit

In recognition of the general function of ***safe***food in the surveillance of foodborne disease, the ***safe***food Scientific Advisory Committee (SAC) asked that a sub-group of the SAC be established together with additional co-opted surveillance experts to convene a Working Group on surveillance.

Purpose of the Surveillance Working Group

To review the ***safe***food report of 2002, "Towards the Enhancement of Foodborne Disease Surveillance"[6] and advise ***safe***food on the further developments necessary to strengthen surveillance and its integration across animal, food and human domains on the island of Ireland. It was not in the remit of the working group to produce an implementation plan to develop the vision.

Aims and Objectives

i. Update information on current surveillance activities, review the implementation of the recommendations from "Towards the Enhancement of Foodborne Disease Surveillance" (***safe***food, 2002) and perform an analysis of gaps in relation to current surveillance activities;
ii. Add additional recommendations, where identified;
iii. Advise on prioritisation of the recommendations (existing and any identified by the Group) focusing on those with an all-island dimension;
iv. Generate a vision for surveillance for the island of Ireland.

[6] ***safe*food** (2002) Towards the Enhancement of Foodborne Disease Surveillance. www.safefood.eu

1.3 Scope of report

In order to address the aims and objectives, this report addresses microbiological issues of food safety concern and is targeted at decision makers and other stakeholders who need to have access to high quality information on foodborne disease and the associated and causative factors leading to it in order to effectively manage food safety. The focus of this report is surveillance of:

- human foodborne microbiological infection and intoxication;
- microbiological contamination of food;
- animal clinical disease and pathogen carriage in food animals.

Although the EU definition of food[7] includes water and water is recognised as a vehicle for the transmission of foodborne disease, water surveillance is not included in this report because the arrangements for water surveillance are separate from those associated with food. This report also excludes the surveillance of animal feed. The surveillance of antimicrobial resistance in animals is addressed in this report although the general issue of antimicrobial resistance as a topic has been considered by a separate Working Group of the ***safe***food SAC and is subject to a report.

In view of the significant organisational and structural changes that have taken place and continue to take place in NI and ROI, it is important to note that this report provides an assessment of the situation pertaining at the time of its adoption by the ***safe***food SAC in December 2009.

1.4 The process

A draft report was prepared in the first instance by the Working Group. Details of contributors can be found in Appendix 1. The group held a number of meetings between January 2008 and November 2009.

[7] A foodstuff, or "food", is defined by the EU as any substance or product, whether processed, partially processed or unprocessed, intended to be, or reasonably expected to be ingested by humans. Food includes drink, chewing gum and any substance, including water, intentionally incorporated into the food during its manufacture, preparation or treatment. This definition also includes drinking water and covers single food items as well as composite meals. Source: REGULATION (EC) No 178/2002 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 28 January2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety.

1.5 Structure of the report

The report initially reviews surveillance arrangements on the island of Ireland in human, food and animal domains, in Chapters 2, 3 and 4, respectively. Each of these Chapters details responsibility for the current systems on the island of Ireland, describes developments since the 2002 report[8], outlines ongoing developments, identifies opportunities for improvement and presents recommendations. Chapter 5 provides an overview of the role of research in the surveillance of microorganisms in the food chain and foodborne disease. The report concludes by articulating a vision for surveillance on the island of Ireland in Chapter 6.

1.6 Introduction to surveillance

Food safety is defined as the assurance that the food will not cause harm to the consumer when it is prepared and/or eaten according to its intended use[9]. In the context of this report the extent to which microbiological hazards are controlled determines the safety of our food. The World Health Organisation (WHO) defines foodborne diseases as diseases, usually either infectious or toxic in nature, caused by agents that enter the body through the ingestion of food[10]. The agents of foodborne disease can originate either from animals, i.e. zoonotic, or from the environment.

1.7 Monitoring and surveillance

The collection of data for the purpose of managing food safety includes both monitoring and surveillance[11].

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[8] ***safe*food** (2002) Towards the Enhancement of Foodborne Disease Surveillance. www.safefood.eu

[9] Joint FAO/WHO Food Standards Programme CODEX ALIMENTARIUS COMMISSION. Codex Alimentarius Food Hygiene Basic Texts Third Edition 2003. ftp://ftp.fao.org/codex/Publications/Booklets/Hygiene/FoodHygiene_2003e.pdf

[10] Food safety and foodborne illness, WHO, Fact sheet N°237 Reviewed March 2007. www.who.int/mediacentre/factsheets/fs237/en/

[11] This text is based on definitions found in the following sources:

- Guidance document of the Task Force on Zoonoses Data Collection - Manual for Reporting on Zoonoses, Zoonotic Agents and Antimicrobial Resistance in the framework of Directive 2003/99/EC and of some other pathogenic microbiological agents for information derived from the reporting year 2008, The EFSA Journal (2009) 255, 1-90.
- Mobilizing for Action through Planning and Partnerships (MAPP). MAPP is a communitywide strategic planning tool for improving community health developed by National Association of County and City Health Officials (NACCHO) in partnership with CDC.
- J McLaughlin et al. (2007). Epidemiology. In Hobbs' Food Poisoning and Food Hygiene, 7th Edition pp. 114-145. Edited by J. McLaughlin and C Little. London: Hodder Arnold.
- O'Brien SJ, Gillespie IA and Adak GK (2005). Foodborne disease surveillance as a basis for policy-making, In Risk Management Strategies: Monitoring and Surveillance, pp33-52. Eds FJM Smulders and JD Collins. Wageningen Academic Publishers.
- Guidance Document on official controls, under Regulation (EC) No 882/2004, concerning microbiological sampling and testing of foodstuffs. 2006. http://ec.europa.eu/food/food/controls/foodfeed/sampling_testing.pdf

Monitoring is a system of collecting, analysing and disseminating data from which useful prevalence information may emerge that can provide an overview of the state of compliance to legislative requirements and the status of public health.

Surveillance is an extension of monitoring where the intention is that the information collected is utilised for the purpose of applying active control measures. Effective surveillance requires the *timely* collection, analysis, interpretation and feedback in order to take the appropriate *action*.

1.8 Objectives of surveillance

The objectives of foodborne disease surveillance are to:

- Determine the magnitude of the public health problem posed by foodborne diseases and monitor trends;
- Identify outbreaks of foodborne disease at an early stage in order to take timely remedial action;
- Determine to what extent food acts as a route of transmission for specific pathogens;
- Determine the risk factors for disease in vulnerable populations;
- Assess the effectiveness of programmes to improve food safety;
- Provide information to enable the formulation and revision of health policies regarding foodborne diseases (including the formulation and prioritisation of preventive strategies).

1.9 Surveillance in 2009

Since publication of the first ***safe*food** report on surveillance in 2002[12], there have been significant developments in surveillance both on the island of Ireland and in Europe. Many of these developments have overtaken and superseded a number of the recommendations made in the 2002 report and are part of European- and EU-led initiatives. These include the establishment of the European Food Safety Authority (EFSA), the European Centre for Disease Control and Prevention (ECDC) as well as the introduction of legislation such as the revised Zoonoses Directive and the requirement to develop multiannual National Control Plans (NCP) in Member States (MS). Whilst the developments and current arrangements for surveillance on the island of Ireland are described in Chapters 2, 3 and 4 of this report, an overview of the developments at EU and international levels are described below.

[12] ***safe*food** (2002) Towards the Enhancement of Foodborne Disease Surveillance.

1.9.1 The European Centre for Disease Control and Prevention

The ECDC was established in 2005 with a mission to identify, assess and communicate current and emerging threats to human health posed by infectious diseases at European level. The overall goal of the ECDC is to contribute to reducing the incidence and prevalence of communicable disease in Europe. The establishment of the ECDC has been a significant development, facilitating a more coordinated and strategic approach to surveillance[13] throughout Europe and included in this is the harmonisation of case definitions for infectious diseases, the development of the European Surveillance System (TESSy[14]) and the Threat Tracking Tool[15] (TTT or 3T). The information provided by these tools can be used by decision makers, professionals and health care workers in Member States (MS) and European organisations. The introduction of EU-wide case definitions for infectious disease and ongoing efforts of standardisation across the MS should benefit harmonisation of data in NI and ROI.

There are a number of routine activities undertaken by the Food and Waterborne Disease Unit within ECDC, which were formerly undertaken by the ENTERNET network (an international surveillance network which was funded by the EU). Data are collated in a central database from Member States on salmonellosis, VTEC and *Campylobacter* infections on a quarterly basis, and on an annual basis for other key gastrointestinal pathogens. These data are analysed in collaboration with EFSA for the annual Community Summary Report. The Food and Waterborne Disease Unit also co-ordinates a system for communication of urgent queries on gastrointestinal disease issues between MS, e.g. early communications on clusters of disease, etc. Participants in this system are the microbiologist(s) in charge of the national reference laboratory(s) for gastrointestinal infections and the epidemiologist(s) responsible the national surveillance of these diseases. In addition, an annual meeting takes place involving microbiology and epidemiology representatives from all 27 countries of the European Union (EU), plus representatives from a number of countries that were partners in the former ENTERNET network, e.g. Australia, Canada, Japan, South Africa, Switzerland and Norway. The meeting serves as a forum to share information on surveillance practices and outbreak investigations, and to discuss future developments in disease surveillance at European level.

[13] The ECDC distinguishes between *indicator-based* and *event-based* surveillance approaches in the gathering of information relevant for the detection of emerging threats. The traditional *indicator-based* surveillance approach relies on the application of a threshold to an indicator in order to detect unusual incidence. This approach is complemented by the emergence of a new event-based approach which continuously scans the internet and other media to detect certain information that may lead to the recognition of emerging threats, thereby contributing to early warning and horizon scanning activities.

[14] TESSy is a surveillance system that aims collect, store, validate and disseminate surveillance data from the EU Member States and European Economic Area (EEA) countries

[15] The TTT is an integrated information system for event-based surveillance at European level

1.9.2 The European Food Safety Authority

The European Food Safety Authority (EFSA) was established in 2002 as part of comprehensive legislation[16] to improve EU food safety, to ensure a high level of consumer protection and to restore and maintain confidence in the EU food supply. EFSA works in close collaboration with national authorities and provides scientific advice on all matters with a direct or indirect impact on food and feed safety. Part of the EFSA mandate is to collect and analyse scientific data, identify emerging risks and provide scientific support to the European Commission (EC), particularly in the case of a food crisis. The role of EFSA is to assess and communicate on all the risks associated with the food chain.

The MS and some other reporting countries submit data on zoonoses, zoonotic agents, antimicrobial resistance, microbiological contaminants and foodborne outbreaks to EFSA and ECDC each year (including data on human, animal and animal feed stuffs) in line with the EFSA guidance on zoonoses[17] and foodborne outbreak[18] reporting. The EFSA Zoonoses Unit in collaboration with ECDC analyse the data and produce and publish an annual Community Summary Report[19]. The Zoonoses Unit also analyses the EU-wide baseline surveys on zoonotic agents in animals and food [20]. The Unit is assisted by the Task Force on Zoonoses Data Collection, which comprises representatives of MS, other reporting countries, the World Health Organisation (WHO) and the World Organisation for Animal Health (OIE). The work aims to harmonise data collection and provide information to support risk managers in taking effective and timely decisions related to protection of humans from zoonotic infections and also to provide information for risk assessors.

1.9.3 Monitoring of zoonoses and zoonotic agents

The Zoonoses Directive (Directive 2003/99/EC)[21] requires MS to ensure that specified zoonoses, zoonotic agents and related antimicrobial resistance are properly monitored at the most appropriate stage or stages, including primary production. MS are required to transmit such

[16] Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety

[17] Guidance document of the Task Force on Zoonoses Data Collection - Manual for Reporting on Zoonoses, Zoonotic Agents and Antimicrobial Resistance in the framework of Directive 2003/99/EC and of some other pathogenic microbiological agents for information derived from the reporting year 2008, The EFSA Journal (2009) 255, 1-90. www.efsa.europa.eu/cs/BlobServer/Report/zoon_report_ej255_manual2008_en.pdf?ssbinary=true

18 Guidance document from the Task Force on Zoonoses Data Collection on Manual for reporting of food-borne outbreaks in the framework of Directive 2003/99/EC, The EFSA Journal (2009) 257, 1-46 www.efsa.europa.eu/cs/BlobServer/Report/zoon_report_ej257_FBOmanual2008_en,3.pdf?ssbinary=true

19 http://www.efsa.europa.eu/EFSA/ScientificPanels/ZOONOSES/efsa_locale-1178620753812_ZoonosesDataCollection.htm

20 http://www.efsa.europa.eu/EFSA/ScientificPanels/ZOONOSES/efsa_locale-1178620753812_ZoonosesDataCollection.htm

21 Zoonoses Directive 2003/99/EC http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:325:0031:0040:EN:PDF

data gathered to the European Commission on an annual basis. Limited statistical analysis is currently possible due to a lack of a harmonised approach to sampling, data collection and delivery by MS. The data submitted may not represent the national situation on zoonoses in MS since the data presented may not be derived from representative national sampling plans. Where possible, however, trends are being identified. An overview of the reporting requirements for MS outlined in the Directive is presented in Figure 1.1. There is also the requirement that foodborne outbreaks receive proper epidemiological investigation. The outcome of such an investigation is to make data easier to compile and to compare, thus enabling the evaluation of relevant trends and sources and enabling its use for risk assessment.

Figure 1.1 Minimum requirements of Zoonoses Monitoring Directive applicable in the Member States

Annual Reports	Results of epidemiological investigations on cases of:
Brucellosis	Viral zoonoses
Campylobacteriosis	Calicivirus
Echinococcosis	Hepatitis A virus
Listerosis	Influenza virus
Salmonellosis	Rabies
Trichinellosis	Viruses transmitted by arthropods
Tuberculosis due to *Mycobacterium bovis*	Parasitic zoonoses
Verotoxigenic *Escherichia coli*	Anisakiasis
Antimicrobial resistance	Cryptosporidiosis
Foodborne outbreaks	Cysticercosis
	Toxoplasmosis
	Bacterial zoonoses
	Borreliosis
	Leptospirosis
	Psittacosis
	Tuberculosis other than *M. bovis*
	Vibriosis
	Yersiniosis

1.9.4 Multiannual National Control Plans

A significant development at European level in relation to food safety and the monitoring of zoonoses and zoonotic agents is that European legislation[22] has required all MS to have a three to five year National Control Plan (NCP) in place since 2007. The aim of this legislation is to create a more comprehensive, integrated, risk-based, EU-wide, farm to fork approach to official controls. NCPs covering the period of January 2007 to December 2011 and January 2007 to March

[22] EU Regulation 882/2004 on official feed, food, animal health and animal welfare controls

2011 are in place in ROI[23] and in NI (as a region of the UK[24]), respectively. Although local arrangements outlined in these NCPs are different, the overall objectives are the same. Both NCPs outline the systems of official control measures and responsibilities to ensure that the effective implementation of relevant EC (European Community) law and appropriate surveillance and monitoring activities covering all stages of production, processing and distribution of feed and food are maintained. Control activities for food animals are a particular focus of such NCPs. Moreover, a shared overarching objective is to deliver their functions by means of a flexible and proportionate, risk-based approach.

2

2.1.1 The Rapid Alert System for Food and Feed

The Rapid Alert System for Food and Feed[25] (RASFF) was put in place by the European Commission to enable the quick and effective exchange of information between MS and the Commission when risks to human health are detected in the food and feed chain. This exchange of information helps MS to act more rapidly and in a coordinated manner in response to a health threat caused by food or feed. Its effectiveness is ensured by keeping its structure simple: it consists essentially of clearly identified contact points in the Commission, EFSA, the European Economic Area[26] and at national level in MS, exchanging information in a clear and structured way by means of templates.

Administrative arrangements are in place throughout the EU for assistance and cooperation in the enforcement of feed and food controls between the competent authorities of different MS and with the European Commission where action is needed in more than one country. Each MS is required to designate a 'liaison body' to act as the first point of communication for transmission and reception of requests for assistance.

Where a food incident arising in NI requires rapid exchange of information with other MS, the appropriate RASFF documentation will be issued by the Food Standards Agency (FSA) through its HQ in London and based on advice from its regional office in Belfast. In ROI, the Food Safety Authority of Ireland (FSAI) is the coordinating body for food alerts and under RASSF it is the contact point for food whilst the Department of Agriculture, Fisheries and Food (DAFF) is the contact point for feed. There are also direct lines of communication to facilitate exchange of

[23] http://www.agriculture.gov.ie/areasofi/food_safety/NationalControlPlan2007-2011.pdf
24 http://www.food.gov.uk/multimedia/pdfs/uknationalcontrolplan.pdf
25 The legal basis of the RASFF is Regulation (EC) N° 178/2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:031:0001:0024:EN:PDF
26 EFTA Surveillance Authority, www.eftasurv.int

information between FSANI and FSAI in relation to food alerts facilitated through a memorandum of understanding between the two authorities.

2.1.2 International Alert Systems

The WHO has an alert system called INFOSAN, which is a voluntary global network managed by WHO and FAO and exchanges information between national agencies responsible for food safety on food safety events with international implications. INFOSAN Emergency National Focal Points alert food safety authorities within their country to foodborne disease outbreaks or food contamination events of international public health significance to allow appropriate action to occur. They are responsible for informing INFOSAN of relevant events at national level.

A public health emergency of international concern (PHEIC) includes a specified list of certain diseases (including polio, smallpox, cholera, SARS etc) or any event of potential international public health concern, including those of unknown causes or sources that or appear to be unusual or have the capacity to have a serious impact or have the capacity for international spread or interference with international travel or trade[27]. Such events shall be notified to the World Health Organization under the International Health Regulations. Member States must maintain the capacity to identify and respond to such events. Foodborne outbreaks have the capacity to be notified to WHO as PHEICs if necessary.

2.2 Surveillance on the island of Ireland - zoonoses committees on the island of Ireland

There are a number of agencies, government departments and both governmental and non-governmental groups who together provide monitoring and surveillance capacity on the island of Ireland. These will be outlined in the subsequent Chapters. In both jurisdictions, zoonoses committees have been established on the island of Ireland since the 2002 report[28]. These committees comprise multidisciplinary teams of Public Health, Veterinary Public Health, Environmental Health and laboratory professionals, and provide a forum for interdisciplinary discussion.

In NI, a Regional Zoonoses Group has been established and is chaired by the Chief Medical Officer (CMO) for NI. In addition, in the UK an overarching UK Zoonoses Group[29] exists. As of 2009 this group has merged with the Surveillance Group on Diseases and Infections of Animals to form the UK Zoonoses Animal Disease and Infection Group. This new group will meet twice a

[27] International health regulations (2005) Second edition. World Health Organization. http://whqlibdoc.who.int/publications/2008/9789241580410_eng.pdf
[28] ***safe*food** (2002) Towards the Enhancement of Foodborne Disease Surveillance. www.safefood.eu
[29] http://www.defra.gov.uk/animalh/diseases/zoonoses/ukzg/index.htm

year and will be chaired by the CMO and co-chaired by a Chief Veterinary Officer (CVO) on an alternating basis.

Zoonoses Committees operate at both regional and national level in ROI. Regional zoonoses committees in ROI share information, foster collaborations, produce joint protocols and engage in horizon scanning at a local level. The ROI National Zoonoses Committee provides a mechanism for information exchange on zoonotic disease among key stakeholders. It also provides an important national forum for the Regional Zoonoses Committees.

Surveillance of human infectious intestinal disease and other foodborne diseases

2.3 Introduction

It is important to note that not all infectious intestinal disease that is reported is foodborne. In order to interpret national surveillance data correctly, one needs to estimate in addition, the proportion of these diseases which can be attributed to transmission via food including water. Attribution studies have been carried out in several countries, which reviewed multiple sources of data in order to determine the proportion of the disease which could reasonably be expected to be foodborne. This will be described in more detail in Section 2.8.2.

The infections caused by *Campylobacter*, *Salmonella*, *Cryptosporidium*, VTEC, *Listeria monocytogenes*, *Clostridium perfringens* and enteric viruses are amongst the most common and clinically significant foodborne diseases. As a proxy for monitoring foodborne disease in the UK, five of these pathogens are used by the FSA[30], namely, *Campylobacter*, VTEC, *Listeria monocytogenes*, *Salmonella* and *Clostridium perfringens*.

The cases and outbreaks of human disease detected via surveillance represent but a small proportion of the true burden of disease in the population, and special studies are needed periodically in order to be able to extrapolate true population experience from what is reported via surveillance, in other words, to estimate the degree of under-reporting at each level of surveillance activity.

2.4 Organisation of systems for surveillance of human infectious intestinal disease and other foodborne diseases in Northern Ireland and Republic of Ireland

2.4.1 Northern Ireland

In NI prior to October 2009, the CDSC (NI), which was part of the UK Health Protection Agency was responsible for the regional surveillance of communicable disease and dissemination activities, and as such its functions include contributing to the UK foodborne disease system. However, from October 2009 these functions were subsumed into the Public Health Agency (PHA) Health Protection Service Northern Ireland (HPS NI).

[30] FSA Foodborne Disease Strategy 2000-2005
http://www.food.gov.uk/multimedia/pdfs/fdscg-strategy-revised.pdf

2.4.2 Republic of Ireland

In ROI, the Health Protection Surveillance Centre (HPSC) has overall responsibility for human infectious disease surveillance. The centre's six main areas of responsibility are:

- Surveillance of the major communicable diseases;
- Operational support by providing expert advice to, and responding to requests for support from, departments of public health or hospitals;
- Training for professionals working in communicable disease control;
- Research by identifying and developing best practice in communicable diseases;
- Policy advice to government departments and appropriate agencies in relation to the development of standards, guidelines and practices, and promoting the adoption of best practice by different agencies; and,
- Public information on infectious diseases to the public and the media.

2.5 Developments in surveillance of human infectious intestinal disease and other foodborne diseases

As already outlined in Chapter 1 there have been significant advances in surveillance systems and structures at European level since the publication of the 2002 report. The impact of these developments in NI and ROI is described below.

2.5.1 Impact of EU developments

As a result of Decisions/Directives of the European Commission (Decision No. 2002/253/EC[31], Directive 2003/99/EC) data relating to surveillance of communicable diseases is now submitted in a uniform manner at EU level by means of an agreed list of reportable pathogens and a set of case definitions. The introduction of EU-wide case definitions for infectious disease and ongoing efforts of standardisation across the MS should bring benefits for harmonisation of data in NI and ROI.

A case definition is the set of clinical, epidemiological and/or microbiological characteristics by which a case of infectious disease is defined. From 2008, both NI and the ROI submit their respective communicable disease data in this manner with NI data forming part of the overall UK dataset submitted to Europe (see later).

Reporting infectious intestinal disease to the appropriate health authorities is a statutory function in ROI and NI and these are described as "notifiable" diseases. The list of notifiable

[31] http://eur-lex.europa.eu/pri/en/oj/dat/2002/l_086/l_08620020403en00440062.pdf

diseases in each jurisdiction differs somewhat (Table 2.1). Nonetheless it has been possible, using laboratory information for specified pathogens, to compare and collate the incidence of infectious intestinal diseases in NI and the ROI. In the future it will be possible to exchange and analyse comparable data, on communicable diseases, including epidemiological, clinical and laboratory data, from both jurisdictions which are reported at the European level.

The ECDC has developed a long-term vision and strategy for the future surveillance of communicable disease in the EU in synergy with the relevant surveillance institutes in MS. This aims to achieve good comparability and high validity of communicable disease data between MS. A key element of this ECDC strategy is the implementation of TESSy, as referred to in Chapter 1. It is envisaged that TESSy will allow a consistent and easily available overview of the current situation in the EU to be readily and easily available.

Under the Zoonoses Directive (Directive 2003/99/EC) MS are required to collect, analyse and publish comparable data on zoonoses and zoonotic agents without delay. These data include:

- Occurrence in animal and human populations, feed and food;
- Gravity of their effects on humans;
- Economic consequences for animal and human health care for feed and food businesses; and
- Epidemiological trends in animal and human populations, feed and food.

There is a requirement on each MS for foodborne outbreak investigation and the production and dissemination of a summary report of foodborne outbreak data including the reporting of attributed sources and trend information on an annual basis. It is important to note that within the context of the EFSA Annual Community Summary Report on Zoonoses as published, it is not possible to disaggregate NI data from UK-wide data presented. Meanwhile the NI data are collated in a similar format to ROI.

2.6 Sources of information for surveillance of infectious intestinal disease and other foodborne diseases in Northern Ireland and Republic of Ireland

In both jurisdictions information on cases of foodborne disease is generated, for example, from one or more of the following:

1. Statutory notifications from medical practitioners (NI and ROI);
2. Statutory notifications from laboratory directors (ROI);
3. Voluntary reporting by laboratories (NI);
4. Reference laboratory reporting (NI and ROI);

5. Reported outbreaks of foodborne disease (voluntary (NI), statutory (ROI));
6. Enhanced surveillance systems for specific diseases, e.g. VTEC in ROI and VTEC O157 in NI;
7. Informal reports from business operators (e.g. hotels) and members of the public;
8. Alerts from international warning systems: EWRS, Food and Waterborne Disease Network etc..

2.6.1 Statutory Notifications

In both jurisdictions if a medical practitioner becomes aware of, or suspects that, an attending patient is suffering from an infectious intestinal disease the practitioner is required to notify the relevant medical officer. The list of notifiable infectious intestinal diseases is set in Table 2.1.

Table 2.1 Notifiable diseases and pathogens transmitted through food in Northern Ireland (NI) and Republic of Ireland (ROI), respectively.

NI*	ROI
Cholera Dysentery Food poisoning* Gastro enteritis (< 2 yrs) Hepatitis A Paratyphoid Typhoid	Acute infectious gastroenteritis including Rotavirus and *C. difficile* *Bacillus cereus* food-borne intoxication Botulism Brucellosis *Campylobacter* infection Cholera *Clostridium perfringens* (type A) Cryptosporidiosis Echinococcosis Enterohaemorrhagic *Escherichia coli* (EHEC) Giardiasis Hepatitis A Listerosis Noroviral infection Paratyphoid Salmonellosis Shigellosis Staphylococcal food poisoning Tuberculosis due to *Mycobacterium bovis* Trichinosis Typhoid variant Creutzfeldt–Jakob disease (vCJD)

	Yersiniosis

*Note in NI food poisoning notifications reported include those formally notified by clinicians and reports of *Salmonella*, *Campylobacter*, *Cryptosporidium*, *Giardia*, *Listeria* and *E. coli* O157 informally ascertained from laboratories.

The systems in NI and ROI for clinical notification are manual, with doctors completing a short form that is then posted to the PHA or Health Service Executive (HSE), respectively. The dataset collected comprises a range of information which differs with each jurisdiction. The dataset collected is presented in Table 2.2. In NI, it should be noted that currently a doctor may make a diagnosis of food poisoning and notify it based on symptoms even though the cause of disease may subsequently not be traced backed to a food source. While organisms which might be transmitted through food and cause illness are not specifically listed among the notifiable diseases, robust surveillance systems for them exist through the NI laboratory based surveillance programme (see Section 2.4.2). In addition in the UK there is a separate clinical confidential reporting scheme co-ordinated by the National CJD (Creutzfeldt–Jakob disease) Surveillance Unit in Edinburgh for the surveillance of vCJD.

Table 2.2 Dataset collected for clinical notification in NI and ROI

NI*	ROI
• case details • age • address and name of the notifiable disease • Other information such as vaccination status (if relevant) and onset of illness as available.	• case details • age • date of birth • sex • occupation • country of birth • case classification • date diagnosis • type of specimen • vaccination status (if vaccine preventable) • Additional information through such linkage is available at local level.

*Requirements of the Public Health Act[32]

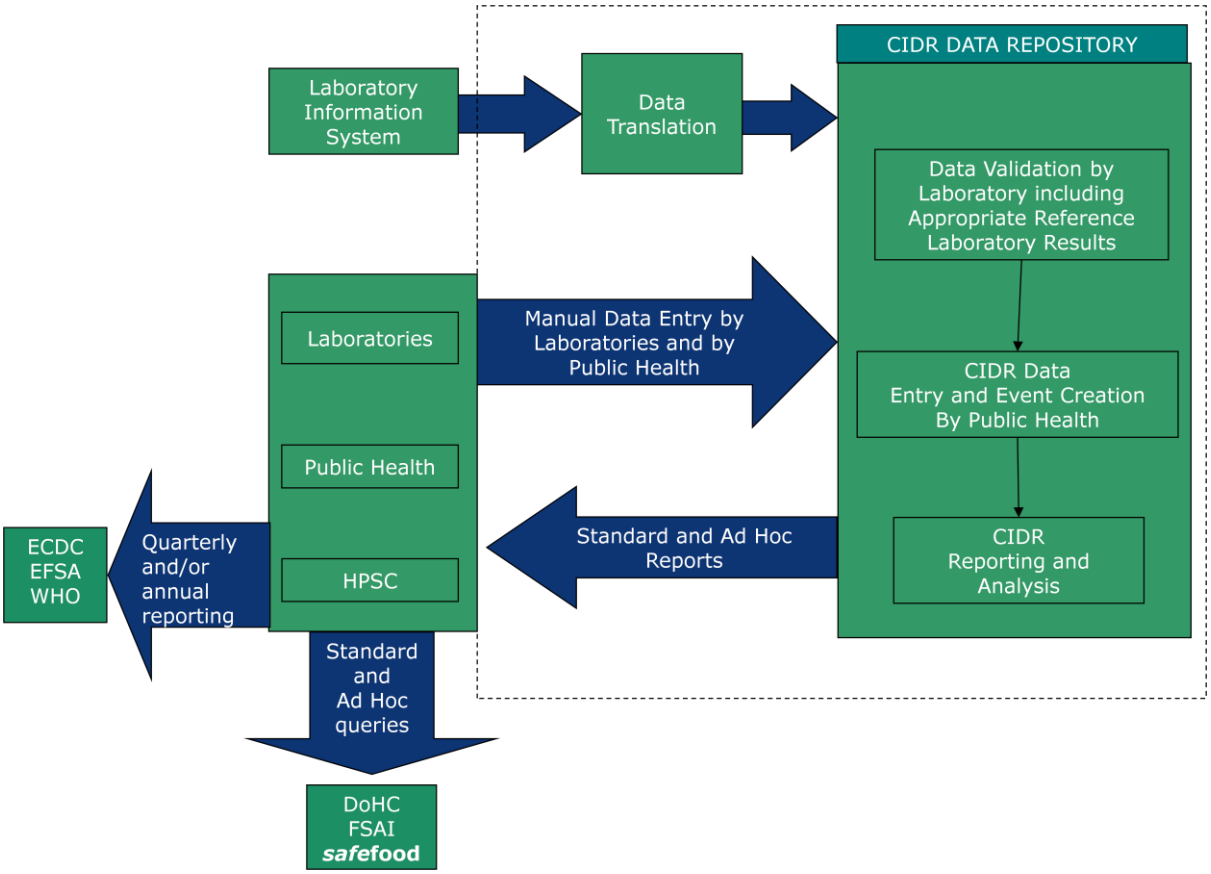
In NI, the notification details are entered into a database for local surveillance and relevant public health action. In NI, this case-based information is available but in the past there has been no central repository of all case-based notification data. Aggregate information only on the number of cases of disease is sent electronically to CDSC (NI) on a weekly basis. It is therefore

[32]Public Health Act (Northern Ireland) 1967, as amended by the Public Health (Amendment) Act (Northern Ireland) 2008.

not possible to link notified reports of foodborne disease by medical practitioners with the voluntary collection of laboratory reports of foodborne infections in NI at a central level.

In ROI case-based reporting has been in place since July 2000. Since 2004, clinical and laboratory data have been linked at public health level and available electronically via a national electronic web-based information system called Computerised Infectious Disease Reporting (CIDR), as illustrated in Figure 2.1. Information in CIDR is held in a single, shared national information repository. Clinical notifications to Public Health Departments are entered into CIDR and laboratory information on all laboratory diagnosed infectious intestinal pathogens is reported to Public Health on a daily basis, via either a Laboratory Information Management System (LIMS) extract upload or manual entry. This information is then linked to clinical and epidemiological information, provided by public health professionals within CIDR. CIDR records outbreaks of notifiable diseases as well as any unusual clusters or changing patterns of any disease. Outbreaks can be identified by linking together individual cases.

Figure 2.1 **The flow of data within the Computerised Infectious Disease Reporting (CIDR) system in the Republic of Ireland**



FSAI – Food Safety Authority of Ireland; ***safe*food**, the Food Safety Promotion Board, DoHC – Department of Health and Children, HPSC – Health Protection Surveillance Centre; WHO – World Health Organization; EFSA – European Food Safety Authority; ECDC – European Centre for Disease Prevention and Control.

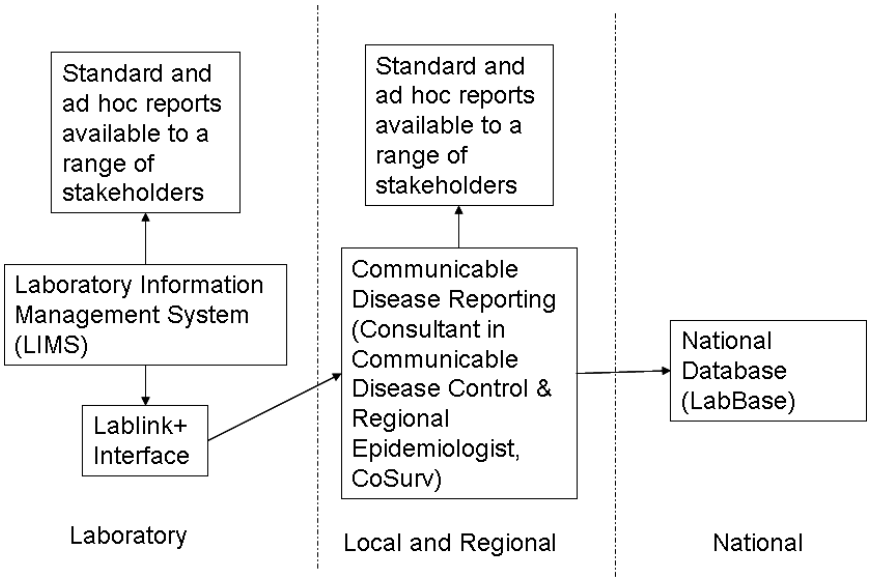
2.6.2 Laboratory reporting

In NI clinical laboratories voluntarily provide information on laboratory isolations/detections of microorganisms of public health significance daily to the HPS NI for local public health action and for regional surveillance. The system used for surveillance, CoSurv (as illustrated in Figure 2.2), is electronic with laboratory reports being forwarded at weekly intervals or less to HPS NI. The advent of electronic reporting has significantly enhanced reporting timeliness with the median delay now less than seven days. A monthly report of aggregate data published by the former CDSC (NI) is available.

CoSurv is a set of database modules for recording both laboratory isolates and notifications and is the preferred method for routine laboratory reporting to the Health Protection Agency UK. Separate modules currently exist for laboratories, Health Protection Units/Local Authorities and

Regional Units of the HPA. A defined output from LIMS is transmitted via the interface Lablink+ which translates local coding to a national surveillance coding scheme. These reports feed into the laboratory module of CoSurv and are electronically transferred to the regional CoSurv module at HPS NI for onward transmission to LabBase, the national laboratory reporting database at the Centre for Infection (CfI) in Colindale, London.

Figure 2.2 Laboratory reporting to the Health Protection Agency: through CoSurv[33]



AmSurv is an automated pathology interface designed by the HPA in the UK for CoSurv which will be used in the surveillance of antimicrobial resistance at laboratory level. AmSurv is being introduced in England over the next two years as an addition to CoSurv. AmSurv aims to underpin laboratory-based surveillance of antimicrobial resistance through routine reporting of susceptibility data of all isolates. Discussions are underway as to the applicability of AmSurv to NI.

In ROI, the clinical laboratory director is required to report all notifiable pathogens to Public Health, and this is linked to clinical epidemiological data on CIDR, and is available for analysis both locally and nationally.

In NI, laboratory reporting is a long established, currently voluntary system. In ROI it is a legal requirement for laboratory directors to notify the diseases listed in Table 2.1 to the Medical Officer of Health. Although the systems are different in NI and ROI, arrangements for laboratory reporting in each jurisdiction ensure completeness in reporting of information.

[33] Health Protection Agency (2007) Laboratory reporting to the Health Protection Agency - guide for diagnostic laboratories. Available from http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1194947381307

The developments in electronic reporting via both CIDR and CoSurv allow production of data in a standard format in each jurisdiction. Such information can be used to provide similar outputs and allow the comparison of NI and ROI data. Although this is being performed periodically, more regular comparison of data would add to the richness of datasets and contribute to an island of Ireland view on the incidence and trends in infectious intestinal disease.

2.6.3 Outbreak surveillance

Outbreaks are an important source of information about disease source and transmission including food.

A foodborne outbreak (as defined by Directive 2003/99/EC) is recognised when two or more human cases of the same disease and/or infection occur, or a situation in which the observed number of cases exceeds the expected number, and where the cases are linked or are probably linked to the same food source, is identified. Outbreaks may be confined to some of the members of one family or may be more widespread and involve cases either locally, nationally or internationally.

Outbreak surveillance systems operate in both NI and ROI. In ROI there is a legal requirement to report outbreaks, unlike in NI.

Standard forms for the reporting of outbreaks have been developed in NI and ROI. In general, in both jurisdictions, the data collected include: information on the source of reporting of the outbreak, the extent of the outbreak, mode of transmission, location, pathogen involved, laboratory investigation, morbidity and mortality data, suspect vehicle and factors contributing to the outbreak. Therefore the core data collected are equivalent. Information on the course of an outbreak is uploaded in CIDR as it is gathered.

Although there have been considerable advances in the routine central reporting of outbreaks by public health departments in ROI, final outbreak investigation reports are not routinely provided to the surveillance institutes.

Evidence for suspecting food as a vector for infection can be microbiological and/or epidemiological; however, this is often not definitive or insufficient to implicate a specific food. Moreover, analytical epidemiological studies are not frequently performed. Furthermore, within the data collection mechanism, separate codes are used for samples collected for outbreak

control and thus identifiable from routine samples. Systematic reporting and horizontal linkages can maximise the value gained from data collected.

In NI the reporting of outbreaks is voluntary and generally only summary data are available. Final outbreak reports are not routinely disseminated to health professionals outside the outbreak control team and there is a need to strengthen the general reporting of outbreaks.

This is a significant issue in both jurisdictions as collation and review of final outbreak reports and evaluation of actions taken in outbreak investigation are essential to inform future responses and to provide important information for the prevention and control of future outbreaks. Ideally, final outbreak reports should be produced for all outbreaks and circulated to appropriate professionals so that lessons learned can be shared. This is a significant gap as it hinders learning from outbreak control and the promotion of and sharing of best practice.

It is worth noting that guidelines for the investigation of zoonotic disease in England and Wales have been published[34]. Similar guidance is expected to be developed in NI following the establishment of the PHA.

EFSA, under the zoonoses directive, publishes information on outbreaks on an annual basis. This includes info on international outbreaks as well as outbreaks confined to one MS.

2.6.4 Enhanced surveillance

Enhanced surveillance of selected pathogens that are considered to be a unique public health risk is a key tool for surveillance purposes. It provides a more detailed dataset, for example, information in addition to that routinely collected on risk factors for disease. It is generally undertaken for diseases of major public health concern, where the extra effort required to collect this information is balanced by the advantages of having this information available for public health action. Such enhanced surveillance has major resource implications and needs to be considered carefully from a cost/benefit perspective.

In ROI an enhanced epidemiological surveillance system for VTEC O157 was established in 1999 and for all VTEC since 2004. Each case identified is investigated thoroughly, contacts are screened as appropriate, potential links between cases are investigated, and a comprehensive standard dataset of information is collected and collated nationally via CIDR by HPSC. This

[34] Health Protection Agency. Guidelines for the Investigation of Zoonotic Disease, Version 1, 23 April 2009. http://www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1240530336599

provides valuable information for action. In NI when cases of VTEC O157 are identified a similar thorough investigation is undertaken, and enhanced information collected locally, and this information has been collated at NI level since 2005.

In recent reviews of the management and surveillance of VTEC in ROI and VTEC O157 in NI, efforts were made to ensure that the data collection forms were designed so that core information gathered in NI and ROI would be compatible.

2.7 Reference laboratory information

Reference services provide crucial data for surveillance by confirming the diagnosis, isolation of and further characterisation of pathogens. Using appropriate sub-typing protocols, enteric reference laboratories can investigate the similarities/differences between clinical isolates and between clinical isolates and isolates of food or animal origin. The reference laboratory uses phenotype-based typing along with molecular sub-typing techniques referenced to international standards and practices. The reference laboratory participates in Global and European External Quality Assessment Programmes. The reference laboratory will operate an accredited quality management system. For rare pathogens or those that are difficult to detect, an enteric reference service can provide the primary diagnosis.

Establishment of a relationship between clinical strains can provide early warning of outbreaks and can identify diffuse outbreaks not recognised by other means. Demonstrating relatedness allows authorities to rapidly determine the scale and intensity of any particular outbreak. It also focuses epidemiological investigation on those cases that are part of the outbreak, to the exclusion of unrelated sporadic cases that may be occurring simultaneously in the community and thus preventing wastage of resources. Further, this approach also facilitates the timely implementation of suitable controls to limit further dissemination.

The relationship between primary, regional and reference laboratories is critical. The reference service provided is only as good as that permitted by the primary isolation of pathogens or submission of samples for further testing by regional laboratories. In order for appropriate action to be taken it is essential that data are communicated in a regular and timely manner to the appropriate surveillance centre.

2.7.1 Northern Ireland

The Centre for Infections (CfI)[35] at Colindale, London provides an enteric reference service for NI. All *Salmonella, Listeria* and VTEC O157 isolates from NI are submitted for further in-depth laboratory investigation and the information is returned to the submitting laboratory. Similarly crytosporidiosis specimens are forwarded to the UK Reference Laboratory in Swansea for genotyping. Information from the reference service is forwarded to local submitting laboratories and the HPS NI, where it is collated and published in its monthly bulletin and incorporated into relevant tables on its website.

2.7.2 Republic of Ireland

In ROI three pathogen specific human reference laboratories exist. The Interim National Reference Laboratory for *Salmonella* (NSRL) was established in 2000 in the Department of Medical Microbiology, University College Hospital, Galway. This laboratory accepts *Salmonella* isolates from all clinical laboratories, public health food laboratories and some veterinary laboratories and research institutes in ROI. It undertakes serotyping, phage typing and antimicrobial sensitivity testing. Where the isolate has been referred from a primary hospital laboratory that has already implemented CIDR, the results of serotyping, phage typing and antimicrobial sensitivity testing are electronically uploaded to CIDR directly from the NSRL database. Where the isolate has been referred from a primary hospital laboratory that has not yet implemented CIDR, serotyping data are circulated to public health personnel and uploaded manually on CIDR. When all primary laboratories have implemented CIDR, the data will be electronically uploaded for all cases.

In addition NSRL also applies molecular typing including Pulse-Net pulsed-field gel electrophoresis (PFGE), also multi-locus variable-number tandem repeat analysis (MLVA) on S. Typhimurium isolates and has recently established capacity to perform Multi-Locus Sequence Typing (MLST). Molecular methods are applied selectively to facilitate detection of unrecognised clusters of cases and to confirm associations between isolates that are suspected on conventional epidemiological grounds and to identify episodes of laboratory cross contamination. The NSRL liaises closely with HPSC, Regional Public Health Departments and FSAI to alert them to potential clusters of cases and to facilitate their investigation of suspect outbreaks. NSRL contributes data also through CIDR system and circulates monthly summary reports of isolates received and typed.

[35] http://www.hpa.nhs.uk/HPA/AboutTheHPA/WhoWeAre/CentreForInfections/

The HSE Public Health Laboratory at Cherry Orchard Hospital, Dublin has established a VTEC O157 and non-O157 diagnostic service for clinical and some food samples, including *E. coli* serotyping, verotoxin detection and VTEC molecular typing. PFGE is performed during investigations of clusters/outbreaks. For all cases, serotyping and verotoxin typing results from Cherry Orchard are currently circulated to public health departments for manual data entry on CIDR, where it is integrated with public health information.

The National Virus Reference Laboratory located at the UCD Centre for Research in Infectious Diseases (CRID), provides a national diagnostic service for Ireland in relation to virus detection and epidemiology using a wide range of methods to identify viral infections in humans. The UCD Centre for Food Safety (UCD-CFS) similarly provides pheno- and genotype based typing support when requested. UCD-CFS can provide identification services for several food-borne zoonotic pathogens in addition to antimicrobial susceptibility testing and genetic characterisation. The latter centre is also designated as the World Health Organisation (WHO) Collaborating Centre for *Cronobacter* (formerly *Enterobacter sakazakii*) – a pathogen associated with powdered infant fomula.

Although typing of *Shigella* isolates is performed by the Department of Medical Microbiology, University College Hospital, Galway and molecular typing of *Listeria* strains by Waterford Regional Hospital and University College Hospital, Galway these facilities are not officially assigned human reference laboratories for these microorganisms. However, speciation/serotyping data on human *Shigella* and *Listeria* isolates from NSRL are regularly circulated to public health departments and entered manually on CIDR, where it is integrated with public health information. In relation to *Campylobacter*, there is currently no national service for speciation and typing of human isolates. Where speciation is performed at the primary hospital laboratory, the results are reported through CIDR.

A number of primary hospital laboratories in the ROI avail of the services of the UK *Cryptosporidium* Reference Laboratory in Swansea for genotyping of human specimens found positive for *Cryptosporidium*. Where typing information is available, the data is reported to CIDR by the referring primary hospital laboratory.

Thus to date comprehensive human reference services are not available in ROI. For the pathogens where human reference service are not available in ROI only a portion of those strains isolated is sent to the reference laboratory at the Centre for Infections (CfI), Colindale for confirmatory tests and detailed identification.

Public health professionals indicate that there is an urgent need for a comprehensive and timely enteric reference service in the ROI. A fully developed human reference service in ROI would deliver:

- Phenotypic and genetic typing of isolates
- A defined level of typing specified for each pathogen
- Antimicrobial resistance testing for a defined range of antimicrobials
- Defined turnaround times for reporting

2.8 Regional and local clinical laboratories in Northern Ireland and Republic of Ireland

Ensuring quality and comparability of data between laboratories is an important feature of laboratory surveillance. Throughout the island of Ireland, this is accomplished through involvement in quality assurance schemes, proficiency testing and accreditation.

In ROI, variability exists in sampling techniques and test protocols used by primary laboratories and there are also differences in the range of tests performed. In NI some variability persists in test protocols but this has been substantially reduced following a series of province-wide audits. Laboratory amalgamations have also led to greater uniformity. Ideally all laboratory methods on the island should be based on reference methods, thus ensuring the quality and comparability among laboratories and leading to the potential for information to be directly comparable on an island of Ireland basis.

This could be accomplished by the sharing of protocols for sampling, testing and reporting among all laboratories screening for enteric pathogens. The criteria for testing specimens for the relevant pathogens should be standardised. Also the level of enrichment used, the criteria for identification including antimicrobial susceptibility should be similar. In the case where different procedures are used there should be a move towards uniformity which could be led by the appropriate reference service.

2.9 Information from the public

The first indication of a possible foodborne outbreak may occasionally come from reports by the public and/or by the Food Business Operator (FBO) to the environmental health or public health departments. These reports are investigated to ascertain if an outbreak is occurring.

2.10 Outputs of surveillance of human infectious intestinal disease and other foodborne diseases

The purpose of surveillance is to allow action to be taken. Because of the relatively short incubation period for infections intestinal disease, optimal control is dependent on rapid availability of surveillance data. Regular reporting of surveillance information is performed in both NI and ROI.

2.10.1 Northern Ireland

The former CDSC (NI) also published a Monthly Report[36] on communicable diseases which contains aggregate data and laboratory reports on infectious diseases in NI and UK. An annual report on foodborne infection is incorporated into one of these editions. The publication is targeted at those interested in diagnosis and surveillance, control and prevention of infectious diseases. It is distributed electronically and is available on the CDSC (NI) website[37]. Outbreak summary information is reported on a quarterly basis. Weekly tables of the number of notifications of infectious disease including food poisoning are posted weekly on the CDSC (NI) website. An Annual Report is also published by CDSC (NI).

2.10.2 Republic of Ireland

The HPSC in ROI publishes, in its electronically disseminated Weekly Infectious Disease Report[38], figures on notifiable infectious diseases by HSE area. HPSC also publishes, on a weekly basis, data on outbreaks of infectious diseases. There is publication of periodic more detailed reports. A report on "Infectious intestinal, zoonotic, and vectorborne disease, and outbreaks of infectious disease" is also published quarterly.

EPI-Insight[39] is published monthly in ROI by the HPSC. It contains data on infectious diseases and informative articles for use locally, regionally and nationally. EPI-Insight is distributed electronically and is available on the HPSC website. HPSC publishes annual statistics on infectious diseases in its annual report.

Outbreak data are available within CIDR and on-line access to this information is provided for partners in a timely fashion. Moreover, a number of standard reports are available in CIDR[40] to health professionals registered with the system. These reports are based on aggregate data and

[36] http://www.cdscni.org.uk/publications/MonthlyReports/Volume_18_2009/MonthlyReportVol18No2.pdf
[37] www.cdscni.org.uk
[38] http://www.hpsc.ie/hpsc/NotifiableDiseases/WeeklyIDReports/
[39] http://www.hpsc.ie/hpsc/EPI-Insight/
[40] http://www.hpsc.ie/hpsc/CIDR/

can be run on an annual, quarterly, monthly and weekly basis. It is also possible for CIDR users to generate their own customised reports.

2.11 International alerts

The European Union has an Early Warning and Response System (EWRS)[41] in place which allows information exchange, consultation and coordination at Community level, should an event due to communicable diseases endanger public health at Community level. It involves the European Commission, the 27 MS, the European Economic Areas and ECDC. These communicable disease events include:

- Outbreaks of communicable diseases extending to more than one Member State of the Community;
- Spatial or temporal clustering of cases of disease of a similar type, if pathogenic agents are a possible cause and there is a risk of propagation between Member States within the Community;
- Spatial or temporal clustering of cases of disease of a similar type outside the Community, if pathogenic agents are a possible cause and there is a risk of propagation to the Community;
- The appearance or resurgence of a communicable disease or an infectious agent which may require timely, coordinated Community action to contain it.

In addition under the International Health Regulations (IHR) (2005)[42], each country is required to report internationally to WHO any potential Public Health Emergency of International Concern, and to rapidly investigate and assess the event[43]. The criteria for reporting include 2 or more of the following criteria for the event:

- Likely to have a serious public health impact;
- Is unusual or unexpected;
- Creates a risk of international disease spread;
- Creates a risk that travel or trade restrictions will be imposed by other countries.

[41] Established under Decision 2119/98/EC
[42] International health regulations (2005) Second edition. World Health Organization. http://whqlibdoc.who.int/publications/2008/9789241580410_eng.pdf
[43] The International Health Regulations (IHR) are an international legal instrument that is binding on 194 countries across the globe, including all the Member States of WHO. Their aim is to help the international community prevent and respond to acute public health risks that have the potential to cross borders and threaten people worldwide. The IHR, which entered into force on 15 June 2007, require countries to report certain disease outbreaks and public health events to WHO. Building on the unique experience of WHO in global disease surveillance, alert and response, the IHR define the rights and obligations of countries to report public health events, and establish a number of procedures that WHO must follow in its work to uphold global public health security.

Since the IHR (2005) entered into force in June 2007 there have been several IHR alerts relating to infectious intestinal disease.

In addition to this, INFOSAN, the voluntary global network managed by WHO and FAO exchanges information between national agencies responsible for food safety.

This information is gathered using the event-based approach mentioned above via systematic searching of media (e.g. Global Public Health Information Network GPHIN), and informal sources including rumour monitoring, and is another potential source of information on infectious intestinal disease.

The Food and Waterborne Disease Unit also co-ordinates a system for communication of urgent queries on gastrointestinal disease issues between MS, e.g. early communications on clusters of disease, etc. Participants in this system are the microbiologist(s) in charge of the national reference laboratory(s) for gastrointestinal infections and the epidemiologist(s) responsible the national surveillance of these diseases.

2.12 Developments in surveillance of human infectious intestinal disease and other foodborne diseases

2.12.1 Organisational issues

The NI health service has been restructured, with the creation of four new bodies including the Public Health Agency from 1st April 2009. The establishment of the Public Health Agency will bring together health protection staff into a single service. This restructuring with a single health protection service provides opportunities for use/development of a common information system for infectious intestinal diseases, the potential linkage of laboratory information with clinical epidemiological information and more complete outbreak reporting. This would enable case-based laboratory and epidemiological information to be linked and available at regional level in NI.

2.12.2 Source attribution studies

Variations in the proportion of disease that is attributable to food are a measure of the systems used to collect information on the disease as well as the differing transmission routes within an individual country. As discussed earlier, not all infectious intestinal disease is foodborne, and it is important to know as far as possible, what proportion of disease can be attributed as foodborne. Source attribution is the capacity to assign cases of infectious intestinal disease for instance to a food vector that is the source of the causal agent for the individual or population

affected. A wide variety of source attribution approaches and data are used around the world, including the analysis of outbreak data, case-control studies, microbial subtyping, source tracking methods and expert judgment, among others.

There are two alternative approaches to source attribution. The HPA uses a database for surveillance of general outbreaks of infectious intestinal disease to determine pathogen-specific proportions of disease which are foodborne[44]. The success of this approach depends on whether thorough epidemiological and laboratory investigation and reporting of outbreaks have been undertaken or not, and it also assumes that disease transmission modes demonstrated in outbreaks represent overall disease transmission modes.

In Denmark a quantitative microbiological risk assessment (QMRA) modelling approach isused[45] to quantify the individual contribution of major food sources to cases of human salmonellosis. This model requires detailed knowledge on the distribution of *Salmonella* types.

The involvement of multiple countries or regions in free trade is also increasingly a feature if foodborne infectious intestinal disease and precise country of origin of food information is required.

Inclusion of recent travel history is also a key element of exposure information in attempting to distinguish between foodborne infectious intestinal disease acquired at home versus that acquired abroad. The completeness and accuracy of travel information in surveillance data have historically been inadequate but with modern ease of travel it is of increasing importance.

Currently, no source attribution studies are being undertaken on the Ireland of Ireland, which would allow accurate and dependable attribution of the proportion of infectious intestinal disease that are due to food. Ideally any such studies should be undertaken on an all-island basis to allow more robust analysis, and would ultimately permit more optimal allocation of resources for foodborne disease control and prevention.

2.13 Interpretation of surveillance data

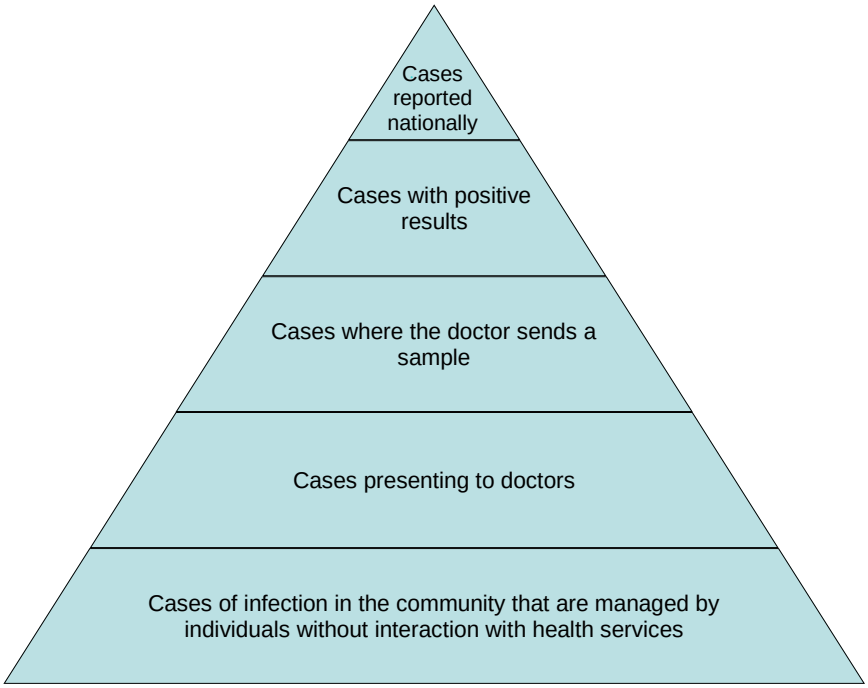
It is important to note that statutory notifications have long been known to underestimate the true number of cases seen by doctors, either because symptoms are short lived and often

[44] Adak, G.K., et al., *Disease risks from foods, England and Wales, 1996-2000.* Emerging Infectious Diseases, 2005. **11**(3): p. 365-72.
[45] Hald, T., et al. A Bayesian Approach to Quantify the Contribution of Animal-Food Sources to Humans Salmonellosis. Risk Analysis 2004 **24** (1): 255-269

relatively mild, or are not attributed to food poisoning or because of variable notification practices. Moreover, in an all island context, it is important to consider whether the differences in health service arrangements may influence the behaviour of patients accessing medical services and investigative practices such as stool sampling. The Economic Impact of Gastroenteritis on the island of Ireland study[46], however, indicated similar proportions of cases consult a doctor in each jurisdiction. Results for out of hours cooperatives indicate a 4% presentation rate per annum both in ROI and NI.

It can be concluded that the true population burden of infectious intestinal disease is not measured comprehensively in surveillance data. This is best conceptualised by imagining infectious intestinal disease as an iceberg. The iceberg comprises several layers as illustrated in Figure 2.3.

Figure 2.3 Schematic illustration of the relative contribution of different types of infectious intestinal disease to the total burden of disease



Routine surveillance data measures cases that present to the health services either via a general practitioner (GP) or hospital. There are many factors that influence these data such as:

[46] ***safe*food** (2008) The Economic Impact of Gastroenteritis on the Island of Ireland. http://www.safefood.eu/PageFiles/2497/the_economic_impact_of_gastro_on%20IOI_08.pdf

- The self-limiting nature of many foodborne diseases usually means that those affected are unlikely to visit a doctor or report the incident to their local health authority. With approximately 10% of the population suffering from gastroenteritis in a given year it is estimated that only 4% present to medical services[47];
- Only a fraction of infectious diseases presenting to a clinician is notified, even though this is a legal requirement. Also whereas for some pathogens it is important to identify all cases, such as with VTEC, for others such as norovirus, identification of each case is not necessary for surveillance purposes. This influences medical practitioner's behaviour regarding notification;
- Submission of a stool sample is not always clinically indicated;
- Outbreaks are far more likely to be reported and investigated than sporadic (single, unlinked) cases even though there is evidence that sporadic cases cause cumulatively far more disease than do recognised outbreaks.

In order to ascertain more fully the burden of gastroenteritis and foodborne disease in the population, several studies have been undertaken on the island of Ireland in the past. A new major study is currently being undertaken in the UK, Infectious Intestinal Disease 2[48], which follows on from that conducted in England in the late 1990s[49]. This new study aims to give a more precise estimate of the level of gastroenteritis in the community per year looking at the burden but not attribution, the numbers who attend their doctors, and by identifying the causative agents. In addition a major infectious intestinal disease telephone survey sampling 3600 people in NI and 3600 in ROI is currently underway. The estimates derived from this will be comparable with the telephone survey element of UK Infectious Intestinal Disease 2.

2.14 Opportunities for improvement

(i) There is an opportunity to improve the standardisation of sampling and testing protocols in both jurisdictions;

(ii) In both jurisdictions, there is scope for more sharing of information on outbreaks to relevant organisations/stakeholders. Initial summary reports are produced, but final reports are rarely available at national level and there is no central collation of these;

(iii) A human enteric reference service in the ROI will ensure more timely identification and greater comparability of human isolates between ROI and NI;

[47] ***safe*food** (2008) The Economic Impact of Gastroenteritis on the Island of Ireland. http://www.safefood.eu/PageFiles/2497/the_economic_impact_of_gastro_on%20IOI_08.pdf?epslanguage=en
[48] http://www.iid2.org.uk/
[49] Food Standards Agency. A report of the study of infectious intestinal disease in England. London: The Stationery Office, 2000.

(iv) On the island of Ireland source attribution studies could be conducted which would mean that the proportion of infectious intestinal diseases that are due to particular foods could be estimated using this methodology;

(v) In NI in the past it has not been possible to link laboratory and notification data at a regional level. This may now become possible with the restructuring of the NI health service;

2.15 Recommendations

2.1. With the establishment of the new Public Health Agency in NI, the possibility of introducing case-based reporting and linking laboratory and clinical information at a central level should be investigated;

2.2. Periodic reporting on an all-island basis using standardised infectious intestinal disease data submitted to EU from NI and ROI should be performed by HPS NI and the HPSC in cooperation with ***safe*food**;

2.3. The provision of a comprehensive human Enteric Reference Service should be pursued in ROI;

2.4. In each jurisdiction final reports on all general outbreaks[50] should be collated centrally. Key surveillance information and lessons learned should be formally disseminated within the system as appropriate with the aim of sharing best practice in the prevention and control of future outbreaks;

2.5. Funding agencies on a jurisdictional or ideally on an all-island basis, should consider commissioning source attribution studies to determine the proportion of infectious intestinal diseases that is foodborne on the island of Ireland;

2.6. NI and ROI should move towards operating with the same core surveillance data set.

[50] A general outbreak is one which involves two or more persons not residing in the same household.

3 Microbiological food safety surveillance

3.1 Introduction

Modern food control systems focus on the development of preventive strategies whereby food contamination is minimised or eliminated during production or preparation, rather than trying to control hazardous food when it has reached the market. Activities are generally organised so that the parts of the food chain that represent the greatest risk are prioritised for attention.

It is important to recognise that pathogens may enter the food supply at any point in the chain from primary production, transport, processing, packaging, distribution, retail/catering operations to supply, preparation and consumption by the end user. Thus, in order to effectively manage food safety it is essential to have up-to-date knowledge and understanding of the various risk factors inherent in the food chain.

Monitoring and surveillance activities along the food chain continuum enable the detection of hazards so that systematic control and intervention strategies can be adopted. This needs to be an ongoing activity so that timely and appropriate actions can be taken, based upon sound scientific information.

This Chapter will examine monitoring and surveillance of foodborne pathogens in the food chain on the island of Ireland. Surveillance data may be generated during official control activities conducted by the competent authorities or during testing conducted by food business operators (FBOs). *Ad hoc* food surveillance data may also, from time to time, be generated by research activities.

3.2 Organisation of official controls for the purpose of microbiological surveillance

Official control is a general and legal description covering a range of activities conducted by a competent authority with the intention of ensuring compliance with the food law. Those activities that directly result in the generation of microbiological surveillance data are but a sub-set of these activities. This section will address only those official control activities that result in the generation of microbiological surveillance data.

On the island of Ireland, most of the regulatory framework is derived from EU feed and food law. This framework establishes responsibilities for both MS and FBOs. The basic rules with regard to

food law are laid down in Regulation (EC) No 178/2002[51] with supplementary legislation covering more specific areas including food hygiene, zoonoses, and microbiological criteria for foodstuffs. Regulation (EC) No 882/2004[52] outlines the official controls to be performed by each MS to monitor and verify the compliance with food and feed law. The frequency of official controls must be regular and proportionate to the risk taking into account any HACCP or Quality Assurance Programmes applied by the FBO. If, within a MS, different enforcement authorities are involved in carrying out official controls, appropriate coordination procedures must be in place. Testing of the microbiological status of food placed on the market is specified in the regulation as one form of official control.

In order to ensure a uniform and transparent approach to official controls, MS must outline their programmes in a NCP and implement them in accordance with EU guidelines. These plans cover all official controls but include official controls pertinent to food surveillance. MS must present an annual report on the controls and audits carried out under the NCP.

3.2.1 Brief summary of organisation of official controls in Northern Ireland

Within the UK FSA is responsible for producing the National Control Plan which it prepares jointly with the Department for Environment, Food and Rural Affairs (DEFRA), and the Agriculture/Rural Affairs Departments in Scotland, Wales and NI.

Within NI the FSANI and Department of Agriculture and Rural Development (DARD) have the executive responsibility for the development of all Food Law and Policy. The main body of food law is monitored and enforced in NI by District Councils (DCs)[53]; however, DARD is responsible through Service Level Agreements (SLA) with FSANI for specific areas of enforcement. For more details on the organisation of official controls in NI in specific parts of the food chain the reader is directed to the UK NCP[54].

3.2.2 Brief summary of organisation of official controls in Republic of Ireland

The responsibility for food policy and legislation is vested in two government departments, Agriculture, Fisheries and Food and Health and Children. The FSAI has overall responsibility for the enforcement of food legislation and this is managed through service contract agreements

[51] REGULATION (EC) No 178/2002 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 28 January2002 laying down the general principles and requirements of food law, establishing the European Food SafetyAuthorityand laying down procedures in matters of food safety
[52] REGULATION (EC) No 882/2004 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 29 April 2004 on official controls performed to ensure the verification of compliance with feed and food law, animal health and animal welfare rules
[53] It should be noted that the District Councils are subject to the NI Review of Public Administration, the implementation of which will lead to a restructuring of local government in NI. See http://www.rpani.gov.uk/
[54] http://www.food.gov.uk/multimedia/pdfs/uknationalcontrolplan.pdf

between the FSAI and the Official Agencies (the FSAI and its official agencies are the competent authorities in ROI as outlined in Figure 3.1.
In ROI the FSAI and DAFF jointly develop the NCP in consultation with other stakeholders.

Figure 3.1 Official Agencies under service contract for the enforcement of food legislation in ROI.

- Department of Agriculture, Fisheries and Food
- Health Service Executive
- Local authorities (27 County Councils and four City Councils)
- Sea Fisheries Protection Authority
- Marine Institute
- Radiological Protection Institute*
- National Standards Authority of Ireland

* No service contract Memorandum of Understanding

Official agencies are charged with enforcing food law and monitoring and verifying that the food industry meets its obligations. In some agencies this is in addition to animal health and welfare rules outlined in Chapter 4.

For more details on the organisation of official controls in ROI in specific parts of the food chain the reader is directed to the FSAI Annual Report for 2007[55] and the ROI NCP[56].

3.3 Current microbiological food safety surveillance under official controls

Food surveillance data are generated under official controls as a result of sampling and analysis activities conducted by the competent authorities. Food samples are taken by authorised officers and are examined in official laboratories designated for the purpose. As mentioned previously, the official laboratory structure is augmented by the appointment of National Reference Laboratories that mirror Community Reference Laboratories for some, but not all zoonoses.

3.3.1 National Reference Laboratories and Official Laboratories

In 2006 following the designation of a number of additional Community Reference Laboratories (CRL) by EU for food, feed and animal health, MS were required under Article 33 of Regulation (EC) No 882/2004 to designate one or more NRLs for each CRL.

[55] http://www.fsai.ie/assets/0/86/204/9deacf10-a965-4ff4-8739-620426c0c3dc.pdf
[56] http://www.agriculture.gov.ie/areasofi/food_safety/NationalControlPlan2007-2011.pdf

In respect of NI, NRLs are appointed on a UK basis by the FSA, DEFRA/DARD, Veterinary Medicines Directorate, and the Pesticides Safety Directorate. Details of the NRLs can be found in Appendix R of the UK NCP[57]. In the UK there are over 30 NRLs some of which are situated in NI e.g. Agri-Food and Bio Sciences Institute (AFBI), for example. Annual reports and details of research work of each NRL can be found on their respective web sites.

In the UK official control laboratories are designated by the central competent authorities for the purposes of microbiological examination of food samples taken by enforcement officers during the course of their duties. Across the UK there are over 100 official control laboratories[58] 5 of which are situated in NI. The current list of laboratories may be found on the food.gov.uk web page and the NRLs and official laboratories are listed in the UK NCP[59].

In ROI the NRLs were designated by the DOHC following consultation with DAFF and the FSAI. All of the NRLs for food in the ROI for microbiological parameters (*Salmonella*, *Listeria*, *E. coli*, *Campylobacter*, *Staphylococci*), TSEs, parasites and antimicrobial resistance are located on the Backweston Complex under the remit of DAFF. Specific functions for the NRLs include coordination of certain activities of official laboratories, dissemination of information and providing technical support to the Competent Authorities.

In addition to the NRLs there is a network of official laboratories designated by the competent authorities (DAFF, DOHC and the Department of Department of Communications, Marine and Natural Resources) in ROI[60] for the purposes of official controls. The roles played by the NRLs, both human and food, feed and animal health, together with the official laboratories are critical to the identification and monitoring of food safety hazards and to provide operational support in emergency incidents and outbreaks. The NRLs and official laboratories for ROI are listed in Appendices 3 and 4, respectively of the ROI NCP[61].

3.3.2 Role of enforcement officers in microbiological food surveillance

Oversight of official controls on food involves a diverse range of enforcement officers from a number of professional disciplines working in various parts of the food chain. The activities of the enforcement officers extend well beyond food sampling and include inspection of animals

[57] http://www.food.gov.uk/multimedia/pdfs/uknationalcontrolplan.pdf
[58] http://www.food.gov.uk/enforcement/monitoring/foodcontrollabs
[59] www.food.gov.uk/multimedia/pdfs/uknationalcontrolplan.pdf
[60] www.agriculture.gov.ie/media/migration/farmingschemesandpayments/nationalcontrolplanforfoodfeedandwelfare/NationalControlPlan2007-2011.pdf
[61] www.fsai.ie/uploadedFiles/Legislation/Food_Legisation_Links/Official_Control_Of_Foodstuffs/national_control_plan_2007_2011.pdf

pre-slaughter and food premises, systems and processes throughout the food and outbreak/food incident investigation. Official food samples collected by enforcement officers as part of their official controls work are tested for microbiological parameters in official laboratories to determine compliance, safety and hygiene. Critically, it is also through the work of the enforcement officers that many of the actions resulting from surveillance are followed through to ensure improvements in food safety. Food samples are also taken at the point of import into the EU.

In NI the 26 DCs use a range of activities referred to as interventions to monitor, support and increase food law compliance within a food establishment. These include but are not restricted to official controls. The food hygiene intervention frequencies of food establishments are determined using the risk rating scheme contained in the Food Law Code of Practice (COP) (NI). Most interventions are carried out by Environmental Health Officers although other suitably qualified officers are used in some areas.

In NI DCs prepare sampling programmes detailing their local sampling priorities using risk based criteria in line with the food law code of practice NI, FSA and NI Food Liaison Group (NIFLG) Guidance. Furthermore, the recent availability of historical data through the use, by DCs in NI, of the FSS (UK) and their detailed expert analysis enables interventions to be directed and future sampling activities to be targeted in accordance with the general philosophy of risk-based control activities as defined under EC feed and food law. The continued support and participation of DCs in the use of the FSS (UK) database together with the expert analysis and guidance of the NI Strategic Committee on Food Surveillance will be the contribution that this makes to risk-based sampling to be maintained and developed.

The NIFLG each year in collaboration with the NIPHL plans and co-ordinates a number of regional surveys in which DCs are invited to participate. The NIFLG also co-ordinates DC participation in national and EU surveys including HPA surveys coordinated by Local Authorities Coordinators of Regulatory Services (LACORS) and the FSA.

Results of these sampling initiatives are considered by the NIFLG and reported to DCs. It is worth noting that LACORS surveys are conducted on a UK basis and the data for NI are not currently disaggregated, although this may be possible to achieve. Furthermore, sampling levels for NI elements do not provide sufficient power to the NI dataset for it to stand alone and be representative on an NI wide basis.

Food sampling activities at primary production level e.g. liquid milk, cream and buttermilk are undertaken by DARD (QAB) officers. Samples are taken in accordance with a sample plan based on risk based activities. The majority of laboratory microbiological analyses to support these activities is performed by the Agrifood and Biosciences Institute (AFBI) laboratory. Analytical data are supplied to the FSA from AFBI via a LIMS on a monthly basis, with immediate notification, if required. Sample results are manually entered onto a DARD (QAB) spread sheet. Currently such data are not available on the UK Food Surveillance System (UK FSS) database and thus not available to other partners.

In ROI, the Environmental Health Service (EHS) of the HSE provides a range of food safety/food control services in accordance with its service contract with the FSAI. Sampling is carried out in accordance with the sampling plan, the relevant legislative requirements, sampling guidelines and /or sampling protocols. The sampling plan includes the various food Sampling Programmes undertaken by the EHS including EU Coordinated Control Plans and National Surveillance Programmes agreed with the FSAI. The plan outlines the number of samples to be taken, the parameters to be analysed and where appropriate the sampling points. Sampling is focused on all areas in the food supply chain from production, importation, manufacture that are within EHS remit but mostly at retail and catering stage as an aid to the determination of compliance of food and food businesses with food legislation, to provide optimal data for the protection of the consumer and as part of agreed focused surveys.

In general in ROI each official agency, sometimes with the collaboration of FSAI, decides on their sampling programmes using risk based criteria like historical trends, the results of risk assessments and expert judgments. An exercise is currently underway in FSAI under the Scientific Committee to review the HSE microbiological data with a view to recommending ways in which risk can be addressed. The HSE has conducted a comprehensive review of their food sampling programmes with a consequent refocusing of sampling towards import, manufacture and distribution.

In addition DAFF laboratories undertake work under the DAFF service contract with FSAI which includes reporting of official control testing. This includes testing open pack retail meat products for a variety of pathogens and indicator microorganisms collected from all processors in line with a national sampling plan agreed with FSAI. Similar arrangements are also in place with the Marine Institute and Radiological Protection Institute that also provide data on surveillance to FSAI. In addition, the HPSC provides data on foodborne disease to the relevant authorities on a weekly basis.

3.4 Monitoring and surveillance data collected by food business operators

The primary purpose of FBO testing is to ensure that unsafe food is not placed on the market.

If unsafe food is identified through FBO testing and product is on the market then it must be withdrawn under Article 19 of Regulation (EC) No 178/2002. This in turn brings with it an obligation to notify the competent authorities. If such food is not on the market then no notification of the competent authorities is necessary. There is no obligation on FBOs to collate or present their data to the competent authority. However, these data are available for inspection and audit by an enforcement officer.

For FBOs manufacturing foods of animal origin there is a requirement for approval of premises. In ROI, at the discretion of the Minister for Agriculture, Fisheries and Food, such approval brings with it an obligation to notify the competent authority of incidents where pathogens are detected in food or in the processing environment. However, no such option exists in the manufacture of food of non-animal production or later in the food chain at retail and catering levels.

In addition to microbiological analyses performed under Regulation (EC) No 2073/2005[62], the food industry as a whole possesses considerable amounts of data on the microbiological safety and quality of a wide variety of products. These have been gathered routinely over a long period of time by individual companies for their own checks using their own sampling and analysis methods. Depending on the business, laboratory analyses may either be carried out in-house or by contracting out on a confidential basis to commercial private laboratories. Relevant commercial data are not available for surveillance purposes.

In addition to the requirements of the Microbiological Criteria legislation, under the Zoonoses Directive (Directive 2003/99/EC), FBOs have an obligation to maintain the results of their testing and preserve the isolates for a period of time specified by the competent authorities. The results and isolates must be provided to the competent authorities on request. Transposition of the Directive in the different jurisdictions may place different requirements on FBOs. Competent authorities would have to consider the requirements placed on them by the freedom of information legislation.

[62] Commission Regulation (EC) No 2073/2005 of 15 November 2005 on microbiological criteria for foodstuffs

In NI, FBOs are required to preserve all isolates for at least two weeks from the date of examination and retain the results of the examination for a period of 12 months, during which they must be supplied to the Department immediately on demand. In ROI, results must be kept for 3 years and isolates preserved for 6 months. In ROI FBOs under DAFF remit are required to use laboratories approved by DAFF and selected pathogenic isolates must be submitted to the NRLs when requested.

To complement this process in the ROI, ***safe*food** funded the development of The FoodMicro Database[63] at the Central Veterinary Research Laboratory to capture data arising from food and environmental testing for foodborne pathogens performed by the food industry and analysed by independent laboratories approved by DAFF and in some cases by DARD. An extensive database on FBO testing is now in place at CVRL and datasets continue to be reported by laboratories on a range of foodborne pathogens and indicator microorganisms. Although this project is now complete some data continue to be collected in ROI.

Furthermore, there are international examples of where large food companies have provided commercially confidential data through a third party (often a university or other organisation not linked to regulation) to assist in the development of Microbial Risk Assessments (MRA). This MRA framework, as discussed later, is particularly data-intensive but enables differences between datasets to be overcome and commercial confidentiality protected. An approach such as this for the island of Ireland would need to take consideration of the willingness and availability of such information to become part of a greater data set which could be analysed for trends. This would be contingent on protecting the confidentiality of data providers, voluntary participation, and consideration of whether food importers would supply similar information.

3.5 EU baseline studies and Zoonoses Directive in food surveillance

Regulation (EC) No 2160/2003[64] sets out provision for the adoption of targets for the reduction of specified zoonoses in animal populations at the level of primary production and at other stages of the food chain, including in food and feed. Under these provisions, in conjunction with Regulation (EC) No 2160/2003, comparative data in all MS though EU baseline studies are collected. These are discussed in detail in Chapter 4. The progressive harmonisation of monitoring in MS of zoonoses and zoonotic agents, such as *Salmonella* which has historically been a priority organism, is being addressed through common microbiological sampling

[63] ***safe*food** (2006) FoodMicro Database Report - A Harmonised System for Approval and Monitoring of Private Laboratories Testing for Foodborne Pathogens. www.safefood.eu/en/Publication/Research-reports/FoodMicro-Database-Report--A-Harmonised-System-for-Approval-and-Monitoring-of-Private-Laboratories-Testing-for-Foodborne-Pathogens/

[64] http://faolex.fao.org/docs/pdf/eur40332.pdf

protocols for foods. For example in 2008, a survey on the prevalence of *Salmonella* and *Campylobacter* in whole chickens was conducted in all MS. This and other EU wide surveys proposed will provide comparable prevalence data between MS allowing and facilitating first risk assessments at Community level.

Given that NI is a region within the UK, which is the designated MS, food surveillance and monitoring data from NI collected and submitted in accordance with the Zoonoses Directive and EU baseline surveys, are reported in a consolidated UK dataset. Meaningful analyses of surveillance data on an all-island basis would be possible if the NI portion of the data was a representative portion of that region of the island of Ireland relative to the amount of data available from the ROI.

3.6 Outputs of food surveillance and monitoring

The majority of food sampling performed in NI and the ROI currently contributes to monitoring programmes. Such activities provide drivers for compliance and provide a greater understanding of microbiological issues associated with food and lead to their more rapid resolution.

3.6.1 Food Surveillance System database in Northern Ireland

The installation of a food surveillance database in NI was successfully completed at the end of 2006. This system is part of the Food Standards Agency UK Food Surveillance System (FSS (UK)). All 26 DCs in NI, the Public Health and Public Analyst's laboratories are linked to the FSS (UK) database.

All data relating to microbiological samples[65] taken by DC in NI are transmitted electronically via LIMS and held in one place to facilitate the:

- Monitoring of trends;
- Comparison of data across regions;
- Identification of emerging issues;
- Identification of priorities for future sampling and surveillance programmes.

The FSS (UK) database enables a coordinated approach to food surveillance and allows food safety professionals to access food sample data across the UK. It offers a wide range of query options and provides a facility for establishing standard reports. The data obtained from FSS UK are examined and interpreted by the NI Strategic Committee on Food Surveillance (Section 3.7.4), an expert group that produced the first report on food sampling by DC in NI in 2007 which is

[65] chemical data are also collated

available on the FSANI website[66]. This is noteworthy in that the data and discussion of trends are also available to the food industry so that feedback can be provided. Thus the introduction of FSS (UK) has the potential for enhancing food safety measures and contributing towards significant public health benefits.

At present the data from food control activities performed on behalf of the FSA by DARD is not held on the FSS (UK), however such data are maintained on a separate database by FSA NI. DARD and FSA officers are currently examining the merits of the FSS (UK) database for recording these data. The QAB of DARD are also examining the potential of the database for holding sample details relating to microbiological results of milk sampled [67]from farms and dairies in NI. The creation of one comprehensive database for NI for all food sampling activities would contribute to further improvements in food safety compliance by enhancing the scope of information held on one database collecting food sample data. Analysis of the data could also inform the development of sampling activities based on risk.

3.6.2 Food safety surveillance data management in Republic of Ireland

All official food surveillance data are submitted by the Competent Authorities (CAs) for compilation and analysis by FSAI. The FSAI provides a data management service and, in addition, undertakes responsibility for the collation, quality assurance, analysis and interpretation of data.

The current manual system for data transmission is being replaced by an electronic communication linkage from the HSE. Data transmission from the HSE OFMLs is in the form of agreed datasets[68] and is supplied to the FSAI on a regular basis. Currently both systems are operating in parallel and it is expected that electronic transfer of data will provide real time information. These national data are used to monitor and evaluate official control systems, as a basis for risk assessment and zoonoses returns to the European Commission and EFSA. These data are then used to produce overview reports that are discussed during scheduled liaison meetings between the FSAI and representatives of the Official Agencies. In addition the results of HSE national surveillance programmes are reported by FSAI on its web site and summaries are posted in the FSAI newsletter[69]. A broad summary of all routine regional and local food control sampling is included in the FSAI annual reports.

[66] http://www.food.gov.uk/news/newsarchive/2008/dec/niscfsfs
[67] chemical data is also collated
[68] http://www.agriculture.gov.ie/foodsafetyconsumerissues/nationalcontrolplanforfoodfeedandwelfare/
[69] http://staging.fsai.ie/news/newsletter/index.asp

Each of the CAs maintains its own data on establishments, inspections, samples and analysis and relevant information is also transmitted to the FSAI for inclusion in the National and EFSA Zoonoses Report. The NRLs for food collectively publish a quarterly newsletter which includes reports of activities coordinated by CRLs. Additionally some NRLs publish annual reports and these are available on the DAFF website. Baseline study data is published by EFSA when analysis completed.

The data from sampling to date have served to provide information to the FSAI, which in many cases, has confirmed the safety of certain foods, and in others, has highlighted or alerted the FSAI to a potential problem. There is also a requirement for the HSE to notify the FSAI of foodborne outbreaks and the outcome of investigations without delay. Currently, however, user groups cannot access these data to perform queries and obtain customised reports. Thus this limits the value and potential utilisation of such information by professionals in the area of foodborne disease control. It is envisaged that user access via the FSAI Extranet will follow once electronic update of the dataset is complete.

3.7 Microbiological food safety surveillance developments

3.7.1 Coordination of food monitoring and surveillance

There is little coordination of food surveillance and food surveys on an island of Ireland basis, with different coding of samples (HPS codes used in the FSS (UK) database in NI and EU coded in ROI) making direct comparisons difficult. Where similar activities in each jurisdiction produce data that are not directly comparable, the power of an all-island dataset cannot be exploited.

3.7.2 EU coding systems

The current EU coding system for the classification of food samples uses groupings that are often so general that meaningful data on individual food types cannot be extracted. The FSAI uses the current EU coding system and this is elaborated in guidance note 2 on the classification of food[70], however, an EFSA working group has been established to make the task of collation of food control data easier and more meaningful. The review of such a food classification system is welcomed. The adoption of an enhanced single coding system in both jurisdictions on the island would contribute to the production of comparable food control data.

3.7.3 The development of the all-island computerised food safety information repository

*safe*food and other stakeholders on the island are investigating the feasibility of a data repository for food control and safety data that combines Geographic Information Systems (GIS)

[70] http://www.fsai.ie/assets/0/86/204/d7af0602-b3e1-4788-802a-0684b3199e91.pdf

and SPSS applications, an analytical software solution, to enable the detailed spatial and statistical analysis of food monitoring and surveillance data generated in both jurisdictions on the island. The proposed system would have the capacity to provide sophisticated reporting tools to various user groups to enable custom data extracts and analyses to be performed at various levels of accessibility, as appropriate. Initial extracts of historical data have been supplied to *safe*food for the creation of this pilot repository.

The provision of the data repository would represent a significant development for food safety and control activities on the island providing enhanced benefits to professional user groups, thus making a strong contribution to the protection of public health.

3.7.4 Northern Ireland Strategic Committee on Food Surveillance

In 2007 in NI the Strategic Committee on Food Surveillance was established to provide assurances to FSANI on analysis and interpretation of data extracted from the FSS (UK) database, produce an annual report on sampling activities and consider targeted or risk based sampling programmes. The committee consists of members from Health Protection Agency (HPA), Department of Health, Social Services and Public Safety (DHSSPS), Public Analyst, Food Examiner, NIFLG, DCs and *safe*food. As mentioned above, their first report was published in December 2008.

3.7.5 Risk Assessment

As already mentioned, Risk Assessment (RA) is now the EU wide recognised methodology underlying the evaluation of food hygiene measures, the development of food safety standards and identification of intervention and risk management options. RAs may be conducted using qualitative or quantitative approaches. Qualitative RAs rely upon the categorisation of risk according to general estimates as informed by available data and from other sources to produce an overall output. Quantitative RAs, however, are resource intensive, require quantitative data and have only been conducted for a limited number of pathogen-food combinations.

The availability of relevant data to allow the development of such Quantitative RAs is a considerable issue, since the quality of the output will be determined by the quality of the data. Surveillance data can be used from time to time in the development of RAs.

3.7.5.1 The microbial risk assessment network in ROI

A network has been established in ROI under funding for 5 years awarded by the Food Institutional Research Measure (FIRM)[71]. This aims to develop a unified database of existing national data/models, including data held by DAFF and FSAI databases. The principal objective is to use quantitative microbial risk assessment (QMRA) as a risk management tool in developing appropriate food safety objectives from farm to fork. Initially this involves reviewing all national funded projects which contain data relevant to microbial risk assessment the outcome of which is to work towards developing a database akin to the Chemical Residues Database. The establishment of the microbial risk assessment network in ROI is envisaged as the first step in the development a multidisciplinary all island risk approach to assessment which in time will explore the data requirements and potential application of this technology to improve the understanding and control of foodborne disease on the island of Ireland.

3.8 Opportunities for improvement

(i) There is an opportunity to coordinate surveillance and risk assessment on the island of Ireland;

(ii) There is an opportunity to improve the comparability of surveillance data on the island of Ireland by an adoption of a comparable coding system for food samples;

(iii) Coordination of priority food surveys on an island of Ireland basis would improve surveillance on the island of Ireland;

(iv) The timeliness of data capture and publication for surveillance purposes could be improved. The improvement of systems for transmitting data to control authorities should contribute to this;

(v) Surveillance data on the island of Ireland could be improved by the inclusion of more surveillance data from industry although there is no legal requirement to do so;

(vi) In ROI, the data collected and collated by the FSAI would have more value if data providers had access to and an ability to perform queries and obtain customised reports;

(vii) Meaningful analyses of surveillance data on an all-island basis would be possible if the NI portion of the data was a representative portion of that region of the island of Ireland relative to the amount of data available from the ROI.

3.9 Recommendations

3.2. Microbiological food safety surveillance and source attribution should be improved by establishing a process to improve data sharing and coordination of food

[71] http://www.agriculture.gov.ie/index.jsp?file=schemes/firm_scheme/intro.xml

monitoring, and risk assessment activities amongst appropriate stakeholders on the island of Ireland by:

a. Addressing diverse food coding systems;
b. Compatibility of sampling programmes;
c. Electronic data capture and analysis;
d. Feedback mechanisms to stakeholders;
e. Exploring the use of under-utilised data sources for example FBO data.

4 Surveillance of food animals

4.1 Introduction

The island of Ireland has historically enjoyed a high animal health and welfare status, with Governments in both jurisdictions continuously deploying resources for disease eradication, control and surveillance.

Food animals can harbour a variety of pathogens which may or may not give rise to clinical disease. Animals may be exposed to pathogenic microorganisms of public health significance from a range of sources including other animals, contaminated animal feed or water, contact with humans or from various on-farm practices e.g. spreading slurry. Animal Health surveillance provides early warning/prompt detection of animal health and welfare problems, together with tracking and analysis of the way diseases spread. This surveillance provides crucial scientific evidence on which to develop prevention and control measures and assess the effectiveness of existing approaches.

Various sources of information contribute to veterinary surveillance, ranging from clinical observations by farmers and veterinary surgeons, ante- and post-mortem observations at the abattoir or diagnostic facility, diagnostic test results from veterinary laboratories and international surveillance systems and alerts. The outputs of veterinary surveillance are utilised at many levels, including that of government policy makers as a basis for the development or refinement of policy on disease control and prevention, as well as private veterinary practitioners (PVPs) and farmers who use such information to make informed judgements about animal purchases (including importations), disease prevention and control measures at the production level. At the international level, surveillance data on animal health and disease are fundamental to the categorisation of the status of countries according to the health of their animal populations, for the purpose of controlling animal movement and minimising spread of disease through international trade. The World Organisation for Animal Health (OIE) plays a key role in this process and the regulation of international trade in animals and food and feed of animal origin is underpinned by World Trade Agreements.

This Chapter will outline the surveillance of diseases, transmissible in food, in food animals on the island of Ireland.

4.2 Responsibility for food animal surveillance activities

As mentioned in Chapter 1, since the publication of the original ***safe*food** report on surveillance, the development of National Control Plans (NCPs)[72,73] has been a significant development at European level in relation to food safety and the monitoring of zoonoses and zoonotic agents. The NCPs gives a broad outline of the systems in place for overseeing animal health issues. Although local arrangements outlined in these NCP are different both in NI and ROI, the overall objectives of DARD and DAFF are similar for the prevention and eradication of animal diseases, including:

- Control and monitoring of imports and trade in animals and animal-derived products within the EU;
- Identification, movement and tracing of animals;
- Controls on and monitoring of farms;
- Enforcement of animal welfare rules.

4.3 Current food animal surveillance

Disease surveillance systems for food animals in both NI and ROI are broadly similar in scope as they both comply with the same EU legislative framework. These systems are comprehensive and operate at both farm and abattoir level and are facilitated by national identification systems at individual animal level for all bovines and at herd or flock level for other species.

Infections caused by some pathogens/agents are notifiable e.g. *Salmonella* Typhimurium and *S.* Enteritidis in all food animals in ROI and any serovar of *Salmonella* found in animals and poultry in NI. The occurrence of *Salmonella* serovars Typhimurium, Enteritidis, Virchow, Hadar and Infantis in any breeding flocks of poultry on the island of Ireland are notifiable as are any occurrences of serotypes Typhimurium, Enteritidis in poultry layer and broiler flocks. Other pathogens are also covered by eradication or control programmes e.g. *Mycobacterium bovis* (tuberculosis), *Brucella* spp. (bovine brucellosis) and Bovine Spongiform Encephalopathy (BSE). Data on these diseases are collated nationally by both DARD and DAFF. Surveillance of some other diseases is primarily undertaken at the slaughterhouse level, (e.g. *Cysticercus bovis*, the infective stage of the human tapeworm, *Taenia saginata* and extensive testing of slaughtered pigs on the island of Ireland for *Trichinella*). In addition, food chain information relevant to public health must be provided by all FBOs supplying poultry, pigs or horses to abattoirs in advance of their slaughter. This latter procedure will also be mandatory for cattle and sheep in 2010. Currently information gained from this surveillance is collated to a varying degree only.

[72] http://www.food.gov.uk/multimedia/pdfs/uknationalcontrolplan.pdf
[73] http://www.agriculture.gov.ie/areasofi/food_safety/NationalControlPlan2007-2011.pdf

4.4 Developments in food animal surveillance

4.4.1 Monitoring and control of zoonoses and zoonotic agents

Zoonoses and zoonotic agents, many of which are foodborne, have been monitored within EU and the data published since 1995 in line with Directive 92/117/EC[74] then in operation. Meanwhile Directive 2003/99/EC increased the range of zoonoses and zoonotic agents to be monitored in MS and also listed additional zoonoses and zoonotic agents to be monitored according to the epidemiological situation in MS as outlined in Figure 1.1. In order to ensure a more comprehensive monitoring of zoonoses, Directive 2003/99/EC also covers the monitoring of related antimicrobial resistance, the requirement for epidemiological investigation of foodborne outbreaks and the exchange of information on zoonoses and zoonotic agents.

As *Salmonella* and *Campylobacter* have been the most common microbiological causes of foodborne zoonotic infection throughout the EU, the initial focus of the MS on control of zoonotic disease has been on their monitoring and control. Regulation (EC) No 2160/2003 (concerning the control of *Salmonella* and other specified foodborne zoonotic agents) introduced control measures for *Salmonella* in food animals with initial focus on poultry and pigs. Targets have since been introduced for *Salmonella* in poultry flocks based on the five most frequently isolated *Salmonella* serovars of public health significance (viz. *S.* Enteritidis, *S.* Hadar, *S.* Infantis, *S.* Typhimurium and *S.* Virchow) for breeding flocks and on *S.* Enteritidis, and *S.* Typhimurium for other flocks.

4.4.2 EU baseline studies

Pursuant to Directive 2003/99/EC and Regulation (EC) No 2160/2003 a number of baseline studies have been conducted or are underway (Table 4.1). These Community-wide studies provide comparable data between MS for the first time and provide a reference for the setting of pathogen reduction targets, as outlined above.

Undertaking this EU-wide surveillance in MS is being facilitated by co-funding from EU and the use of standardised sampling criteria and analytical methods.

[74] Zoonoses Directive named European Council Directive (92/117/EEC) concerning measures for protection against specified zoonoses and specific zoonotic agents in animals and products of animal origin in order to prevent outbreaks of food-borne infections and intoxications, as amended. *OJ of the European Communities L*. pp. 38–48.

Table 4.1 Baseline studies completed or underway in MS

Date	Food Animal	European Commission Decision
2005	*Salmonella* in laying hens	2004_665
2006	*Salmonella* in broilers	2005_636
Oct 2006-Sep 2007	*Salmonella* in turkeys	2006_662
Oct 2006-Sep 2007	*Salmonella* in fattening pigs	2006_668
2008	*Salmonella* and MRSA in breeding pigs	2008_55
2008	*Campylobacter* and *Salmonella* in broiler meat	2007_516

NI was included as a region of the UK for the purposes of the baseline studies and the sampling undertaken was weighted to provide meaningful UK data rather than regional data.

A reduction target for *Salmonella* in breeding hens was set by Regulation (EC) No 1003/2005[75] to allow a maximum of 1% of breeding flocks to be infected by one of the five main serotypes by end 2009. In addition, Regulation (EC) No 1237/2007[76] places restrictions on placing on the market eggs from flocks infected with *S.* Typhimurium or *S.* Enteritidis. Imports of poultry and hatching eggs intended for breeding are only permitted from third countries which have control programmes considered equivalent to EU provisions.

FBOs are required to sample breeding flocks at 4 weeks and 2 weeks prior to moving to the laying phase. FBOs must sample adult breeding flocks every two weeks during egg production. In ROI all samples must be tested in laboratories approved by DAFF. Official samples are collected on three occasions per year.

Reduction targets for *Salmonella* in laying hens, broilers and turkeys have also been set. In ROI the new national control programme for *Salmonella* in laying hens commenced in January 2008 and in July 2008 in NI with the initial focus on control on *S.* Typhimurium and *S.* Enteritidis, with other serotypes of public health significance to be included after three years. FBOs are required to sample and test laying flocks at the day-old stage, two weeks before laying and at least every 15 weeks during the laying phase. In both jurisdictions at least one official sampling is

[75] COMMISSION REGULATION (EC) No 1003/2005 of 30 June 2005 implementing Regulation (EC) No 2160/2003 as regards a Community target for the reduction of the prevalence of certain salmonella serotypes in breeding flocks of Gallus gallus and amending Regulation (EC) No 2160/2003

[76] COMMISSION REGULATION (EC) No 1237/2007 of 23 October 2007 amending Regulation (EC) No 2160/2003 of the European Parliament and of the Council and Decision 2006/696/EC as regards the placing on the market of eggs from Salmonella infected flocks of laying hens.

undertaken annually.In ROI all FBO samples must be tested in laboratories approved by DAFF, or in the case of NI in laboratories approved by DARD as accredited to ISO 17025 standards.

For broilers the current target for control is that a maximum of 1% of flocks may remain positive for *S.* Typhimurium or *S.* Enteritidis by the end of 2011. In ROI the national control programme for broilers commenced in January 2009 and in June 2009 in NI. Flocks are sampled 3 weeks before slaughtering and in ROI samples are tested in laboratories approved by DAFF, or in the case of NI in laboratories approved by DARD as accredited to ISO 17025 standards. In both jurisdictions official samples are collected annually from one flock of broilers on 10% of holdings.

In turkeys the current target for control for both adult breeding flocks and fattening turkey flocks is that a maximum of 1% of flocks may remain positive for *S.* Typhimurium or *S.* Enteritidis by the end of 2012. FBOs are required to sample fattening flocks 3 weeks before slaughtering. Rearing flocks must be sampled when 4 weeks old and again 2 weeks before laying. Adult breeding flocks must be sampled at the holding or hatchery every three weeks. In ROI FBO samples must be tested in laboratories approved by DAFF, or in the case of NI in laboratories approved by DARD as accredited to ISO 17025 standards. Official samples are collected annually from all flocks on 10% of holdings in both jurisdictions.

In NI official samples must be submitted to laboratories approved by DARD as accredited to ISO 17025 standards. The results are included in the UK reports submitted to the EU trends and sources report as required by EU legislation, and the UK Zoonoses report.

As all FBO testing related to the control programmes in ROI must be undertaken in laboratories approved by DAFF it is a legal requirement that approved laboratories submit all isolates and information on tests regularly to CVRL for collation.

Regarding slaughter pigs, before setting a reduction target for this category a cost/benefit analysis is required, as specified in Regulation (EC) No 2160/2003. This analysis will be based on results of the 2008 baseline study and include a quantitative assessment of the risk factors and mitigation options. A quantitative assessment of the risk factors and mitigation options will also be carried out for breeding pigs with an expected reduction target being set in 2010. Notwithstanding developments at EU level control programmes for *Salmonella* in pigs have been operating in both NI and ROI. The ROI programme has had a legal basis for this action since 2002. The NI programme is a voluntary one and is industry-led with inputs from various stakeholders including the FSA and DARD/DEFRA.

4.4.3 Surveillance of Antimicrobial Resistance in pathogens derived from food animals

Directive 2003/99/EC on the monitoring of zoonoses and zoonotic agents provides a legal basis for the requirement for antimicrobial resistance monitoring of zoonotic bacteria and indicator microorganisms isolated from animals and food. This monitoring supplements the monitoring of human isolates conducted in accordance with Decision No 2119/98/EC.

To date, two harmonised monitoring schemes for antimicrobial resistance have been made a legal requirement: Decision 2007/407/EC which outlines a harmonised approach for monitoring antimicrobial resistance in poultry and pigs in MS, and European Commission Decision 2007/516/EC which is the legal basis for the baseline survey on the prevalence and antimicrobial resistance of *Campylobacter* spp. in broiler flocks and on the prevalence of *Campylobacter* spp. and *Salmonella* spp. in broiler carcasses. In NI, as is the case in the rest of the UK, testing has been harmonised by the NRLs for food, feed and animal health and specifies *inter alia* the use of the dilution method, the range of antimicrobials and breakpoints or cut-off points to be used for classification of strains as susceptible (S) or resistant (R), all of which are now standardised between laboratories.

4.5 Outputs of surveillance

In NI, the Animal and Public Health Information System (APHIS)[77] is the central register of all food animal keepers and their animals. In addition to the animal registration and traceability information, the system contains information on animal health programmes and food safety issues such as herd and animal's bovine tuberculosis and brucellosis status; bovine animal's age and TSE status, and exposure to pharmaceutical and /or chemical contaminants and communicates this to the meat plant operators and the Official Veterinarian (OV) prior to or at the time of slaughter.

In cattle, sheep and pig meat plants, the system records real time on-line data on ante-mortem and post-mortem, welfare information from lairages and slaughterlines. The system also delivers the various medicine residues surveillance programmes for all species including poultry as well as *Trichinella* surveillance for pigs. The system enables the flow of food safety information in both directions along the food chain, and particularly the feedback of data to farmers and FBOs.

[77] http://eservices.ruralni.gov.uk/onlineservices/secure/aphis.asp

The system is not used for the transmission of information to FSA officials. DARD supplies animal health information relating to food safety to the FSANI through a system of monthly, quarterly and annual reports the requirements for which are described in a Service Level Agreement. In addition, to these regular reports, any serious animal disease incident with food safety implications is notified to the FSANI immediately. In Great Britain (GB) the Veterinary Investigation Diagnosis Analysis database (VIDA) has been created that contains a record of every submission to the Veterinary Laboratory Agency (VLA) and Regional Laboratories (RLs) and Scottish Agricultural College Disease Surveillance Centres. Data are published annually on the VLA website[78]. Equivalent NI data are published quarterly in the BVA publication, the Veterinary Record.

In ROI, the Agricultural Farm Inspection and Testing (AFIT) System in DAFF captures information on all animal welfare inspections carried out by DVO's or the VPH on farms, marts and slaughter plants. In addition, the Animal Identification and Movement System (AIMS) and the Animal Health Computer System (AHCS) support the full life-cycle of the DAFF animal traceability and bovine tuberculosis and brucellosis testing programmes. Information from the Animal Identification and Movement System (AIMS) is published annually by DAFF.

Annual reporting on animal disease surveillance activities undertaken by DAFF, through the Regional Veterinary Laboratory (RVL) Service, is accomplished through the publication of an Annual Report which is also available on the DAFF website[79]. This provides a representative summary of diseases detected in farm animals – either in carcasses or clinical pathology material submitted to the laboratory, or as a result of on-farm investigations. Bi-monthly reports of disease investigations conducted by RVLs of interest to veterinary practitioners are also published in the Irish Veterinary Journal. This is facilitated through the integrated LIMS linking of laboratories and provides a central database that permits access to information. In addition to these activities, meetings are held on an ad hoc basis between the relevant competent authorities to address issues as they arise.

The outcomes of surveillance conducted in fulfillment of the requirements of the Zoonoses Directive are compiled annually by DAFF and FSAI in ROI and DEFRA and FSA in NI for submission each May to the European Commission for analysis by EFSA and publication in the EFSA Community Summary Report. National data are made available in a timely manner; however, there is a time lag between the collation of such data and its dissemination by EFSA in the form

[78] http://www.defra.gov.uk/vla/reports/rep_vida.htm
[79] http://www.agriculture.gov.ie/publicat/publications2008/RVLSurveillanceReport2007.pdf

of its annual report, thus limiting the potential for surveillance functions. The data presented from NI are mostly presented as total UK data. In ROI, in addition to contributing to reports mentioned above, the NRLs for *Salmonella* and antimicrobial resistance for Food, Feed and Animal Health publish reports on all testing undertaken by them on the DAFF website.

4.6 Other communication, liaison and joint working groups for zoonotic infections

With NI being a region in the UK, there are a number of other groups, networks and committees that have been formed that contribute to surveillance activities at UK level that provide outputs relevant to NI.

4.6.1 Human Animal Infections and Risk Surveillance

The joint Human Animal Infections and Risk Surveillance (HAIRS) group[80] is a multi-agency and cross-disciplinary horizon scanning group with members from the Health Protection Agency (HPA), Department of Environment, Food and Rural Affairs (DEFRA), the Veterinary Laboratories Agency (VLA), and the DH. The Chair of the National Expert Panel on New and Emerging Infections, representatives from the devolved administrations and the FS A also attend. The group has met every month since February 2004 and acts as a forum to identify and discuss infections with potential for interspecies transfer (particularly zoonotic infections).

4.6.2 United Kingdom Zoonoses Network

The UK Zoonoses Network comprises national bodies and regional and local zoonoses liaison groups. The network is lead by the Zoonoses Network Steering Group (ZNSG), chaired by HPA and includes representatives from VLA, DEFRA, DH, Veterinary Schools, FSA and the devolved administrations. The network provides a structure for links between local and regional zoonoses liaison groups, and between local groups and national bodies. It aims to foster the dissemination of information to and from local/regional groups, and identify contact points for public health control of zoonoses in the UK.

4.6.3 National Expert Panel on New and Emerging Infections

The National Expert Panel on New and Emerging Infections[81] (NEPNEI) regularly reviews new or emerging infectious diseases reported in this country or from elsewhere in the world. The panel reports to the DH and it assesses the potential threat to the population and advises on protection or control measures that should be initiated to reduce the potential threat to the populations' health.

[80] www.hpa.org.uk/HPA/Topics/InfectiousDiseases/InfectionsAZ/1206575051338/
[81] www.advisorybodies.doh.gov.uk/nationalexpertpanel/index.htm

EFSA has published a report on ways in which the issue of emerging risks can best be approached[82]. This report along with many of the lessons learned from the UK Foresight programme indicate a way forward for both jurisdictions to prepare for and contribute to a coordinated international effort aimed at the early detection of emerging and re-emerging risks that have consequences both for human and animal health as well as food safety.

4.7 Food safety crisis management plan: live animals and food products of animal origin

In ROI a food safety crisis management plan and crisis management team is in operation as required by Regulation (EC) No 178/2002. The general plan, specified by European Commission Decision 2004/478/EC, sets out measures in place to respond without delay when feed or food is found to pose a serious risk to humans or animals either directly or through the environment. The plans also describes the crisis planning measures which have been put in place, the responsibilities of DAFF officers and the legal basis with regard to the actions to be taken and responsibilities and channels and procedures for sharing information between the relevant parties in the event of a crisis.

4.8 Developments in food animal surveillance - all-island animal health and welfare strategy

It is recognised that outbreaks do not respect territorial boundaries and that relationships between key personnel in adjacent areas may be critical. As already mentioned above, close liaison between veterinary public health and human public health personnel within and between both jurisdictions is essential.

Under the North South Ministerial arrangements established by the Belfast Agreement in 1998, officials in DARD and DAFF have developed an all-island animal health and welfare strategy[83], which was the subject of a consultation exercise in spring 2008. As part of those arrangements a Working Group on zoonoses, including *Salmonella* in pigs and poultry, was established. This group seeks to ensure that as far as is possible complementary arrangements for surveillance and control are in place in both jurisdictions on the island. While the area is increasingly becoming harmonised under EU regulations these arrangements help to ensure that each jurisdiction is informed of the activities of the other and as far as practical these activities are complementary.

[82] Technical report of EFSA prepared by the ESCO WG on Emerging Risks. EFSA Technical Report (2009) 224, 1-34.
[83] www.dardni.gov.uk/index/consultations/archived-consultations/ahw-strategy-consultation.htm

More systematic sharing of surveillance data between data providers would strengthen collaboration, provide better scope for directing work, reduce the potential for duplication, improve the ability to detect unforeseen gaps and optimise ability to identify new and emerging issues. Improved detection of the links between human and animal disease and the ability to use animal health data as an indicator of potential human health problems would better inform decisions about disease management and risk.

4.9 Opportunities for improvement

(i) Existing links between surveillance of foodborne infectious disease in humans, food animal diseases and food safety issues are minimal, and the ability to use animal health data as an indicator of potential human health problems is limited;

(ii) The EFSA Community Summary Report provides some information but it has several limitations as follows:

a. As it is published on an annual basis, the information it provides is retrospective in nature;

b. Data for NI are not separated from data for the UK as a whole. In the context of the UK Zoonoses Report, there are only small amounts of data disaggregated for NI. This limits the potential to consider the island of Ireland as a distinct epidemiological entity to combine ROI and NI data on zoonoses;

(iii) The EU baseline survey summary reports present overall UK data. NI data are not identified as a separate data set thus limiting the potential to produce a unified epidemiological picture of animal health status on an all-island basis;

(iv) While there are informal mechanisms for reviewing data e.g. zoonoses committees, there is currently no forum dedicated to or formally required to review up-to-date surveillance data across the human, food and animal health domains on an ongoing systematic basis, either jurisdictionally or on the island of Ireland.

4.10 Recommendations

4.1. There needs to be more regular interactions between animal health agencies with those responsible for food safety and human health on the island of Ireland including more timely and effective sharing of data;

4.2. The National Zoonoses Committee (ROI) and Regional Zoonoses Group (NI) together should be supported and enabled to conduct an analysis of regular surveillance data on a shared basis;

4.3. Annual or more frequent meetings of the 2 committees (National Zoonoses Committee (ROI) and Regional Zoonoses Group (NI)), should be facilitated by ***safe***food, to share

experiences and surveillance data and to review current trends both in foodborne disease and surveillance methodologies, and to consider new approaches, as necessary.

4.4. The feasibility of enhancing the data collected in NI from any future EU baseline surveys should be considered to supplement the NI sample to provide representative information that would be compatible with that from ROI.

4.5. Detailed consideration should be given to the feasibility of making the NI submissions on surveillance to the UK bodies and to the European Commission available concurrently for consolidation with comparable data from the ROI with a view to providing a more extensive data base for risk assessment on an island of Ireland basis.

5 Role of research in the surveillance of microorganisms in the food chain and foodborne disease

5.1 Introduction

Considerable research activity that is relevant to foodborne pathogen surveillance is conducted on the island of Ireland by a range of stakeholders across human, food and animal domains. This research is conducted by a number of research institutions, government laboratories and universities across the island of Ireland, and is underpinned by collaboration both on the island of Ireland and internationally.

Although research can provide important information to direct strategies for the control and prevention of foodborne disease, it is less common for it to be used in ongoing surveillance functions. The outcomes of research are published predominantly in peer-reviewed scientific journals, typically after the completion of a study. Access to research-derived information in a timely manner by policy makers, food and feed enforcement authorities and analytical laboratory staff may be hampered by the peer reviewed scientific dissemination channels commonly used. As a result there are a number of challenges to the use of research-derived data *viz.* its timeliness and the traditional dissemination channels and difficulties in deriving implications of findings for policy and food safety practice.

In 2004, ***safe***food established five research networks in specific food safety themes that included VTEC, foodborne viruses and *Cryptosporidium* that ran for a five year period up to March 2009. These networks brought together multi-disciplinary and cross-jurisdictional groups of professionals to support dissemination of information, capacity building and assist in the integration of food safety research. ***safe***food plans to expand and enhance this approach through the creation of a number of knowledge-based networks in 2010 covering a range of relevant thematic areas. It is envisaged that this approach will broaden participation from a wider range of professional groups with interests in an increased number of specific areas relating to food safety in each phase of the food chain, on an all-island basis. These networks provide opportunities for coordinating research in both jurisdictions, for generating comparable data and maximising financial and other resources.

It is important to note that research cannot replace surveillance. However, research findings can inform surveillance systems.

5.2 Opportunities for improvement

(i) The existing collaboration in food safety research on the island of Ireland offers further opportunities to bring about improvement in the following areas:

a. Timely access to real time data research-generated information in order that its application can inform surveillance actions;
b. Better coordination of the considerable body of research funded on the island of Ireland relevant to surveillance of foodborne diseases and of the prevalence of pathogenic microorganisms throughout the food chain.
c. More effective liaison between regulatory sectors and relevant research funders to identify knowledge gaps.

5.3 Recommendations

5.1 There is a need for the coordination of research relevant to foodborne pathogen surveillance on an island of Ireland basis where a clear all-island benefit is identified. The potential for such a development should be discussed by organisations that publicly fund research on island of Ireland.

5.2 Broaden participation in ***safe***food networks to include particularly stakeholders not involved in research and explore new mechanisms of information dissemination that allow early access to surveillance data by all interested parties.

6 A vision for foodborne disease surveillance on the island of Ireland

6.1 Introduction

Before considering a vision for surveillance of foodborne pathogens on the island of Ireland, it is worth stating once again the key themes from the review of current arrangements as outlined in Chapters 1 to 5. These key themes are:

- Linkages between key surveillance stakeholders;
- All-island considerations;
- Comparability of data;
- Data sharing;
- Source attribution studies;
- Inter-disciplinary working.

6.2 The vision

A clear vision for foodborne pathogen surveillance on the island of Ireland has been established:

"Surveillance playing its full part in securing the safety of food"

6.3 The principles

The key principles of this vision are:

1. Stronger relationships and collaboration between the key stakeholders on the island of Ireland via an interdisciplinary framework;
2. Developing surveillance databases in each jurisdiction that are capable of being consolidated on an all-island basis;
3. Smarter interpretation and application of surveillance data;
4. While prioritising the protection of human health, taking due account of the benefit-cost implications of each measure to be considered.

6.4 The outcomes

The achievement of this vision will lead to enhanced consumer protection through safer food and will engender confidence in food chain controls amongst stakeholders.

6.5 Achieving enhanced foodborne pathogen surveillance on the island of Ireland

In an island of Ireland context, the adoption of the measures recommended in this report on a jurisdictional basis, through regular meetings of all relevant stakeholders and a structured

sharing and interpretation of data, as well as annual inter-jurisdictional meetings on an island of Ireland basis, will begin the journey to achieving the stated vision.

Options for achieving the above should be considered including particularly developing the Regional Zoonoses Group in NI and the National Zoonoses Committee in ROI as a possible means of facilitating the achievement of this vision. This could include the development of surveillance data sharing activities whereby surveillance partners would present up to date surveillance information for discussion, interpretation and synthesis. By incorporating ongoing regular sharing of surveillance data, any association that exists between the occurrence of human disease attributable to pathogenic microorganisms found in food and concurrently found in the food animals of origin would be more readily established. This approach would have the added advantage of identifying future research needs.

Surveillance systems that are successful in other countries should also be considered as they may contain elements that are likely to be useful when moving towards the achievement of this vision on the island of Ireland. Examples from Denmark and Canada are presented in Appendix 2. The common elements that underpin these systems are communication, collaboration, coordination and the systemised storage and analysis/interpretation of surveillance data.

6.6 The role for *safe*food

The role for ***safe***food in achieving the vision is to initially conduct a targeted consultation exercise with key surveillance stakeholders on the island of Ireland on the recommendations and the vision presented here and, based on the outcomes, to present a strategic proposal for enhancing foodborne pathogen surveillance in each of the two jurisdictions and on an island of Ireland basis. It is envisaged that this would be achieved by ***safe***food through functions such as providing proactive support to the zoonoses committees, facilitating all-island meetings of surveillance stakeholders, supporting cooperation between zoonoses groups, contributing to capacity building for surveillance, addressing knowledge gaps through research programmes and addressing the need for better co-ordination of microbiological food safety research.

In adopting this approach, ***safe***food is addressing a real human health imperative to enhance the gathering and sharing of data on foodborne diseases, zoonoses and zoonotic agents on an all-island basis. At the same time ***safe***food is cognisant that a trade border exists between NI and ROI that restricts the transfer of trade-sensitive information between jurisdictions. Notwithstanding this impediment, and given the commercial sensitivities of food producers and processors, the potential of this gathering and sharing of information for the improvement of

the surveillance of foodborne diseases needs to be carefully explored with food industry partners in the interests of all concerned.

6.7 Recommendations

6.1 ***safe*food** should conduct a targeted consultation exercise with key surveillance stakeholders on the island of Ireland on the recommendations and the vision presented here;

6.2 ***safe*food** should present to the NSMC a strategic proposal for enhancing foodborne pathogen surveillance both in each jurisdiction and on an island of Ireland basis.

Appendix 1 Members of the Working Group

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Appendix 2 International examples of surveillance arrangements

Denmark

In Denmark, the successful implementation of a number of surveillance and control programmes can be accredited to the close cooperation between public sector and private industry[84]. The authorities have delegated the responsibility for technical coordination of the programmes to committees with representatives from the industry, government bodies and science. In the planning and implementation of programmes, there has been a close involvement of microbiologists and epidemiologists. In addition, there is a very close collaboration between medical and veterinary epidemiologists and microbiologists in monitoring the effect of the programmes on the incidence of human infection.

To initiate and generate the basis for targeted action, the Danish Zoonosis Centre was established in January 1994. The Zoonosis Centre is an epidemiological surveillance and research unit under the Ministry of Family and Consumer Affairs. The Zoonosis Centre collects all data from all national surveillance and control programmes on zoonoses and conducts an ongoing analysis of the national zoonoses situation from farm-to-fork, including the identification of outbreaks, the assessment of sources of human food-borne disease as well as basic epidemiological research.

A report on trends and sources of zoonoses in Denmark is published annually by the Zoonosis Centre. The report includes an annual account of major sources of food-borne salmonellosis based on surveillance, as well as an overview of the trends in the estimated attribution of these sources to human infection since 1988. Detailed knowledge of the distribution of *Salmonella* subtypes in all relevant food animals and food types, generated through intensive and continuous monitoring, is an essential prerequisite for the analysis[85].

The Zoonosis Centre conducts quarterly meetings where the current status of the human incidence and control programmes on food-borne zoonoses is communicated to relevant stakeholders. The stakeholders are organized in three so-called "coordination-groups". The first coordination-group also serves as a board for the Zoonosis Centre. It has representatives of all government agencies and institutions involved in monitoring and control of food and water borne infections. This group includes; Statens Serum Institut, the Danish Veterinary and Food

[84] Wegener HC, Hald T, Lo Fo Wong DM, Madsen M, Korsgaard H, et al. 2003. Salmonella control programmes in Denmark. Emerg Infect Dis. 2003 Jul; 9(7):774-780.
[85] Hald T, Vose D, Wegener HC, Koupeev T.A Bayesian approach to quantify the contribution of animal-food sources to human Salmonellosis.Risk Anal. 2004; 24(1):251-265.

Administration, the Danish Plant Directorate, the Danish Institute for Food and Veterinary Research, the National Board of Health, the Danish Environmental Protection Agency and the Royal Veterinary and Agricultural University. The second coordination-group represents the producers; the Danish Bacon and Meat Council, the Danish Meat and Livestock Board, the Danish Dairy Board, the Federation of Egg Producers, the Federation of Slaughter Poultry Producers and the National Board of Agricultural Producers. The third coordination-group consists of "other interested parties", such as the National Consumers Board, the National Retailers Board, the Union of Food Industry Workers, the Danish Industry Board and the Federation of Hotel and Restaurant Owners. The Centre is also responsible for communication to the general public and the media through press-releases, printed reports, publications, and a website.

This integration has been achieved by the creation of a framework involving a single agency with responsibility for collection and collation of zoonotic information[86], and 3 coordination groups with representation from all relevant stakeholders. It is clear from the Danish model that integration of foodborne disease surveillance activities has been achieved through: 1) communication, 2) collaboration, 3) coordination and 4) central storage of data. Communication between major stakeholders has been maintained through regular meetings and direct, informal contact between veterinary and public health workers in key-positions. Collaboration has been achieved by the routine exchange of data and in participation in outbreak investigation and response. Control activities and the sharing of information are coordinated, within and between programmes. Managing a central database containing all surveillance data has allowed for coherent analyses of the relationship between foodborne pathogen reservoirs and disease in time and space. These four components ensure the optimal use of data that are already being generated.

Canada - C-EnterNet - National Integrated Enteric Pathogen Surveillance Program[87]

C-EnterNet is a multi-partner surveillance initiative facilitated by the Public Health Agency of Canada. Agriculture and Agri-Food Canada (AAFC) and the Public Health Agency of Canada (PHAC) are major funding partners for the pilot phase of C-EnterNet. It is designed to provide information to evaluate and guide activities that will reduce the burden of enteric (gastrointestinal) disease in Canada, similar to the CDC's FoodNet in the USA.

[86] Emerging Infectious Diseases • www.cdc.gov/eid • Vol. 11, No. 7, July 2005 available from http://www.cdc.gov/ncidod/EID/vol11no07/pdfs/Vol11No7.pdf
[87] www.phac-aspc.gc.ca/surveillance-eng.php

C-EnterNet, based on a sentinel surveillance model, is a leading-edge surveillance approach that utilises enhanced surveillance activities within selected areas to obtain information that would not be possible on a broader scale. Each sentinel site requires a unique partnership with the local public health unit, private laboratories, water and agri-food sectors, as well as the provincial and federal institutions responsible for public health. C-EnterNet's pilot sentinel site – the Regional Municipality of Waterloo, Ontario – is a community of approximately 500,000 residents, a mix of urban and rural activities, and demonstrates innovation in public health and water conservation. Four additional sites are planned to provide a national representation of enteric disease.

The core objectives of the C-EnterNet program are to: 1) detect changes in trends in human enteric disease and in levels of pathogen exposure from food, animal and water sources in a defined population; 2) generate human disease attribution values (proportion of human cases due to exposure via water, food and animals); and 3) improve the analysis, interpretation and reporting of laboratory and epidemiological data for public health, water and agri-food purposes.

C-EnterNet conducts continuous and episodic surveillance activities in four components: human, food, water, and food animals. Continuous surveillance activities are undertaken throughout the year to derive trends in human disease occurrence, exposure sources and source attribution for the most important enteric pathogens and exposure sources. Episodic surveillance activities are limited in time and provide specific information to complement the continuous activities (e.g. inclusion of emerging pathogens, focus on specific exposure sources, focus on specific human subpopulations).

This work focuses on the necessity of collaboration among jurisdictions and of integration of efforts, new communication networks, rigorous systemisation, and involvement of local public health units to inform policy at the local, regional and national levels.

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