



Consumer Focused Review of the Chicken Food Chain

October 2005

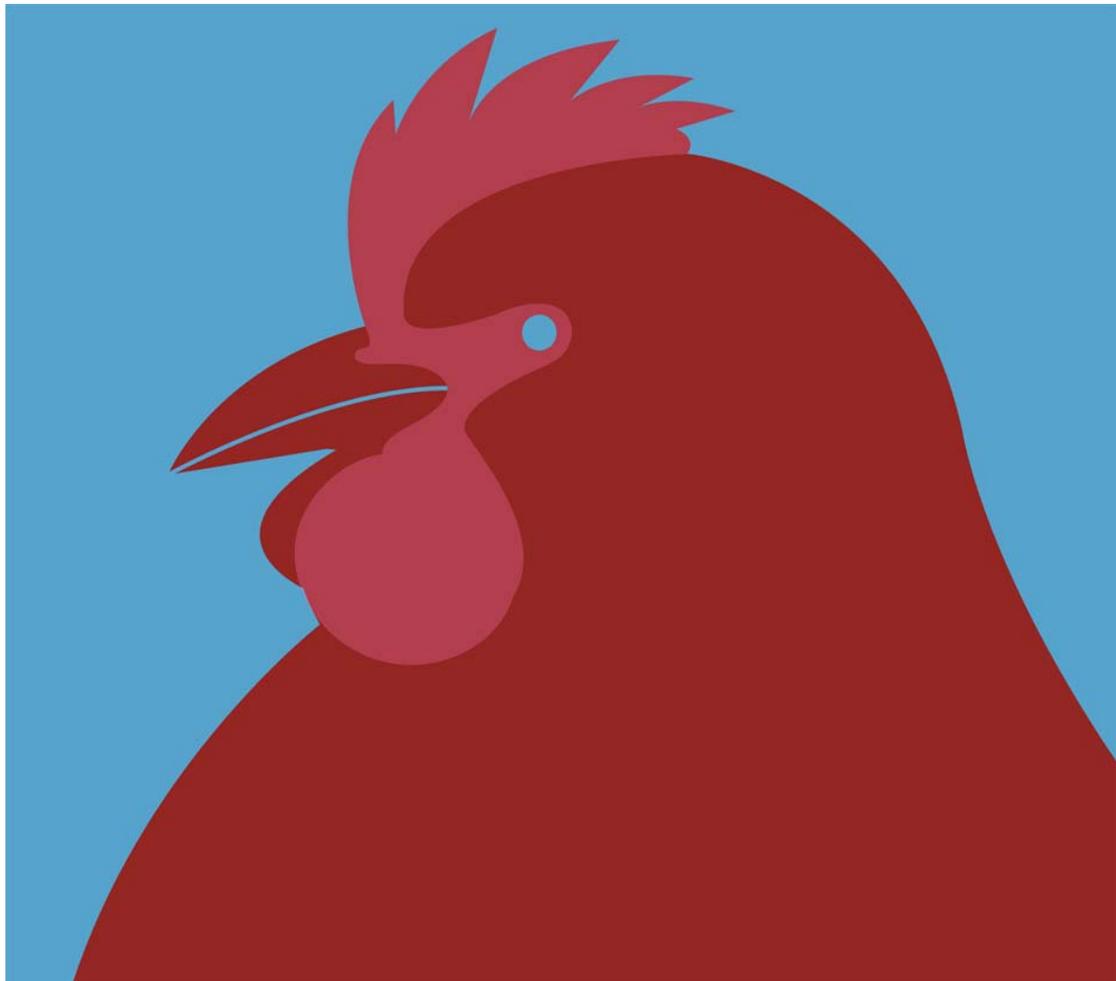


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Assured Chicken Production Scheme

Bord Bia

Central Statistics Office

Communicable Disease Surveillance Centre, Northern Ireland

Department of Agriculture and Food

Department of Agriculture and Rural Development, Northern Ireland

Food Safety Authority of Ireland

Food Standards Agency

Health Protection Surveillance Centre, Republic of Ireland

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ABBREVIATIONS

ACP	Assured Chicken Production
ACMSF	Advisory Committee on the Microbiological Safety of Food
ADI	Acceptable Daily Intake
AI	Avian Influenza
ALARA	As Low As Reasonably Achievable
AVI	Authorised Veterinary Inspector
BIP	Border Inspection Post
CIEH	Chartered Institute of Environmental Health
CMI	Checkmate International plc.
CPMP	Committee for Proprietary Medicinal Products
CSO	Central Statistics Office
CVMP	Committee for Veterinary Medical Products
DAF	Department of Agriculture and Food
DARD	Department of Agriculture and Rural Development
DEFRA	Department of the Environment Food and Rural Development
EFSA	European Food Safety Authority
EFSIS	European Food Inspection Service
EHO	Environmental Health Officer
EMA	European Agency for the Evaluation of Medicinal Products
EU	European Union
FAO	Food and Agriculture Organisation
FEEDAP	Panel on Additives and Products or Substances Used in Animal Feed
FSA	Food Standards Agency
FSAI	Food Safety Authority of Ireland
FSTC	Food Safety Training Council
FVO	Food and Veterinary Office
HACCP	Hazard Analysis and Critical Control Point
HSE	Health Service Executive
IBEC	Irish Business and Employers' Confederation

IOI	Island of Ireland
JECFA	Joint FAO/WHO Expert Committee on Food Additives
LD₅₀	Lethal Dose
MRL	Maximum Residue Level
MRM	Mechanically Recovered Meat
MS	Member State(s)
MT	Thousand Tonne
ND	Newcastle Disease
NDSC	National Disease Surveillance Centre
NI	Northern Ireland
NMS	New Member State(s)
NOEL	No Observed Effect Level
NSIFCS	North South Ireland Food Consumption Survey
OVS	Official Veterinary Surgeon
PCB	Polychlorinated Biphenyl(s)
PCDD	Polychlorinated dibenzo- <i>p</i> -dioxin
PCDF	Polychlorinated dibenzofuran
PMI	Poultry Meat Inspector
PVP	Private Veterinary Practitioner
QUID	Quantative Ingredient Declaration
RASFF	Rapid Alert System for Food and Feed
RDA	Recommended Daily Allowance
RIPH	Royal Institute of Public Health
ROI	Republic of Ireland
RSPH	Royal Society for Promotion of Health
SCF	Scientific Committee for Food
SMP	Salmonella Monitoring Programme
TCDD	2,3,7,8-tetrachloro dibenzo- <i>p</i> -dioxin
TDI	Tolerable Daily Intake
TNS	Taylor Nelson Sofres plc.
UFAS	UKASTA Feed Assurance Scheme
UK	United Kingdom

UKASTA	United Kingdom Agricultural Supply Trade Association
VI	Veterinary Inspector
VMP	Veterinary Medicinal Product
WHO	World Health Organisation
WTO	World Trade Organisation

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EXECUTIVE SUMMARY

In order to address in part its function in relation to carrying out independent science-based assessment of the food chain, as well as adopting the theme of complementary working and added value, **safefood** has initiated a programme which will involve two comprehensive food chain screening exercises each year for the next three years. Each review will focus on a particular food category or process with the objectives of:

- Providing consumers with the most relevant and pertinent information available to enable them to make informed choices in respect of the food they eat,
- Helping consumers understand how the food safety system works,
- Informing consumers of the efforts being taken by the regulators, producers, and industry, to reduce the inherent risks,
- Making consumers aware of the prudent and sensible steps that can be taken to address both perceived and potential risks, and
- Providing opportunities to promote good practice along the food chain.

Each review will profile a specific food category, identify and describe the relevant food safety issues pertaining to it at various points along the food chain, and identify opportunities to communicate the human health benefits to, and influence the behaviour of, the various stakeholders.

The primary focus of these reviews is directly pertaining to food safety and nutrition issues. However, other concerns identified by the consumer not directly related to food safety will be discussed, e.g. animal welfare, environmental impact of the industry, etc.

In order to help define the food commodity for the initial consumer focussed review, in September 2004 **safefood** commissioned research to identify the foods that consumers had most concerns about. The concerns were in relation to how the foods were produced, packaged, sold in shops, or handled in the home. The results of the research indicated that chicken was the food that consumers were most concerned about. There is also strong scientific evidence that consumption of contaminated chicken carries a high risk of illness compared with other foods.

Chicken is the protein source of choice for many consumers, both from a nutritional and cost perspective. Currently chicken is approximately half the price of beef on a comparable weight basis.

The chicken industry is highly integrated with a small number of companies dominating on the island of Ireland. This integration enables the industry and companies involved to have greater control, and introduce new protocols including food safety measures, with higher efficiency. In recent years, increasing imports from Third Countries, such as Brazil and Thailand, have placed extra economic pressures on indigenous industry, and have forced the closure of some processing companies and redundancy in others.

While the chicken industry must contend with the growing levels of imports, it also must concern itself with other challenges such as the human and economic significance of *Campylobacter*. Evidence suggests that chicken is the single most significant carrier of food poisoning microorganisms causing illness in humans. The risk of illness through contamination of chicken with *Campylobacter*, and *Salmonella*, should be a concern of all parties from farm to fork.

While excellent efforts have been made throughout the chicken food chain in controlling *Salmonella* spp., particularly heat treatment of feed and on-going surveillance, the control of *Campylobacter* spp. presents a new set of challenges.

At farm level, there appears to be a relationship between aspects of bird husbandry and *Campylobacter* infection. In general terms, two strategies for the control of *Campylobacter* may be identified: preventing the entry of the bacterium into the flock and, improving the resistance of the birds to colonization. At the moment there are no viable alternatives to proper and sustained biosecurity. Once *Campylobacter* has infected at farm level, there is limited scope for further control efforts through subsequent stages in production and the supply chain.

Allied to biosecurity, is the concept of “all in, all out” system, rather than the use of thinning, which is considered to compromise biosecurity measures. Such a system has been advocated by both the Food Safety Authority of Ireland (FSAI) and Food Standards Agency (FSA). However, market demands are for a range of chickens of different sizes and the industry currently does not have an economically viable alternative to thinning. To further support a move away from thinning, an increase of the coccidiostat Nicarbazine residues has been demonstrated following the process.

Both FSA and FSAI have recognised the significance of *Campylobacter*, and are currently implementing strategies to reduce the level of infection along the food chain. FSA has set targets to reduce the level of *Campylobacter* in the United Kingdom (UK) produced chickens on retail sale by 50% by 2010. The main focus of this strategy is on the broiler farm, specifically through biosecurity measures. However, it also considers potential options for control at the slaughterhouse. In its 2002 report on the “Control of *Campylobacter* in the Food Chain”, the FSAI made several recommendations including: improved biosecurity at farm level; improvement of monitoring by the Department of Agriculture and Food (DAF) of imports; and ongoing consumer information campaigns to highlight the danger of consuming contaminated meat.

Both qualitative and quantitative research conducted by **safefood** with consumers indicates that alongside food safety, the other issue that consumers considered to be of importance was labelling, and specifically country of origin.

The issue of country of origin is contentious. Market and economic statistics from 2003 demonstrate that the value of imports of poultrymeat into the Republic of Ireland (ROI) was €187 million (figures from Northern Ireland (NI) unavailable), and this is expected to increase substantially in the future. The growth in imports is sustained by the increase in demand on the island of Ireland (IOI) for chicken, outstripping indigenous production, and the preference of consumers for white chicken meat.

Consumers identify country of origin with food safety, in the, unproven, belief that locally produced chicken is safer than imported.

To assuage consumer concerns with regard to imported poultrymeat from Third Countries, it is important to recognise the respective roles of the EU Food and Veterinary Office (FVO) and Border Inspection Posts (BIPs) in the food chain. However, currently the frequency of sampling is still relatively low, suggesting that the opportunity may exist for non-compliant food to enter the food chain. In 2003, the FVO highlighted a number of deficiencies in the operation and management of BIPs.

From an industry perspective the main concern with regard to country of origin is economic. Production costs in Third Countries are significantly lower than on IOI, and the long-term concern is that the lower unit cost of chicken emanating from these countries will force overall prices down, and have major repercussions for IOI industry. At present, fresh chicken meat from Third Countries is only presented for sale as chicken pieces (i.e. fillets, thighs etc), some having undergone substantial transformation and being labelled country of origin IOI. Anecdotal evidence suggests that retailers on the island and in the

UK are beginning to drive the import of whole chickens from Third Countries. One retailer is reputed to be proposing to import their own label frozen chicken range from Thailand (this will be dependent on a review of the ban on uncooked chicken from Thailand expected later in 2005); while another is looking at the possibility of importing "fresh" whole chickens from Brazil.

Meanwhile, 70% of all chicken meat used in the catering industry has been sourced from Third Countries; much of this imported as cooked meat from Thailand. Thus, while consumers give much time and effort to ensuring that they purchase IOI chicken from their retailer, there is no information provided to them (or onus put on the caterer to provide such) of the source of the chicken that they may purchase in their sandwich or in a restaurant meal. This is compounded by the lack of labelling requirements at the catering stage of the food chain.

Some retailers, particularly butchers and premises with butcher counters, can legitimately sell loose, unlabelled chicken, which may not be IOI of origin. The legislation stipulates that information regarding the produce including country of origin, must be displayed. Anecdotally this is often not the case.

Substantial transformation is an issue of concern to consumer organisations and is one that the current Minister of Agriculture and Food in ROI has put on the agenda. Regulatory bodies consider this is a customs issue and not a food safety one. Consumers do not understand this contentious trade issue and are being misled with regard to the country of origin of the chicken that they purchase.

From an international trading perspective, country of origin is seen as a barrier to trade and not widely endorsed.

Conclusions

At Farm Level

- Much effort has been spent in ensuring that the grandparent stock and their offspring are disease free. The industry has also been proactive in identifying the potential risks to its business and the safety of the food chain. However, there remain a number of critical issues.
- Biosecurity on farms is at the corner stone of food safety along the food chain, particularly in relation to *Campylobacter*. The cessation of the practice of thinning would appear to be a prudent step towards minimising the risks of *Campylobacter* at farm level, until such time that more is known about the route of infection or a suitable preventative measure is available.
- Best practice models, such as that in Iceland, should be considered in attempts to reduce the burden of *Campylobacter* infection at farm level.
- The heat treatment of feed has been shown to be an effective step in the control of *Salmonella* and levels of animal infection and human salmonellosis have been on the decrease in recent years. There is merit in the introduction of mandatory heat treatment in NI. Best practice evidence from countries such as Denmark and Sweden suggest that the decrease in human salmonellosis is the direct result of the control programmes put in place at farm level.
- Surveillance of both *Campylobacter* and *Salmonella* is essential to the control of these microorganisms.
- The acceptability of the use of antimicrobial procedures, such as irradiation, should be investigated amongst consumers.
- Toxicological data supports the cessation of thinning with respect to a potential reduction in Nicarbazin residues.

- There is substantial evidence to support the use of the double bin system as a precautionary approach to the reduction of Nicarbazin residues.
- The issue of GM status of feed is of concern to producers, particularly those involved in organic chicken production. This is also an area that the consumer is often provided with very little information.

Transport from Farm to Slaughterhouse

- The high integration of the industry on IOI means that most slaughterhouses are within close proximity of broiler farms. However, this remains a stressful process for the birds, leading to a potential high cross-contamination situation. Evidence suggests that current washing procedures used for crates are not sufficiently adequate to remove pathogenic microorganisms. This is a step, which could improve the microbiological load of animals entering the processing plants, and efforts would be well spent trying to reduce potential contamination.

Primary Processing

- The processing industry is highly efficient. In modern processing plants, the time that it takes from when the chicken is stunned and slaughtered, to the time that chicken meat is packed and placed in storage for distribution, can be less than 2 hours.
- In an ideal world, pathogen free chickens should be presented for slaughter. However, the reality is somewhat different, and the processing environment is highly susceptible to cross-contamination from infected birds.
- Even when steps are taken to reduce the pathogenic load of chickens coming from broiler farms, protocols within the processing plant can undo this. The slaughtering and processing of organic

chickens (where there may be potentially higher infection rates *Campylobacter* levels) without subsequent decontamination of the line, poses a potential serious risk of cross-contamination within the plant. This area warrants further investigation.

- The importance of HACCP and training within the processing environment is critical to the successful elimination and containment of potentially pathogenic microorganisms. New legislation coming into force in 2006, places even more emphasis on the duty of care of a Food Business Operator to produce safe food.

Retail and Catering

- The retailer and caterer represent the front line of the food industry to consumers. Therefore, both sectors must do all within their powers to take the appropriate steps of ensuring food safety.
- As with the processing industry, HACCP and training are at the core of good food safety practice. The influx of non-nationals into IOI, and their uptake, in large numbers, of employment within the food sector, has put even more emphasis on the need for training, including that within their native languages. The FSA and FSAI, and some members of the food sector, are to be commended for their proactive work in this respect.
- Surveillance of chicken and chicken products within the sectors over recent years has indicated that the levels of *Salmonella* positive samples are declining, while the numbers of *Campylobacter* positive samples has remained static. There is little that the catering and retail sectors can do once presented with raw chicken, which is positive for pathogenic microorganisms, other than ensure that all steps are taken to prevent cross-contamination and that foods are properly cooked.

- Current legislation states that all raw poultrymeat for sale at retail level must be labelled to include information in respect of class, price per weight, country of origin, etc. In butchers' shops and butcher counters in ROI, where loose produce is sold, this information must also be made available to the consumer. Anecdotal evidence suggests that this information is not readily available to the consumer, and neither is it enforced by the regulatory agencies. In NI, the only requirement for poultry meat sold loose is that the name of the product is displayed.
- There is currently no legislative onus on caterers to label their produce. Approximately, 70% of all chicken meat used in the catering trade is sourced from Third Countries. Consumers have identified country of origin as a major concern. The lack of information emanating from the catering sector on this and other information with respect to the product, such as ingredient listing and nutrition information, serves only to misinform the consumer, or prohibit them from making informed choices.
- The proposed move by the Netherlands to label raw chicken products with a warning that it contains potentially pathogenic bacteria is a strong positive step towards the protection of public health and is to be commended.
- There is an onus on the industry and enforcement agencies to ensure, not only that meat coming from Third Countries is safe, but that also the consumer is not misled about the source of this meat through loops in the system, such as substantial transformation.

In the Home

- The consumer may be described as an important link at the end of the chicken food chain. All other steps of the chain are regulated by legislation and industry codes of practice, and are monitored and audited on a regular basis.
- Consumers should be advised with respect to the correct handling, storage and preparation of foods. This extends to steps taken to eliminate the potential risk of cross-contamination from raw to ready-to-eat foods. This advice should include information with respect to the following points:
 - Research suggests that consumers have significant understanding and awareness of the potential levels of *Salmonella* in chicken and its consequences. An education campaign should be undertaken to raise consumer awareness of *Campylobacter*.
 - Research has shown that packaging of chicken products is contaminated with *Salmonella* and *Campylobacter*, so consumers should make sure that all surfaces, including hands and utensils, are cleaned to prevent cross-contamination.
 - The common practice of washing chicken breast fillets and whole chickens, which was identified in the focus groups, should be discouraged. Such products, prepared for direct sale to consumers, are “oven ready” and do not require further washing. Washing of such poultry creates aerosols, increasing the risk of cross-contamination.
 - The proper and adequate cooking of foods will eliminate the risk of illness from contaminated chicken. This involves cooking chicken until the food is piping hot throughout, ensuring that there is no pink meat remaining and the juices

run clear. Practices such as “relying on taste” should be discouraged.

- The use of food thermometers is not widespread on IOI. Consumers should be advised that these are the most reliable method to check that foods, including chicken, are cooked properly.
- All foods should be stored in a refrigerator at less than 5°C.
- Growth of pathogenic bacteria can be increased by a significant time delay in the transport of perishable foods to and/or from the home and also by incorrect storage during this time. Raw poultry should be packed in separate bags or containers away from others to avoid potential cross-contamination. The use of insulated bags or freezer bags is recommended during transportation. Food should be refrigerated, cooked or frozen as soon as possible following purchase.
- The nutritional benefits of chicken can be compromised by the ingredients and methods employed in the manufacturing/cooking process. There should be an emphasis placed on the importance of reading labels on commercially processed foods, and the incorporation of fresh vegetables and starchy foods prepared in the home.

Surveillance and Controls

- The introduction of the Zoonoses Directive and the new Hygiene Package are welcome developments towards the protection of human health.
- To further enhance the understanding of *Campylobacter* infection, detailed typing data of human isolates, as well as those from food and animals would be welcome.
- In some instances, little scientific significance can be drawn from surveillance data due to the low number of samples. This is both from a microbiological and toxicological perspective.
- The harmonisation of mycotoxin limits in member states (and indeed worldwide) would be a welcomed measure, as it is recognised that mycotoxins can cause major illness in humans and animals, as well as significant economic losses for the poultry industry.

CHAPTER 1 INTRODUCTION

1.1 Background to safefood

safefood, the Food Safety Promotion Board, espouses a vision of an environment where consumers have confidence in the food they eat. In order to create this environment, **safefood** works in close collaboration with its partners in food safety and nutrition and seeks to add value, rather than duplicate their work.

The role of **safefood** is determined by its governing legislation, which sets out its functions. These functions are summarised as follows:

- Promotion of food safety
- Research into food safety
- Communication of food alerts
- Surveillance of food borne disease
- Promotion of scientific co-operation and linkages between laboratories
- Development of cost-effective facilities for specialised laboratory testing.

safefood's functions also include the provision of independent science-based assessment of the food chain and the organisation has a role in giving advice on the nutritional aspects of certain foods.

1.2 Objective and Terms of Reference of the Review

In order to address in part its function in relation to carrying out independent science-based assessment of the food chain, as well as adopting the theme of

complementary working and added value, **safefood** has initiated a programme which will involve two comprehensive food chain screening exercises each year for the next three years. Each review will focus on a particular food category or process with the objectives of:

- Providing consumers with the most relevant and pertinent information available to enable them to make informed choices in respect of the food they eat.
- Helping consumers understand (a) how the food safety system works, (b) the efforts being taken by the regulators, producers, and industry, to reduce the inherent risks, and (c) the prudent sensible steps that can be taken to address both perceived and potential risks.
- Providing opportunities to promote good practice along the food chain.

The purpose of these reviews will be to profile the food category, identify and describe the relevant food safety issues pertaining to it at various points along the food chain, and to identify opportunities to communicate the human health benefits to, and influence the behaviour of, the various stakeholders.

The general terms of reference of each review are:

To report on foods in light of their impact on human health and consumer concerns, and in particular to:

1. Profile the food category, identify and describe the issues relevant to human health at various points along the food chain.
2. Report on how the food safety system works across the entire food chain.
3. Identify opportunities to communicate the human health benefits and potential risks of this food category to the consumer.
4. Identify means to promote best practice to key stakeholders.

5. Examine the various communication needs of all stakeholders to influence the behaviour across the food chain.

The primary purpose of these reviews is directly pertaining to food safety and nutrition issues. However, other concerns identified by the consumer not directly related to food safety will be discussed, e.g. animal welfare, environmental impact of the industry, etc.

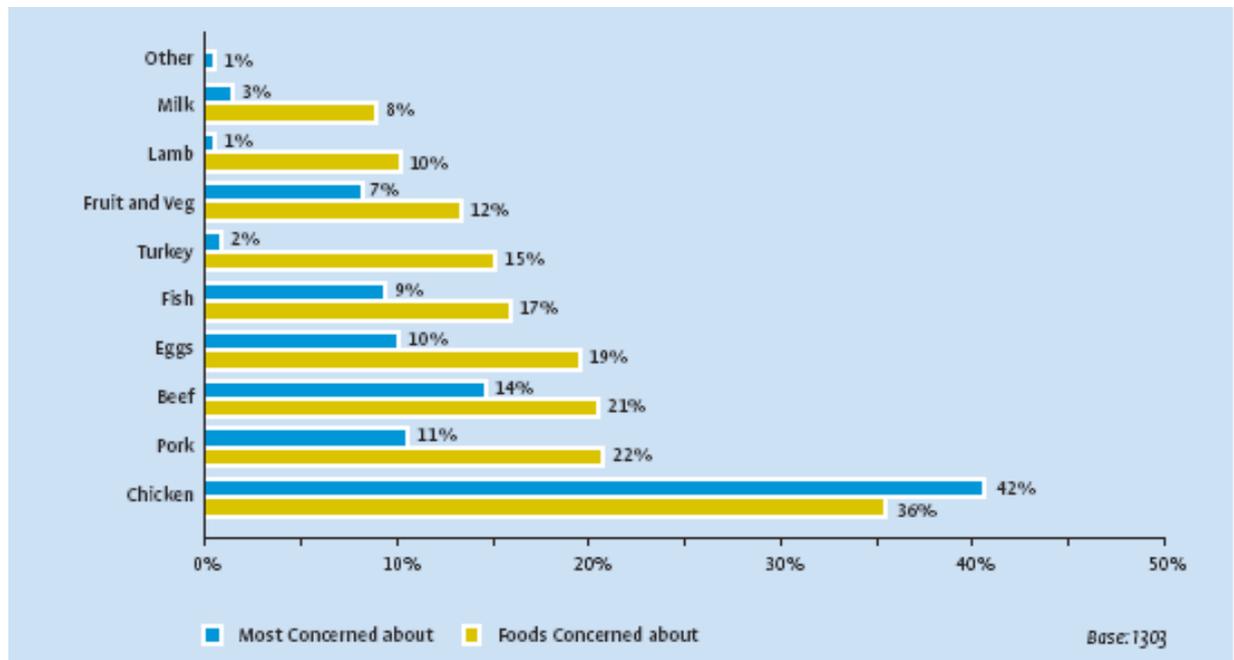
1.3 Rationale for Choosing Chicken

1.3.1 From the Consumer Perspective

1.3.1.1 Quantitative Research

In order to help define the food commodity for the initial consumer focussed review, in September 2004 **safefood** commissioned research to identify the foods that consumers were most concerned about. The concerns were in relation to how the foods were produced, packaged, sold in shops, or handled in the home. This research formed part of **safefood's** bi-annual consumer tracking research entitled *safetrak*. The results of the *safetrak* research indicated that chicken was the food that consumers were most concerned about (Figure 1.1).

Figure 1.1 Foods Consumers are Most Concerned About in Terms of How They are Produced, Packaged, Sold in Shops and Handled in the Home.



In light of the extent of expression of consumer concern in relation to chicken, **safefood** incorporated a number of questions in its January 2005 *safetrak* pertaining to consumers' specific concerns with regard to chicken. Tables 1.1a and 1.1b indicate the top five concerns (unprompted) of consumers in Northern Ireland (NI) and the Republic of Ireland (ROI) respectively with regard to chicken production, preparation and consumption, while tables 1.2a and 1.2b indicate the issues that these consumers were most concerned about when prompted with a series of statements regarding chicken.

Table 1.1a Top Five Unprompted Concerns of Consumers Regarding Chicken Production, Preparation and Consumption, NI

n = 317

Concerns	% Concerned
Preparing and cooking properly	12
Country of origin	12
Salmonella/food poisoning	11
Battery chickens/what they are fed	9
Best before date	8

Table 1.1b Top Five Unprompted Concerns of Consumers Regarding Chicken Production, Preparation and Consumption, ROI

n = 502

Concerns	% Concerned
Preparing and cooking properly	19
Battery chickens/what they are fed	15
Salmonella/food poisoning	13
Country of origin	13
Undercooked chicken	7

Table 1.2a Top Five Prompted Issues Consumers Were Most Concerned About Regarding Chicken, NI

n = 317

Concerns	% Concerned
Getting food poisoning from chicken meat/chicken products	19
The country of origin/traceability of chicken meat/chicken products	16
Being given undercooked chicken when eating out	15
The way chicken meat/chicken products are packaged	14
The presence of <i>Campylobacter</i> in chicken, chicken meat/chicken products	11

Table 1.2b Top Five Prompted Issues Consumers Were Most Concerned About Regarding Chicken, ROI

n = 502

Concerns	% Concerned
Getting food poisoning from chicken meat/chicken products	24
The presence of antibiotics in chicken meat/chicken products	17
Being given undercooked chicken when eating out	14
The presence of <i>Campylobacter</i> in chicken, chicken meat/chicken products	14
The way chickens are reared and produced	9

1.3.1.2 Qualitative Research

To develop some of the issues raised in the quantitative research, a number of focus groups were held by **safefood** throughout the Island of Ireland (IOI) in May 2005. The objective of the research was to elicit consumers' perceptions of the chicken supply chain and analyse their opinions of the industry and the commodity from farm to fork.

Overall consumers considered chicken to be versatile, convenient, nutritious and "good value". Chicken was reported as the meat of choice, particularly when it comes to feeding children. Consumers did indicate a number of inherent issues of concern in the production and processing of chicken, including production methods, but reported that these did not affect food selection and consumption patterns. The assumption was that such issues were the responsibility of retailers, who they expect to act on their behalf. One exception to this pattern relates to country of origin, which consumers did consider important, especially in the purchase making decision.

The visual appearance of the product was reported as very important in the purchasing decision. Similarly, labelling was reported as central in purchasing decisions, in terms of the origin of the chicken, use by date and nutrient (specifically fat) content. Consumers were prepared to buy unlabelled/unpackaged chicken from those butcher shops with which they had an established relationship of trust.

Consumers saw little advantage in "Free Range"/"Organic" chicken in comparison with "conventionally produced" chicken. The idea of "Free Range" is reported as "pleasant", but failed to translate into meaningful purchase. "Organic" foods were considered to be a lifestyle choice and expensive. The focus groups did not identify price as a major determinant in purchasing decisions. However, price was noted as important (and brand less important) when participants were

taking part in an accompanied shop organised as part of the focus group activities.

Country of origin and place of purchase were reported as major determinants in the purchase of chicken. The naming of the producer farm or farmer on labels was noted to provide reassurance for consumers in terms of food safety. This reassurance was enhanced where a quality assurance scheme exists, although consumers in NI were not as familiar as their counterparts in ROI with such schemes. Consumers assumed that, for simple logistical reasons, fresh whole chicken and chicken fillets had been produced on the island of Ireland. Consumers from NI and ROI had no difficulty purchasing chickens from anywhere on the island. Similarly, ROI consumers reported chicken from the United Kingdom (UK) as acceptable. Country of origin was not reported as a major determinant in the purchase of chicken-based frozen or ready meals.

Consumers considered the retailer reputation as fundamental in purchase decisions, particularly in the purchase of fresh chicken. They saw the retailer's brand as an indicator of quality, origin, and safety. In the absence of a recognised brand name, consumers assumed that retailers were taking the steps necessary to ensure food safety and quality. This dependence on the retailer is even more important if the retailer is a traditional butcher, who was thought to provide a range of benefits including: the sale of quality meat; more trusted source; reliance on reputation; and personalised service.

Consumers reported the preparation of chicken products, both in the food chain and the home as an area which carries an increased risk. Consumers were familiar with the dangers of undercooked chicken and they considered that it is the consumer himself/herself who has ultimate responsibility to ensure food safety at this stage of the food chain.

1.3.2 From a Scientific Perspective

Chicken, when prepared and served in an appropriate manner, is a low fat, high protein food, and from consumer research has been shown to be the protein source of choice of many consumers.

There is scientific evidence that consumption of contaminated chicken carries a high risk of illness. Data from population studies and national surveillance systems from England and Wales has shown that from 1996 – 2000, consumption of contaminated chicken accounted for more disease, deaths and healthcare usage than any other food type¹.

The increased risk of illness as a result of chicken consumption can be associated with the susceptibility of chicken to contamination with microorganisms such as *Salmonella* and, particularly, *Campylobacter*. Infections due to *Campylobacter* spp. are the most commonly identified bacterial cause of human gastrointestinal illness in both ROI and NI and other countries with temperate climates². In ROI in 1999 and 2000, there was approximately twice the number of notifications of infection with *Campylobacter* compared to *S. Enterica* for each year.

The control of *Campylobacter* in the food chain is an immense challenge for every stakeholder, due to both the ubiquity of the organism and the low infective dose required for illness.

Other issues which consumers have identified as concerns include labelling, and in particular, country of origin. Country of origin is driven by the, unproven, belief that chicken from IOI will be safer. Recent publicity in relation to the adulteration of chicken meat from Brazil, and the outbreak of Avian Influenza (AI) in Thailand, has increased consumer concerns in relation to imported

¹ Adak, G.K., Meakins, S.M., Yip H., Lopman, B.A., O'Brien, S.J., Disease Risks from Foods, England and Wales 1996-2000, *Emerging Infectious Diseases* Vol. 11 pp. 365-372.

² www.ndsc.ie/Publications/Annualreport/d818.pdf

chicken (Chapter 5). However, the increasingly global nature of the food chain and the growth in demand on IOI for chicken and chicken products means that increasing proportions of the chicken consumed here will be imported. Therefore, there is an onus on the industry and enforcement agencies to ensure, not only that meat coming from Third Countries (i.e. a country other than a member state of the European Union) is safe, but that also the consumer is not misled about the source of this meat through loopholes in the system, such as substantial transformation (discussed in more detail in Chapter 5).

1.4 Consumer Focussed Review of Chicken

The review of the chicken food chain will focus only on chicken meat i.e. as derived from chicken muscle or flesh and excluding chicken liver, kidney, skin, bone and other parts of the animal, and will not include processed chicken products.

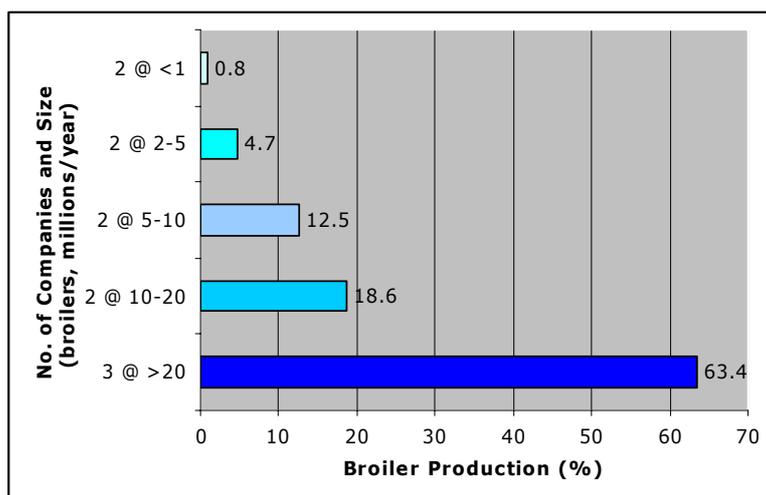
CHAPTER 2 THE CHICKEN MEAT SUPPLY CHAIN

2.1 Profile of the Chicken Industry

2.1.1 Island of Ireland

At farm gate, the poultry industry on IOI is worth in excess of €150 (£101*) million (ROI) and £120stg (€177*) million (NI) to the economies annually, with chicken representing in excess of €105 (£71*) million³ and £88 (€130*) million, respectively⁴. Today's industry is characterised by vertical integration with large companies integrating several stages of the supply chain such as breeding, hatchery, feed production, rearing, primary processing, further processing and distribution within their company or under close contract systems. This is typical of poultry systems operating worldwide. There are a number of key players, with eleven companies representing in excess of 90% of all domestic broiler production on the island (Figure 2.1 and Table 2.1). * Currency Conversion: €1.00 = £0.68

Figure 2.1: Distribution of Broiler Production Across Companies⁵



³ www.bordbia.ie

⁴ www.cso.ie/releasespublications/documents/statisticalyearbook/agriculture,forestryandfishingq.pdf

⁵ **safefood**, 'A Review of Coccidiostat Residues in Poultry', www.safefoodonline.com/uploads/SF_Poultry.FINAL.pdf

Table 2.1: Size of Companies Involved in Broiler Production⁵

No. of Birds/Farm/Year (thousands)	No. of Companies	Proportion of Total Broiler Production (%)
40-70	2	<1
150-200	4	28
220-250	4	50
300	1	9

The most recent figures available from the Central Statistics Office (CSO) in ROI and the Department of Agriculture and Rural Development (DARD) in NI indicate annual poultry numbers in excess of 31 million on IOI (Table 2.2).

Table 2.2: Poultry Livestock Numbers on IOI (thousands)

Region	June 2000	June 2001	June 2002	June 2003
ROI	13,961	12,603	12,709	12,738
NI	15,376	14,348	16,862	18,525
IOI	29,337	26,951	29,571	31,263

Source: ROI – CSO⁶, NI – NISRA⁷ (Poultry NI figures include shipments and exports of non-breeding birds)

In ROI there are approximately 10,652 poultry holdings⁸ of which over 800 are specifically broiler farms. While this figure is considerably lower in NI, where there are just under 2,000 poultry farms, of which 334 are broiler, there is little difference in actual output of broilers despite the variance in farm numbers (Table 2.3).

⁶ www.cso.ie/releasespublications/documents/statisticalyearbook/2004/agriculture,forestry&fishing.pdf

⁷ http://www.nisra.gov.uk/Uploads/publications/ch10_annual_abstract_2004.pdf

⁸ Point of Note: CSO consider holdings rather than farms as they count every person owning poultry, regardless of the size of the flock.

Table 2.3: Poultry Farm Numbers on IOI

Number of Poultry Farms			
Region	Total Poultry Farms	Total Broiler Farms	Total no. of Broilers
ROI⁹	10,652	837	10,109,680
NI¹⁰	1,980	334	9,655,000
IOI	12,632	1,171	19,764,680

In ROI in 2003, a total of 77 million birds were slaughtered in approved premises, of these 65 million were broiler chickens¹¹. In NI, 177,900 tonnes of broilers (liveweight) were produced in 2003¹⁰.

2.1.1.1 Employment

NI figures indicate employment of 4,178 in the poultrymeat processing sector alone, accounting for 22% of total employment in the food processing sector. In ROI, there were 15,713 workers involved in the production, processing and preserving of meat and poultry meat in 2002¹². Figures specific to poultry are unavailable for ROI.

2.1.1.2 Consumption

Annual average consumption of poultry meat on IOI is considerably higher than in most other areas in the EU. For example, in 2003 ROI consumers ate an average of 31.43kg of poultry per person, second only to Spain (34.45kg per person)¹³. Separate figures are not available for NI, but average UK consumption was 26kg per person. Consumption is increasing, i.e. by 71% in ROI and by 54% in NI between 1986 and 2003 (Table 2.4).

⁹ http://www.cso.ie/releasespublications/pr_agrifishpubshardcopies.htm

¹⁰ www.dardni.gov.uk/econs/file/srev2004/spub26.pdf

¹¹ A Guide to Irish Agriculture & Food, DAF 2004

¹² www.agriculture.gov.ie/index.jsp?file=publicat/compendium_nov04/listoftables.xml

¹³ Personal Communication, Agriculture Division of the EU, June 2005

Table 2.4: Consumption Data (kg/capita)¹³

Region	1998	1992	1996	2000	2003
ROI	20.71	24.45	31.08	33.41	31.43
UK	19.26	21.18	26.90	28.79	26.43

2.1.1.3 Imports

Despite the large numbers of broilers produced each year on the island, as indicated above, output volume does not currently meet market demand. Over one-third of the weekly consumption of poultry in NI and ROI is provided from imports⁵. Imports into Europe are facilitated by the significantly lower production costs in exporting countries, e.g. in Brazil labour costs are approximately one-fifth the cost in the EU and total production costs are approximately half those in the EU (Table 2.5)¹⁴. Most companies involved with domestic broiler production also import poultry products. It is estimated that greater than seventy per cent of poultry used in the catering trade, including further processed products, is imported⁵.

Table 2.5: Production Cost of Chicken (2003)¹⁴

Country	US\$/kg Live	Av. Labour Cost/Month (US \$)
EU	>1.00	1700
United States	0.55	1400
Thailand	0.65	150
Brazil	0.41	300
Argentina	0.41	280

Some of the larger companies in the UK have established subsidiaries in Third Countries, which export to the EU⁵. In order to fulfil the demand by consumers for fresh chicken meat/chicken meat products, over 55,500 tonnes of poultry

¹⁴ <http://www.north-south.nl/files/Peter/Brazil/Poultry%20Brazil.ppt>

meat is currently imported into ROI per annum, a figure valued at over €187m (Table 2.6). Separate figures for NI are not available to overall UK figures.

Table 2.6: Value of Imports and Exports of Poultrymeat, ROI¹⁵

€000	Poultry			
	2002 [^]		2003 [^]	
	Imports	Exports	Imports	Exports
Total EU	165,021	223,289	177,018	234,889
of which				
Great Britain	70,502	188,365	63,946	205,590
Northern Ireland	20,788	16,423	23,789	13,286
Netherlands	41,806	3,426	51,046	2,581
Other EU	31,925	15,075	38,237	13,432
CC-10	402	545	277	1,019
Total Other Non-EU	9,993	7,194	10,290	5,447
Total	175,416	231,028	187,585	241,355

[^] Preliminary

2.1.1.4 Exports

In 2003, the value of poultrymeat exports for ROI was €241 million. Exports of processed poultry meats and prepared products accounted for nearly two thirds of the total poultry exports during that year. The UK is the main market for ROI poultry exports, accounting for approximately 80% of total sales (Table 2.6). ROI averages 100% self sufficiency in poultrymeat being a net importer of chicken meat and a net exporter of other varieties of poultrymeat. Exports of unprocessed fresh and frozen poultry are in decline, while processed poultry products are increasing¹⁶. Figures for NI are not available separately to overall UK figures.

2.1.1.5 Expenditure

TNS (Taylor Nelson Sofres plc) Retail Sales Data indicates that the ROI value of sales of chicken for 2004 was over €145 million, with major multiples accounting

¹⁵ www.bordbia.ie

¹⁶ www.agriculture.gov.ie/publicat/publications2004/guidetoagandfood/guidetoagandfood_english.pdf

for more than €113 million of this (Table 2.7). Sales of chicken in Butcher shops were valued at almost €20 million for the same period. Figures for NI are not available separately to overall UK figures.

Table 2.7: TNS Retails Sales Data for ROI Period Ending 7th Dec 2004¹⁷

Total 2004 Chicken Sales	Value (€'000)	Volume per Buyer (kg)	Average Spend per buyer (€)	Average Buying Frequency
Total Outlets	145,221.0	24.9	116.8	19.2
Total Multiples	113,882.4	21.3	98.8	17.1
Total Discounters	7,719.6	7	23.9	4.8
Other Multiples	3,265.7	4.2	38.6	4.9
Total Symbols	7,388.9	8.3	30.8	5.6
Other Symbols	2,835.4	8	25.7	4.5
Other Butcher	19,995.7	8.6	59	6.9
Other Outlets	3,954.3	11.4	28.5	4.8

2.1.2 European Perspective

In 2004 the main European poultry producers were Spain, UK, France, Turkey and Poland. Broiler meat production increased in Denmark, Germany, Poland, the Czech Republic, and the Benelux countries. Production decreased in France, Italy and Sweden as a result of increased competition from Third Country imports, and in Germany due to increased domestic production.

There are varying trends in consumption between the EU states formerly comprising the EU-15 and New Member States (NMS). In the former there is a modest annual consumption increase of mainly breast meat and fillets, while NMS consume cheaper cuts. In 2004, average annual poultry meat consumption was at the same level of circa 23kg/capita in the former EU-15 and NMS.

¹⁷ TNS, 2005

However, in 2005 it is anticipated that the poultry consumption increase in NMS will be double the increase in the former EU-15¹⁸.

The leading importers in 2003 were UK, Germany, Netherlands, France and Belgium¹⁸. Due to the restructuring of tariffs, Third Country imports, mainly from Brazil and Thailand, decreased from 479,000 million tonnes in 2003 to about 380,000 million tonnes in 2004 (see Section 5.2.8 for further information). Imports from Thailand also decreased due to AI and the EU ban on raw poultry meat.

The leading exporters in 2003 were Netherlands, France, Belgium, Germany and Denmark. In 2004, in spite of strong competition from Brazil, EU-25 exports of broiler meat, mostly low value and mechanically recovered meat (MRM), increased by approximately 8% compared to 2003.

2.1.3 Global Perspective

In 2004, the largest chicken meat producers in the world were the USA, China, Brazil and Mexico (Table 2.8). Thailand ranked lower than previous years (16th) due to the outbreak of AI.

Table 2.9 shows the relative growth in chicken meat production over the four-year period, 2000 to 2004. Brazil has had the greatest growth increase and is now recognised as one of the lowest cost producers in the world. However, most of the future growth in production will be restricted to developing countries¹⁹.

¹⁸ <http://www.fao.org/es/ess/toptrade/trade.asp>

¹⁹ Prospects for Agricultural Markets and Income 2004-2011 for EU-25, December 2004, europa.eu.int/comm/agriculture/publi/caprep/prospects2004b/fullrep.pdf

Table 2.8: Global Production (MT - Thousand Tonnes) – Indigenous Chicken Meat 2004¹⁸

Country	Rank	2004
USA	1	15,539,000*
China	2	8,897,964 ^F
Brazil	3	8,668,500 ^F
Mexico	4	2,245,000 ^F
India	5	1,651,928 ^F

F = FAO Estimate, * = Unofficial Figure

Table 2.9: Relative Growth World Chicken Meat Production (2000-2004)¹⁴

Brazil	Mexico	EU	China	US	World
36.6%	26.3%	-11.9%	9.7%	8.7%	9.2%

Global consumption of poultry increased by 100% in the ten year period from 1984 to 2004 (Table 2.10).

Table 2.10: Global Consumption of Poultry¹⁶

	1984	2004	% Change
World Population	4.7 billion	6.4 billion	+ 36%
World Poultry Production	26 million MT	66million MT	+ 154%
Per Capita Consumption	6kg	12kg	+ 100%

The leading importers of chicken meat worldwide in 2003, based on value, were UK, Japan, Russian Federation, Germany and Saudi Arabia (Table 2.11).

Table 2.11: Global Chicken Meat Imports 2003 (Sorted By Value)⁸

Rank	Country	Quantity (MT)	Value (000 US\$)	Unit Value (000 US\$)
1	United Kingdom	292936	924417	3156
2	Japan	466115	741326	1590
3	Russian Federation	1073724	630689	587
4	Germany	230055	513036	2230
5	Saudi Arabia	451216 ^P	456649 ^P	1012

P = Trading Partner Estimations

The leading exporters in 2003, again based on value, were Brazil, USA, Netherlands, France and Thailand (Table 2.12).

Table 2.12: Global Chicken Meat Exports 2003 (Sorted By Value)¹⁸

Rank	Country	Quantity (MT)	Value (000 US\$)	Unit Value (US\$)
1	Brazil	1922042	1709743	890
2	USA	2448716	1517377	620
3	Netherlands	584787	931859	1594
4	France	362757	615926	1698
5	Thailand	370417	597634	1613

2.2 Outline of the Chicken Food Chain

The chicken supply chain is extremely time efficient. It takes approximately 21 days to hatch an egg, 35-42 days to rear a 'conventional' (also known as

'commercial' or 'intensively reared') chicken and 70 days to rear an 'organic' chicken up until the time of slaughter.

2.2.1 Poultry Production Systems

Poultry production systems can be divided into three main categories: Conventional, Free Range, and Organic which are discussed briefly below. Appendix A contains a summary of some of the main differences between each of these systems.

2.2.1.1 Conventional

Conventional broiler production involves rearing chickens indoors on litter in a controlled environment and feeding a sequence of high nutrient diets. The birds are slaughtered at 35 to 42 days of age when their live weight reaches up to 3 kg. The breeds used are selected for rapid growth and birds have a high proportion of breast meat.

2.2.1.2 Free Range

In order to be classified as 'Free Range', birds must have continuous access to range for at least half of their lifetime and be slaughtered at not less than 56 days. There are further restrictions on stocking density and feed.

2.2.1.3 Organic

Like 'Free Range', an organic label indicates to the consumer that a product was produced using certain production methods. Organic birds must be produced in accordance with the standard practices set out by the European Council Regulation 2092/91 as augmented by Council Regulation 1804/99, and monitored by certifying bodies in each country (Appendix B). Claims for organic farming include consideration and application of production methods that do not damage the environment; concern for animal welfare and the production of high quality goods. Organic poultry production standards require free-range systems with access to the outdoors in both layer and broiler units. Maximum stocking densities, both indoors and outdoors, are specified. Broilers in the organic system cannot be slaughtered before 81 days.

Use of antibiotics and growth promoters in feed is prohibited. All feed used in organic farming must be certified GM-free and the use of synthetic amino acids and solvent-extracted products, such as Soya oil, is prohibited. Prophylactic use of drugs is prohibited and restrictions are placed on the use of conventional medicines. Veterinary inputs in the form of antibiotics, antiparasitic drugs and vaccines can only be used in the treatment of clinical disease or as a short term intervention to limit the threat posed by a specific disease.

2.2.2 Broiler Breeding

The poultry industry is said to operate as a 'pyramid' structure with large numbers of broiler farms at the foot of the pyramid and much smaller numbers of specialist or 'grandparent' flocks at the top. The breeding birds themselves come from a smaller number of specialist flocks. The high levels of vertical integration allow major industry players to exercise a lot of control over most phases of production and processing. Additionally, it means that innovations, which involve substantial economies of scale, can be employed that otherwise would be impossible due to limiting capital available to the average farmer.

Commercial layer and broiler chicks come from separate breeding lines, for example, 'Ross' and 'Cobb' are the standard breeds used in the broiler industry on the island.

Day-old chicks (parent stock) produced from pedigree breeders are supplied to contracted rearers, who rear the birds for 18-20 weeks, before sending them on to contracted breeders, i.e. laying farms, where they produce eggs until age approximately 60 weeks. These birds are then slaughtered; however their meat does not enter the food chain. The eggs are sent to a contracted hatchery, producing day-old (commercial) chicks after approximately three weeks.

2.2.3 Broiler Rearing

Conventional broilers are reared on litter in environmentally controlled sheds housing up to 30,000 birds.

Chicken feed is formulated to meet the nutritional requirements of broilers or layers. Current bird strains used in the broiler industry have been selectively bred for increased growth rate and lower (more efficient) feed conversion ratios. The feeding programme on a broiler farm is dictated by both the stage in the growth cycle of the birds, and consumer/retail requirements in terms of overall bird weight or fat content, etc.

'Starter' feed (administered 1 to 7 days approx.) has the highest level of protein a chicken receives during its lifetime. As the chick matures, it requires a lower percentage of dietary protein and a higher level of energy which is provided for in the 'grower' (8 to 21 days approx.) and 'finisher' feed (21 to slaughter-5 days approx.). Withdrawal feed is administered for a specific period; (typically 5 days) before slaughter takes place as it does not contain any drugs.

NI currently produces approximately 55 – 60% of the total IOI production of broiler feed. In NI, approximately 570,000 tonnes of poultry feed are produced per annum, of which 47,200 tonnes are sold outside of NI. Of the total poultry feed produced, 94,000 tonnes are for chick rearing; 157,3000 tonnes for layer and breeder feed; 315,000 tonnes for broiler feed; and the remaining 86,800 tonnes are produced for turkey and other poultry feed²⁰. There is very little cross-border movement of broiler feed with less than 5% of compound feed consumed in ROI in 2003 being imported from NI. However, a significant proportion of the pre-mixtures and mineral mixtures used in the broiler industry in ROI are imported, chiefly from NI.

Annual production of compound feed in ROI is around 3.5 million tonnes, of which 500,000 tonnes is produced for poultry. Native cereals make up about one third of the ingredients. Most feed additives are imported from sources

²⁰ DARD 2003 Animal Feedstuffs Statistics

outside IOI. The remaining ingredients, predominantly plant proteins, are imported mainly from outside the EU.

In the case of organic production, feed used in ROI is imported from England and all feed used in NI is produced in NI.

2.2.4 Slaughter and Primary Processing

Thinning of broilers is carried out in up to three or four stages before final depopulation in order to satisfy particular market weight requirements and also to provide more space for the remaining birds. Conventional birds are 'harvested' at 5-6 weeks of age. Harvesting consists of manual catching of the birds and placing them in transport crates, which are then stacked on a vehicle for transport to the processing plant. Journey times are short for live broilers on IOI due to the geographical proximity of farms and processing plants.

Poultry slaughter can take place in one of two types of slaughterhouse – 'EU approved' or 'domestic'. In NI there are 9 slaughterhouses with co-located cutting premises, and 6 stand alone cutting premises²¹. In ROI there are 6 poultry slaughtering plants²².

Licensed premises can be classed as full-throughput or low-throughput. Low throughput premises are defined as those that slaughter no more than 150,000 birds per year or in the case of cutting premises, those that cut less than 3 tonnes of meat per week. Above these levels, the premises are termed full-throughput. There are no low throughput slaughter plants in ROI.

Current EU legislation requires an Official Veterinary Surgeon (OVS) to be present throughout ante-mortem and post-mortem inspection in full throughput premises. In low throughput premises, the OVS is required to carry out ante-mortem inspection but not to directly supervise post-mortem inspection if a meat inspector carries this out.

²¹ Personal Communication, FSANI, April 2005

²² Personal Communication, DAF, April 2005

In addition, exemptions exist for farmers who rear and slaughter less than 10,000 birds annually and retail this meat under certain conditions direct to the final consumer or to a retailer for sale direct to the final consumer. These premises operate under the supervision and control of the Local Authority Veterinary Services in ROI and District Council Environmental Health Control Departments in NI. The majority of these premises are involved in turkey production and a number only operate seasonally.

Following the introduction of new EU hygiene regulations on 1st January 2006, there will be no distinction between full and low throughput premises. All such premises will require approval. Premises slaughtering less than 10,000 birds annually will continue to operate under national controls.

At the processing plant, birds are removed from their crates by holding both legs, suspended upside down on an overhead rail, allowed to settle and are stunned/gassed. The latter renders birds unconscious, insensible to pain, and immobilised, facilitating subsequent slaughter and processing. Birds can be stunned by being drawn through an open tank of water in which the water acts as a live electrode, and a metal bar, which makes contact with the shackle, acts as the earth electrode. Thus, current flows through the whole of the bird (except for its feet), including its brain, rendering it unconscious. By law²³, the competent authority must ensure that birds are sufficiently stunned to ensure that they do not recover before dying through blood loss, and the competent authority in the plant oversees this. Gas stunning involves the use of carbon dioxide, which may be mixed with an inert gas, such as argon or nitrogen. An increasingly used alternative approach involves gassing of birds, before removal from the transport crates.

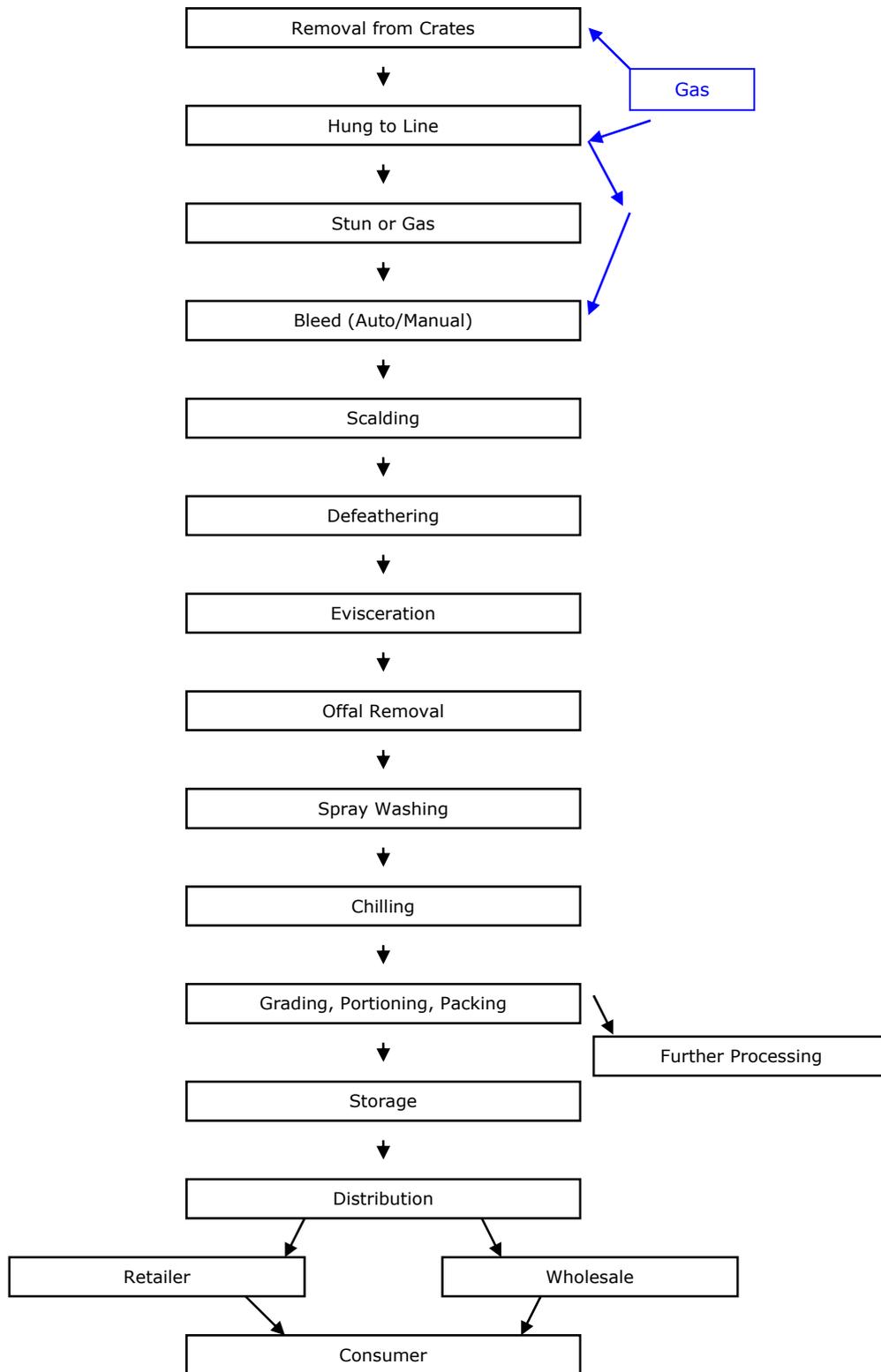
The necks of the birds are cut, either manually or automatically, and the birds are allowed to bleed for 1.5 to 2 minutes. The overhead rail moves the birds

²³ Council Directive 93/119/EC of 22 December 1993 on the protection of animals at the time of slaughter or killing, OJ L 340, 31.12.1993, p. 21.

from the stunning/bleeding area and lowers them into a scalding tank, to open the feather follicles which facilitates the removal of feathers. During defeathering, finger-like projections remove the feathers from the bird. Defeathered birds are eviscerated, i.e. the contents of the body cavity are removed, and inedible parts of the bird are removed for rendering.

The resultant carcasses are washed to remove physical contaminants, such as blood, tissue fragments and faecal matter, and chilled by air chilling, air-spray chilling, or immersion chilling. The carcasses are then graded and subsequently prepared for packaging as whole birds or cuts, or sent for further processing. The finished products are held in chilled storage until distribution (Figure 2.2).

Figure 2.2: Overview Broiler Processing



CHAPTER 3 FOOD SAFETY ISSUES

3.1 Microbiological Issues

3.1.1 Introduction

A recent major review of data from England and Wales (1996 – 2000) found that contaminated chicken was the most significant cause of indigenous food borne disease at 21% (Table 3.1)¹.

Table 3.1: Estimated Annual Impact of Indigenous Foodborne Disease, By Selected Food Group and Type, England and Wales

Food Group/Type	Cases (%)	Death (%)	Case-Fatality Rate
Poultry	502,634 (29)	191 (28)	38
Chicken	398,420 (23)	141 (21)	35
Eggs	103,740 (6)	46 (7)	44
Red Meat	287,485 (17)	164 (24)	57
Seafood	116,603 (7)	30 (4)	26
Shellfish	77,019 (4)	16 (2)	21
Milk	108,043 (6)	37 (5)	34
Vegetable/Fruit	49,642 (3)	14 (2)	29
Salad Vegetables	37,496 (2)	11 (2)	28
Fruit	5,275 (0)	1 (0)	25

The report concluded that reducing the impact of indigenous foodborne disease is mainly dependant on controlling the contamination of chicken by pathogenic microorganisms.

Campylobacter and *Salmonella* are the two bacteria most commonly associated with foodborne illness related to the consumption of chicken. Other agents of foodborne illness associated with the consumption of contaminated chicken include *Listeria monocytogenes* and *Staphylococcus aureus*, although these are

more likely to be associated with the consumption of ready-to-eat chicken and ready-to-eat chicken products.

In this chapter, a number of issues will be reviewed including foodborne illness on IOI as a result of chicken consumption; the contamination of chicken by pathogenic microorganisms (particularly *Campylobacter* and *Salmonella*) along the food chain, and the current measures being undertaken by the industry, and the legislative tools in place, to protect the consumer from illness as a result of consuming contaminated chicken. Finally, the success of these measures and the experiences of other countries in reducing the levels of pathogenic organisms in chicken and foodborne illness, as a result of the consumption of contaminated meat, will be discussed.

3.1.2 Chicken Related Foodborne Illness on IOI

3.1.2.1 Campylobacteriosis

Campylobacter spp. are widespread in the intestinal tract of warm-blooded animals and are also commonly found in the alimentary tract of healthy birds, including domestic poultry. Thus raw meat and raw milk can be readily contaminated during normal farming and food production processes. *Campylobacter* spp. are fragile organisms, sensitive to freezing, heating (pasteurisation/cooking), drying, acidic conditions (pickling), disinfectants and irradiation. The organisms normally die off quickly in the presence of air and are very sensitive to oxygen breakdown products. It has been estimated that consumption of a small number of organisms (500 or less) may be associated with illness. Therefore, the fact that the organism does not multiply very effectively in most foods does not prevent it from causing foodborne illness.

Campylobacteriosis is the commonest bacterial cause of human gastrointestinal illness in the developed world. *C. jejuni* is the predominant species associated with human illness, with the remainder mostly being *C. coli* and *C. lari*. It is primarily a diarrhoeal illness. The diarrhoea is often bloody and frequently

associated with acute abdominal pain. Symptoms may subside after a number of days or may persist for weeks. Rarely, long-term side-effects may develop such as reactive arthritis, Reiter's syndrome (a subtype of reactive arthritis), or haemolytic uraemic syndrome and approximately one in every 1000 cases leads to a severe neurological disorder called Guillain-Barre Syndrome.

A striking piece of evidence provided inadvertently by the dioxin crisis in Belgium in 1999 contributed a unique opportunity to observe exceptional changes in the occurrence of chicken related *Campylobacter* infections²⁴. Dioxin contaminated feed resulted in the withdrawal of chicken from the Belgian market, while a decline of 40% in the number of human *Campylobacter* was observed.

In 2003, a total of 2,308 cases of laboratory confirmed campylobacteriosis were reported on IOI. Of these 1,568 cases were reported in ROI and 740 cases in NI^{25,26}. This gives crude incidence rates of 39.9 cases/100,000 population for ROI and 43.81 cases/100,000 population for NI²⁷. Figure 3.1 illustrates recent trends in human campylobacteriosis on IOI.

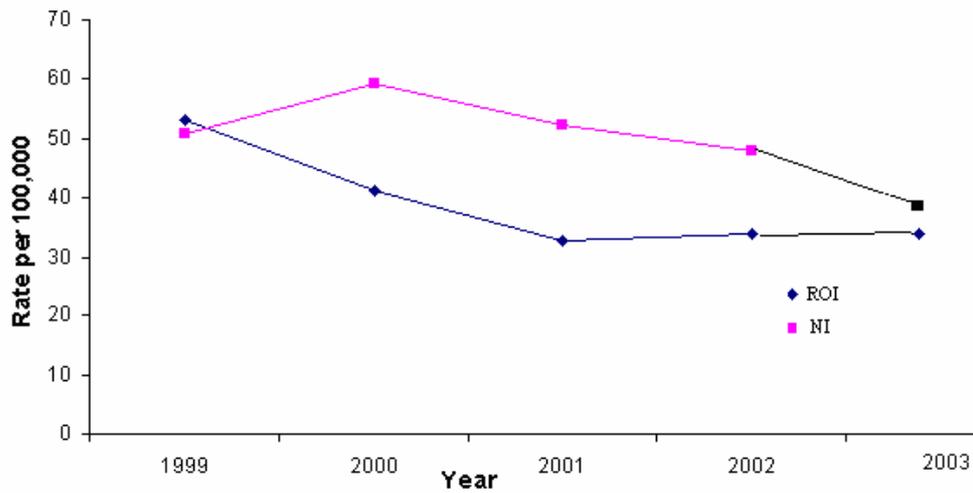
²⁴ Vellinga, A., Van Loock, F., The Dioxin Crisis as Experiment to Determine Poultry Related *Campylobacter* Enteritis. *Emerging Infectious Diseases* 2002 Jan; 8(1):19-22

²⁵ *Communicable Disease Surveillance Centre – Northern Ireland. Communicable Diseases – Provisional Summary 2003. Northern Ireland Edition, vol 12 NO13, Belfast, CDSC-NI 2003, ISSN 1361-1887*

²⁶ Foley B, McKeown P, Campylobacteriosis in Ireland 2003. *EPI-Insight* April 2005: 2-3

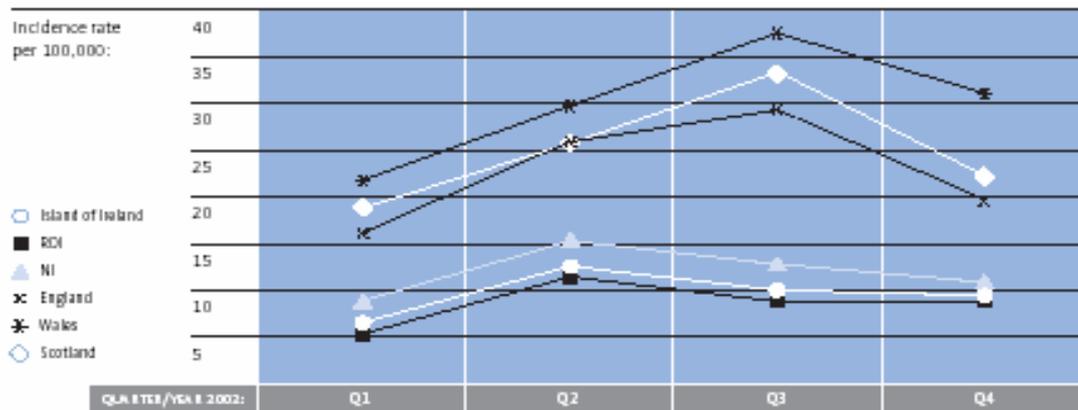
²⁷ It is important to note that different sources of information are used in the two jurisdictions and that laboratory notification was only introduced in ROI in January 2004.

Figure 3.1: Incidence Rate of *Campylobacter* Cases by Year, ROI and NI, 1999-2003



Human campylobacteriosis on IOI is known to have a well-characterized seasonal distribution, with a peak seen in early summer each year (Figure 3.2). The majority of cases are reported earlier in the year on IOI (2nd Quarter) compared with Great Britain (3rd Quarter). It is also worthy to note that the rates of campylobacteriosis in Great Britain are twice those on IOI²⁸.

Figure 3.2: Isolation of *Campylobacter* by Quarter, IOI, ROI, NI, England, Wales and Scotland, 2002



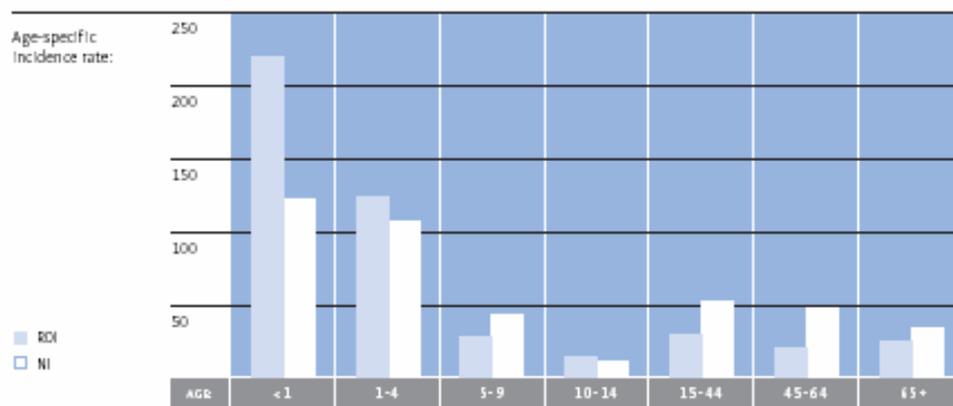
²⁸ Foodborne Infections and Gastrointestinal Disease on the island of Ireland in 2002. Food Safety Promotion Board. <http://www.safefoodonline.ie>

Note: The quarter refers to the date of onset of illness in ROI and to the date the specimen was received from the laboratory in the UK

The majority of *Campylobacter* isolates on IOI are not speciated (84% in NI and 62% in ROI). However, where species are reported, 92% of infections are due to *C. jejuni*.

By far the highest burden of illness is seen in children less than five years of age (Figure 3.3) and this is a feature of the illness worldwide²⁸.

Figure 3.3: Age Specific Incidence Rate (per 100,000 population) of Confirmed Cases of Campylobacteriosis, ROI and NI, 2002



Outbreaks of campylobacteriosis are rare and there were none reported in either ROI or NI in 2003.

In Europe, an overall decreasing trend is evident since 2002 after an increasing trend over several years. However, there is no common trend among the individual countries²⁹. While there has been a pronounced increase in the number of notified human cases observed in France, ROI and Spain, there has been a clear decreasing tendency in Denmark, Finland, the Netherlands and the

²⁹ European Commission Directorate of Health and Consumer Protection. Reports on trends and sources of zoonotic agents in the European Union and Norway, 2003. http://europa.eu.int/comm/food/food/biosafety/salmonella/zoonoses_reps_2003_en.htm

UK, with evidence of a decrease beginning to occur in Austria, Belgium and Germany. There is considerable variation in reported rates across Europe and further research is required to clarify the level of real, as distinct from reported, difference in rates.

3.1.2.2 *Salmonellosis*

Salmonella is a bacterial zoonotic pathogen that is a relatively common cause of foodborne illness worldwide. At present, there are over 2,500 known serotypes of *Salmonella*. In recent years, two serotypes, namely, *S. enterica* serotype Enteritidis and *S. enterica* serotype Typhimurium have accounted for the majority of cases of human salmonellosis throughout Europe³⁰.

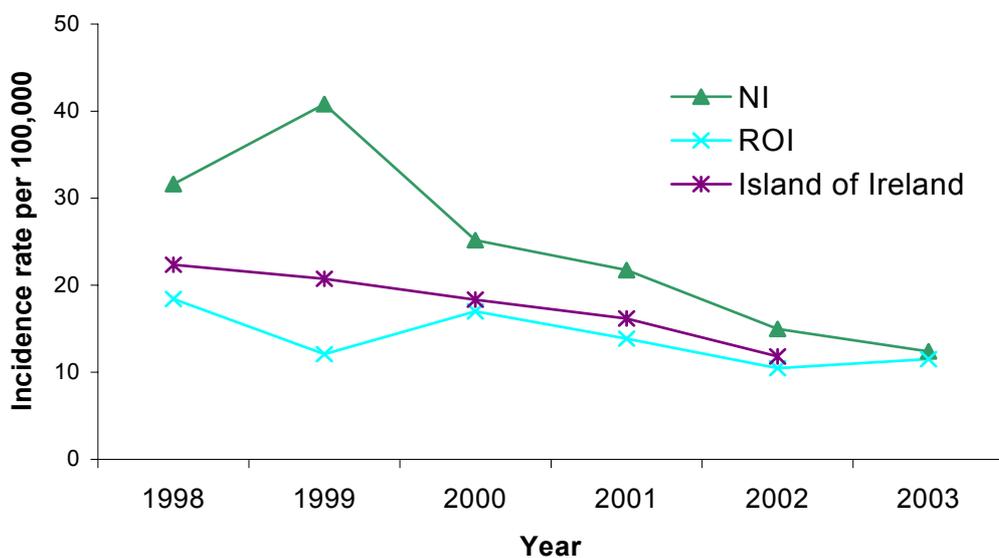
Salmonella are not fastidious organisms; they can survive and multiply under a variety of environmental conditions outside of living hosts and grow readily in many foods. Normally, relatively large numbers of bacteria are required to cause illness in healthy adults, but vulnerable groups, such as the very young, the elderly and immuno-compromised, can be infected by lower numbers. Animals become infected with the bacteria by direct contact with other animals, by consuming contaminated feed or water, or through environmental contact from grass, wild birds and rats. Humans acquire the bacteria from contaminated foods such as beef products, poultry, unpasteurised milk, eggs and egg products. *Salmonella* spp. are eliminated by thorough cooking and by the pasteurisation of milk.

Salmonellosis presents as an acute enterocolitis, with sudden onset of headache, abdominal pain, diarrhoea, nausea and occasionally vomiting. Fever is almost always present. Dehydration, especially amongst vulnerable populations such as infants, the immunocompromised and the elderly, may be severe. *S. Typhi* and *S. Paratyphi* can cause enteric fever, a severe systemic life threatening condition, but this is very rare on IOI and mainly travel-associated.

³⁰ <http://www.ndsc.ie/EPI-Insight/Volume32002/File,667,en.PDF>

In total, 696 cases of laboratory confirmed salmonellosis were reported on IOI in 2003, of which there were 486 cases in ROI and 210 cases in NI^{25,31}. This gives crude incidence rates of 11.5 cases/100,000 population for ROI and 12.4 cases/100,000 population for NI³². Figure 3.4 illustrates the recent downward trends in human salmonellosis on IOI.

Figure 3.4: Incidence Rates of Salmonellosis (per 100,000 population) NI, ROI and IOI, 1998-2002



The highest incidence rate in both jurisdictions is recorded in young children and this is a global pattern. Overall, there is a marked seasonality in incidence rates, with a peak observed in late summer/early autumn.

The predominant serotype of *Salmonella* causing human illness in 2003 was *S. Enteritidis*, accounting for 42% of ROI isolates and 44% of NI isolates. Second in frequency was *S. Typhimurium*. Together, *S. Enteritidis* and *S. Typhimurium* serotypes accounted for 64% of all *Salmonella* isolates in 2002 in ROI and 70%

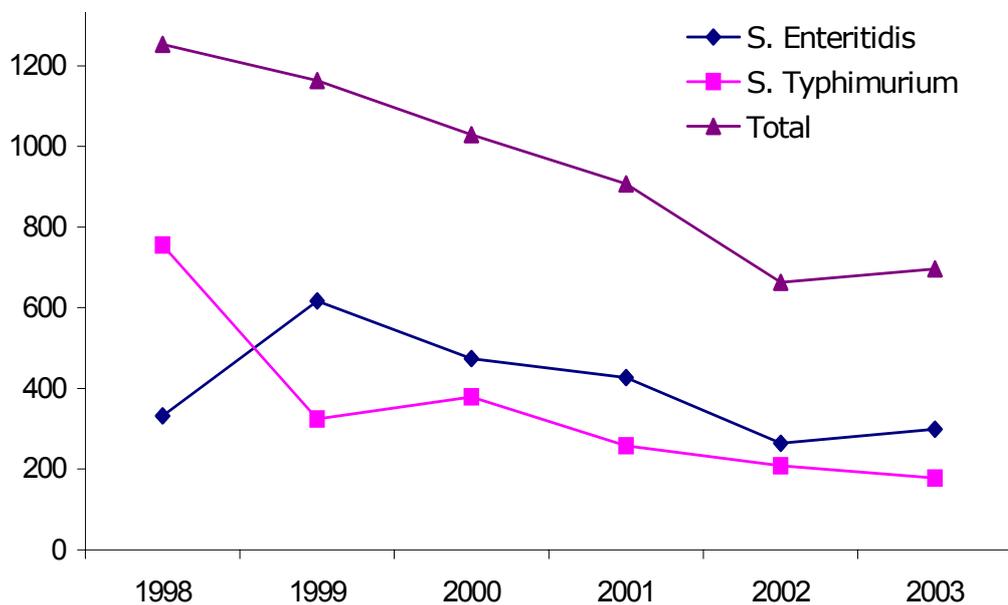
³¹ Salmonella in Ireland, 2003. NSCS Annual Report 2003 56-60

³² It is important to note that different sources of information were used in the two jurisdictions.

in NI. The next most common isolated serotypes accounted for very small numbers.

As well as a decrease in the total number of *Salmonella* isolations on IOI, there has been a downward trend in the two predominant *Salmonella* serotypes isolates (Figure 3.5)

Figure 3.5: Laboratory Reports of *Salmonella*, IOI, 1998-2002



In Europe, there has been an overall decreasing trend in cases since 1995. In the individual countries, there are considerable variations in incidence and in trends. Reported cases increased considerably in some countries (Belgium, Greece, Ireland, Portugal and Netherlands) whereas in Denmark, Germany and Sweden a downward trend is evident³³. In 2003, as in previous years, *S. Enteritidis* and *S. Typhimurium* dominated accounting for 78% of all cases with *S. Enteritidis* representing between 88% of *Salmonella* isolates in Austria and 33% of cases reported in France.

³³ Trends and sources of Zoonotic agents in the European Union and Norway, 2003.
<http://www.eurosurveillance.org/em/v09n09/0909-222.asp>

3.1.3 Microbiological Risks Along the Food Chain

The microflora associated with chickens on the farm is determined by a number of factors. Chickens can be exposed to microorganisms found within poultry production units or those inhabiting the external environment surrounding the poultry houses. These can originate from a wide range of sources, including the production environment and husbandry practices, breeding stock, feed, other chickens, water sources and, rodents or insects, and potentially, farm personnel or other farm livestock. For intensively reared broilers, the risk of exposure to infectious agents would be lower compared with extensive production systems, such as free range and organic systems, as greater levels of control are possible.

Hygiene measures taken during production on the farm, transport, and at slaughter will therefore influence the microorganisms present on the carcass. A major challenge for the chicken industry is to limit the attachment and colonisation of undesirable microorganisms in live animals. The ultimate aim, if currently unattainable, should be to supply pathogen-free live poultry to the processing plant. In the present situation, industry has to contend with potentially contaminated flocks being presented for slaughter. In this scenario there is opportunity for cross-contamination to occur within the processing environment, whereby microorganisms may be transferred from contaminated carcasses to non-contaminated carcasses and/or equipment.

This section will consider the current risk status of each stage of the food chain with regard to the level of microbiological contamination and review the current legislation and best practices in operation to protect public health.

3.1.3.1 At Farm Level

Breeding Flocks

Control of microorganisms during the broiler breeding stages is critical to protect the end product from contamination with pathogens. If there is contamination of the grandparent or parent flocks directly or through the consumption of contaminated feed, then there is limited scope for further control efforts through subsequent stages in production and the supply chain.

Under national legislation and control programmes in NI and ROI, all breeding flocks must be registered and up to date records regarding disease status must be kept. Owners of breeding flocks and hatcheries are required to take samples and submit them to authorised laboratories for testing for *Salmonella* at defined points in the life of each flock. The results of the tests are reported to the competent authority, namely the Department of Agriculture and Food (DAF) in ROI and DARD in NI.

Poultry Feed

It is well established that contaminated feed is a potentially important route of flock infection with *Salmonella* species³⁴. With regard to *Campylobacter*, feed is generally not regarded as a primary source of infection provided that it is stored under dry conditions and adequately protected from contamination by vermin (wild birds or rodents)³⁵. Raw feed ingredients will often become contaminated with *Campylobacter*, however, *Campylobacter* spp. are relatively susceptible to the effects of heat and generally have a low tolerance for aerobic conditions, and thus will not multiply or survive in feedstuff³⁶.

The importance of feed in ensuring the safety of poultry meat is highlighted in the context of legislation in both jurisdictions. In ROI under Regulations 4 of SI 435 of 1999 and SI 390 of 1999, compound feedstuffs must be quality assured products, which do not present a danger to animal or human health. Under the Poultry Feedingstuffs Order (NI) 1999, records of all feed deliveries and usage must be maintained to allow each delivery to be traced back to the supplier. Regulation 178/2002 requires full traceability of feed and is applicable in both ROI and NI.

While heat treatment of poultry feed is not a legal requirement in NI³⁷, the Code of Practice for the Prevention and Control of *Salmonella* in Poultry Produced for

³⁴ White PL, Baker AR, James WO (1997) Strategies to control *Salmonella* and *Campylobacter* in raw poultry products. Rev Sci Tech 1997; 16(2):525-541.

³⁵ Food Safety Authority of Ireland. 2002. Control of *Campylobacter* in the food chain. Page 20.

³⁶ Cox N A, Berrang M E, Stern N J, Musgrove M T. (2001) Difficulty in recovering inoculated *Campylobacter jejuni* from dry poultry-associated samples. J Food Protect 64(2): 252-254.

³⁷ In the past, heat treatment of feed was mandatory in NI to combat Newcastle Disease, however, this was replaced by a vaccination policy.

Human Consumption³⁸, recommends obtaining feed from UKASTA approved suppliers and the treatment of feed with time/temperature combinations capable of eliminating *Salmonella*. Those producers participating in the Assured Chicken Production (ACP) scheme must use feed which has been produced in accordance with the UKASTA Feed Assurance Scheme³⁹ (UFAS) or equivalent.

In ROI, heat treatment is made compulsory under S.I. 364 Diseases of Animals (Poultry Feed) Order 1991. Feeds must be heated to at least 75°C for 1 minute, or equivalent.

Water, like feed, can also act as a vehicle for horizontal transmission in a broiler house once *Campylobacter* has become established and is subject to the requirements of Council Directive 80/778/EEC.

Campylobacter at Farm Level

Newly hatched chicks are reportedly *Campylobacter*-free, and normally remain so for the first 7 days, although infections at earlier ages have been reported. Most flocks become infected with *Campylobacter* 2-3 weeks after the introduction of chicks into a broiler house. Once exposed to infection, the bird's alimentary tract is rapidly colonised by *Campylobacter* spp. and within a relatively short period following initial exposure, a high proportion of the flock become life-long excretors of large numbers of these bacteria⁴⁰.

Thinning represents an opportunity for house-to-house and farm-to-farm spread of *Campylobacter*, as teams of workers and their equipment (crates, modules and forklift trucks) may access multiple farms in a single working day for the purpose of removing a proportion of the flock for slaughter. Recommendations in relation to the practice of thinning have been made in both jurisdictions^{41,42}, with an 'all-in, all-out' policy preferable from a biosecurity perspective.

³⁸ DARD (2005) Code of Practice for the Prevention and Control of *Salmonella* in Poultry Produced for Human Consumption.

³⁹ www.efsis.com

⁴⁰ Newell, D.G. and Fearnley, C. (2003) Sources of *Campylobacter* colonisation in broiler chickens. Applied Environmental Microbiology 69(8): 4343-4351

⁴¹ FSAI. 2002. Control of *Campylobacter* in the food chain. Page iv

⁴² Advisory Committee on the Microbiological Safety of Food: Second Report on *Campylobacter* (2005). Paragraph 4.21: FSA London.

However, these have not been put into practice under commercial conditions because of their impact on initial stocking densities. Biosecurity is the prevention of disease-causing agents entering or leaving any place where they can pose a risk to farm animals, other animals, humans, or the safety and quality of a food product⁴³.

In a study published in 1999, 60-70% of broilers in ROI were found to be faecal culture positive for *Campylobacter* when sampled at the farm of origin⁴⁴. Figures for 2002 and 2003 were 75% and 78% respectively⁴⁵. Cloacal swabs (i.e. swabs taken from the common external opening for the digestive, urinary and reproductive tracts) from pre-slaughter broiler chicken flocks in NI between February 2000 and October 2001 revealed 67.7% (262/387) flocks *Campylobacter* positive⁴⁶. No more recent data is available for flocks in NI.

Salmonella at Farm Level

Statutory *Salmonella* monitoring programmes have been in place in breeding flocks in both ROI and NI since the late 1980s. The main interventions which have taken place include compulsory slaughter, without compensation, of *Salmonella*-infected breeding flocks; heat treatment of feed; dedicated conveyors and transport for finished feed; proper cleansing of poultry houses; control of vermin; and active routine surveillance of commercial hatcheries. Industry is also involved in this programme. There is a legislative requirement for private laboratories to notify positive results of own samples to the relevant Department of Agriculture. Under this provision, the person in charge of the laboratory carrying out the test for *Salmonella* is required to report any positive isolation in a sample taken from any animal or bird, or from the carcass, products or surroundings of any animal or bird, or from any feedstuff. Department of Agriculture Inspectors also have the power to take samples and carry out tests if *Salmonella* infection is suspected. This may result in movement

⁴³ Department of Agriculture and Rural Development (2004) Biosecurity Code for Northern Ireland Farms.

⁴⁴ Whyte, P. (1999) Hazard Analysis Critical Control Point (HACCP) Systems- A Basis for Food Safety Management in Commercial Poultry Processing. PhD thesis, National University of Ireland.

⁴⁵ Report on Zoonoses in Ireland 2002 and 2003.

⁴⁶ Oza, A.N., McKenna, J.P., McDowell, S.W.J., Menzies, F.D. and Neill, S.D. (2003) Antimicrobial susceptibility of *Campylobacter* spp. isolated from broiler chickens in Northern Ireland. *J. Antimicrob. Chem.* 52: 220-223

restrictions, isolation requirements, and compulsory cleaning and disinfection of premises and vehicles also being imposed.

Where *S. Enteritidis* or *S. Typhimurium* is suspected in a breeding flock, an investigation of the suspect flock is carried out by DARD or DAF. Bacteriological culture of a statistically valid number of post-mortem samples from the flock is used to confirm that the flock is infected with *S. Enteritidis* or *S. Typhimurium*. On confirmation of infection in a breeding flock, no further eggs may be sent for hatching and the flock is compulsorily slaughtered. In NI, this policy has been unchanged since 1990. In addition in ROI, broiler carcasses are sampled by DAF for *Salmonella* as part of the Enhanced Poultry Monitoring Programme.

Although there is no statutory requirement upon poultry producers to monitor the *Salmonella* status of chickens reared for meat, most producers adhere to best practice and have monitoring regimes in place. Usually flocks are tested 1-2 weeks before depopulation so that a positive result can be acted upon before slaughter, and appropriate cleaning and disinfection can take place when the broiler house is emptied. *Salmonella*-positive flocks may be slaughtered at the end of each days slaughter run to prevent cross-contamination of other uninfected flocks.

As a result of these interventions, *S. Typhimurium* and *S. Enteritidis* now rarely contaminate poultry flocks on IOI. Neither species was detected during 2003 in the 327 flocks within the 213 flocks registered under the NI Poultry Breeding Flocks and Hatcheries Scheme Order⁴⁷. In ROI, only *S. Enteritidis* was detected in environmental samples taken to monitor poultry flocks during the same period and was detected at low levels⁴⁸.

⁴⁷ Zoonoses Report United Kingdom, 2003, Department of Environment, Food and Rural Affairs.

⁴⁸ Egan et al. (2004) FoodMicro Database Report 2002 and 2003. Final Report on **safefood** project 00-RESR-105.

Salmonella other than *S. Typhimurium* and *S. Enteritidis* were detected in 10% of flocks in ROI in 2002 and in 6.5% of flocks in 2003⁴⁹. In 2002 and 2003, no salmonellae were detected in finished feed samples tested as part of the SMP in ROI, but low prevalences of *S. Kentucky*, *S. Senftenberg*, *S. Group C* and an unknown serotype were detected in individual feed ingredients tested in both years²². Statutory testing of poultry feedstuffs for *Salmonella* has not been carried out in NI since 1996.

Effective cleaning and disinfection procedures at farm level are also considered to be of prime importance in the control of *Salmonella*⁵⁰.

Biosecurity on Poultry Farms

During 2004, the respective Departments of Agriculture in ROI⁵¹ and in NI⁵² issued biosecurity advice to poultry flock owners, in an effort to control diseases in the poultry population on IOI.

Biosecurity procedures have been successful in reducing *Salmonella* colonisation of chickens. Standard biosecurity procedures have not, however, been very successful in preventing colonisation of commercial flocks with *Campylobacter*. This is probably because of high exposure levels, low infectious dose, and rapid bird-to-bird transmission rates once *Campylobacter* is introduced to a poultry house. However, *Campylobacter* colonisation has been shown to be halved by stringent biosecurity measures⁵³.

The Food Safety Authority of Ireland (FSAI) in its recent report 'Control of *Campylobacter* species in the Food Chain', recommended that poultry farm managers/operators should comply to the highest possible degree with the

⁴⁹ Report on Zoonoses in Ireland 2002 and 2003. FSAI, 2005.

http://www.fsai.ie/publications/reports/Zoonoses_report2.pdf

⁵⁰ Davies, R., Breslin, M., Corry, J.E.L., Hudson, W. and Allen, V.M. (2001) Observations on the distribution and control of *Salmonella* species in two integrated broiler companies. *Veterinary Record* 149(8) 227-232.

⁵¹ Biosecurity Advice for Poultry Flock owners, January 2004 issued by Department of Agriculture and Food. Accessible online: www.agriculture.gov.ie/animal_health/avian_influenza/Biosecurity1.doc.

⁵² Poultry Biosecurity, Department of Agriculture and Rural Development for Northern Ireland. Accessible online: www.dardni.gov.uk/vetservice/biosecurity/poultryindex.shtml.

⁵³ Gibbens, J.C., Pascoe, S.J.S., Evans, S.J., Davies, R.H. and Sayers, A.R. (2001) A trial of biosecurity as a means to control *Campylobacter* infection of broiler chickens. *Prev. Vet. Med.* 48: 85-99.

biosecurity measures outlined in the report in order to protect poultry flocks from exposure to *Campylobacter* spp⁵⁴.

The Food Standards Agency (FSA) is currently running a biosecurity campaign as part of its strategy towards the control of *Campylobacter* in chickens⁵⁵ in the UK.

Veterinary Supervision of Poultry Farms

Poultry farms may be under the supervision of company veterinary surgeons or private veterinary practitioners (PVPs). Birds consigned from large holdings must either be accompanied by a health attestation signed by a veterinary surgeon, or the holding must be supervised by a veterinary surgeon and the birds accompanied to the slaughterhouse by a production report.

Additionally, PVPs undertake duties in relation to the export certification of poultry and poultry products, by inspecting the health and welfare of the birds, their eligibility for export, as well as completing export health certification.

In ROI, PVPs are not authorised to provide health attestation/certification for poultry flocks. Veterinary Inspectors (VIs) from DAF District Veterinary Offices, perform this function.

3.1.3.2 *Transport from Farm to Slaughterhouse*

The thinning process and subsequent transport from farm to slaughterhouse is potentially one of the most stressful periods of a chicken's life due to the withholding of feed prior to transport, the catching and crating process, and the crowded conditions whilst in transit. Stress can lead to increased excretion of pathogens including *Salmonella* and *Campylobacter*, therefore increasing susceptibility to infection and the risk of bird-to-bird cross-infection. However, journey times for live poultry between broiler houses and slaughtering plants on IOI are relatively short in duration due to the geographic proximity of broiler production sites and processing plants.

⁵⁴ 'Control of *Campylobacter* species in the Food Chain', FSAI, 2003

⁵⁵ Foodborne Disease Strategy Consultative Group, FSA (2004) FSA strategy for the control of *Campylobacter* in chickens – biosecurity campaign – phase 2. www.food.gov.uk/multimedia/pdfs/fdscg4d.pdf.

Another source of contamination at the depopulation and transport stage is dirty crates. A recent review of poultry transport crate hygiene by the FSA⁵⁶ indicated that most current crate washing systems are not capable of eliminating either *Salmonella* and/or *Campylobacter* spp. from crates consistently.

3.1.3.3 Primary Processing

Campylobacter

Data from ROI indicates that neck-skin flaps of freshly dressed carcasses at the processing plant are 80-90% positive for *Campylobacter jejuni*²². DAF in association with the FSAI commenced sampling of poultry for *Campylobacter* isolation in September 1999.

One study has shown that *Campylobacter*-negative flocks arriving at a processing plant are rapidly contaminated by various *Campylobacter* subtypes during processing⁵⁷. Opportunities for cross-contamination between birds exist during lairage before slaughter, at scalding, defeathering, and evisceration.

Since *Campylobacter* are ubiquitous in the natural environment, free-range and organic poultry flocks may potentially have higher prevalence of *Campylobacter* infection and therefore may represent a higher risk with regard to campylobacteriosis⁵⁸. The FSA's Advisory Committee on the Microbiological Safety of Food (ACMSF) in its second report on *Campylobacter* found that there is some evidence to support this hypothesis; however, this evidence is not comprehensive⁵⁹. For traceability reasons, organic chickens are normally slaughtered at the start of a production period before conventionally produced chickens. There is no decontamination of lines between flocks and consequently, the potential exists that birds from flocks with lower rates of *Campylobacter* may

⁵⁶ <http://www.food.gov.uk/science/research/researchinfo/foodborneillness/eggsresearch/b15programme/b15projects/zb00033/zb00033r>

⁵⁷ Newell, D.G., Shreeve, J.E., Toszeghy, M., Domingue, G., Bull, S., Humphrey, T. and Mead, G. (2001) Changes in the carriage of *Campylobacter* strains by poultry carcasses during processing at abattoirs. *Appl. Environ. Microbiol.* 67(6): 2636-2640.

⁵⁸ EFSA Scientific Panel on Biological Hazards (2004) Opinion of the Scientific Panel on Biological Hazards on the request from the Commission related to *Campylobacter* in animals and foodstuffs. *EFSA Journal* 177: 1-10.

⁵⁹ Advisory Committee on the Microbiological Safety of Food: Second Report on *Campylobacter* (2005). Paragraph 4.21: FSA London.

become contaminated by exposure to equipment previously used for organic birds.

During 2002 and 2003, the Enhanced Monitoring Programme for poultry in ROI, co-ordinated by the FSAI, recorded *Campylobacter* spp. in 53% (n=3222) and 48% (n=2489) of samples tested in 2002 and 2003, respectively (from both domestic and imported raw poultry sampled at processing level)⁴⁹. The total number of samples was 5,711 of which domestic 4,275 and imports 1,426). The level of contamination of domestic poultry (63% and 58%) with *Campylobacter* was much greater than that for imported poultry meat (22% and 18%) in 2002 and 2003 respectively. However, it is important to note that different levels of sampling and types of samples were employed, e.g. while imported samples mainly consisted of fillets, domestic samples included whole carcasses which are more likely to have a higher contamination rate.

Data available from the **safefood** FoodMicro Database project on the prevalence of *Campylobacter* spp. on raw chicken, raw chicken products and cooked chicken products at processing level in ROI in 2003⁴⁸ indicated 35.1% *Campylobacter* positive samples amongst raw poultry and raw poultry products at processing level. There were no positive *Campylobacter* samples amongst cooked chicken products.

Salmonella

During primary processing, the areas where the risk of *Salmonella* contamination is high are scalding, defeathering, evisceration and offal removal. Scalding tank water temperature is normally maintained at 54±1°C to ensure inactivation of *Salmonella*. Cleaning procedures for de-feathering machines must be effective. They are normally cleaned and disinfected overnight, but during the day they are continuously rinsed with cold water, which at best will reduce numbers of *Salmonella*. Evisceration must take place without rupturing viscera as this would result in release of intestinal contents which may contain large numbers of potentially pathogenic bacteria. Similarly, offal must be removed intact. There

is some evidence to support the possibility for cross-contamination of *Salmonella* between carcasses during primary processing operations⁶⁰.

The processing environment (walls, floors and other surfaces) may become contaminated by splashes or contact during a production run. One study has shown that *Salmonella* spp. can remain viable on surfaces such as formica, stainless steel and ceramic tiles for extended periods⁶¹, so effective cleaning and disinfection regimes are essential.

Data from ROI indicates that 4% (n=7713) and 3.5% (n=9158) of raw poultry meat samples tested at processing level were positive for *Salmonella* spp. in 2002 and 2003, respectively⁴⁹. Data available from the **safefood** FoodMicro Database project on the prevalence of *Salmonella* spp. on raw chicken, raw chicken products and cooked chicken products at processing level in the ROI in 2003⁴⁸, indicated 3.2% *Salmonella* positive samples amongst raw chicken (n=3745); 2.6% *Salmonella* positive samples amongst raw chicken products (n=2562); and one cooked poultry sample was positive for *Salmonella* in the same year (n=2322).

Unlike red meat species, there is currently no legislative requirement for poultry processors to conduct microbiological testing on carcasses. This is currently being discussed among Member States (MS) in the draft Commission Regulation SANCO/4198/2001 Rev. 14, which proposes that chicken carcasses should be tested for the presence of *Salmonella* spp. The definition of such microbiological criteria will facilitate the articulation of food safety objectives for poultry carcasses that will define the acceptability of the process and focus efforts to further enhance product safety.

Hygiene in Poultry Slaughter and Cutting Premises

In slaughter and cutting premises, the primary aim of the Veterinary Public

⁶⁰ Corry, J.E.L., Allen, V.M., Hudson, W.R., Breslin, M.F. and Davies, R.H. (2002) Sources of *Salmonella* on broiler carcasses during transportation and processing: modes of contamination and methods of control. *J. Appl. Microbiol.* 92(3): 424-432.

⁶¹ De Casare, A., Sheldon, B.W., Smith, K.S. and Jaykus, L.A. (2003) Survival and persistence of *Campylobacter* and *Salmonella* species under various organic loads on food contact surfaces. *J. Food Prot.* 66(9): 1587-1594.

Health Service of DAF and the Veterinary Service in the Veterinary Public Health Unit of DARD, is to protect public health and safeguard animal health and welfare.

Veterinary supervision of hygiene in slaughter premises is carried out by teams, led by the OVS in NI or VI in ROI. They are assisted by Poultry Meat Inspectors (PMI) in NI and by Poultry Officers and Temporary Veterinary Inspectors in ROI. OVS/VIs are responsible for securing the observance of hygiene requirements in relation to staff, premises, equipment and implements, and the hygiene requirements for slaughter and the handling and storage of poultry and poultry meat. Only premises that meet the minimum standards set down in the meat hygiene regulations are approved to slaughter, process, and store poultry meat. These standards include programmes such as a HACCP (Hazard Analysis and Critical Control Points) plan, and HACCP prerequisite programmes including staff training (e.g. in food safety, HACCP, Good Manufacturing Practice, Good Hygiene Practice, etc.) and medical certification (e.g. pre-employment medicals, fitness to return to work certificates, etc.). In the case of non-compliance, appropriate enforcement action is initiated.

(i) Ante-mortem Inspection

EC Directive 71/118/EEC, as amended by Directive 92/116/EC, on health problems affecting trade in fresh poultry meat, contains provisions for veterinary supervision in full throughput slaughterhouses. Unlike red meat species, where individual animals are inspected, ante-mortem inspection for poultry is flock based. In ROI, poultry farms are under the supervision of veterinarians headquartered in the District Veterinary Offices in each county. The producers in these supervised facilities are required to provide appropriate farm production records (flock records) to the VI in the slaughter plant in advance of the intended date of slaughter. The contents of the flock records will determine whether special checks are required during ante and post mortem procedures. In addition, spot checks are carried out on individual loads of birds presented for slaughter. The different approach to ante-mortem inspection with poultry reflects the much greater numbers being slaughtered in a given period.

(ii) Post-mortem Inspection

Post-mortem inspection ensures that only meat that is fit for human consumption enters the food chain. Provisions are made in the Directive for the OVS/VI to personally inspect a random sample of rejected birds and examine a random sample of 300 birds which have passed post-mortem inspection. Differences exist in the level of veterinary supervision required dependent on the type of plant (as outlined in Chapter 2).

(iii) Own Checks and HACCP

There is an onus on the owner/occupier to carry out checks (including microbiological checks) on the general hygiene of conditions of production in his establishment to ensure that all equipment, machinery, instruments, fittings and facilities and, if necessary, fresh meat, comply with requirements.

Occupiers are also required to apply HACCP principles (Appendix C) to their operation as a prevention-based approach to ensure the safe production of food. This relies upon the identification of 'hazards', which unless eliminated or reduced, could cause adverse health problems for consumers. Under EU regulations, DAF and DARD enforce HACCP programmes for meat products, minced meat and meat preparations, including slaughter and cutting of fresh meat operations.

Notifiable Diseases

Notifiable animal diseases are those where there is a statutory duty for the suspicion or confirmation of disease to be notified to the respective Departments of Agriculture. Some of these diseases are potentially zoonotic, whilst others are not of concern to human health, but have serious implications for the farming and food industry and the economy in general. The Diseases of Animals Act 1996 and Diseases of Animals Order (NI) 1981 provide the basic legislation for the control and eradication of animal diseases in ROI and NI, respectively, supplemented by various pieces of subordinate legislation. Both DAF and DARD

work in conjunction with the industry to protect national flocks against such diseases which are notifiable.

Zoonoses

Two EU laws on monitoring zoonotic agents came into force at the end of 2003, namely Directive 2003/99/EC (concerning the monitoring of zoonoses and zoonotic agents) and Regulation (EC) No 2160/2003 (concerning the control of *Salmonella* and other specified foodborne zoonotic agents).

The new legislation facilitates harmonisation of zoonoses monitoring schemes, with the aim of making evaluation of trends and sources at the EU level possible, and to provide data to be used as a basis for risk assessment in this field. It also introduces control measures in more types of animal populations, and for more types of *Salmonella* and other zoonotic agents, which means that Member States (MS), including ROI, which currently have such measures will be able to receive co-financing. The five most frequent *Salmonella* serotypes of public health significance will be used to establish targets for poultry breeding stocks. In recent years, next to *S. Enteritidis* and *S. Typhimurium*, most cases of human salmonellosis in the EU have been caused by *S. Infantis*, *S. Virchow* and *S. Hadar*. The monitoring will take place at the stage or stages of the food chain most appropriate to the zoonoses or zoonotic agent concerned. The European Food Safety Authority (EFSA) will be instrumental in collating, assessing and reporting surveillance data. In response to the Directive, a baseline study in laying flocks in the UK is currently underway with a similar baseline survey for broiler production commencing in October 2005. A similar approach in ROI is also being considered.

Once the prevalence of these pathogens in MS has been investigated, targets will be set to reduce them over time, as required by Regulation 2160/2003/EC. MS will have to adopt national control programmes and encourage collaboration from the private sector in order to achieve the reduction targets. Certification of *Salmonella* status will be compulsory for trade between MS and Third Countries.

Consolidation and Simplification of EU Food Hygiene Legislation

On 29 April 2004 new EU food hygiene legislation was adopted that will apply from 1 January 2006. This raft of legislation, commonly referred to as the "hygiene package", encompasses five measures to update and consolidate the 17 existing hygiene Directives (Appendix D). The intention of this new legislation is to introduce consistency and clarity throughout the food production chain from 'farm to fork', by optimising public health protection through the improvement and modernisation of existing EU legislation. The new measures recognise that legislation needs to establish the conditions under which food is produced to prevent, eliminate, or acceptably control, pathogen contamination of food. For the first time the definition of food is extended to include live animals.

One of the most pertinent aspects of this new legislation is that it maintains, and sets out more clearly, the duty of Food Business Operators to produce food safely.

3.1.3.4 Storage and Distribution

The most critical control during the distribution and storage of chicken meat and chicken meat products is the maintenance of correct storage temperature. Council Regulation 1906/90/EC stipulates that fresh poultrymeat must be kept at a temperature not below -2°C and no higher than 4°C at any time. Frozen poultry meat must be kept at a temperature no higher than -12°C and quick-frozen poultrymeat kept at a temperature no higher than -18°C.

3.1.3.5 Retail and Catering

Campylobacter

A retail survey of raw chicken from Dublin, Belfast and Galway between March 2001 and October 2002 found 49.9% *Campylobacter* positive samples, with *C. jejuni* being the predominant species isolated⁶². In 2002, 63 fresh and 44 frozen chickens in NI were tested for *Campylobacter*, with 94% and 77% of chickens in the fresh and frozen categories, respectively, testing positive. However, there

⁶² Whyte, P., McGill, K., Cowley, D., Madden, R.H., Moran, L., Scates, P., Carroll, C., O'Leary, A., Fanning, S., Collins, J.D., McNamara, E., Moore, J.E. and Cormican, M. 9 (2004) Occurrence of *Campylobacter* in retail foods in Ireland. Int. J. Food Microbiol. 95:111-118.

were no *Campylobacter* positive results in ready-to-eat poultry-related cooked products samples⁶³.

Unlike *Salmonella*, a study conducted in NI during 1995-2000, demonstrated no significant decline in *Campylobacter* prevalence in raw whole chickens at retail level during this period.

The recently published Report on Zoonoses in Ireland 2002 and 2003, reports that of 553 samples of poultry meat products sampled at retail level in 2002 and 710 samples taken in 2003, less than 1% of the poultry meat products were found to be positive for *Campylobacter* spp⁴⁹.

A study conducted by the FSA⁶⁴ found that the frequency of *Campylobacter* contamination was higher in UK-produced chicken than in non-UK chicken. This difference was largely accounted for by whole chicken, as there was little difference in terms of frozen chicken portions. In total, 252 out of 691 samples of non-UK origin were *Campylobacter* positive (36%).

A recent study of food safety knowledge, microbiology and refrigeration temperatures in restaurant kitchens on IOI⁶⁵ gave some indicators of the knowledge of those responsible for food safety in relation to the possible food safety risks associated with poultry. Of the 200 interviewees, all had heard of the pathogen *Salmonella*, with 72% of those associating poultry as the source of the pathogen. However, with regard to *Campylobacter*, only 41.5% of those interviewed had heard of the pathogen and 14% of these associated poultry as a source.

⁶³Moore, J.E., Wilson, T.S., Wareing, D.R.A., Humphrey, T.J. and Murphy, P.G. (2002) Prevalence of thermophilic *Campylobacter* spp. in ready-to-eat foods and raw poultry in Northern Ireland. *J. Food Prot.* 65(8): 1326-1328.

⁶⁴ <http://www.food.gov.uk/multimedia/pdfs/campsalmsurvey.pdf>

⁶⁵ Food Safety Knowledge, Microbiology and Refrigeration Temperatures in Restaurant Kitchens on the Island of Ireland. **safefood** (in press)

Salmonella

A study of *Salmonella* contamination of raw whole chickens from retail premises in NI during the years 1995-2000, demonstrated a significant decline in *Salmonella* prevalence in chicken over the 6 years. Results indicated *Salmonella* in 10% of samples in 1995, peaking in 1996 to 14%, and reduced to 1% in 2000⁶⁶.

Surveillance for *Salmonella* in retail chicken leg and breast portions purchased in NI between September and December 2002 detected 1.5% *Salmonella* positive samples⁶⁷. In ROI in 2002/2003, no salmonellae were detected in raw whole chicken at retail level, (note: sample numbers were low in this survey) with less than 1% of retail poultry products testing positive⁴⁹. An earlier study for *Salmonella* in retail refrigerated cooked chicken pieces, tested as part of National Microbiology Surveillance Programme, also detected no salmonellae⁶⁸.

In terms of differences in *Salmonella* levels between domestic and imported chicken meat, a study published by the FSA⁶⁹ found that the frequency of contamination was lower in UK-produced chicken meat and that this difference was statistically significant for frozen samples (8.3% UK compared to 13.6% non-UK). The figures were not significant for fresh chicken due to the small number of fresh non-UK samples.

Food Safety Controls at Retail and Catering Level

Risk management by the business operator is at the core of ensuring food safety during retail and catering activities. HACCP systems are mandatory requirements for food businesses.

⁶⁶ Wilson, I.G. (2002) *Salmonella* and *Campylobacter* contamination of raw retail chicken from different producers: a six-year survey. *Epidemiol. Infection* 129: 635-645.

⁶⁷ Soutos, N, Koidis, P. and Madden, R.H. (2003) Presence of *Listeria* and *Salmonella* spp. in retail chicken in Northern Ireland. *Lett. Appl. Microbiol.* 37: 421-423.

⁶⁸ Food Safety Authority of Ireland (2001) 2nd Quarter National Survey 2001: Refrigerated cooked chicken pieces. www.fsai.ie/surveillance/food/2ndQuarter.pdf

⁶⁹ <http://www.food.gov.uk/multimedia/pdfs/campsalmsurvey.pdf>

(i) Northern Ireland

In the UK, as a result of the Pennington Report, specific licensing of butchers' shops, as distinct from other retailers, was introduced. The specific legislation in NI is the Food Safety (General Food Hygiene) (Amendment) Regulations (NI) 2001⁷⁰. For the purposes of the Regulations, a 'butcher's shop' is a food premises engaged in the handling of unwrapped raw meat and the sale of raw meat, either wrapped or unwrapped, together with ready-to-eat foods. Premises such as delicatessens and grocers, which sell only uncooked meat products (e.g. fermented meats, salamis, etc.) and preparations, and ready to eat foods (but not raw meat), do not require a licence.

Butcher licensing conditions require HACCP procedures to be in place. Intermediate Food Hygiene Training is mandatory for all supervisors of persons handling meat, and Basic Food Hygiene Training for all persons handling meat. All food products sold from a licensed butcher's shop are covered by licensing conditions and need to be addressed in the shop's food safety management arrangements and HACCP plan.

Licences are granted by District Councils, and the Butchers Regulations give the appropriate District Council the discretionary power to suspend or revoke a licence of premises that do not satisfy the licensing conditions.

In NI District Councils, via Environmental Health Officers (EHOs), have responsibility at the point where food enters a distribution network and retain control until sale to the final consumer. EHOs regularly inspect food premises with the frequency of inspection based upon assessment of the risk the business poses i.e. whether the business trades with a small or large customer base; whether that customer base is local, regional or national; if customers are likely to be within the susceptible groups for *E. coli* O157; and whether the foods handled are of a type more or less likely to present a risk to food safety.

⁷⁰ Food Safety (General Food hygiene) (Amended) Regulations (NI) 2001 Statutory Rules of Northern Ireland 2001 No 85. London: HMSO.

The role of the EHO includes ensuring that managers and staff understand the possible hazards that the foods they handle could create for consumers, and facilitating the knowledge and capacity to control those risks to an acceptable level. Where inspecting officers identify food safety risks, they operate a hierarchy of measures from provision of advice to formal letters, legal notices requiring action, and instigation of legal proceedings. Where significant risks are posed to the public by the condition or operation of a business, it may be closed immediately.

In addition to a programme of inspections, EHOs will undertake sampling of foods along the food chain to determine their microbiological fitness. Sampling programmes are co-ordinated across NI by the Northern Ireland Food Liaison Group and frequently link with regional or national sampling surveys. Unsatisfactory results are followed up and may result in a review of food handling practices or could even result in product recall and formal action being taken against a business.

There is a legislative requirement that new businesses register with District Councils four weeks prior to opening. This allows environmental health staff to advise and assist the new business to ensure that standards are met when once opened. There is also a general requirement for all food businesses to ensure that food handlers are supervised, instructed and/or trained so as to enable the safe preparation and handling of food.

(ii) Republic of Ireland

In ROI, under the Food Safety Authority of Ireland Act 1998, as amended, the FSAI is the responsible agency charged with protecting consumers' health and interests by ensuring that food produced, distributed or marketed in ROI meets the highest standards of food safety and hygiene; to ensure that food complies with legal requirements or where appropriate, with recognised standards. The Health Service Executive (HSE) employs EHOs and carries out official food

control activities through service contracts with the FSAI. EHOs are responsible for implementing national and EU laws on food safety and hygiene. The role of the EHO in ROI is similar to that of his/her counterpart in NI.

All food business proprietors (including butchers' premises) must comply with the Hygiene of Foodstuffs Regulations 2000 (S.I. No. 165 of 2000), which set out the statutory requirements in relation to food hygiene and premises, and is enforced by EHOs. The main provisions of the Regulations are set out in Appendix E.

The FSAI has also developed a guide for all food businesses, to include butcher shops, to assist in the development and implementation of HACCP. There are also national standards: IS 341:1998 which outlines hygiene requirements in the retail sector and identifies typical food safety hazards; and standard IS 343:2000 that outlines a food safety management system based on the principles of HACCP. With the introduction of the Food Hygiene Package in 2006, however, IS 343:2000 will be replaced by ISO 22000, more specifically ISO 22001 entitled "Food Safety Management Systems – Requirements for Organisations Throughout the Food Chain" in order to address the consolidation of food legislation.

The provisions of the Food Hygiene Regulations (1950-1989) also apply. These Regulations address the issues of structural hygiene and general cleanliness of the equipment and the premises. In addition, these Regulations set out the categories of food businesses that must be registered with each HSE area. This legislation is currently under review.

Further to registration, inspections will be carried out using a risk based approach which will determine the nature, frequency and type of inspection, with due regard being given to the nature of the risk presented by the business (as

categorised by FSAI Code of Practice No. 1⁷¹), the history of compliance with food safety legislation and the outcomes of previous inspections.

All catering businesses must also comply with the Hygiene of Foodstuffs Regulations 2000 and EHOs currently assess these businesses for compliance with the legislation. In addition, the FSAI have produced a guide for catering businesses to assist in the development and implementation of their own HACCP food safety management system. Standard IS 340:1994, Hygiene in the Catering Sector, also defines the stages in a catering operation and how to prevent known food risks from happening.

Furthermore, the pivotal role played by the food handler in reducing foodborne illness has been recognised and a number of recommendations relating to hygiene, reporting, fitness to work, health surveillance, work exclusion/restriction, specific pathogens and prevention of infection with foodborne pathogens at work have been proposed⁷².

3.1.3.6 *The Home*

The presence of pathogenic bacteria on the exterior of packaged chicken is a potential source of cross-contamination from packaging to hands to other fresh produce during shopping, during transit between supermarket and home, and during food preparation and storage. Three studies have isolated *Salmonella* spp. from the exterior of 0.2%⁷³, 6%⁷⁴ and 0%⁷⁵ packs of chicken. When the packaging was removed and tested in its entirety, *Salmonella* was isolated from 19% and 15% of packs. *Campylobacter* spp. were isolated from the exterior of

⁷¹ Code of Practice on the Risk Categorisation of Food Businesses to Determine Priority for Inspection. Code of Practice No.1 2000. Food Safety Authority of Ireland.

⁷² National Disease Surveillance Centre (2004) Preventing Foodborne Disease: A Focus on the Infected Food Handler.

⁷³ Burgess, F., Little, C.L., Allen, G., Williamson, K. and Mitchell, R.T. (2005) Prevalence of *Campylobacter*, *Salmonella* and *Escherichia coli* on the external packaging of raw meat. J. Food Prot. 68(3):469-475.

⁷⁴ Jorgensen, F., Bailey, R., Williams, S., Henderson, P., Wareing, D.R.A., Bolton, F.J., Frost, J.A., Ward, L. and Humphrey, T.J. (2002) Prevalence and numbers of *Salmonella* and *Campylobacter* spp. on raw, whole chickens in relation to sampling methods. Int. J. Food Microbiol. 76:151-164.

⁷⁵ Harrison, W.A., Griffith, C.J., Tennant, D. and Peters, A.C. (2001) Incidence of *Campylobacter* and *Salmonella* isolated from retail chicken and associated packaging in south Wales. Lett. Appl. Microbiol. 33:450-454.

3%⁷³, 6%⁷⁴ and 4%⁷⁵ packs of chicken and from 56% and 44% of the entire packs.

A recent study of consumer food safety knowledge, microbiology and refrigeration temperatures in domestic kitchens on IOI⁷⁶ has shown that consumer knowledge on the risks associated with domestic storage and preparation of chicken and the simple steps to reduce such risks is incomplete. Of the 1020 householders who participated in the study, 93% had heard of the pathogen *Salmonella* and 23% of those associated the pathogen with poultry as a source. In relation to *Campylobacter*, however, only 10% of those interviewed had heard of the pathogen and 20% of these associated *Campylobacter* with poultry as a source.

A UK study in 2004,⁷⁷ found in a domestic kitchen, that 29% of food preparation sessions resulted in positive *Campylobacter* isolations from prepared salads, cleaning materials and food-contact surfaces. Typing results showed that specific *Campylobacter* strains isolated from prepared chicken salads were the same as those isolated from raw chicken pieces, indicating microbial transfer during food preparation.

A study published earlier this year by the FSA⁷⁸, demonstrated that overall, consumers handled food with a considerable number and variety of food handling errors. All participants failed to wash/dry hands immediately and adequately after handling raw chicken during food preparation and half used the same unwashed/inadequately washed and dried knives or chopping boards following preparation of raw chicken for the preparation of salads and vegetables. Eighty percent of the chicken portions used in the initial handling study were contaminated with *Campylobacter* and 6% with *Salmonella*. Overall,

⁷⁶ A Study of Consumer Food Safety Knowledge, Microbiology and Refrigeration Temperatures in Domestic Kitchens on the island of Ireland. **safefood** (in press)

⁷⁷ Redmond, E.C., Griffith, C.J., Slader, J., Humphrey, T.J. (2004) Microbiological and observational analysis of cross contamination risks during domestic food preparation. *British Food Journal*, vol. 106, no. 8, pp. 581-597.

⁷⁸ FSA (2005), *The Evaluation and Application of Information on Consumer Hazards and Risk to Food Safety Education (BO2010)*, Food Standards Agency, London.

Campylobacter isolations were made from 33% food preparation sessions from swabbed surfaces or end food products. *Campylobacter* was isolated from dishcloths, hand-towels, finished dishes and work surfaces.

Focus groups conducted by **safefood** for this review have highlighted the common practice of washing raw poultry in kitchen sinks. Washing of such raw poultry in the domestic kitchen serves to spread any microbial contamination through the kitchen environment by creating aerosols.

These studies demonstrate that the basic food safety messages that revolve around home practices such as storage, handling and cooking, are critical to eliminating the possibility of cross-contamination from raw to ready-to-eat foods. This is particularly important with *Salmonella* since the pathogen will readily multiply in many ready-to-eat foods should they not be adequately refrigerated. Therefore consumer actions may amplify the risk associated with a particular food product through improper handling.

3.1.4 Other Microbiological Risks

3.1.4.1 *Staphylococcus aureus*

Staphylococci are ubiquitous in nature, with humans and warm-blooded animals as the primary sources. *Staphylococcus aureus* can be found on hands and around the nose areas of healthy humans. During food preparation food handlers can easily transfer the organism on to food. Essentially all raw foods, especially raw meats and poultry, can be contaminated with staphylococci, either by humans or animals, or both. *S. aureus* produces heat-stable toxins in foods where the conditions are suitable.

The presence of *S. aureus* on chicken is generally indicative of poor hygiene and poor food handling practices. Contamination does not derive from infected flocks. Surveillance by the FSAI in 2001 found unsatisfactory (100 - 10^4 cfu/g,

according to the Irish Microbiology Guidelines) or potentially hazardous ($\geq 10^4$ cfu/g) levels of *S. aureus* in 12/432 (2.78%) samples of cooked chicken pieces (diced/shredded/sliced) taken from retail outlets⁷⁹.

3.1.4.2 *Listeria monocytogenes*

Listeria monocytogenes is widespread in the environment and is most commonly found in soil. Eating foods containing high levels of *Listeria monocytogenes* can cause listeriosis resulting in serious illness in at risk groups, including, pregnant women, infants, the elderly and the immunocompromised. *Listeria* is not highly pathogenic in otherwise healthy adults.

Foods can become contaminated with *Listeria* at any stage in the food chain, from the farm, through processing and distribution, to the consumer's kitchen, especially in moist environments. *L. monocytogenes* can be found in a wide range of foods including milk, soft cheese, raw and pre-cooked chickens and meats, pâté, fermented sausage, vegetables, smoked and lightly processed fish products and seafood.

The importance of *Listeria* spp. (and *L. monocytogenes* in particular) as a foodborne pathogen stems from its ability to grow at low temperatures (down to 0°C), and soft cheeses and meat-based pâté have been implicated in outbreaks in the past. *Listeria* can also survive freezing and drying, but is inactivated by pasteurisation.

Listeria spp. have been shown to be present within the poultry processing environment and hence the opportunity for cross-contamination of raw and cooked chicken products during processing exists⁸⁰. Two studies of retail chicken products in NI confirmed the presence of *L. monocytogenes* in 18% of fresh chickens tested,⁸¹ and in 11% of ready-to-eat chicken products⁸².

⁷⁹ Food Safety Authority of Ireland (2001) 2nd Quarter National Survey 2001: Refrigerated cooked chicken pieces. www.fsai.ie/surveillance/food/2ndQuarter.pdf

⁸⁰ Lawrence, L.M. and Gilmour, A. (1995) Incidence of *Listeria* spp. and *Listeria monocytogenes* in a poultry processing environment and in poultry products and their rapid confirmation by multiplex PCR. *Appl. Environ. Microbiol.* 60(12): 4600-4604.

⁸¹ Soutos, N, Koidis, P. and Madden, R.H. (2003) Presence of *Listeria* and *Salmonella* spp. in retail chicken in Northern Ireland. *Lett. Appl. Microbiol.* 37: 421-423.

3.1.5 Antimicrobial Resistance and Cross-resistance

Antibiotics are at the cornerstone of the practice of human medicine, but this great achievement is under threat by the emergence and development of antimicrobial resistance. Many potentially life-threatening infections (both hospital and community) are caused by pathogens that are now resistant to commonly used anti-microbials (so called first line treatments) and, in some cases, to agents held in reserve for severe infections.

There is evidence of some antimicrobial resistance in *Salmonella* and *Campylobacter* isolates in the food supply in IOI and other developed countries. There are particular concerns in terms of emerging resistance to those antimicrobials, such as fluorinolones and cephalosporins, because they are critically important in the treatment of a number of serious and life threatening systemic bacterial infections in humans.

Resistance to sulfonamide and trimethoprim was found to be reasonably common in *S. Bredeney* isolates from food/animals in ROI and NI in a recent study⁸³. One poultry strain from NI was shown to be multi-resistant to ampicillin, streptomycin, sulfonamide, tetracycline and trimethoprim. However, as *S. Bredeney* accounts for a small proportion of human cases of salmonellosis on IOI, antimicrobial resistance observed is considered of little public health consequence to date.

The 2003 National Disease Surveillance Centre (NDSC) Annual Report expresses concern at the trend over the past number of years of high levels of multi-resistance among *S. Typhimurium* DT104 human isolates⁸⁴ from ROI.

⁸² Wilson, I.G. (1995) Occurrence of *Listeria* species in ready to eat foods. *Epidemiol. Infect.* 115: 519-526.

⁸³ Cormican, M., DeLappe, N., O'Hare, C., Doran, G., Morris, D., Corbett-Feeney, G., Fanning, S., Daly, M., Fitzgerald, M. and Moore, J. (2002) *Salmonella enterica* serotype Bredeney: antimicrobial susceptibility and molecular diversity of isolates from Ireland and Northern Ireland. *Applied and Environmental Microbiology* 68, 181-186.

⁸⁴ National Disease Surveillance Centre Annual Report 2003. Available at [http://www.ndsc.ie/Annual Report](http://www.ndsc.ie/AnnualReport)

The Scientific Panel on Biological Hazards of EFSA has issued an opinion on the use of antimicrobials for the control of one pathogen (*Salmonella*) in poultry⁸⁵. It concludes that from a food safety/public health viewpoint, using antimicrobials to control *Salmonella* spp. in poultry has little justification. Any use in exceptional circumstances on animal health grounds must recognise the consequences for public health.

There have been recent reports of increasing ciprofloxacin and erythromycin resistance in *Campylobacter* isolates from poultry on IOI^{86,87}. A recent study provides evidence suggesting that chickens raised without antibiotics are less likely to carry antibiotic-resistant strains of *Campylobacter*, and also that antibiotic-resistant *Campylobacter* can persist in poultry populations and products long after producers stop using the drugs⁸⁸.

In recent years there has been some concern about microorganisms found on chicken (particularly *Enterococcus* spp.) developing resistance to certain antimicrobials used for growth promotion in poultry, namely avoparcin (glycopeptides) and virginiamycin (streptogramins). Antibiotics from the same classes of drugs, namely vancomycin (glycopeptides) and Quinupristin-Dalfopristin (streptogramins), are now used as last resort antibiotics in human medicine for the treatment of multi-resistant nosocomial infections. An association between prior use of avoparcin as a growth promoter on the farm and detection of vancomycin-resistant enterococci in animals raised on the same farm was first documented in 1997⁸⁹. The EU subsequently banned all antimicrobial growth promoters belonging to classes also used in human

⁸⁵ Opinion of the Scientific Panel on Biological Hazards on the request from the Commission related to the use of antimicrobials for the control of salmonella in poultry. Question No. EFSA – Q – 2004-079 available at <http://www.efsa.eu.int>.

⁸⁶ Lucey, B., Cryan, B., O'Halloran F., Wall, P.G., Buckley, T. and Fanning, S. (2002) Trends in antimicrobial susceptibility among *Campylobacter* species in Ireland and the emergence of resistance to ciprofloxacin. *Vet Record* 151, 317-320.

⁸⁷ Rao, D., Rao, J.R., Crothers, E., McMullan, R., McDowell, D., McMahon, A., Rooney, P.J., Millar, B.C. and Moore, J.E. (2005) Increased erythromycin resistance in clinical *Campylobacter* in Northern Ireland – an update. *Journal of Antimicrobial Chemotherapy* 55, 395-396.

⁸⁸ Price, L.B., Johnson, E., Vailes, R. and Silbergeld, E. (2005) Fluoroquinolone-resistant *Campylobacter* isolates from conventional and antibiotic-free chicken products. *Environmental Health Perspectives* 113, 557-560

⁸⁹ Bager F, Madsen M, Christensen J and Aarestrup FM. (1997) Avoparcin used as a growth promoter is associated with the occurrence of vancomycin-resistant *Enterococcus faecium* on Danish poultry and pig farms. *Prev Vet Med* 31:95-112.

medicine. This has resulted in significant reductions in occurrence of resistant bacteria in food animals, but not the complete disappearance of the strains⁷⁶. Transmission of resistant bacteria from food-animals to humans results in more healthy individuals becoming carriers of resistant bacteria.

Poultry are highly susceptible to the disease, coccidiosis, caused by protozoan parasites called 'coccidia'. Treatment involves veterinary drugs, coccidiostats, which are routinely used in intensively reared poultry (see Section 3.2.2.2). It is recognised that the causative *Eimeria* species are, for the most part, partially resistant to the coccidiostats commonly used in the industry. However, the FEEDAP panel (Panel on Additives and Products or Substances Used in Animal Feed) of EFSA has concluded that, under conditions of normal usage, the efficacy of these drugs has not been jeopardized by the development of resistance.

The consequences of developing resistance can be successfully counteracted in practice by rotation (the alternation of coccidiostats between production batches), or by shuttle programmes in which one coccidiostat follows or precedes the other after 2 – 3 weeks. Resistance to coccidiostats has been recorded in other gut flora microorganisms including enterococci isolated from poultry⁹⁰. There is currently no evidence of cross-resistance to other anti-microbial drugs of importance in human (and veterinary) medicine for a number of bacterial and coccidial species.

3.1.6 Antimicrobial Treatment (Decontamination) of Poultry Meat

Current production and processing techniques remain unable to provide poultrymeat that is free from pathogens. A number of possibilities exist to facilitate the decontamination of poultry. Such potential approaches may provide an additional level of protection for the consumer from exposure to pathogens. It is important that the measures used to reduce pathogenic

⁹⁰ Butaye P, Devriese LA and Haesebrouck F. (2000) Incomplete cross resistance against ionophores in *Enterococcus faecium* and *Enterococcus faecalis* strains from pigs and poultry. *Microb Drug Resist* 6:59-61.

organisms, particularly *Campylobacter* spp., do not replace preventative measures taken at earlier stages in the food chain.

Methods to effect the post-slaughter decontamination during poultry processing may be a worthwhile intervention in the reduction of pathogenic microorganisms. This may be particularly relevant where current hygienic processing protocols are unable to sufficiently control the hazard when present in the birds at slaughter e.g. with *Campylobacter* spp. Furthermore, the use of such strategies may have a potential food safety benefit if used in special circumstances in addition to existing controls, e.g. with known positive *Campylobacter* spp. or *Salmonella* spp. flocks if no other control measure is available or has been successful. It is important that these potential benefits are balanced with consumer concerns and informed by risk assessments to determine the toxicity of reaction products.

Gamma irradiation is an effective way of reducing the microbial loadings on a range of food products including poultry meat. Both *Salmonella* spp. and *Campylobacter* spp. may be inactivated by application of low doses (2.5kGy) of gamma radiation, a practice which is employed in the USA. In view of consumer resistance to this technology, it is uncertain how acceptable such an approach would be to consumers on IOI.

Surface pasteurization treatments to reduce contamination levels are utilised in red meat species in the USA and ROI to lower microbial numbers on carcass surfaces. Exposure to hot water or steam effects a surface decontamination of the product in question. However, there is potential damage to the outer epidermal skin making this treatment unsuitable for products, such as chicken, to be sold with the skin retained. Unacceptable damage/discolouration of poultry skin as a consequence of hot water immersion and steam pasteurisation was reported in a recent study⁹¹.

⁹¹ Whyte, P., Collins, J.D. and McGill, K. (2003) Assessment of commercial steam pasteurisation and hot water immersion treatments for control of surface microbial contaminants on broiler carcasses. *Food Microbiol.* 20: 111-117.

Another interesting development is the possibility that carcass surfaces could be frozen in a transient manner such that underlying tissues are not affected and the quality is not impaired. This strategy has the potential to reduce surface contamination with *Campylobacter* in a commercially acceptable fashion. The value of this approach in the future remains to be seen⁹².

Chemical treatments represent a further approach. Discussions among MS are currently considering a draft Commission Regulation (SANCO/2111/2004 Rev. 1) with regard to specific conditions for the antimicrobial treatment of food of animal origin as a result of Regulation (EC) 853/2004 Article 3(2). The draft Regulation states that, following a thorough assessment, specified antimicrobial agents can be used for decontaminating specified products of animal origin, including poultry carcasses. Such treatments are permitted in USA and international trade is a driver in such considerations. Currently there are three products specified for use only in poultry processing, namely chlorine dioxide, acidified sodium chloride and trisodium phosphate, with the provision for further products being added at a later stage, following EFSA opinion. The antimicrobial substance must be rinsed off the food (with potable water) to such an extent that it will not have a technological function in the final product. Encouraging results have been reported for the application of trisodium phosphate for broiler carcass decontamination⁹³.

This review recognises that the antimicrobial treatment of foods of animal origin should only be part of an effective HACCP system and should not be used as the primary or only pathogen control measure. Additionally, the food business operator should inform the consumer, through labelling, when the food has been treated with a particular antimicrobial substance. However, under the current proposal such labelling is not required where the treated poultry carcass or

⁹² Stern NJ, Rothenberg PJ and Stone JM. (1985) Enumeration and reduction of *Campylobacter jejuni* in poultry and red meats. *J Food Prot* 48: 606-610

⁹³ Whyte, P., Collins, J.D., McGill, K., Monahan, C. and O'Mahony, H. (2001) Quantitative investigation of the effect of chemical decontamination procedures on the microbiological status of broiler carcasses during processing. *J. Food Prot.* 64(2): 179-183.

pieces have had the skin removed after treatment, or have been subsequently processed into meat products or meat preparations.

3.1.7 Learning from Best Practice Models in Other Countries

3.1.7.1 *Campylobacter* Control in Icelandic Poultry Industry

Iceland is an island nation (population 281,154 in 2000), which is self-sufficient in broiler production (2,500,000 broilers/year) and consumption. A recent study described the observed relationship of *Campylobacter* in poultry operations to human cases in Iceland⁹⁴, and highlighted the measures which contributed to a significant reduction in poultry contamination levels (62% of chicken carcasses contaminated with *Campylobacter* in 1999, 15% of flocks infected in 2000) and in *Campylobacter* cases in humans (116/100,000 in 1999 to 33/100,000 in 2000), and, in a short space of time in this closed environment.

Comprehensive sampling of carcass rinses, poultry production samples (grandparent breeders, sexually immature breeders and parent breeders), caecal specimens, faecal droppings and crate swabs was carried out to identify sources of infection and factors involved in transmission of *Campylobacter* infection within poultry operations in Iceland. Grandparent breeder stock in Sweden, which served to populate the commercial Iceland parent broiler breeder stock, was found to have a high prevalence of *Campylobacter* infection (82%). Breeder flocks were variably colonised (0-72%) with *Campylobacter*, and 10% of transport crates were contaminated with *Campylobacter*.

In 2000, the Chief Veterinary Office in Iceland introduced an Official Sampling Programme, testing for the presence of *Campylobacter*. Flocks identified as *Campylobacter*-colonised at 4 weeks of age, were processed at the end of the week (on Fridays), to minimize cross-contamination to flocks presumed not colonised. Carcasses from these birds were then frozen and marketed.

⁹⁴ Stern NJ, Hiatt KL, Alfredsson GA, Kristinsson KG, Reiersen J, Hardardottir H, Briem H, Gunnarsson E, Georgsson F, Lowman R, Berndtson E, Lammerding AM, Paoli GM and Musgrove MT (2003) *Campylobacter* spp. in Icelandic poultry operations and human disease. *Epidemiology and Infection* 130: 23-32.

(Freezing causes a 10-100-fold reduction in levels of *Campylobacter* spp. compared to carcasses that are chilled⁹⁵). Additionally, the subsequent two flocks raised in the same broiler house had to be frozen after processing. The substantially lower prices paid to producers for frozen poultry acted as an economic impetus for them to place more emphasis on broiler house clean-out, disinfection, and application of other strict biosecurity measures.

These changes in poultry industry practices coincided with reductions in human disease in Iceland. However, it was not possible to discern which, if any, of the above interventions played a direct role in reducing the human case burden during the period. Stern et al.⁸¹ acknowledged that other interventions (e.g. changes in consumption and consumer handling practices) or natural phenomena (e.g. changes in the environmental sources of *Campylobacter* in the period 1999-2000) could also explain the dramatic decrease in the human health burden observed.

3.1.7.2 *Salmonella* Control in the Swedish Poultry Industry

Sweden initiated a *Salmonella* control programme in its poultry industry in 1970⁹⁶. From 1970-1984 the programme was voluntary and the Swedish government met full compensation costs for compulsory slaughter of infected flocks. Since 1984 the programme has consisted of voluntary (control of parent stock, hatcheries and layers) and compulsory (control and quarantine of grandparent stock, pre-slaughter control of broilers) parts⁹⁷. The compulsory component of the programme has achieved the most significant improvement in numbers of infected flocks. At the start of the programme (1970) 2-3% of flocks

⁹⁵ Stern NJ, Rothenberg PJ and Stone JM. (1985) Enumeration and reduction of *Campylobacter jejuni* in poultry and red meats. J Food Prot 48: 606-610.

⁹⁶ Mulder RWAW (1999) Pathogen Control Programmes in Poultry Production, pp. 13-19. In Safety of poultrymeat: from farm to table, RA Molins and J Corry (eds). International Atomic Energy Agency, Vienna, Austria.

⁹⁷ Wierup, M., Engstrom, B., Engvall, A., and Wahlstrom, H. (1995) Control of *Salmonella enteritidis* in Sweden. Int. J. Food Microbiol. 25: 219-226.

in Sweden were *Salmonella* positive, in 1997 just 2 (0.05%) Swedish flocks were *Salmonella* positive.

3.1.7.3 *Salmonella* Control in the Danish Poultry Industry

In Denmark a similar programme aimed at the control of *Salmonella* in poultry has resulted in fewer cases in humans⁹⁸. This programme was launched in 1996 and consisted of compulsory slaughter of infected poultry flocks. The percentage of broiler flocks positive for *Salmonella* before slaughter declined from 12.9% in 1997 to 1.5% in 2002. There was a striking 59% decline in human *Salmonella* cases from 5015 in 1997 to 2071 in 2002 and 1712 cases in 2003. As the majority (almost 75%) of chicken consumed in Denmark is home produced, it can be concluded that the decrease in human infection is a direct result of the control programme in chicken farming.

⁹⁸ The National Salmonella Programme for the Production of Table Eggs and Broilers, 1996-2002. <http://www.foedavedirektoratet.dk/FDir/Publications/2004006/Rapport.pdf>

3.2 Toxicological Issues

The incidences of chemical contamination of chicken meat are largely confined to the primary production level. Contamination can result from deliberately added chemicals, such as pharmaceuticals and food additives, and also from environmental contaminants such as mycotoxins and dioxins.

3.2.1 Broiler Feed Formulation

The feed used in the broiler industry on IOI, for conventionally-grown, free-range and organically-grown chicken, is primarily based on GM-free European wheat (see Appendix F for breakdown of the composition).

Approximately 90% of the broiler feed manufactured on IOI contains added enzymes, specifically a phytase which liberates phosphorous from plant material thereby preventing its accumulation in the litter, and a combination of three enzymes (Endo-1,3(4)-betaglucanase, Endo-1,4-beta-xylanase and Endo-1,4-betaglucanase), which serve as digestion aids.

Microorganisms, although sanctioned for use in broiler feed under EU legislation, are not used as a feed additive in the broiler industry on IOI.

Different feed formulations (starter, grower or finisher) require a different spectrum of coccidiostat drugs (discussed later in this Chapter). Withdrawal feed does not contain these or other drugs which are also absent from all feed (i.e. not just withdrawal feed) used in organic production.

There is no prohibition on the use of ingredients of GM origin in the formulation of broiler feed. In ROI, approximately 60% of broiler feed is formulated using certified non-GM ingredients and 40% do not specify this requirement. Soya and Soya products are the source of GM material. The requirement for certified GM-

free material is market driven. Currently, organic broiler feed must be constituted from at least 80% certified organic ingredients and difficulties arise especially with the Soya-based ingredients, although certified organically grown Soya is available.

3.2.1.1 Control Systems for Broiler Feed on IOI

Within the EU, Council Directive 95/53/EC requires the designated competent authority in each MS to check compliance with the provisions laid down in Community legislation, including legislation in Table 3.2. This includes provisions to assess control procedures in Third Countries and to resolve disputes between MS.

Table 3.2: Animal Feed Legislation

Legislation	Concerning
Directive 70/524/EEC, Regulation 1871/2003	Additives in feedingstuffs
Directive 1999/29/EC	Undesirable substances and products in animal nutrition
Directive 2002/32/EC	The presence of undesirable substances in feed
Directive 96/25/EC	The circulation of feed materials
Directive 79/373/EEC	The marketing of compound feedingstuffs
Directive 82/471/EEC	Certain products used in animal nutrition
Directive 93/74/EEC	Feedingstuffs intended for particular nutritional purposes such as nutritional supplements
Directive 2000/766/EC	Protection measures with regard to TSEs and the feeding of animal protein
Directive 96/23/EC	Monitoring certain substances and residues thereof in live animals and animal products
Directive 98/68/EC Directive 95/53/EC	Certain rules for checks at the introduction into the Community of feedingstuffs from third countries

MS are required to establish and implement a yearly inspection and sampling programme designed to assess compliance with feed legislation. A detailed report on the implementation of the programme is then forwarded to the Commission for discussion among MS. MS are also required to establish protocols and procedures for a contingency plan to minimise the effects of any non-compliance. Both feed operators and laboratory personnel are expected to be proactive in this regard. If a non-compliance with EU regulations is raised following an inspection, a warning is issued to the offending establishment. The

consignment of feed can be seized and detained and it is the responsibility of the operator to instigate measures for the recall of all non-compliant products. Licences, Approvals to Market, or Registrations, can be withdrawn and financial penalties levied following a successful court prosecution.

Both indigenously-produced and imported feedingstuffs (from within the EU and from Third Countries) are inspected. The latter at one of the 283 EU Border Inspection Posts (BIPs) currently operated by individual MS. Following these inspections, imported feedingstuffs can, in principle, circulate freely in the internal market once they are accompanied by documentary evidence indicating a positive outcome to the inspection (see Section 3.3.2 for further information on BIPs). The competent authority at the point of destination may instigate further checks.

Regulation (EC) No.178/2002 lays down detailed requirements for ensuring feed safety and traceability, and the responsibilities of feed business owners in this regard.

In ROI, the competent authority with regard to the enforcement of EU legislation on feedingstuffs is DAF, specifically the Feedingstuffs Inspectorate, which implements the inspection and sampling programme for each year. In NI, DARD are the enforcement authority in relation to all animal feeds and are the competent authority with regard to medicated and zootechnical feedingstuffs. The FSA, however, are the competent authority for all other animal feeds. Individual producers can instigate in-house analyses for contaminants in feed as a matter of due diligence, however, DAF/DARD are chiefly responsible for such analyses.

3.2.2 *Compounds Classified as Additives for Use in Animal Feedingstuffs*

Chemicals classified as feed additives are legislated for under Regulation (EC) No. 1831/2003, which allocates feed additives to one of five different categories:

- i. Technological additives which include any substance added to feed for a technological purpose,
- ii. Sensory additives which include any substance, the addition of which to feed improves or changes the organoleptic properties of the feed, or the visual characteristics of the food derived from animals,
- iii. Nutritional additives,
- iv. Zootechnical additives which include any additive used to affect favourably the performance of animals in good health or used to affect favourably the environment, and,
- v. Coccidiostats and histomonostats.

(See Appendix G for further information).

3.2.2.1 Legislation Concerning the Authorisation of Feed Additives and Bioproteins on IOI

Regulation (EC) No 1831/2003 concerning additives for use in animal nutrition supersedes Directive 70/524/EEC and establishes an EU-wide procedure for authorising the marketing and use of feed additives as well as defining rules for labelling. Similarly, Directive 82/471/EEC concerning certain products used in animal nutrition establishes this procedure for bioproteins.

The legislation on feed additives requires that Maximum Residue Levels (MRLs) are established where considered necessary for the protection of consumers. These limits, or MRLs, are primarily based on the Acceptable Daily Intake (ADI) value which is derived from the intrinsic toxicological properties of a chemical. Derogation exists where an MRL has already been established for the use of the substance as a veterinary medicinal product (VMP).

3.2.2.2 *Coccidiosis*

Coccidiosis is the disease state induced by a protozoan parasite, called *Coccidia*, that infects the intestinal gut wall of the host animal. Several species of *Coccidia* have been identified and most are species specific in terms of the host animal they infect. While there are species of *Coccidia* that can infect people such as *Toxoplasma* and *Cryptosporidium*, the *Eimeria* species found in chickens are not parasitic on humans.

Coccidial infection is quite common in the chicken industry where it represents a significant economic burden for the producer. At least seven *Coccidia* species are important and these are classified on the basis of the coccidiosis they induce which is either intestinal or caecal. The death rate in infected birds may be quite high. Unlike in other animals in which the infection manifests as a disease state in young, old or otherwise immuno-compromised individuals, in broiler chickens otherwise healthy adults may be affected. The cramped confines of modern broiler production units are probably a significant factor in the prevalence of the disease. The strains reared in these units are not sufficiently immunocompetent to meet the challenge presented by disease outbreaks. Immunity to one species of *Coccidia* will not confer immunity to other species as well.

Details of the mechanism of infection and diagnosis of coccidiosis can be accessed in **safefood** report on Coccidiostats⁵.

Treatment and Prevention

Treatment of coccidiosis in poultry is based on inhibiting coccidial reproduction, rather than eliminating the mature parasites. See Appendix H for the mechanism of action (classification) of each of the fifteen coccidiostats currently approved for use on IOI.

The presence of coccidiosis is not necessarily an indication of poor animal husbandry practices. In fact, practical animal husbandry procedures such as the avoidance of overcrowding, the provision of dry bedding, and good ventilation

can augment drug-based control strategies by reducing the potential for oocyst (immature *Coccidia*) build-up. Insect control within broiler houses is also important as these can act as mechanical vectors for *Coccidia*. However, in modern broiler production units, these procedures are probably insufficient in themselves. Vaccines against the most pathogenic species of *Coccidia* are used as an alternative to coccidiostatic treatments, especially on young birds. However, vaccination is, as yet, an expensive procedure. Its use will not give the indirect benefits associated with coccidiostat use, including improved performance and other therapeutic effects, such as a reduction in the incidence of clostridial infections which can cause necrotic enteritis (this has been further emphasised with the removal from the market of many feed additive antimicrobials such as flavomycin)⁹⁹.

Good animal nutrition is also an integral part of anti-*Coccidia* treatment regimes. Vitamin A or K deficiencies can aggravate the effects of infection as will other diseases that deplete the bird's resistance to coccidiosis^{100,101}.

Coccidiostatic Drugs used on IOI

Thirteen of the fifteen coccidiostat drugs currently used on IOI are listed as authorised additives for use in broiler chickens within the EU¹⁰². With the exception of Decoquinate, which requires a prescription for use as a feed additive, these coccidiostats do not require a veterinary prescription for use. A further two antiprotozoal drugs, Toltrazuril and Sulfadimidine sodium, are prescription-only medications and are sanctioned for use under EU Directive 2004/28/EC. These are used for supplemental control with in-feed coccidiostats as well as a primary anticoccidial with nonmedicated feed.

⁹⁹ Brennan J, Skinner J, Barnum DA and Wilson J., The efficacy of bacitracin methylene disalicylate when fed in combination with narasin in the management of necrotic enteritis in broiler chickens, *Poult. Sci.* 2003 March 82(3):360-3.

¹⁰⁰ Dalloul RA, Lillehoj HS, Shellem TA and Doerr JA., Effect of vitamin A deficiency on host intestinal immune response to *Eimeria acervulina* in broiler chickens, *Poult. Sci.*, 2002 Oct; 81(10):1509-15.

¹⁰¹ Ryley JF and Hardman L., The use of vitamin K deficient diets in the screening and evaluation of anticoccidial drugs, *Parasitology*, 1978 Feb; 76(1):11-20.

¹⁰² Council Directive 70/524/EEC Annex B, chapters 1 – 3

In a survey of broiler producing companies on IOI in 2001, between five and ten of the approved fifteen drugs were commonly used as part of treatment programmes against coccidiosis¹⁰³.

In practical terms, a starter diet containing Nicarbazin is administered for the first two weeks of life as susceptibility to coccidiosis is greatest in chicks. This is followed by treatment with ionophore-containing grower and finisher diets from two to four weeks. Narasin, which has both coccidiostat and anti-gram-positive effects, is the main treatment drug but other ionophore/antimicrobial drug combinations are also used. Non-medicated withdrawal feed is administered to broilers from four weeks until slaughter at five to seven weeks. Summer and winter treatments are varied to prevent the development of resistance by the parasite. Outbreaks of clinical coccidiosis are treated generally with Toltrazuril by inclusion in the drinking water.

Toxicological Evaluation of Coccidiostat Drugs Used on IOI

The toxicological profile of most of the fifteen coccidiostat and antiprotozoal drugs is not adequately completed (Appendix H). Of the eight drug data packages evaluated by the FEEDAP Panel of EFSA, four were of a sufficient standard to permit the derivation of an ADI, and six MRLs were established.

There is no evidence of a genotoxic or carcinogenic potential, or for reproductive or developmental effects, for those coccidiostats/ antiprotozoals for which adequate data is available. However, there is some suggestion of fetotoxicity in rats administered Decoquinat. For all drugs withdrawal times have been recommended.

As of 1st January 2006, Avilamycin and Flavophospholipol will be withdrawn from the EU market, along with all Salinomycin and Monensin-based formulations classified as growth promoters (those formulations classified as coccidiostats are not scheduled to be withdrawn).

Advocated Changes in Husbandry Practices

¹⁰³ O' Keeffe M, Report from the safefood-funded research project, 'Poultry meat: improving food safety by improving chemical residue surveillance', Food Safety Promotion Boardm, Cork, 2002

The critical points for contamination by *Coccidia* are during feed manufacture, bin handling on the farm, the feed delivery systems, and drug recycling. The use of a 'buffering' system in the manufacture of feed in which medicated and non-medicated feed production are separated by a less medicated feed such as turkey grower feed, has been advocated as a cross-contamination alleviation measure.

The use of single bins for medicated finisher and withdrawal feed was implicated in the cross-contamination of non-medicated with medicated feed. The adoption of a twin-bin system was advocated as a precautionary measure.

On IOI, broiler companies accounting for approximately 75% of broiler production use the double-bin feed segregation system on 70 – 100% of their farms. Just two companies, representing approximately 7% of total broiler production use the single-bin system on more than 90% of their farms.

Nicarbazin has been detected in liver samples from three consecutive thinnings, despite a withdrawal period of 6 days in each case⁵. A number of practical changes have been muted to address this. At farm level, the risk of contamination of poultry tissue may be reduced by employing an "all-in/ all-out" production system. Other methods, which may reduce the level of Nicarbazin residues, include flushing feed lines with non-medicated feed to 'mop-up' any medicated feed. However, problems may arise due to incomplete flushing of the lines and the lack of homogeneity after incorporation of the flushings into similarly medicated feed. Other measures include the specification of feeding amounts for 1000 birds per day, emptying, washing and fumigation of bins between feed types, recording of feed usage, and specifying when withdrawal feed should be used.

It was noted that the feeding lines and feeders in broiler houses were not cleared prior to the introduction of Nicarbazin-free feed. Liver residues were correlated with the Nicarbazin level in the broiler house feeding pans. Therefore, allowing the birds to pick the feeders clean and scavenge in the litter prior to the introduction of the Nicarbazin-free feed may further reduce the risk of

contamination. Preliminary studies suggest the success of this approach with liver samples registering Nicarbazin levels below the Joint FAO/WHO Expert Committee on Food Additives (JECFA) MRL after finisher feed and withdrawal feed. However, this will involve 'training' the birds from a young age to get used to periods of 'starvation' thereby ensuring the consumption of all residual feed from feeding pans and litter prior to the introduction of finisher or withdrawal feed.

Feed is analysed on a regular or occasional basis for anti-coccidials in four companies on IOI representing approximately 6% of total production, while two companies representing more than 10% of total production do so when concerns over flock performance arise. Another five companies, representing less than 30% of total production, do not analyse their feed for anti-coccidials⁵. Only positive samples need to be reported to the competent regulatory authority.

3.2.3 Compounds Classified as Contaminants in Animal Feedingstuffs

3.2.3.1 Legislation Concerning the Analysis of Animal Feedingstuffs and Feed Additives for Contaminants

The aim of EU legislation on undesirable substances in animal nutrition is to ensure that feed materials, feed additives and feedingstuffs are put into circulation only if they are sound, genuine and of merchantable quality and, when correctly used, do not represent any danger to human health, animal health or the environment, or do not adversely affect livestock production. EU legislation on undesirable substances in animal feed was consolidated by Council Directive 1999/29/EC and subsequently replaced by Directive 2002/32/EC, which introduced several major amendments. This Directive, and its subsequent amendments, includes maximum limits for heavy metals such as arsenic, lead, mercury and cadmium as well as for dioxin, aflatoxins B1, certain pesticides, and botanical impurities in certain feed materials, feed additives and feedingstuffs.

3.2.3.2 *Mycotoxins*

Mycotoxin contamination of cereals used in feedingstuffs arises from mould growth that can occur during crop production or storage. As a group, mycotoxins can elicit a range of toxic effects in humans and animals including effects on the liver, kidneys and other organs and immunosuppression. Mycotoxins are highly potent with adverse effects being observed after exposure to trace levels. Certain mycotoxins, such as the aflatoxins group, are known human carcinogens and some, such as Ochratoxin A, have been shown to elicit neoplasia via a genotoxic mechanism. For these substances there is no exposure threshold below which harmful effects will not occur and consequently no tolerable daily intake can be established.

Current scientific technical knowledge and improvements in production and storage techniques, have not led to any major developments in the prevention of these moulds and consequently, the presence of these mycotoxins cannot be entirely eliminated from the food chain. It is, therefore, advisable to set maximum permissible limits as low as reasonably achievable (ALARA) for precautionary consumer protection.

The recognition that mycotoxins can cause major illness in humans and animals, as well as significant economic losses for the poultry industry, has led to limits being set for aflatoxins and some other mycotoxins in different countries around the world, often however on an *ad hoc* basis. Within the EU, attempts are being made to harmonise limits established in the MS. However, new residue limits can result in increasing technical demands on producers which can lead to trading tensions. Current EU legislation on mycotoxins is tabulated in Table 3.3.

Table 3.3 Relevant EU Legislation on Mycotoxins

Legislation	Concerning
Commission Regulation (EC) No. 2174/2003	Established maximum levels of 2 µg/kg and 4 µg/kg for aflatoxin B1 and total aflatoxin levels, respectively, in raw cereals
Commission Regulations (EC) No. 123/2005 updating Commission Regulation (EC) No 466/2001	Established maximum levels of 5 µg/kg for Ochratoxin A, also in raw cereals
Commission Directive 2003/100/EC amending Directive 2002/32/EC	Established a maximum level of aflatoxins B1 in complete feedingstuffs for poultry of 20 µg/kg which reduces to 10 µg/kg for chicks.

Sampling and analytical methodologies for mycotoxins have been established in Commission Directives 98/53/EC (aflatoxins), as amended by 2002/27/EC, and 2002/26/EC (Ochratoxin A). Furthermore, there are national laws and regulations in the MS covering both foodstuffs not regulated by European law and other mycotoxins. EU regulations for deoxynivalenol and zearalenone levels in raw cereals have not been established.

3.2.3.3 Dioxins

The term dioxins generally relates to a group of theoretically 75 polychlorinated dibenzo-*p*-dioxins (PCDDs) and 135 polychlorinated dibenzofurans (PCDFs). Seventeen specific PCDD/F compounds are considered to have particular toxicological significance and these are generally the focus of analyses. Dioxins do not occur naturally in the environment but are generally, though not exclusively, by-products of industrial chemical processes. Their persistence in the environment underpins the likelihood that these compounds may enter the food chain. Dioxins are known to biomagnify and the clearance half-life in human tissue is approximately seven years. Certain dioxins, including 2,3,7,8-tetrachloro dibenzo-*p*-dioxin (TCDD), are classified as known human carcinogens.

The Scientific Committee for Food (SCF) of the EU has assessed the risks for public health arising from the presence of dioxins and dioxin-like polychlorinated biphenyls (PCBs) in food. This includes an assessment of the dietary intake of dioxins and dioxin-like PCBs by the EU population, and identifying the main contributors to dietary intake. Given the persistent nature of these compounds,

the SCF has established a tolerable weekly intake of 14 pg toxic equivalents per kg body weight for dioxins and dioxin-like PCBs. Relevant EU legislation governing dioxins is outlined in Table 3.4.

Table 3.4: Relevant EU Legislation on Dioxins

Legislation	Concerning
Directive 1999/29/EC	Undesirable substances and products in animal nutrition
Commission Directive 2003/57/EC amending Directive 2002/32/EC	Maximum levels of dioxin permissible in feedingstuffs and feed additives
Recommendation 2002/201/EC	Concerning the reduction of dioxins, furans and PCBs in feedingstuffs and foodstuffs
Directive 2002/70/EC	Establishing requirements for the determination of levels of dioxins and dioxin-like PCBs in feedingstuffs
Recommendation 2004/704/EC Recommendation 2004/705/EC	Monitoring of background levels of dioxins and dioxin-like PCBs in foodstuffs

A threshold level of 0.75 ng/kg dioxin has been established for compound feedingstuffs above which a MS, in cooperation with operators, is required to (a) initiate investigations to identify the source of contamination, (b) check for the presence of dioxin-like PCBs and (c) take measures to reduce or eliminate the source of contamination.

As part of the feedingstuffs inspection programme conducted by DAF in ROI, a variety of feed materials and additives are analysed for dioxin contamination. Poultry fed was not specifically targeted in this inspection programme.

3.2.3.4 Nitrofurans

Nitrofurans are a group of chemicals previously used as veterinary medicinal products. Nitrofurans have been banned for use in food-producing animals in the EU since 1995 due to toxicological concerns including an increased cancer risk in humans as a result of chronic exposure.

Nitrofurans, specifically furazolidone, was detected in chicken products in the UK in 2004. The contamination resulted from furazolidone deposition in the sediment of old water tanks on broiler farms. In the UK, the replacement of water tanks that were in use prior to 1998 has been recommended to eliminate the further possibility of contamination from furazolidone-contaminated sediments.

Nitrofurans contamination of poultry meat imports is still an issue. The development and adoption of more sensitive methods of analysis, capable of detecting low levels of nitrofurans metabolites, has facilitated the detection of nitrofurans residues in poultry meat from Thailand, Brazil and Portugal. In 2002, the EU Commission ruled that all Brazilian poultry meat imports into the EU should be tested prior to their release onto the internal market.

3.2.4 Compounds Classified as Veterinary Medicinal Products for Use in Animal Health

EU Directive 2004/28/EC of 31st March 2004 amending Directive 2001/82/EC on the Community code relating to Veterinary Medicinal Products (VMPs), defined the latter as:

- (a) any substance or combination of substances presented as having properties for treating or preventing disease in animals; or
- (b) any substance or combination of substances which may be used in, or administered to, animals with a view either to restoring, correcting or modifying physiological functions by exerting a pharmacological, immunological or metabolic action, or to making a medical diagnosis.

The Directive does not apply to medicated feedingstuffs as defined in Council Directive 90/167/EEC or any additives for use in feedingstuffs covered by Council Directive 70/524/EEC.

The European Agency for the Evaluation of Medicinal Products (EMA) coordinates the scientific evaluation of the safety, quality and efficacy of medicinal products for human and veterinary use for licensing throughout the EU. Within

the EMEA, the Committee for Proprietary Medicinal Products (CPMP) is responsible for opinions on the marketing of medicinal products. EC decisions agreed under this system are binding on MS and there is no scope for MS to take a final national decision on a product out of line with a majority Community opinion. The Irish Medicines Board is the designated competent authority for the licensing of VMPs in ROI and advises the Minister of Agriculture on their control. The Veterinary Medicines Directorate and DARD are responsible for the licensing of VMPs in NI. VMPs controlled under this legislation are not for sale to the general public and require a prescription for use by authorised personnel.

Current EU legislation requires the establishment of an MRL for all pharmacologically active substances in VMPs marketed in the EU for administration to food-producing animals. The conditions for establishing an MRL are set out in Council Regulation (EEC) No. 2377/90. Vaccines and coccidiostatic drugs are not covered by this regulation.

3.2.4.1 Veterinary Medicinal Products Authorised for Use in Broiler Chickens in ROI

As of 1st March 2005, a total of 23 products were approved for use within ROI as VMPs in broiler chickens (See Appendix I). Potential interactions with other medicines were not found for the vast majority of these products. However, certain antibiotics are contraindicated for use with Sulfadimidine Sodium, Flumisol and Paracillin. The normal route of administration is via drinking water although five products - Uniprim, Flubenol, Aurogran, Aurofac and Trimeiazine – are administered in feed and Aluspray is applied topically as a spray.

3.2.5 Surveillance Programmes

Both ROI and UK operate annual residue and contaminant monitoring programmes to ensure that consumer health is protected and that the principles of Good Agricultural Practice and Good Manufacturing Practice are applied. These form part of an EU-wide endeavour in which each MS is required to implement residue surveillance plans and to submit their programmes annually

to the European Commission for approval (Council Directive 96/23/EC). Third Countries wishing to export animal products to the EU are similarly required to satisfy the European Commission that their residue surveillance measures provide equivalent guarantees for EU consumers. The scope of such programmes is quite extensive and involves government, and public and private laboratories. MRLs for individual residues and contaminants in chicken meat have been established. The legislation also underpins the actions that are deemed necessary following any identified breaches of these limits, or 'non-compliances'.

Implementation of the plan involves taking samples from food producing species at both farm and primary processing levels. Samples are generally taken in accordance with criteria designed to target animals or products which are more likely to contain illegal residues or where the presence of illegal residues is suspected. In addition to residue testing at farm and primary processing levels, the respective Departments of Agriculture monitor the use of veterinary medicines on an ongoing basis mainly through inspections at various commercial premises involved in distribution.

The analytical data generated under these programmes is published annually. The data gives some indication of the contribution made to the total human body burden of xenobiotic chemicals resulting from the consumption of various food products. As part of the residue surveillance plan for 2003, in excess of 65,000 samples were tested in ROI. Sampling was conducted on eleven domestic food-producing species (including chicken) and from products imported from Third Countries, particularly those where the European Commission had taken a 'safeguard decision'. The residue groups fall into three broad categories: banned substances such as growth-promoting hormones and beta-antagonists, approved veterinary medicines (these usually arise where animals enter the food chain before expiry of the prescribed withdrawal period of the medicine concerned) and environment contaminants.

3.2.5.1 Surveillance Results for Coccidiostat Residues on IOI

In recent years, the residue levels of most coccidiostats in broiler meat were within acceptable upper limits. However, the notable exception has been Nicarbazin residue levels which have exceeded the JECFA MRL of 200µg/kg. Highest levels have been detected in chicken liver and muscle samples, especially in the UK, with certain samples registering Nicarbazin levels of up to 3400 µg/kg in the 2004 surveillance programme.

In ROI, 300 samples of broiler liver were tested for Nicarbazin under the residue monitoring programme for 2004 of which 17% were positive for this residue, with 8% exceeding the JECFA MRL. Results from in-house testing in the broiler industry confirm that 40% of samples tested over 2004 – 2005 were positive with 10% exceeding this MRL. It has been ascertained that two distinct groupings of Nicarbazin liver residue results are evident; one group, with residue levels ranging from 0 – 350 µg/kg, associated with good animal husbandry practices, and a second group, with residue levels of ≥ 1000 µg/kg, which are indicative of unsatisfactory on-farm husbandry practices.

3.2.5.2 Surveillance Results for Chemical and Drug Residues

During the 2003 residue surveillance programme in ROI, no residues of growth promoters covered by the EU hormone ban were found (see Appendix J). Testing for residues of antibiotic medicines continued at levels well in excess of those required by EU obligations. In the poultry sector, the results incorporate the outcome of an ongoing programme conducted in conjunction with the FSAI in the context of a strategy to address the antibiotic resistance problem. Under this programme, samples are tested for the presence of antimicrobials and for antibiotic resistant bacteria.

In the same year, as part of the feedingstuffs inspection programme conducted by DAF in ROI, a single sample of poultry feed was analysed for aflatoxin B1 which proved to be negative. The presence of deoxynivalenol, ochratoxin A and zearalenone in poultry feed was not determined. A variety of feed materials and additives are analysed for dioxin contamination. The results were unremarkable.

Poultry feed was not specifically targeted in these particular analyses (see Appendix J).

3.3 *Third Country Import Controls*

Live animals or animal products imported into the EU may only originate from a Third Country, or part of a Third Country, approved by the Community via routine audits conducted by the Food and Veterinary Office (FVO). The establishments from which products are derived must be approved in accordance with the relevant EU legislation by the competent authority of the Third Country.

Guidelines to explain the EU's import requirements for animals and animal products were issued by the FVO in 2003 in order to facilitate safe food trade with Third Countries. The guidelines are based on existing legislative requirements and specific needs identified by FVO inspectors in their contacts with Third Country partners. They explain approval system, administrative procedures, and provide information on the EU's animal health, animal welfare and food safety requirements.

3.3.1 *European Union, Food and Veterinary Office*

The function of the FVO is to assure effective control systems through the evaluation of compliance with the requirements of EU food safety/quality, veterinary and plant health legislation, both within the EU and in Third Countries exporting to the EU. The FVO does this mainly by carrying out inspections in MS and in Third Countries exporting to the EU.

Each year the FVO develops an inspection programme, identifying priority areas and countries for inspection. In order to ensure that the programme remains up to date and relevant, it is reviewed mid-year. The FVO makes recommendations to the country's competent authority to deal with any shortcomings revealed during the inspections. On IOI the competent authorities are FSA/FSAI for public health related issues and DAF/DARD for animal/plant health issues. The

competent authority is requested to present an action plan to the FVO on how it intends to address any shortcomings. Together with other Commission services, the FVO evaluates this action plan and monitors its implementation through a number of follow-up activities.

In its role, the FVO, where appropriate, may highlight areas where the Commission may need to consider clarifying or amending legislation or areas where new legislation might be required.

In addition, the FVO produces other reports, such as general overview reports that summarise the results of a series of inspections to a number of MS on the same subject, or the annual EU-wide pesticide residues monitoring reports. The FVO also publishes an annual report on its activities, which reviews the progress of its inspection programme and presents the global results.

3.3.2 Border Inspection Posts

Imports of animals and animal products from Third Countries must come through designated Border Inspection Posts (BIPs) and be subjected to a series of checks before they are allowed access to the EU market. Third Country import controls can be undertaken in any one MS before the product is allowed to circulate freely in other MS, which effectively means that each MS is dependent on every other state to ensure that imports are controlled. It should be noted that the BIP is not always in the country of final destination of the product. The BIPs are situated in strategic locations in each MS and are under the supervision of the relevant competent authority of the MS. Central Authorities in each MS issue guidelines for the operation of the BIP in their jurisdiction. The Food and Veterinary Office of the European Commission routinely audit the controls carried out in these BIPs.

The list of BIPs operating within the EU is drawn up Commission Decision 2001/881/EC, as amended. There are currently five BIPs on IOI, namely Dublin Airport, Dublin Port, Shannon Airport, Belfast Airport and Belfast Port.

Council Directive 97/78/EC governs the organisation of veterinary checks on products entering the EU from Third Countries. Such imports must be accompanied by health certification signed by an official veterinarian in the country of export and must be presented at the BIP at point of entry into the EU. The animal products must be appropriately wrapped, packaged and labelled with a health mark. The importer must be registered with the competent authority and must give 24 hours advance notification to the latter.

All consignments from Third Countries undergo a 100% documentary and identity check, while physical checks are carried out at frequencies laid down in EU law under Commission Decision 94/360/EC. Poultry meat comes under category 2, which means the frequency of physical checks is 50%, while for other fresh meats the frequency is 20%. Sampling for laboratory analysis may also be carried out. Foods failing to comply with the control checks may be detained for further examination, returned to the exporting country or destroyed. All rejections are notified to the EU Commission and if a public health risk communicated to all MS via the Rapid Alert System for Food and Feed (RASFF). Once the shipment has met the required conditions it is released for free circulation within the EU. However, copies of the Health Certificate and the BIP clearance document must accompany the consignment to its destination. The aforementioned Directive has been transposed into national legislation in NI by the 'Products of Animal Origin (Third Country Imports) Regulations (Northern Ireland) 2004', and in ROI by European Communities (Importation of Animal and Animal Products from Third Countries) Regulations, 1994 (S.I. No. 292 of 2000); as amended.

The Competent Authority in the MS carries out initial monitoring of controls at BIPs. In the case of ROI, this is done by VIs in DAF on behalf of the FSAI and in NI by VOs in DARDNI. The FVO is required to inspect BIPs with an

annual throughput of more than 2000 consignments each year and smaller ones less frequently, with all MS visited at least every three years, to assess the performance and uniformity of national enforcement systems. Where the operation or the facilities for checking product at a BIP is considered inadequate, approval of the BIP may be withdrawn. In the FVO Annual Report for 2003, the findings of BIP Audits conducted during that time period in MS visited show that there were minor non-compliances in the areas of staff training, identification and selection of consignments, working procedures, supervision of transit trade, hygiene and documentation. In addition, a number of major non-compliances were also found, mainly related to facilities and equipment in BIPs.

3.4 Product Traceability and Recall

In recent years there have been a series of high profile food scares, which have focussed attention on how the supply chain operates, from production through processing, and finally distribution. Such 'scares' have the potential to seriously damage consumer confidence in the food chain, whether they present real or perceived food safety risks. They have also highlighted serious deficiencies in traceability systems and also in European Law, resulting in the formulation and adoption of Regulation (EC) No. 178/2002. This Regulation lays down the general principles and requirements of food law and pays particular attention to traceability and recall systems and the role of food/feed business operators. In today's global food market, effective traceability and product recall systems are paramount, even in the best-managed food business where an issue involving the safety of a foodstuff may occur.

3.4.1 Product Traceability

Regulation (EC) No. 178/2002 clearly states that all food businesses must have a traceability system in place.

Traceability is fundamental to establishing and eliminating the root cause of a problem. The objective of a traceability system is to identify a unique batch of product and then follow that batch and each individual unit comprising the batch, through the production and distribution process, to the immediate customer in the event of a food safety/quality issue arising. Such an issue may be the result of a packaging defect, a preservation failure, a production, storage or ingredient problem.

There are three basic levels of traceability required:

- 1) Supplier Traceability: the traceability of suppliers and their goods entering a business.
- 2) Process Traceability: the traceability of foodstuffs through a business.
- 3) Customer Traceability: the traceability of foodstuffs to the immediate customer.

3.4.2 Product Recall

The objective of a product recall is to protect public health by informing consumers of the presence on the market of a potentially hazardous foodstuff and by facilitating the efficient, rapid identification and removal of the unsafe foodstuff from the distribution chain. There are two levels of product recall:

- 1) Recall – the removal of unsafe food from the distribution chain extending to food sold to the consumer, and
- 2) Withdrawal – the removal of an unsafe food from the distribution chain. Does not extend to food sold to the consumer.

Regulation (EC) No. 178/2002, in addition to laying down the requirements for product recall, also established RASFF which is a notification system

operated by the European Commission to exchange information on identified hazards between MS. In each MS there must be a single liaison contact point to deal with alerts, arising within that State, or issued by RASFF. The FSANI and the FSAI in ROI are the primary contact points on IOI.

Notifications of alerts are issued by the single liaison contact point within each MS to official agencies and food businesses relating to an identified hazard and are classified as either one of two categories, "For Action" or "For Information". Action is required when there is an identified direct or indirect risk to consumers. Information alerts do not require action, but relate information concerning a food or feed product that is unlikely to pose a risk to health, e.g. inform relevant authorities of consignments blocked at border inspection posts.

The FSAI has issued a Guidance Note¹⁰⁴ relating to Product Recall and Traceability (applicable only to food) and also a Code of Practice on Food Incidents and Food Alerts. A similar guidance document has been issued by FSA NI, Guidance Note on EC Directive 178/2002, and includes guidance on product recall and traceability.

In ROI, a "National Crisis Management Plan" was developed by the FSAI in conjunction with all of the official agencies so that a structured, coordinated and efficient response to any food safety crisis can be employed where the event arises. The FSA has set up an incidents taskforce to strengthen existing controls in the food chain so that the possibility of future food incidents occurring may be reduced, and to improve the management of such incidents when they do occur.

¹⁰⁴ http://www.fsai.ie/publications/guidance_notes/gn10.pdf

CHAPTER 4 NUTRITIONAL ISSUES

4.1 *Nutritional Composition of Chicken*

From a nutrition perspective the benefits of chicken meat are often promoted, particularly for those who wish to follow a healthy, low-fat diet. Chicken has received much of its good reputation on the basis of it being a high protein, low fat food. The nutrient profile of the category can be changed dramatically however by the ingredients and methods employed in the manufacturing and/or processing of the product and the preparation/cooking methods used in the kitchen, resulting in a final product that may be high in total energy, fat (particularly saturated fat) and sodium, and lower in total protein per serving¹⁰⁵.

Chicken is an excellent source of protein in the diet. A medium serving (130g) of grilled chicken, without skin, provides approximately 60% of the Recommended Daily Amount (RDA) of protein for men and 70% of the RDA for women.

With regard to fat, a 100g portion of raw, white chicken meat, without its skin, contains approximately 1.1 g fat and 106 kcals (449 kJ). Generally the breast portions of chicken meat contain the lowest levels of total and saturated fat, followed by the thigh and drumsticks, with chicken wings having the highest fat content. Removing the skin from the chicken portion considerably lowers the overall fat content of that meat. The predominant type of fat in chicken is monounsaturated, with almost half of the total fatty acids being monounsaturated. Saturated fatty acids form the next largest

¹⁰⁵ Food Standards Agency (2002) McCance and Widdowson's Composition of Foods, 6th ed., Cambridge: Royal Society of Chemistry.

category and polyunsaturated fatty acids the smallest. The fatty acid profile present in the chicken is indicative of the fatty acid profile of the feed.

From a micronutrient point of view chicken is a source of a range of vitamins, minerals and trace elements. Table 4.1 shows the contribution of chicken to micronutrient intakes of adults on IOI. It demonstrates that chicken is a good contributor of niacin but a relatively poor contributor to iron intake in the diets of men and women.

Table 4.1: Percentage Contribution of Chicken to Mean Daily Nutrient Intakes in Irish Men and Women¹⁰⁶

Nutrients (%)	Men n = 366		Women n = 392		P
	Mean	SD	Mean	SD	
Macro					
Energy	2.1	2	2.4	2	*
Protein	7.7	5	9.1	6	**
Total fat	2.2	2	2.3	2	NS
Saturated Fat	1.6	2	1.7	2	NS
Monounsaturated Fat	2.5	3	2.5	2	NS
Polyunsaturated Fat	2.2	2	2.0	2	NS
Micro					
Sodium	1.5	2	1.7	2	NS
Potassium	3.0	2	3.5	2	NS
Phosphorous	4.3	3	4.9	3	NS
Iron	1.8	2	1.9	2	NS
Copper	2.8	2	2.9	2	NS
Zinc	3.3	3	3.5	3	NS
Total Vitamin A	1.2	2	1.4	3	NS
Vitamin D	2.4	3	2.5	3	NS
Thiamin	1.4	1	1.6	2	NS
Riboflavin	2.9	2	2.9	3	NS
Niacin	10.0	7	11.9	8	*
Vitamin B6	4.0	3	4.8	4	NS
Vitamin B12	1.3	3	1.5	3	NS
Panthenic Acid	5.7	4	6.3	5	NS

¹⁰⁶ Kiely, M. (2005) Personal Communication.

The micronutrient content of chicken varies by chicken part. Fat soluble vitamins accumulate in larger concentrations in the skin and separable fat than in the lean tissue. The levels of iron and zinc are higher in the dark meat, such as the thigh and drumstick, than in the white breast meat and chicken wings. Minerals are also more highly concentrated in the lean tissue than in the fat and skin of chicken meat.

4.2 Consumer Consumption of Chicken

Poultry meat (including chicken) is the second most common type of meat consumed by the adult population on IOI (Table 4.2). Eighty nine percent of all adults consume poultry, compared with 92% bacon and ham, and 80% consuming beef. Data from the North South Ireland Food Consumption Survey (NSIFC)¹⁰⁷ indicates that the consumption of poultry, on a weight per day basis, is moderate, with the mean intake of the adult (18 - 64 y) population being 36.7 g/d (27.3% of total daily meat intake) [in the NSIFCS chicken intake data was not disaggregated from total poultry, however, it was estimated that chicken accounted for 95% of the total poultry figure]. Males consumed 41.3 g/d of poultry meat with both beef, and bacon and ham, being consumed in more amounts daily. However, poultry meat represented the highest contribution to the total intake of meat for females (32.4 g/d, 31.9% of total daily meat intake).

Dinner and lunch are the primary meal occasions for poultry meat consumption¹⁰⁷. Poultry meat is consumed as part of composite dishes in 39% of all occasions where it was eaten¹⁰⁷. Women tended to consume poultry meat as part of a composite meal more often, and in younger ages groups, than men¹⁰⁷.

¹⁰⁷ Cosgrave, M., Flynn, A. and Kiely, M. (2005) Impact of disaggregation of composite foods on estimates of intakes of meat and meat products in Irish adults, *Public Health Nutrition* 8(3); 237-337.

Table 4.2: Mean Daily Intakes (g) of Meat by Male and Female Consumers on IOI (NSIFCS, 2001) and Percentage of Each Category to Total Meat Consumption¹⁰⁷

	Total Population (n = 958)			Male (n = 475)			Female (n = 483)		
	%	g/day	Consumption of total meat (%)	%	g/day	Consumption of total meat (%)	%	g/day	Consumption of total meat (%)
Bacon & Ham	92	33.0	24.6	93	42.1	25.1	90	23.7	23.3
Beef	80	39.1	29.1	86	46.8	27.9	74	30.5	30.0
Lamb	38	22.8	17.0	41	28.1	16.7	36	16.9	16.6
Pork	42	26.9	20.0	46	30.6	18.4	39	22.7	22.3
Poultry	89	36.7	27.3	87	41.3	24.6	91	32.4	31.9
Offal	8	13.6	10.1	7	15.3	9.1	9	12.2	12.0
Burger	27	12.7	9.5	32	14.0	8.3	22	10.8	10.6
Sausage	64	16.1	12.0	71	19.6	11.7	57	11.7	11.5
Meat Products	30	10.0	7.5	35	12.0	7.1	25	7.4	7.3
Total Meat	99	134.3	100	98	167.9	100	99	101.6	100

4.3 Public Health Implications

Results from the NSIFCS indicate that high consumers of chicken tend to have significantly lower intake of carbohydrate, particularly men¹⁰⁶. Evidence from the survey suggests that 77% of adults on IOI are not meeting the population goal of non-starch polysaccharides, including fibre, of 18 g/d, and of those adults, 37% fail to meet the minimum 12 g/d¹⁰⁸. It is important therefore that emphasis is put on the foods such as breads, cereals and potatoes, and fruits and vegetables that accompany chicken in a meal, is given. It could be postulated that individuals who consume large portions of chicken may eat smaller portion sizes of accompanying foods, such as potatoes and bread, as well as potentially consuming less fruit and vegetables. Although, there is limited evidence to support this, it is clear from a public health perspective that we communicate the intake of any given food in the context of the overall diet.

Consumption of poultrymeat via composite dishes contributes to approximately 39% of all poultrymeat intake of the population of both men and women on IOI (34 g/d), with a higher proportion of intake reported in the 18 – 35 y age group¹⁰⁷. The contribution of composite foods to total meat intake is significantly higher in women than men. Further cooking and processing of chicken can increase the sodium content of the dish as well as the fat and overall energy content¹⁰⁵. Therefore, there should be an emphasis placed on the importance of reading labels on commercially processed foods, and the incorporation of fresh vegetables and starchy foods, where possible, in foods prepared in the home. Composite dishes containing chicken can contribute more positively to the diet depending on the added ingredients and the cooking method employed. Indeed it has been shown that, on IOI, composite meat dishes made a major contribution to vegetable intakes¹⁰⁹.

¹⁰⁸ Galvin, M.A, Kiely, M., Harrington, K.E., Robson, P.J., Moore, R. and Flynn, A. (2001) The North/South Ireland Food Consumption Survey: the dietary fibre intake of Irish adults, *Public Health Nutrition* 4(5A); 1061-1068.

¹⁰⁹ O' Brien, M., Kiely, M., Galvin, M. and Flynn, A. (2003) 'The importance of composite foods in estimates of vegetable and fruit intakes', *Public Health Nutrition* 6(7); 711-26.

While chicken can be considered a highly nutritious food, compared with other meats such as beef, it is relatively low in iron (100 g raw chicken breast contains 0.5 mg iron while 100g raw beef contains 2.7 mg). The NSIFCS indicates that as the amount of poultry meat consumed per day increases, the amount of red meat consumed decreases¹⁰⁶. The survey showed that women tend to eat more poultry meat than beef or other red meats¹⁰⁷. The Survey of Lifestyle, Attitudes and Nutrition estimated that 23% of the population failed to meet the 2 servings per day of meat, fish, eggs and alternatives, as recommended by nutrition guidelines in ROI, thus increasing the potential for a decrease in iron intake¹¹⁰. The results of the NSIFCS indicated that over 50% of women in the 18 – 35 y age group, and 45% of women aged 36 - 50 y, had mean daily intakes of iron below the average requirement for menstruating women¹¹¹. In contrast to this, the survey indicated that 40% of the population were consuming in excess of the recommended 140g meat per day. This emphasises the importance of a balance of different types of food in the diet and also the relevance of appropriate portion sizes.

¹¹⁰ The National Health and Lifestyle Surveys (2003),
http://www.healthpromotion.ie/uploaded_docs/Health_Lifestyle_Survey.pdf

¹¹¹ Hannon, E., Kiely, M., Harrington, K.E., Robson, P.J., Strain, J.J. and Flynn, A. (2001) 'The North/South Ireland Food Consumption Survey: mineral intakes in 18-64 year old adults', *Public Health Nutrition* 4(5A); 1081-1088.

CHAPTER 5 GENERAL ISSUES

5.1 Introduction

The following chapter includes issues, which though not food safety issues *per se*, were cited as concerns from a consumer perspective and thus it is necessary to address these issues in the context of this review. It also covers other aspects of the food safety continuum, such as training, which are at the core of ensuring food safety.

5.2 Labelling

Labelling allows consumers to make informed decisions about the food they buy and also builds confidence in products. The labelling of chicken products is governed by Council Directive 2000/13/EC on the Labelling, Presentation and Advertising of Foodstuffs, and by Council Regulation 1906/90/EC on the Marketing Standards for Poultrymeat.

5.2.1 General Food Labelling Requirements

Council Directive 2000/13/EC sets out general provisions on the labelling of pre-packaged foodstuffs to be delivered to the ultimate consumer. Sale of loose/over the counter, non-prepackaged food (when it is packaged on the premises from which it is to be sold), is governed by Article 14 of Directive 2000/13/EC which permits individual MS to decide what labelling information needs to be shown, and how it should be displayed, subject to the condition that the consumer still receives sufficient information. The only requirement for foods sold loose specified on IOI is that the name of the product must be given.

Directive 2000/13/EC is implemented in ROI by the European Communities (Labelling, Presentation and Advertising of Foodstuffs) Regulations 2002 (S.I. No. 483 of 2002) and in NI by the Food Labelling Regulations (Northern Ireland) 1996 (SR NI 1996 No. 383), as amended. Enforcement of this legislation lies with the FSAI in ROI and the District Councils in NI.

5.2.2 Specific Meat Labelling Requirements

Commission Directive 2001/101/EC, an amendment to the General Labelling Directive, sets out specific rules regarding the labelling of meat. This Directive only applies to the labelling of products which contain meat as an ingredient and does not apply to the labelling of meat cuts and anatomical parts which are sold without further processing. The latter, such as offal, including the heart, intestine and liver, have to be labelled as such and not as 'meat'.

Mechanically recovered meat (MRM) is not covered by the definition of meat and therefore must be designated as MRM and by the name of the species. However, there is provision for a certain part of the fat and connective tissue content, where it adheres to the muscles, to be treated as meat, subject to maximum limits laid down in the definition. The Directive also provides for the systematic indication of the species from which the meat comes so that for example 'chicken meat' is distinguished from 'pig meat'.

In ROI there is no legislation in place that stipulates the compositional standard of processed chicken products (i.e. in order for it to be called 'chicken', e.g. chicken burger, chicken nugget). The only requirement is that the chicken is "quided", (QUID: Quantitative Ingredient Declaration), meaning that the percentage of chicken in the product is stated in the ingredient listing if mentioned in the name of the product. Pictorial representation or graphics that selectively emphasise certain ingredients may also trigger this requirement. In NI, this is also generally the case;

however chicken burgers are defined in the Meat Products Regulations (NI) 2004¹¹². The FSAI have issued a guidance note on Directive 2001/101/EC¹¹³ as have FSA NI¹¹⁴.

5.2.3 Specific Poultry Meat Labelling Requirements

Council Regulation 1906/90/EC and Commission Regulation 1538/91/EC (on the implementation of the latter), and their subsequent amendments were adopted to facilitate harmonised standards throughout the EU for the marketing of poultry meat intended for human consumption. These Regulations apply to fresh, chilled or frozen whole carcasses, parts and offal of poultry, and relate to the grading by quality (Class 'A' or 'B'), weight classification, packaging/presentation (including labelling), water content, storage (including temperature control), and Special Marketing Term criteria. The latter specify the criteria which must be met before certain claims about types of farming can be made, e.g. 'Fed with% of', 'Extensive indoor' ('Barn reared'), 'Free range', 'Traditional free range' and 'Free-range-total freedom'.

The Regulations do not apply to prepared or preserved poultry, e.g. cooked, processed, treated (includes uncooked products that have been basted, seasoned, sprinkled with herbs or spices or undergone any other form of treatment or preserving process other than cold treatment), or value added products/recipe dishes. In addition, certain categories of poultrymeat are specifically exempt from the marketing standards namely: poultrymeat intended for export from the EC; sales from farms with an annual production of under 10,000 birds, providing that the farmer supplies the fresh poultrymeat from the holding; and New York Dressed Poultry. The Regulations require that poultrymeat is only marketed in certain conditions – 'fresh', 'frozen' or 'quick-frozen' (See Section 3.1.3.4).

¹¹² <http://www.opsi.gov.uk/sr/sr2004/20040013.htm>

¹¹³ Guidance Note 14: The Application of Commission Directive 2001/101/EC as amended by Commission Directive 2002/86/EC on the Definition of Meat

¹¹⁴ Labelling and Composition of Meat Products Guidance Notes September 2003

The declaration of added water in food, including poultrymeat, is covered by the General Food Labelling Regulation, stating that when added water exceeds 5% of the finished product it must be listed in order of weight in the finished product.

Water added during the preparation of frozen or quick-frozen chicken carcasses is governed by the Marketing Regulations. Frozen and quick-frozen whole chickens may only be marketed within MS if the water content does not exceed technically unavoidable values. If the added water level exceeds these limits, then the competent authority may allow the batch to be marketed providing it carries a declaration of same, i.e. "Water content exceeds EC limit". Different methods of chilling used in basic processing will result in different amounts of water being incorporated into the chicken carcass, ranging from 2% to 7%. Within this piece of legislation, each method has an associated limit for the maximum amount of water permissible. The slaughterhouse is required to carry out regular checks to determine water content, and enforcement authorities are also required to carry out sampling checks.

Council Regulation 1906/90/EC states that the labelling of prepackaged, unprocessed poultrymeat must indicate the following information particulars: the class, price per weight unit, condition (fresh, frozen or quick-frozen), recommended storage temperature, approval number of slaughterhouse/cutting plant (except in the case of cutting and boning at the place of sale) and country of origin if imported from a Third Country. In NI, this Regulation extends the application of the aforementioned Article 14 of Directive 2000/13/EC in relation to the labelling of non-prepackaged unprocessed poultrymeat (i.e. sold loose), which effectively means that the latter may not contain all of the above particulars at the point of sale. In 2004 in ROI, legislation was introduced (SI No. 50 of 2004) which requires that the labelling provisions for non-prepackaged, unprocessed poultrymeat are extended to those for prepackaged, unprocessed poultrymeat.

For frozen chicken breast fillets sold into wholesalers or caterers and not directly to the ultimate consumer, a derogation allows for some labelling information to be carried on the accompanying commercial documentation rather than on the label. All other information listed above must appear on the pre-packaging label.

Council Regulation 1906/90/EC defines the terms fresh, frozen and quick-frozen, subsequently it is illegal to market poultry meat as "fresh" when it has been frozen at any stage in its production and/or distribution.

Regulation 1906/90/EC has been transposed into national legislation in ROI by S.I. No. 42 of 2004, European Communities (Labelling and Marketing Standards for Poultrymeat) Regulations 2004 and its subsequent amendment, S.I. No. 50 of 2004. This regulation was not transposed into legislation in NI or UK, however, DARD is currently drafting a combined set of Egg and Poultry Meat Marketing Standards Regulations, which they intend to consult on during July-August 2005.

Enforcement of the Poultry Meat Marketing Regulations lies with the FSAI in ROI and with DARD in NI. A Guide to the Marketing Standards for Poultrymeat in NI has been issued by the Department of the Environment, Food and Rural Affairs (DEFRA)^{115, 116} in the UK.

5.2.4 Health Marking

EU (Council Directive 92/116/EEC on Health Problems Affecting Trade in Fresh Poultry Meat) and national legislation requires that unprocessed poultry should bear a health mark. This enables an enforcement officer to identify the factory in which the product was packaged. All such factories, which meet the specified hygiene requirements and are licensed, are allocated a code number which is part of the health mark along with the code of the particular country. A health mark indicates that the carcass has passed ante and post mortem inspection and that hygiene

¹¹⁵ www.defra.gov.uk/foodrin/poultry/pdfs/guideintro.pdf

¹¹⁶ www.defra.gov.uk/foodrin/poultry/pdfs/enfguide.pdf

regulations have been complied with. Health marking is carried out under the responsibility of Veterinary Inspectorate staff in the slaughter/processing plant. In the case of red meat carcasses, the health mark may be applied directly to meat, but in relation to poultry this may not be possible and it may be printed on wrapping or packaging materials.

Processed poultry products, as part of the controls on foods of animal origin, are also required to have a 'health mark' on their label.

Health marking is an important element of any traceability system; however, it should not be confused with, or related to, country of origin as is often the case. A product produced in one country can be exported to another country, where it is repackaged and relabeled, can bear the health mark of the factory in which the latter took place.

5.2.5 Country of Origin

With the exception of a number of primary foodstuffs, e.g. beef, there is no compulsory requirement to declare origin of food sold over the counter under EU food law. However, under the General Labelling Directive (2000/13/EC) the place of origin of the foodstuff must be given "only if its absence might mislead the consumer to a material degree".

When two or more countries are involved in the production of a good, the origin of the good must be determined in accordance with Article 24 of Council Regulation No. 2913, establishing the Communities Customs Code which states: "Goods whose production involved more than one country shall be deemed to originate in the country where they underwent their last, substantial, economically justified processing or working in an undertaking equipped for that purpose and resulting in the manufacture of a new product or representing an important stage of

manufacture". This means that a product whose main ingredients have been sourced outside of IOI can be described as being a product of IOI when it is processed within IOI.

Substantial transformation can result in the consumer being easily misled about the true origin of a product, or given a false impression that the product originated elsewhere than where its main ingredients were sourced. This is a term used in Codex Alimentarius for which there is neither clear legislation nor any agreed definition, although there is a draft definition awaiting EU approval.

Labelling issues, however, are no longer just about country of origin but also about how, where, and when poultry meat was grown and processed. This issue has been addressed in ROI in relation to Beef Labelling implementing Regulation (EC) No. 1760/2000. This legislation made it mandatory for fresh, chilled, and frozen beef sold as cuts or as mince to have the following information on the label:

- i. a batch number or code which ensures that the beef can be traced back to the batch of animals from which it came
- ii. details of the slaughterhouse (approval number and country)
- iii. details of cutting plant where beef was processed
- iv. country of birth of the animal
- v. country or countries where the animal was reared
- vi. country where slaughter took place.

If all of the above are the same, then the label can state "Country of Origin, Ireland". This legislation does not currently extend to other meat types.

The FSA have issued a guidance note on Origin Labelling¹¹⁷.

5.2.6 Nutrition Labelling

The nutrition labelling of foodstuffs is governed by Council Directive 90/496/EEC, as amended. This piece of legislation states that nutrition labelling is compulsory when a nutrition claim is made. In this instance, and in other instances where nutrition labelling is provided voluntarily, the information given must consist of one of two formats - group one (the 'Big Four') or group two (the 'Big Eight'). Group one consists energy value, protein, carbohydrate and fat; while, group two consists of the latter four plus sugars, saturates, fibre and sodium. Nutrition labelling may also include starch, polyols, mono-unsaturates, polyunsaturates, cholesterol and any minerals or vitamins that are listed in the legislation.

Nutrition information must be given 'per 100g/ml'. It may also be given 'per serving size', provided that the serving size is also stated.

This piece of legislation applies to prepackaged foodstuffs to be delivered to the ultimate consumer and also foodstuffs intended for supply to 'mass caterers', i.e. restaurants, hospitals, canteens, and so on. It does not however apply to non-prepackaged foodstuffs packed at the point of sale at the request of the purchaser or prepackaged with a view to immediate sale.

5.2.7 Labelling of Organic Chicken

EU Legislation EC 2092/91 and subsequent amendments govern the production and marketing of organic produce. Organic production methods may also be included in labelling of products, where the appropriate requirements are met, but are not covered within the poultry meat Marketing Regulations.

The EU legislation governing organic production includes requirements on labelling of products at the point of sale. An organic product produced according to the EU

¹¹⁷ www.food.gov.uk/multimedia/pdfs/originlabelling.pdf

regulations, should bear the indication 'organic' on the labelling, advertising material or commercial documents. Packaged organic food must indicate the name and/or code number of the organic certification body. Organic products imported from Third Countries must be produced in conformity to EU standards.

5.2.8 Re-Labelling

The practice of re-labelling to change the 'use by' date is not illegal if undertaken by the person originally responsible for setting this date, is within the recognised shelf life of the product, and is done safely and lawfully in the interest of public health.

In March 2004 the consumer magazine "Which?" reported that some processing plants re-label their poultry meat several times before it reaches the shops, extending its 'use by' dates to up to 20 days after slaughter¹¹⁸. An investigation on behalf of the FSA found that the shelf life used by supermarkets is between 7 and 12 days. No evidence was uncovered to support the allegations that re-labelling was being used to extend the shelf life of product. However, there was evidence of repackaging, re-labelling and change of 'use by' date on fresh chicken, which was done safely and lawfully due to market fluctuations.

5.2.9 Adulteration

Adulteration involves the addition of ingredients to chicken such as water, animal protein, salt and others, without adequately informing the consumer that the product has such added ingredients. It is not illegal to process chicken fillets by adding water and other ingredients, provided that these ingredients are approved and clearly stated on the label of pre-packed products, in addition to the added water content. The percentage of meat content must also be accurately labelled. While there is no major food safety risk associated with such practices, the consumer is being misled by the inclusion of other ingredients, such as undeclared pork and bovine material, in chicken fillets. Anecdotal evidence suggests that

¹¹⁸ www.food.gov.uk/multimedia/pdfs/usebychicken.pdf

industry has developed hi-tech methods to break down added DNA material so that it can go undetected by external testing.

Council Regulation (EEC) No. 1906/90 first defined poultry meat as “poultry meat suitable for human consumption, which has not undergone any treatment other than cold treatment to ensure its preservation”. This definition allowed for chicken fillets with added water and other ingredients to be termed ‘poultry meat’. Council Regulation (EEC) No. 317/93 amended the latter piece of legislation to redefine poultry meat as “poultry meat suitable for human consumption, which has not undergone any treatment other than cold treatment”. As a result, unfrozen chicken fillets with added water are no longer covered by the Marketing Standards for Poultry Meat (1906/90); they are, however, still controlled by the General Labelling Directive.

The issue of adulteration had its beginnings in 1996, when Thailand and Brazil began to export salted chicken meat in direct response to requests from European food companies. This meat was used in the manufacture of processed products. Until 2002, it was permissible to import salted chicken into the EU under a reduced import tariff (15.4%) covering chicken for further processing (Code 0210). In the period 1996 – 2001, EU imports of salted chicken meat from Brazil and Thailand soared from 3,000 million tonnes in 1996 to 400,000 million tonnes in 2001¹¹⁹. In 2002 the European Parliament reclassified the products as “salted meat” rather than “frozen products”, subjecting the imports to a 58.9% tariff rate (Code 0207) instead of the 15.4% rate. On 30th May 2005, the World Trade Organisation (WTO) ruled that the EU’s tariffs on such imports were illegal and restrictive under the body’s trade rules. A decision by the EU on compliance of this judgment is awaited.

On import, European processors tumble or inject defrosted imported chicken fillets with water and binding agents such as animal proteins (derived from a variety of

¹¹⁹ USDA Foreign Agricultural Service Gain Report No. E35113 ‘EU-25 Poultry and Poultry Products’ www.fas.usda.gov/gainfiles/200506/146130026.pdf

different sources, including gelatine, blood, whey protein, spray-dried beef and pork protein, some of which may be mechanically recovered), which help retain the water, and other ingredients, in the meat. Following processing, the chicken breasts are packed into 10 kg boxes and frozen prior to distribution throughout the EU, including ROI and NI. These fillets are then sold into wholesale catering suppliers at a lower price than normal unprocessed chicken fillets.

In butcher shops, it is possible that these products could be sold directly to consumers as raw chicken breast fillets either in a frozen or unfrozen state. The cyclical freezing and defrosting of such fillets does not contravene food safety, provided that it is done in a controlled manner. The issue of “freshness” also arises as fillets with added ingredients that have been frozen and refrozen at different stages in the food chain may be sold in establishments as “fresh chicken” despite the definition of “fresh” in the EC Marketing Regulations. Until recently, the Food Labelling Regulations (NI) 1984 required a statement to be displayed near any meat that had been frozen but was being sold thawed, to the effect that it had been “previously frozen, do not refreeze”. The Food Advisory Committee advised that the practice of such notes should continue as such meat would not be considered by the consumer to be “fresh”, despite the fact that the updated Food Labelling Regulations (NI) 1996 do not include this requirement.

The FSA first reported the issue of inaccurate labelling of many chicken products supplied to UK catering establishments in 2000¹²⁰. Follow up surveys in December 2001¹²¹ and in March 2003¹²² concluded that these practices were still occurring. The FSAI conducted surveys in 2002¹²³ and 2003¹²⁴ and uncovered similar findings. These surveys found that chicken fillets, which reputedly had no added water, other than technologically unavoidable water incorporated during preparation and freezing, did in fact contain added water and other ingredients in the form of animal protein.

¹²⁰ www.food.gov.uk/science/surveillance/fsis-2000/8chick

¹²¹ www.food.gov.uk/science/surveillance/fsis-2001/20chick

¹²² www.food.gov.uk/news/pressreleases/2003/mar/chickenwater0303

¹²³ www.fsai.ie/news/press/pr_02/pr20020521.asp

¹²⁴ www.fsai.ie/news/press/pr_03/pr20030312.asp

Pressure from the FSAI and FSA has secured a commitment from the European Commission to re-examine the scope of the labelling legislation to cover fresh meat preparations as well as fresh meat and to impose a maximum limit on the amount of added water in poultry meat products generally. Additionally, the EU have included the assessment of the safety, quality and labelling of same in its Co-ordinated Programme for the Official Control of Foodstuffs 2005, as specified in Commission Recommendation 2005/175/EC¹²⁵.

5.2.10 Best Practice Labelling Model in the Netherlands

In the Netherlands, by Decree of 5 June 2001 Bulletin of Acts and Decrees 272, a new Article (4a) was added to the Commodities Act Decree (forms backbone of the Dutch system for food commodities legislation) on the preparation and treatment of foodstuffs involving poultry meat¹²⁶. As a result of this article, poultry meat may only be sold or delivered in packaging to the consumer and must be labelled with a warning to inform the consumer to prepare the meat with great care on account of the possible presence of pathogenic bacteria, mainly *Salmonella* and *Campylobacter*.

In the explanatory note to this Decree, it was explained that, in the somewhat longer term (4 to 5 years), the delivery or sale to the consumer of poultry meat contaminated with *Campylobacter* or *Salmonella* would no longer be deemed acceptable. If necessary, the sale of contaminated poultry meat to the consumer would nonetheless be prohibited once that period had lapsed. The figures in the Decree show that, of all foodstuffs, it is still mainly poultry meat contaminated with *Campylobacter* and/or *Salmonella* that leads to disease and death in man, however, the above mentioned warnings have not been able to prevent this.

¹²⁵ europa.eu.int/eur-lex/lex/LexUriServ/site/en/oj/2005/l_059/l_05920050305en00270039.pdf

¹²⁶ European Commission Communication SG (2005) D/51472, Notification 2005/0314/NL.

The activities carried out by the Dutch poultry sector have led to some degree of success in the case of *Salmonella*, but have not resulted in the desired level of reduction (<5% by the end of 2002). As for *Campylobacter*, there is hardly any effect discernible, if any at all, with the exception of 1998 and 1999. The Netherlands therefore deemed it necessary to actually impose the possible ban on the sale of contaminated poultry meat to the consumer and in July 2005 notified the Commission of this proposed draft technical regulation.

5.3 Quality Assurance Schemes

There are two quality assurance schemes specific to chicken produced in IOI, namely: Assured Chicken Production and the Bord Bia Chicken Quality Assurance Scheme.

5.3.1 Assured Chicken Production

Assured Chicken Production (ACP) is an independent company, composed of the British Retail Consortium, the British Poultry Council, and the National Farmers' Union of England and Wales, which has set out specific standards for the production of chicken meat¹²⁷. Reflecting the tightly integrated nature of the chicken industry, ACP operates detailed poultry standards applicable in respect of breeder replacement farms, breeder layer farms, broiler rearing and free-range chickens for human consumption. The scheme employs European Food Safety Inspection Service (EFSA) standards from the point of slaughter onwards. ACP standards cover the farm site and emergency plan; health and hygiene; management and stockmanship; feed and water; the environment; provisions for chicks and breeder layer flocks; records; and depopulation. Similar standards apply in relation to hatcheries; and there are detailed provisions covering catching, transport, and slaughter. Standards also stipulate the biosecurity measures which must be employed. ACP Scheme members are required to monitor for *Salmonella* but there are currently no measures specifically aimed at tackling the problem of *Campylobacter*.

¹²⁷ Assured Chicken Production www.assuredchicken.org.uk

All significant chicken processors in the UK support the scheme and require their supplying farms to be certified against the standards. As a result, almost all commercial chicken units in the UK participate in the scheme including those in NI. The number of primary sites in NI participating in the scheme is 508. Membership is open to ROI producers and processors; however, there are currently no ROI affiliated members¹²⁸. CMI (Checkmate International plc) and EFSIS are the two certification bodies which audit members for compliance.

5.3.2 Bord Bia Chicken Quality Assurance Scheme

In 2004, Bord Bia introduced its Chicken Quality Assurance Scheme. This scheme involves the marketing of Quality Assured chickens and derived products through identification of approved product with a 'Country of Origin' label.

Control of the scheme is exercised by an independent Bord Bia Certification Committee composed of representatives from Bord Bia, DAF, and others. Membership of the Scheme is voluntary and is open to all chicken producers and processors. Participating farms are independently audited for compliance, with the code of practice set out in the scheme covering key aspects of production including the site, housing and environment, house preparation, chicken sourcing, flock health, feed and water, flock welfare, site hygiene and biosecurity, catching and transport, health and safety on the farm, environmental protection, and also a section on free range chickens. Processors participating in the scheme must meet certain requirements relating to a number of issues including, quality systems, animal welfare and transport, product identification and traceability, process control, inspection and testing, hygiene and good manufacturing practices, and training.

Chicken producers and processors outside of ROI can participate in the scheme, provided that they are produced to an equivalent standard which is approved by the

¹²⁸ Personal Communication, Assured Chicken Production, June 2005.

Bord Bia Certification Committee. However, at present there are no such participants. If this was the case; the label would have to indicate the exact country of origin of the chicken.

5.4 Training

Training initiatives for staff are crucial to ensuring the production of safe food, in addition to being a legal requirement. Deficiencies in staff training have been identified as the main failure in compliance to the ACP scheme in 2004 – 2005¹²⁹. In the current climate, training is also essential due to the growing number of foreign nationals in the workforce on IOI.

Food handlers must receive adequate training in food hygiene in accordance with legislation based on the EC Food Hygiene Directive (93/43/EEC). This is the case for all staff, part-time, full-time or casual, or whether they are employed in the public or private sector. This is transposed into national legislation in NI by SI 1763 Food Safety (General Food Hygiene) Regulations 1995 and in ROI by SI 165 EC (Hygiene of Foodstuffs) Regulations of 2000.

5.4.1 On the Island of Ireland

FSAI has a clearly defined food safety training policy¹³⁰. It established the Food Safety Training Council (FSTC), which comprises representatives from education and training, the food industry, and inspectors from the official agencies with responsibility for food safety, such as health boards and local authorities. The FSTC advises the FSAI on the contribution to food safety through training, on agreeing levels of skills required for best practice in food safety, and agreeing guidelines for assessing the impact of food safety training in the work environment. The FSAI, with input from the FSTC, has set training standards for the foodservice, retail, and manufacturing sectors. These standards are outlined in a series of food safety

¹²⁹ Assured Chicken Production Spring 2005 Newsletter, available on:
<http://www.assuredchicken.org.uk/chickens/media.asp>

¹³⁰ www.fsai.ie/industry/training/FSAI_training_policy.pdf

training guides covering three levels of skills: induction, additional, and for management.

The FSAI has published a Guidance Note on the Inspection of Food Safety Training and Competence (No. 12), the purpose of which is to establish a consistent approach to the inspection of the training and competence of operational staff dealing with food, and the provision of advice to food businesses in relation to training. In conjunction with this, FSAI has developed a number of training programmes including:

- i. 'Domestic Abattoir Training Programme' for workers in all domestic meat abattoirs
- ii. 'Food Safety and You', induction training programme for new staff in the food service industry. This programme is available in eight languages including Lithuanian, Latvian, Mandarin, Polish Portuguese, Romanian, Spanish and English.
- iii. 'Food Safety Training for Management in the Chinese Food Sector' specifically for staff in Chinese food restaurants and takeaways

The FSAI has also constructed an on-line database of professional food safety training providers in ROI.

In NI, the FSA also recommend three levels of training: foundation, intermediate, and advanced. FSA do not provide a database of training providers in NI but recommend three professional bodies for food safety training: the Chartered Institute of Environmental Health (CIEH), the Royal Institute of Public Health (RIPH), and the Royal Society for the Promotion of Health (RSPH).

In NI, as previously mentioned, the Food Safety (General Food Hygiene) (Amendment) Regulations (Northern Ireland) 2001 (commonly referred to as the butchers licensing regulations) require that all supervisors of persons handling meat

within butchers' premises, must receive a level of training to at least the standard of the CIEH Intermediate Food Hygiene Certificate Course or the RSPH Certificate in Food Hygiene Management. In addition, all persons handling meat in a butcher shop must receive a level of training in food hygiene to at least the equivalent of the CIEH Basic Food Hygiene Certificate or the Certificate in Essential Food Hygiene of the RSPH. DEFRA provides information on and links to training organisations and training courses that are available and applicable to the poultry sector on its website.

Industry has also taken a lead in the training of staff. IBEC (Irish Business and Employers Confederation) has initiated a programme through European Social Fund funding, in conjunction with FÁS, aimed at training workers in the meat sector (although a training programme for the poultry sector has yet to be developed) as well as a web based foundation course for food handlers.

Regulation 854/2004: Paragraph 6 of Article 5 permits MS to allow company staff in poultry slaughterhouses to assist with official controls by carrying out specific tasks, e.g. post-mortem inspection, under the full time supervision of the OVS. Under the draft Food Hygiene Regulations (NI) 2005, company staff must be trained in the same way as official meat inspectors and pass the same exam. The new rules would allow company staff to carry out post mortem inspections only, as at present, or to carry out all the duties of an official meat inspector.

Training is a major focal point in quality assurance schemes such as ACP, Bord Bia Chicken Assurance Scheme, and also in quality standards such as British Retail Consortium, EFSIS and ISO 9000:2000.

5.4.2 At European Level

"Better Training for Safer Food" is a new initiative of the European Commission aimed at organising a Community training strategy, complementary to the action taken by MS at national level. This covers the area of official controls performed to

ensure compliance with food and feed law, animal health and welfare rules, and plant health rules. The aim of the initiative is to ensure a high level of training of staff of competent authorities of MS involved in official. Training will also be available to participants from Third Countries, and in particular developing countries, to assist in their understanding and familiarisation of EU import requirements.

5.5 *Animal Diseases*

5.5.1 *Avian Influenza*

Avian influenza (AI) is a naturally occurring infectious disease of migratory waterfowl caused by influenza A viruses. Of the 15 main subtypes of influenza A virus, strains H5 and H7 are highly pathogenic and contagious and result in high mortality (up to 100%) among susceptible bird species, especially domestic chickens. Since 1959, several AI subtypes have crossed the species barrier to infect humans on a number of occasions. Most infections result in mild respiratory symptoms or conjunctivitis. However, infection with the H5N1 strain results in a severe disease state and high mortality, as recorded in outbreaks occurring in 1997 (Hong Kong), 2003 (China, Hong Kong) and 2004 (Thailand, Vietnam). There is no evidence to date of human infection with AI on IOI.

The principal risk factor for human infection is close contact with live infected poultry either directly from the infected birds or via an intermediate host. Reports from infected areas of limited human-to-human transmissions remain unsubstantiated. The immediate slaughter of infected flocks is highly effective in preventing the spread of the disease in both animal and human populations as evidenced in Hong Kong in 1997. This is facilitated by the rapid and obvious onset of symptoms once flocks have become infected.

To date, there is no epidemiological information to suggest that the disease can be transmitted through contaminated food or that products shipped from affected areas have been the source of infection in humans. Infected chicken flocks are

rapidly destroyed before entering the food chain. Freezing and refrigeration of meat does not reduce the concentration or virulence of viruses. Proper cooking will destroy the virus. However, proper cooking will destroy the virus and the World Health Organisation (WHO) recommends that foods should be cooked to reach an internal temperature of at least 70°C. While the risk of infection from contaminated processed poultry products from outbreak areas has not been ascertained, certain countries, including the EU, have put trade restrictions in place as a precautionary measure to protect human and animal health.

5.5.2 Newcastle Disease

Newcastle Disease (ND) is a highly contagious viral disease of domestic poultry, cage and aviary birds, as well as wild birds. Infection is characterised by digestive, respiratory and/or neurological symptoms. Many European countries have been free of the disease for many years. However, it is still endemic in some countries. The last outbreak of ND on IOI occurred in 1997.

Although mild conjunctivitis and influenza-like symptoms have been reported in people who have been in contact with infected birds (those working in poultry processing plants and laboratories where infected birds have been handled), exposure through food is not considered a risk factor. The spread of the virus within bird populations is usually by contact with infected or diseased birds. The virus can be readily destroyed by heat but is also readily deactivated by soaps and detergents, hypochlorites, alkalis and gluteraldehyde. A minimum temperature of 80°C for one minute deactivates the virus in meat products.

There is no treatment for ND. The control strategy is immediate eradication of ND infected flocks and the disposal of infected or exposed products to remove the most dangerous source of the virus.

5.6 *Animal Welfare*

Animal welfare legislation protects all animals that interact with humans. Staff from the Veterinary Public Health Service of DAF and the Veterinary Service of DARD monitor and enforce welfare of animals' regulations during their regular visits to farms.

In June 2005, the European Commission adopted a proposed directive (for submission to the European Parliament) which marks the first in a series of minimum standards on farm animal welfare the European Commission wants to propose for MS and also marks the first time that the EU will set out legislation specifically targeting broilers. The latter will set out a maximum stocking density of 30 kg of broiler chickens per square metre and also a number of minimum conditions for the care of broiler chickens, including appropriate access to litter, drinkers, feed and ventilation. Farms will be allowed to stock up to 38 kg of broiler chickens per square metre if they provide additional welfare resources and if inspections at the slaughter stage continue to prove that the animals have not suffered any problems. There would be a minimum of two daily inspections, and any chickens that are seriously injured or in poor health must be treated or immediately culled. In addition to following the minimum standards set out in the legislation, farmers would also have to keep detailed records on issues such as house temperatures, medical treatments and mortality rates. Currently EU farmers must follow the general requirements of Directive 98/58/EC, which deals with the welfare of farm animals and also the legislation and codes of practice in the countries in which they are based. The proposal also requires the European Commission to report within two years on a possible mandatory labelling scheme based on compliance with the animal welfare standards in the directive.

Directive 91/628/EEC stipulates welfare conditions for the transport of animals and DAF and DARD monitor compliance through non-discriminatory checks. Compliance

with legislation on the transit of animals is ensured through specific roadside checks.

The EU adopted detailed welfare rules at slaughter in 1993 which are set down in Directive 93/119/EC on the protection of animals at the time of slaughter or killing and implemented in ROI by the European Communities (Protection for Animals at Time of Slaughter) Regulations, 1995 (S.I. No. 114 of 1995) and in NI by the Welfare of Animals (Slaughter or Killing) Regulations (Northern Ireland) 1996, as amended. Implementation of the Directive is the responsibility of DARD (through OVSSs) in NI and DAF (through VIs) in ROI.

CHAPTER 6 SUMMARY & CONCLUSIONS

6.1 Summary

Chicken is the protein source of choice for many consumers, both from a nutritional and cost perspective. Currently chicken is approximately half the price of beef on a comparable weight basis.

The chicken industry is highly integrated with a small number of companies dominating on IOI. This integration enables the industry and companies involved to have greater control, and introduce new protocols including food safety measures, with higher efficiency. In recent years, increasing imports from Third Countries, such as Brazil and Thailand, have been placing extra economic pressures on indigenous industry, and have forced the closure of some processing companies and redundancy in others.

While the chicken industry must contend with the growing levels of imports, it also must concern itself with other challenges such as the human and economic significance of *Campylobacter*. Evidence suggests that chicken is the single most significant carrier of food poisoning microorganisms causing illness in humans. The risk of illness through contamination of chicken with *Campylobacter*, and *Salmonella*, should be a concern of all parties from farm to fork.

While excellent efforts have been made throughout the chicken food chain in controlling *Salmonella* spp., particularly heat treatment of feed and on-going surveillance, the control of *Campylobacter* spp. presents a new set of challenges.

At farm level, there appears to be a relationship between aspects of bird husbandry and *Campylobacter* infection. In general terms, two strategies for the control of *Campylobacter* may be identified: preventing the entry of the bacterium into the flock and, improving the resistance of the birds to colonization. At the moment there are no viable alternatives to proper and sustained biosecurity. Once *Campylobacter* has infected at farm level, there is limited scope for further control efforts through subsequent stages in production and the supply chain.

Allied to biosecurity, is the concept of "all in, all out" system, rather than the use of thinning, which is considered to compromise biosecurity measures. Such a system has been advocated by both FSAI and FSA. However, market demands are for a range of chickens of different sizes and the industry currently does not have an economically viable alternative to thinning. To further support a move away from thinning, an increase of the coccidiostat Nicarbazin residues has been demonstrated following the process.

Both FSA and FSAI have recognised the significance of *Campylobacter*, and are currently implementing strategies to reduce the level of infection along the food chain. FSA has proposed to reduce the level of *Campylobacter* in UK produced chickens on retail sale by 50% by 2010. The main focus of this strategy is on the broiler farm, specifically through biosecurity measures. However, it also considers potential options for control at the slaughterhouse. In its 2002 report on the "Control of *Campylobacter* in the Food Chain", the FSAI made several recommendations including: improved biosecurity at farm level; improvement of monitoring by DAF of imports; and ongoing consumer information campaigns to highlight the danger of consuming contaminated meat.

Both qualitative and quantitative research conducted with consumers indicates that alongside food safety, the other issue that consumers considered to be of importance was labelling, and specifically country of origin.

The issue of country of origin is contentious. Market and economic statistics from 2003 demonstrate that the value of imports of poultrymeat into ROI was €187 million (figures from NI unavailable), and this is expected to increase substantially in the future. The growth in imports is sustained by the increase in demand on IOI for chicken, outstripping indigenous production, and the preference of consumers for white chicken meat.

Consumers identify country of origin with food safety, in the, unproven, belief that locally produced chicken is safer than imported. Quality assurance schemes, such as Bord Bia, use this concern to promote produce produced in ROI.

To assuage consumer concerns with regard to imported poultrymeat from Third Countries, it is important to recognise the role of the EU Food and Veterinary Office and Border Inspection Posts in the food chain. However, currently the frequency of sampling is still relatively low, suggesting that the opportunity may exist for non-compliant food to enter the food chain. In 2003, the FVO highlighted a number of deficiencies in the operation and management of BIPs.

From an industry perspective the main concern with regard to country of origin is economic. Production costs in Third Countries are significantly lower than on IOI, and the long-term concern is that the lower unit cost of chicken emanating from these countries will force overall prices down, and have major repercussions for IOI industry. At present, fresh chicken meat from Third Countries is only presented for sale as chicken pieces (i.e. fillets, thighs etc), some having undergone substantial transformation and being labelled country of origin IOI. Anecdotal evidence suggests that retailers on the island and in the UK are beginning to drive the import of whole chickens from Third Countries. One retailer is reputed to be proposing to import their own label frozen chicken range from Thailand (this will be dependent on a review of the ban on uncooked chicken from Thailand expected later in 2005); while another is looking at the possibility of importing "fresh" whole chickens from Brazil.

Meanwhile, 70% of all chicken meat used in the catering industry has been sourced from Third Countries; much of this imported as cooked meat from Thailand. Thus, while consumers give much time and effort to ensuring that they purchase IOI chicken from their retailer, there is no information provided to them (or onus put on the caterer to provide such) of the source of the chicken that they may purchase in their sandwich or in a restaurant meal. This is compounded by the lack of labelling requirements at the catering stage of the food chain.

Some retailers, particularly butchers and premises with butcher counters, can legitimately sell loose, unlabelled chicken, which may not be IOI of origin. The legislation stipulates that information regarding the produce including country of origin, must be displayed. Anecdotally this is often not the case.

Substantial transformation is an issue of concern to consumer organisations and is one that the current Minister of Agriculture and Food in ROI has put on the agenda. Regulatory bodies consider this is a customs issue and not a food safety one. Consumers do not understand this contentious trade issue and are being misled with regard to the country of origin of the chicken that they purchase.

From an international trading perspective, country of origin is seen as a barrier to trade and not widely endorsed.

6.2 *Conclusions*

6.2.1 *At Farm Level*

- Much effort has been spent in ensuring that the grandparent stock and their offspring are disease free. The industry has also been proactive in identifying the potential risks to its business and the safety of the food chain. However, there remain a number of critical issues.
- Biosecurity on farms is at the corner stone of food safety along the food chain, particularly in relation to *Campylobacter*. The cessation of the

practice of thinning would appear to be a prudent step towards minimising the risks of *Campylobacter* at farm level, until such time that more is known about the route of infection or a suitable preventative measure is available.

- Best practice models, such as that in Iceland, should be considered in attempts to reduce the burden of *Campylobacter* infection at farm level.
- The heat treatment of feed has been shown to be an effective step in the control of *Salmonella* and levels of animal infection and human salmonellosis have been on the decrease in recent years. There is merit in the introduction of mandatory heat treatment in NI. Best practice evidence from countries such as Denmark and Sweden, suggest that the decrease in human salmonellosis is the direct result of the control programmes put in place at farm level.
- Surveillance of both *Campylobacter* and *Salmonella* is essential to the control of these microorganisms.
- The acceptability of the use of antimicrobial procedures, such as irradiation, should be investigated amongst consumers.
- Toxicological data supports the cessation of thinning with respect to a potential reduction in Nicarbazin residues.
- There is substantial evidence to support the use of the double bin system as a precautionary approach to the reduction of Nicarbazin residues.
- The issue of GM status of feed is of concern to producers, particularly those involved in organic chicken production. This is also an area that the consumer is often provided with very little information.

6.2.2 Transport from Farm to Slaughterhouse

- The high integration of the industry on IOI means that most slaughterhouses are within close proximity of broiler farms. However, this remains a stressful process for the birds, leading to a potential high

cross-contamination situation. Evidence suggests that current washing procedures used for crates are not sufficiently adequate to remove pathogenic microorganisms. This is a step, which could improve the microbiological load of animals entering the processing plants, and efforts would be well spent trying to reduce potential contamination.

6.2.3 Primary Processing

- The processing industry is highly efficient. In modern processing plants, the time that it takes from when the chicken is stunned and slaughtered, to the time that chicken meat is packed and placed in storage for distribution, can be less than 2 hours.
- In an ideal world, pathogen free chickens should be presented for slaughter. However, the reality is somewhat different, and the processing environment is highly susceptible to cross-contamination from infected birds.
- Even when steps are taken to reduce the pathogenic load of chickens coming from broiler farms, protocols within the processing plant can undo this. The slaughtering and processing of organic chickens (where there may be potentially higher infection rates *Campylobacter* levels) without subsequent decontamination of the line, poses a potential serious risk of cross-contamination within the plant. This area warrants further investigation.
- The importance of HACCP and training within the processing environment is critical to the successful elimination and containment of potentially pathogenic microorganisms. New legislation coming into force in 2006, places even more emphasis on the duty of care of a Food Business Operator to produce safe food.

6.2.4 Retail and Catering

- The retailer and caterer represent the front line of the food industry to consumers. Therefore, both sectors must do all within their powers to take the appropriate steps of ensuring food safety.
- As with the processing industry, HACCP and training are at the core of good food safety practice. The influx of non-nationals into IOI, and their uptake, in large numbers, of employment within the food sector, has put even more emphasis on the need for training, including that within their native languages. The FSA and FSAI, and some members of the food sector, are to be commended for their proactive work in this respect.
- Surveillance of chicken and chicken products within the sectors over recent years has indicated that the levels of *Salmonella* positive samples are declining, while the numbers of *Campylobacter* positive samples has remained static. There is little that the catering and retail sectors can do once presented with raw chicken, which is positive for pathogenic microorganisms, other than ensure that all steps are taken to prevent cross-contamination and that foods are properly cooked.
- Current legislation states that all raw poultrymeat for sale at retail level must be labelled to include information in respect of class, price per weight, country of origin, etc. In butchers' shops and butcher counters in ROI, where loose produce is sold, this information must also be made available to the consumer. Anecdotal evidence suggests that this information is not readily available to the consumer, and neither is it enforced by the regulatory agencies. In NI, the only requirement for poultry meat sold loose, is that the name of the product is displayed.
- There is currently no legislative onus on caterers to label their produce. Approximately, 70% of all chicken meat used in the catering trade is sourced from Third Countries. Consumers have identified country of origin as a major concern. The lack of information emanating from the catering sector on this and other information with respect to the product,

such as ingredient listing and nutrition information, serves only to misinform the consumer, or prohibit them from making informed choices.

- The proposed move by the Netherlands to label raw chicken products with a warning that it contains potentially pathogenic bacteria is a strong positive step towards the protection of public health and is to be commended.
- There is an onus on the industry and enforcement agencies to ensure, not only that meat coming from Third Countries is safe, but that also the consumer is not misled about the source of this meat through loops in the system, such as substantial transformation

6.2.5 In the Home

- The consumer may be described as an important link in the chicken food chain. All other steps of the chain are regulated by legislation and industry codes of practice, and are monitored and audited on a regular basis.
- Consumers should be advised with respect to the correct handling, storage and preparation of foods. This extends to steps taken to eliminate the potential risk of cross-contamination from raw to ready-to-eat foods. This advice should include information with respect to the following points:
 - Research suggests that consumers have significant understanding and awareness of the potential levels of *Salmonella* in chicken and its consequences. An education campaign should be undertaken to raise consumer awareness of *Campylobacter*.
 - Research has shown that packaging of chicken products is contaminated with *Salmonella* and *Campylobacter*, so consumers should make sure that all surfaces, including hands and utensils, are cleaned to prevent cross-contamination.

- The common practice of washing chicken breast fillets and whole chickens, which was identified in the focus groups, should be discouraged. Such products, prepared for direct sale to consumers, are “oven ready” and do not require further washing. Washing of such poultry creates aerosols, increasing the risk of cross-contamination.
- The proper and adequate cooking of foods will eliminate the risk of illness from contaminated chicken. This involves cooking chicken until the food is piping hot throughout, ensuring that there is no pink meat remaining and the juices run clear. Practices such as “relying on taste” should be discouraged.
- The use of food thermometers is not widespread on IOI. Consumers should be advised that these are the most reliable method to check that foods, including chicken, are cooked properly.
- All foods should be stored in a refrigerator at less than 5°C.
- Growth of pathogenic bacteria can be increased by a significant time delay in the transport of perishable foods to and/or from the home and also by incorrect storage during this time. Raw poultry should be packed in separate bags or containers away from others to avoid potential cross-contamination. The use of insulated bags or freezer bags is recommended during transportation. Food should be refrigerated, cooked or frozen as soon as possible following purchase.
- The nutritional benefits of chicken can be compromised by the ingredients and methods employed in the manufacturing/cooking process. There should be an emphasis placed on the importance of reading labels on commercially processed foods, cooking methods and the incorporation of fresh vegetables and starchy foods in meals prepared in the home.

6.2.6 Surveillance and Controls

- The introduction of the Zoonoses Directive and the new Hygiene Package are welcome developments towards the protection of human health.
- To further enhance the understanding of *Campylobacter* infection, detailed typing data of human isolates, as well as those from food and animals would be welcome.
- In some instances, little scientific significance can be drawn from surveillance data due to the low number of samples. This is both from a microbiological and toxicological perspective.
- The harmonisation of mycotoxin limits in MS (and indeed worldwide) would be a welcomed measure, as it is recognised that mycotoxins can cause major illness in humans and animals, as well as significant economic losses for the poultry industry.

As mentioned at the outset of this chapter, chicken is the protein source of choice for consumers. From the focus groups, consumers did not wish to be made aware of any issues with respect to chicken, which might “put them off”. However, it is important that the consumer is made aware of these risks, so that they may take the necessary preventative steps to reduce the risk of foodborne illness, from this otherwise healthy commodity.

Appendix A

Main Points of Difference Between Poultry Meat Production Systems¹³¹

	Production System		
	Intensive Conventional	Free-range	Extensive Organic
Minimum age at slaughter (days)	None, generally 35-45	56	81 (if not slow growing)
Breed specification	None	None	None as such, but slow growing preferred
Max house stocking density (fixed housing)	34.0kg LW/m ²	13b/m ² or 27.5kg LW/m ²	10b/m ² (fattening) max 21kg LW/m ² .
Flock Size	Unlimited	Unlimited	4800 chickens per poultry house, and max 1600m ² /unit
Access to range	Not required	Continuous daytime access required for at least half their lifetime	Weather permitting, for at least 1/3 of their life
Pasture allowance	None	1m ² /bird	Min. 4m ² /bird
Feed specification	None	Finisher contains at least 70% cereals	At least 65% cereals, no synthetic amino acids, 100% organic ingredients. However a derogation exists that allows 15% from non-organic sources.

Key:

b = birds kg = kilogram m² = metres squared
 ha = hectare LW = live weight N = Nitrogen

¹³¹ Organic Poultry Production in Ireland, Problems and Possible Solutions, May 2004 http://www.agriculture.gov.ie/organics/publications/organic_poultry_report.pdf. The data contained within this table has been updated since the original publication date. Specific requirements for each of the poultry meat production systems can be found in the relevant piece of EU legislation; namely Council Regulation 1538/91, as amended, and for organic birds (Council Regulation 2092/91, as amended).

Appendix B

Organic Certification Bodies on IOI

DAF in ROI has approved three organic organisations for certification and inspection services, namely

- (i) Bio-dynamic Agricultural Association of Ireland (“Demeter”),
- (ii) Irish Organic Farmers and Growers Association (IOFGA), and
- (iii) Organic Trust Ltd.

DARD in NI has approved three organic organisations in addition to the above:

- (iv) Soil Association,
- (v) Organic Farmers and Growers, and
- (vi) Organic Food Federation.

Appendix C

Principles of HACCP

1. Conduct a hazard analysis.
2. Determine the Critical Control Points (CCPs).
3. Establish critical limit(s).
4. Establish a system to monitor control of the CCP.
5. Establish the corrective action to be taken when monitoring indicates that a particular CCP is not under control.
6. Establish procedures for verification to confirm that the HACCP system is working effectively.
7. Establish documentation concerning all procedures and records appropriate to these principles and their application.

Appendix D

Food Hygiene Package

The new Food Hygiene Package comprises the following legislation:

- Regulation 852/2004 on the hygiene of foodstuffs.
- Regulation 853/2004 laying down specific hygiene rules for food of animal origin.
- Regulation 854/2004 laying down specific rules for the organisation of official controls on products of animal origin intended for human consumption.
- Directive 2002/99 laying down the animal health rules governing the production, processing, distribution and introduction of products of animal origin for human consumption.
- Directive 2004/41 repealing certain directives concerning food hygiene and health conditions for the production and placing on the market of certain products of animal origin intended for human consumption and amending Council Directives 89/662 and 92/118 and amending Decision 95/408.

Appendix E

Main Provisions of the Hygiene of Foodstuffs Regulations 2000 (S.I. No. 165 of 2000) – ROI

- The obligation is on the proprietor of the food business to ensure the business is carried out in a hygienic way. This includes all aspects of the business from the storage and transport of food, to its final preparation for sale or supply. This also includes requirements for premises, equipment, personal hygiene and training.
- The proprietor is obliged to develop and implement a food safety control system based on the principles of HACCP.
- The HSE area of the food premises shall enforce the regulations through assessment of the general hazards and the controls implemented. An EHO, on behalf of the HSE, may inspect food premises at any time, in order to ensure compliance with the Regulations.
- Procedures upon failure to comply with regulations along with any penalties liable are given.
- The Regulations give both specific and general requirements for food premises. For example, part one of the schedule relates to the layout and design of a food business with reference to cleaning facilities, ventilation, lighting and changing facilities.
- The onus is on the proprietor to ensure food handlers are trained in food hygiene matters commensurate with their work activity.

Appendix F

Typical Composition of Chicken Feed

The feed used in the broiler industry on IOI, for conventionally-grown, free-range and organically-grown chicken, is primarily based on GM-free European wheat. Barley is also added, but the proportion used is dependent on the market value at any given time. The wheat and barley fraction usually represents about 64% by weight. Free-range chickens are required by legislation to receive at least 70% cereal in the diet. The protein content of the feed is contributed by both high protein soya and full fat soya (about 22% by weight) as well as full fat rapeseed or rapeseed extract and peas (about 8% by weight). Together with animal- or vegetable-based tallow and soya oil (about 3% by weight), these products account for approximately 90% of the ingredients in broiler feed. The tallow and soya are added to improve the taste and texture of the feed. Tallow can be of animal fat origin (bovine, ovine, porcine or avian) or a blend of palm oil and mixed soft mid-oils which are themselves by-products of vegetable oil production. The remaining 10% of ingredients consists of limestone flour and dicalcium phosphate that act as calcium supplements as well as other nutritional supplements including vitamins, minerals and amino acids

Appendix G

Authorised Additives Permitted In Broiler Feed under Article 9t (B) Of Council Directive 70/524/EEC

Technological additives

Forty eight emulsifying and stabilising agents, thickeners and gelling agents are authorised for an unlimited period including Lecithins (E322), Alginate acid (E400), Sodium alginate (E401), Potassium alginate (E402), Ammonium alginate (E403), Calcium alginate (E404) Propane-1,2-diol alginate (Propyleneglycol alginate: E405), Agar (E406), Carrageenan (E407), Locust bean gum (Carob gum: E410), Tamarind seed flour (E411), Guar gum (E412), Tragacanth (E413), Acacia (Gum Arabic: E414), Xanthan gum (E415), Sorbitol (E420), Mannitol (E421), Glycerol (E422), Pectins (E440), Microcrystalline cellulose (E460), Cellulose powder (E460ii), Methylcellulose (E461), Ethylcellulose (E462), Hydroxypropylcellulose (E463), Hydroxypropylmethylcellulose (E464), Ethylmethylcellulose (E465), Carboxymethylcellulose (Sodium salt of carboxymethyl ether of cellulose: E466), Sodium, potassium and calcium salts of edible fatty acids, alone or in mixtures, derived either from edible fats or from distilled edible fatty acids (E470), Mono- and di-glycerides of fatty acids (E471), Mono- and di-glycerides of edible fatty acids esterified with the following acids: (a) acetic, (b) lactic, (c) citric, (d) tartaric, (e) mono- and diacetyltartaric (E472), Sucrose esters of fatty acids (esters of saccharose and edible fatty acids: E473), Sucroglycerides (mixture of esters of saccharose and mono- and di-glycerides of edible fatty acids: E474), Polyglycerol esters of non-polymerised edible fatty acids (E475), Mono-esters of propane-1,2-diol (propyleneglycol) and edible fatty acids, alone or in mixtures with diesters (E477), Stearoyl 2-lactylic acid (E480), Sodium stearoyl 2-lactylate (E481), Calcium stearoyl 2-lactylate (E482), Stearyl tartrate (E483), Glyceryl polyethyleneglycol ricinoleate (E484), Dextrans (E486), Propane-1,2-diol (E490), Sorbitan monostearate (E491), Sorbitan tristearate (E492), Sorbitan monolaurate (E493), Sorbitan monooleate (E494), Sorbitan monopalmitate (E495),

Polyethyleneglycol 6 000 (E496) and Polyoxypropylene-polyoxyethylene polymers of molecular weight 6 800-9 000 (E497).

Thirty two preservatives are authorised for an unlimited period including Sorbic acid (E200), Sodium sorbate (E201), Potassium sorbate (E202), Calcium sorbate (E203), (Formic acid (E236), Sodium formate (E237), Calcium formate (E238), Acetic acid (E260), Potassium acetate (E261), Sodium diacetate (E262), Calcium acetate (E263), Lactic acid (E270), Propionic acid (E280), Sodium propionate (E281), Calcium propionate (E282), Potassium propionate (E283), Ammonium propionate (E284), Ammonium formate (E295), DL-Malic acid (E296), Fumaric acid (E297), Sodium lactate (E325), Potassium lactate (E326), Calcium lactate (E327), Citric acid (E330), Sodium citrates (E331), Potassium citrates (E332), Calcium citrates (E333), L-tartaric acid (E334), Sodium L-tartrates (E335), Potassium L-tartrates (E336), Potassium sodium L-tartrate (E337), Orthophosphoric acid (E338)

Eighteen Binders, anti-caking agents and coagulants are authorised for an unlimited period including Citric acid (E330), Sodium, potassium and calcium stearates (E470), Calcium sulphate, dehydrate (E516), Silicic acid, precipitated and dried (E551a), Colloidal silica (E551b), Kieselgur (E551c), Calcium silicate, synthetic (E552), Sodium aluminosilicate, synthetic (E554), Bentonite-montmorillonite (E558), Kaolinitic clays, free of asbestos (E559), Natural mixtures of steatites and chlorite (E560), Vermiculite (E561), Sepiolite (E562), Sepiolitic clay (E563), Lignosulphonates (E565), Natrolite-phonolite (E566), Synthetic calcium aluminates (E598) and Perlite (E599). The mixing of E558 (Bentonite-montmorillonite) with additives from the 'antibiotics', 'growth promoters', 'coccidiostats and other medical substances' groups is prohibited, except in the case of: monensin-sodium, narasin, lasalocid-sodium, flavophospholipol, salinomycin sodium and robenidine. Authorisations for two compounds – Clinoptilolite of volcanic or sedimentary origin – expired in 2004 while authorisation of Sodium Ferrocyanide (E535) and Potassium Ferrocyanide (E536) expire in 2006.

Sensory additives

All natural flavouring and appetising products and corresponding synthetic flavouring and appetising products are authorised for an unlimited period. Colourants, including pigments authorised for an unlimited period include Capsanthin (E160c), Beta-apo-8i-

carotenal (E160e), Ethyl ester of beta-apo-8i-carotenoic acid (E160f), Lutein (E161b), Cryptoxanthin (E161c), Canthaxanthin (E161g) and Zeaxanthin (E161h), Patent blue V (E131), Acid brilliant green BS (Lissamine green: E142) and those colouring agents authorised for colouring foodstuffs by Community rules, other than Patent blue V, Acid brilliant green BS, and Canthaxanthin as well as Canthaxanthin authorised for colouring foodstuffs by Community rules.

Nutritional additives

Antioxidant substances which are authorised for an unlimited period include L-Ascorbic acid (E300), Sodium L-ascorbate (E301), Calcium L-ascorbate (E302), 5,6-Diacetyl-L-ascorbic acid (E303), 6-Palmitoyl-L-ascorbic acid (E304), Tocopherol-rich extracts of natural origin (E306), Synthetic alpha-tocopherol (E307), Synthetic gamma-tocopherol (E308), Synthetic delta-tocopherol (E309), Propyl gallate (E310), Octyl gallate (E311), Dodecyl gallate (E312), Butylated hydroxyanisole (BHA: E320), Butylated hydroxytoluene (BHT: E321) and Ethoxyquin (E324).

Two vitamins - Vitamin A (E672) and Vitamin D3 (E671) – are authorised for use with defined upper limits of addition in the category 'vitamins, provitamins and chemically well-defined substances having similar effect'. All other substances in this group in addition to vitamins A and D are also authorised. These are authorised for an unlimited period as are the trace elements iron (E1), iodine (E2), cobalt (E3), copper (E4), manganese (E5), zinc (E6), molybdenum (E7) and selenium (E8) for which the maximum content for the complete feedingstuff is specified.

Zootechnical additives

A total of ten enzymes, produced by a variety of microorganisms, are authorised for use as feed additives either singly or in various combinations. These include Alpha-amylase (EC 3.2.1.1), 3 Alpha-galactosidase (EC 3.2.1.22), Bacillolysin (EC 3.4.24.28), Endo-1,3(4)-betaglucanase (EC 3.2.1.6), Endo-1,4-betaglucanase (EC 3.2.1.4), Endo-1,4-beta-xylanase (EC 3.2.1.8), 3-Phytase (EC 3.1.3.8), 6-Phytase (EC 3.1.3.26), Polygalacturonase (EC 3.2.1.15) and Subtilisin (EC 3.4.21.62). The authorisation period for most combinations expired in 2004 / 2005 with the exception of one 3-Phytase and one Endo-1,3(4)-betaglucanase / Endo-1,4-beta-xylanase combination which are authorised for use under specific conditions for an unlimited period. Enzymes

act as digestive aids and are beneficial in the case of wheat-based diets where the risk of necrotic enteritis is enhanced. The addition of enzymes can also serve to negate any differences in apparent metabolisable energy that can exist between different batches of wheat thereby improving broiler body weight uniformity. Xylanase has been shown to have a bacteriostatic effect, especially with regard to campylobacter while phytase can reduce phosphorous excretion¹⁵. Proteases, amylases and lipases can assist in the metabolism of protein, carbohydrate and fat, respectively.

A number of micro-organisms are authorised for use as feed additives and in this regard function as gut flora stabilisers. These include *Bacillus cereus* var. *toyoi* (NCIMB 40112/CNCM I-1012), *Enterococcus faecium* (ATCC 53519) + *Enterococcus faecium* (ATCC 55593) (1:1 ratio), *Enterococcus faecium* (NCIMB 10415), *Enterococcus faecium* (DSM 5464), *Enterococcus faecium* (DSM 10 663/ NCIMB 10 415), *Bacillus licheniformis* (DSM 5749) + *Bacillus subtilis* (DSM 5750) (1:1). These micro-organisms are not contraindicated with coccidiostats.

Coccidiostats and histomonstats

Coccidiostats and other medicinal substances authorised for use as feed additives in chicken feed within the EU include Maduramicin Ammonium (E770), Diclazuril (E771), and a 1:1 w/w mixture of Narasin and Nicarbazine (E772) which are authorised until 30th September 2009. Also authorised until this date is the antibiotic Avilamycin (E717). Semduramicin sodium (no E number) is authorised until June 1st 2006 while Flavophospholipol (E756), Decoquinatate (E756), Monensin sodium (E757), Robenidine (E758), Lasalocid sodium (E763), Halofuginone (E764), Narasin (E765) and Salinomycin sodium (E766) are due to be phased out, as coccidiostats, by 31st December 2012.

Appendix H

Coccidiostatic Drugs Sanctioned for Use in the Broiler Industry on IOI.

ROI	Classification	Concentration in feed / drinking water	EU ADI (mg/kg bw/day)	EU MRL mg/kg	WP (days)
Avilamycin	ZFA, Antibiotic growth promoter	2.5-10 mg/kg	1 ²	0.05	Not necessary
Decoquinate	MFS, Coccidiostat	20-40 mg/kg	0.075 ³	Not established	3
Diclazuril	ZFA, Coccidiostat	1 mg/kg	0.03 ⁴	Not necessary	5
Flavophospholipol	ZFA, Antibiotic growth promoter	1-20 mg/kg	Unavailable	Unavailable	Unavailable
Halofuginone	ZFA, Coccidiostat	2-3 mg/kg	Not established	Not established	5
Lasalocid sodium	ZFA, Ionophore Coccidiostat	75-125 mg/kg	0.005 ⁵	Not established	5
Maduramycin ammonium	ZFA, Ionophore Coccidiostat	5 mg/kg	0.002 ⁶	Not established	5
Monensin sodium	ZFA, Ionophore Coccidiostat	100-125 mg/kg	0.003 ⁷	0.05	3
Narasin	ZFA, Ionophore Coccidiostat	60-70 mg/kg	0.005 ⁸	0.05	1
Nicarbazin in Maxiban	ZFA, Coccidiostat	40-50 mg/kg	0.4	0.2 ⁹	5
Robenidine hydrochloride	ZFA, Coccidiostat	30-36 mg/kg	0.0375 ¹⁰	Not established	5
Salinomycin sodium	ZFA, Ionophore Coccidiostat	50-70 mg/kg	0.005 ¹¹	0.005	1
Semduramycin sodium	ZFA, Ionophore Coccidiostat	20-25 mg/kg	Unavailable	Unavailable	5
Sulfadimidine sodium	POM, Antiprotozoal	1 g / 1-2 L water	Unavailable	Unavailable	14
Toltrazuril	POM, Antiprotozoal	≤75 mg / L water	0.002 ¹²	0.1-0.6	14

ZFA: Zootechnical feed additive, MFS: medicated pre-mix requiring an MFS prescription, POM: prescription only medicine

2. Australian evaluation and approval for Avilamycin, Public Release Summary Evaluation of the new active Avilamycin in the product Elanco AF0375 Surmax 100 Avilamycin premix, Australian Pesticides and Veterinary Medicines Authority
3. Opinion of the Scientific Panel on Additives and Products or Substances used in Animal Feed on a request from the Commission on the coccidiostat DECCOX in accordance with article 9G of Council Directive 70/524/EEC. (Question No EFSA-Q-2003-044), The EFSA Journal (2003) 17, 1-40
4. Arnold, D, World Health Organisation (WHO)/Food & Agriculture Organisation (FAO) Joint Expert Committee on Food Additives (JECFA) evaluation of Diclazuril Federal Institute for Health Protection of Consumer and Veterinary Medicine, Berlin, FRG.
5. Update¹ of an opinion² of the Scientific Panel on Additives and Products or Substances used in Animal Feed on the re-evaluation of coccidiostat Avatec in accordance with article 9G of Council Directive 70/524/EEC, (EFSA-Q-2004-076), The EFSA Journal (2004) 77, 1-45
6. US FDA evaluation and approval for Maduramycin ammonium, NADA 139-075, February 2, 1989
7. Opinion of the Scientific Panel on Additives and Products or Substances used in Animal Feed on the request of the Commission on the re-evaluation of coccidiostat Elancoban in accordance with article 9G of Council Directive 70/524/EEC (EFSA-Q-2003-0045), The EFSA Journal (2004), 42, 1-61
8. Opinion of the Scientific Panel on Additives and Products or Substances used in Animal Feed on a request from the Commission on the re-evaluation of efficacy and safety of the coccidiostat Monteban® G100 in accordance with article 9G of Council Directive 70/524/EEC (Question No. EFSA-2003-046), The EFSA Journal (2004), 90, 1-44
9. Wells, RJ, World Health Organisation (WHO)/Food & Agriculture Organisation (FAO) Joint Expert Committee on Food Additives (JECFA) evaluation of Nicarbazin, Australian Government Analytical Laboratories, Australia.
10. Opinion of the Scientific Panel on Additives and Products or Substances used in Animal Feed on a request from the Commission to update the opinion on the safety of "Cycostat 66G" based on robenidine hydrochloride, as a feed additive in accordance with Council Directive 70/524/EEC (Article 9g), (Question No EFSA-Q-2004-108), The EFSA Journal (2004) 98, 1 - 4
11. Opinion of the Scientific Panel on Additives and Products or Substances used in Animal Feed on a request from the Commission on the safety and the efficacy of product "BIO-COX 120G" as feed additive in accordance with Council Directive 70/524/EEC (Question No EFSA-2003-009), The EFSA Journal (2004), 75, 1-51
12. Commission regulation (EC) No 1916/98 of 9 September 1998 amending Annexes I and II to Council regulation (EEC) No 2377/90 laying down a Community procedure for the establishment of maximum residue limits of veterinary medicinal products in foodstuffs of animal origin (OJ L 250, 10.9.1998, p. 8).

Appendix I

Veterinary Pharmaceutical Products Authorised for Use in Broiler Chickens in ROI

Product	Active Ingredient(s)	Target micro organisms / diseases	Dosing regimen (days)	Withdrawal Period (days)	Micro ADI µg/kg bw/day	Tox ADI µg/kg bw/day	MRL µg/kg
Uniprim Premix	150 Sulphadiazine (12.5% w/w)	E. coli, Salmonella, Pasteurella multocida / Septicaemic infections	10	1	Not available	Not available	100 (muscle, kidney, liver & skin+fat)
	Trimethoprim (2.5% w/w)						50 (muscle, kidney, liver, skin+fat)
Linco-Spectin Soluble	100 Spectinomycin (66.7g/150g)	Broad activity including E.coli & Micoplasma / Chronic respiratory disease	≤ 7	7	40	250	300 (muscle) 5000 (kidney) 1000 (liver) 500 (skin+fat)
	Lincomycin (33.3g/150g)						1300 (muscle) 1500 (kidney) 500 (liver) 50 (skin+fat)
Baycox 2.5%	Toltrazuril (25mg/ml)	Coccidia species	2	14	Not established	2	100 (muscle) 400 (kidney) 600 (liver) 200 (skin+fat)
Baytril 10% Oral Solution	Enrofloxacin	Broad activity including Micoplasma & Chronic respiratory disease	≤ 5	28	6.2	30	100 (muscle) 300 (kidney) 200 (liver) 100 (skin+fat)
Tylan Soluble	Tylosin tartarate	Broad activity including Micoplasma / Necrotic enteritis & Chronic respiratory disease	≤ 5	1	6	500	100 (muscle, kidney, liver, skin+fat)
Apralan Soluble	Apramycin sulphate (≤1000g activity per container)	Broad activity / E.coil septicaemia & Salmonellosis	5	7	40	250	Not needed
Pulmotil AC	Tilmicosin (250 mg/ml)	Broad activity / Respiratory infections	3	12	4	40*	75 (muscle) 250 (kidney) 1000 (liver) 75 (skin+fat)
Tribrissen Suspension	Oral Sulphadiazine (400 mg/ml)	Broad activity / Respiratory infections	5	5	Not available	Not available	100 (muscle, kidney, liver & skin+fat)
	Trimethoprim (80 mg/ml)						50 (muscle, kidney, liver, skin+fat)
Flubenol	5% Flubendazole	Nematode & cestode infections	7	7	Not available	12	50 (muscle)

Premix	(5% w/w)	of GIT and RT						300 (kidney) 400 (liver) 50 (skin+fat) Not applicable
Collovet	Caffeine citrate (1.20 % w/v) Iron (0.42 % w/v) Thiamine HCl (0.02 % w/v)	General tonic	Not specified	28	Not applicable	Not applicable		
Aurogran Premix	10% Chlortetracycline HCl (10% w/v)	Broad activity / E.coil septicaemia, Infectious bursal disease, Chronic respiratory disease	≤ 7	3	0-3	Not available		100 (muscle) 600 (kidney) 300 (liver)
Aurofac Granular Premix	100 Chlortetracycline HCl	Chronic respiratory disease & fowl cholera		1	0-3	Not available		100 (muscle), 600 (kidney), 300 (liver)
Aureomycin Soluble Powder	Chlortetracycline HCl (5.5 % w/v)	Broad activity / Respiratory, enteric & systemic infections	≤ 7	1	0-3	Not available		100 (muscle) 600 (kidney) 300 (liver)
Trimediazine Premix	15 Sulphadiazine (12.5% w/w) Trimethoprim (2.5% w/w)	Broad activity / Pasteurellosis	10	1	Not available	Not available		100 (muscle, kidney, liver & skin+fat) 50 (muscle, kidney, liver, skin+fat)
Amoxinsol 50	Amoxicillin trihydrate (50 % w/v)	Broad activity / Respiratory & enteric infections	≤ 5	2	Not available	Not available		50 (muscle, kidney, liver, skin+fat)***
Chlorsol 50	Chlortetracycline (50 % w/v)	Broad activity / Colibacillosis secondary to Infectious bursal disease & Chronic respiratory disease	≤ 5	3	0-3	3**		100 (muscle) 600 (kidney) 300 (liver)
Aluspray	Aluminium (4 % w/w)	Wound healing & antimicrobial properties	Not applicable	0	Not applicable	Not applicable		Not necessary
Sulfadimidine Sodium	Sulfadimidine (100% w/v)	Broad activity including Coccidia	3	14	Not available	Not available		100 (muscle, kidney, liver & skin+fat)
Erythrocin soluble	Erythromycin (11.56 g/70 g)	Broad activity / Micoplasma-induced Chronic respiratory disease	≤ 5	6	5	Not available		200 (muscle, kidney, liver & skin+fat)
Flumisol oral	Flumequine (100 mg/ml)	Gram negative including Colibacillosis & Salmonella	5	2	8.25	25		400 (muscle) 1000 (kidney) 800 (liver) 250 (skin+fat) 50 (muscle, kidney, liver, skin+fat)
Paracillin SP	Amoxicillin trihydrate (697 mg/g)	Broad activity including viral & micoplasma infections	≤ 5	1	Not available	Not available		300 (muscle) 600 (kidney) 1900 (liver) 400 (skin+fat)
Dicural oral	Difloxacin HCl (100 mg/ml)	E. coli & Micoplasma-induced Chronic respiratory disease	5	1	40.6	10		

Data source EMEA profiles

* Tilmicosin (WHO Food Additives Series 38) JECFA review; IPCS INCHEM 1996

** A toxicological ADI of 3 mg/kg bw/day was established based on effects on human gut flora.

*** Amoxicillin trihydrate MRL taken from New Zealand (Maximum Residue Limits of Agricultural Compounds) Food Standards 2005

Appendix J

Analysis of Additives, Pre-mixtures and Compound Feedingstuffs used in the Poultry Industry (Broilers & Layers) for Undesirable Substances and Products: ROI 2003

Type of analysis			Total samples analysed	Non-compliances
Undesirable substance	Heavy metals	Arsenic	0	0
		Cadmium	1	0
		Lead	2	0
		Mercury	2	0
	Dioxins and PCBs	Dioxins (PCDD + PCB)	0	0
		Dioxin-like PCBs	0	0
	Mycotoxins	Aflatoxin B1	1	0
		Deoxynivalenol	0	0
		Ochratoxin A	0	0
		Zearalenone	0	0
Micro-organisms	Micro-organisms	Salmonella	14	0
Unauthorised substances and products	PAP	PAP terrestrial origin	139	0
		PAP fish origin	139	0
	Other unauthorised	Other*	9	0

* These include some or all of the unauthorised antibiotics zinc bacitracin, virginiamycin, dimethridazole, carbadox and tylosin phosphate

Appendix K

Results of the 2003 National Residue Monitoring Programme, Republic of Ireland

Chemical group	Poultry samples analysed	Positive samples
Group A - (Prohibited Substances) Substances having anabolic effect and unauthorised substances		
Stilbenes, stilbene derivatives, and their salts and esters	67	0
Antithyroid agents	24	0
Steroids	75	0
Resorcylic acid lactones including zeranol	71	0
Beta-agonists	72	0
Substances which have been banned because they pose a risk to human health	209	0
Total analysed	518	0
Group B - Veterinary Drugs and Contaminants: B1 - Antibacterial substances, including sulphonamides, quinolones		
Antibacterial substances, including sulphonamides, quinolones	1890*	0
Group B - Veterinary Drugs and Contaminants: B2 - Other veterinary drugs		
Anthelmintics	75	0
Anticoccidials, including nitroimidazoles	97	0
Carbamates and pyrethroids	28	0
Sedatives	0	0
Non-steroidal anti-inflammatory drugs (NSAIDs)	10	0
Other pharmacologically active substances	0	0
Total analysed	210	0
Group B - Veterinary Drugs and Contaminants: B3 - Other substances and environmental contaminants		
Organochlorine compounds	27	0
Organophosphorus compound	0	0
Chemical elements	31	0
Mycotoxins	12	0
Others	0	0
Total analysed	70	0
Overall total analyses	2688	0

Includes samples taken under joint FSAI/DAF programme

GLOSSARY

POULTRY CLASSIFICATION

Broiler: young chicken being raised for meat or alternatively fowl in which the tip of the sternum is flexible (not ossified).

Capon: male fowl castrated surgically before reaching sexual maturity and slaughtered at a minimum age of 140 days; after castration the capons must be fattened for at least 77 days.

Chicken: the domestic fowl, *Gallus domesticus*, family Phasianidae. Birds including chicks, broilers, hens, pullets, cockerels and cocks.

Cock: mature male chicken or other fowl.

Cock, Hen, Casserole or Boiling Fowl: fowl in which the tip of the sternum is rigid (ossified).

Cockerel: male chicken less than one year old.

Hen: mature female bird (e.g. chicken, turkey).

Poussin, Coquelet: chicken of less than 650g carcass weight (expressed without giblets, head and feet), chicken of 650g to 750g may be called 'poussin' if the age at slaughter does not exceed 28 days.

Young Cock: male chicken of laying strains in which the tip of sternum is rigid but not completely ossified and for which the age at slaughter is at least 90 days.

GENERAL

Acceptable Daily Intake: the amount of a particular chemical in food which, based on all facts known at the time, is thought not to present any possibility for adverse health effects if ingested daily over a lifetime.

ADI = NOEL x 10 (Interspecies uncertainty) x 10 (safety factor)

Accompanied Shop: a market researcher accompanies a member of the public on a shopping trip in order to gain some understanding into what triggers and impacts on a purchasing decision.

Air Chilling: method of chilling used in which the carcass is chilled in cold air.

Air-Spray Chilling: method of chilling used in which the carcass is chilled in cold air interspersed with a water haze or fine water spray.

Biosecurity: the prevention of disease-causing agents entering or leaving any place where they can pose a risk to farm animals, other animals, humans, or the safety and quality of a food product.

CMi: a company involved in Consulting & Technical Services and also Certification, specialising in the certification of recognised food industry standards.

Competent Authority: the central authority of a Member State competent to carry out veterinary checks or any authority to which it has delegated that competence.

Derogation: the partial taking away of the effectiveness of a law or a partial repeal or abolition of a law.

EFSIS: a third party independent inspection and certification service.

Extensive Indoor Broiler Flocks: broilers produced in a less intensive rearing system (than conventional) in a confined environment with a low stocking density. These broilers are given low protein and low energy feed and the minimum age at slaughter is 56 days.

Focus Group: a small sample group of people selected from a wider population for open discussion about a particular topic.

Fresh Poultrymeat: poultrymeat not stiffened by the cooling process, which is to be kept at a temperature not below -2°C and not higher than 4°C at any time.

Frozen Poultrymeat: poultrymeat which must be frozen as soon as possible within the constraints of normal slaughtering procedures and kept at a temperature no higher than -12°C at any time.

Immersion Chilling: method of chilling used in which the carcasses are chilled in tanks of cold water or ice and water.

HACCP: a documented food safety management system consisting of seven principles as laid out in pages 35/36 of Codex Alimentarius Food Hygiene Basic Text. It involves the systematic identification of hazards in a food processing business and the introduction of control, monitoring, and verification procedures, at chosen steps in the processing operation that are considered essential for the control of food safety hazards.

Ionophores: chemicals which facilitate a transmembrane ion flux resulting in a perturbation of transmembrane ion gradients vital for cell functioning leading to cell death.

Lethal Dose: the concentration killing 50% of exposed animals.

Maximum Residue Level: the maximum permissible concentration of a residue in a food, agricultural or animal feed commodity as a result of permitted agricultural or veterinary chemical usage. MRLs are not safety limits for human health although these (e.g. the ADI) are taken into consideration when establishing the MRL which is invariably lower. An MRL is not a toxicological limit and a violation is not necessarily a cause of concern for public or animal health.

New York Dressed Poultry: delayed evisceration poultry which receive a 'post mortem' health inspection at the latest 15 days after slaughter, during

which period it must be stored at a temperature not exceeding +4°C (as per Council Directive 71/118/EEC).

No Observed Effect Level: the dose at which no demonstrable toxic effects are recorded.

Poultry Meat Inspectors: work on the production line alongside plant staff at various critical points, each inspector performing a specific task as the carcasses move along the line. They may also assist with ante mortem inspection. They ensure that animal welfare and hygiene standards are observed throughout the production process, under the direction of the Official Veterinary Surgeon.

Quick-frozen Poultrymeat: poultrymeat kept at a temperature no higher than -18°C at any time within the tolerances as provided for in Council Directive 89/108/EEC of 21 December relating to quick-frozen foodstuffs for human consumption.

Rendering: preparing or treating the bodies of dead animals to take out the fat and other substances that can be used in other products, e.g. pet food.

Thinning: the depletion of poultry houses in three or four stages before final depopulation in order to satisfy market requirements.

Third Country: a country other than a Member State of the European Union.

Undesirable substances: any substance or product, with the exception of pathogenic agents, present in and/or on the product intended for animal feed which presents a potential danger to human health, animal health or the environment or do not adversely affect livestock production.

Zoonose: a disease of animals that can be transmitted to humans.