New Zealand Food Safety Authority

Campylobacter in Poultry – Risk Management Strategy 2006-2009

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1 Introduction

The New Zealand Food Safety Authority's mission is to protect consumers and enhance New Zealands position as a trusted supplier of food. NZFSA recognises the high rates of human campylobacterioisis in New Zealand and the contribution that food, and poultry especially, make to this unacceptable health burden.

Raw poultry is considered to be a primary exposure pathway and NZFSA has a comprehensive risk management strategy for *Campylobacter* in poultry aimed at achieving sustainable reduction in *Campylobacter* levels in chicken meat through scientifically robust interventions at appropriate points in the food chain, and adopting a multi-pronged approach to *Campylobacter* risk reduction.

The *Campylobacter* risk management strategy includes:

- **developing targeted controls throughout the food chain**
- **focusing on risk-based controls in the medium term and determining the proportionality of poultry compared with other transmission pathways**
- **intensifying monitoring programmes to establish current baselines and show changes over time**
- **promoting good hygienic practice (GHP) by consumers**
- **collaborating with the international science community on all aspects of risk assessment and risk management**

While the ideal is for risk-based controls, given the scale of the public health problem, overseas experience, and the evolving science, hazard based interventions may be required as an urgent response to reduce the public's exposure to *Campylobacter*.

This document describes the NZFSA *Campylobacter* in NZ poultry risk management strategy for the next three years and, specifically, spells out the interventions that will be implemented and/or trialed in the next six months. We will report at the end of each six month period, or earlier, on progress.

2 Objectives of the *Campylobacter* risk management strategy

The objectives of the *Campylobacter* risk management strategy are as follows:

1. To reduce the incidence of foodborne human campylobacteriosis
2. To improve knowledge on food source attribution
3. To understand the relative value of different interventions throughout the food chain in reducing risks to human health
4. To make informed risk management decisions on appropriate control measures and their implementation
5. To design and implement an ongoing monitoring and review programme to assess the effectiveness of risk management decisions

3 Background

What is Campylobacter?

Campylobacter is a bacterial organism that causes the gastrointestinal disease campylobacteriosis when it lodges in the walls of a person's intestine. In particular, there are two species of *Campylobacter* that cause human illness and these are *Campylobacter jejuni* and *Campylobacter coli.*

Human campylobacteriosis

Illness usually strikes within 2 – 5 days of exposure but can take up to 10 days. Symptoms include general muscle pain, stomach cramps, nausea, headache or fever followed by sudden watery diarrhoea that may contain blood. Most people feel ill for about a week. During the illness, and up to a fortnight afterwards, bacteria are shed from the gut and can survive on hands and moist surfaces for up to an hour.

The relationship between exposure and human illness is by no means clear. The dose-response relationship of *Campylobacter* and human illness is not well established. The role of immunity is not clear either. Nevertheless it can be assumed that the smaller the exposure, the more likely a reduction in the incidence of human illness will be.

The incidence of human campylobacteriosis in New Zealand is unacceptably high. Much research is being undertaken to identify solutions capable of reducing these high rates.

Pathways

There are many pathways for *Campylobacter* to reach the human population (especially in New Zealand) and knowing the relative importance of each of these is obviously very important when prioritizing areas for control. Once a significant pathway has been identified, its relative significance must be established using attribution techniques.

Knowledge of the cost and the feasibility of application of measures to reduce risks is an important input to risk management. In this regard, a risk model is a very useful tool that assists in the decision making process by organizing existing knowledge on potential interventions, identifying data gaps and providing estimates of outputs.

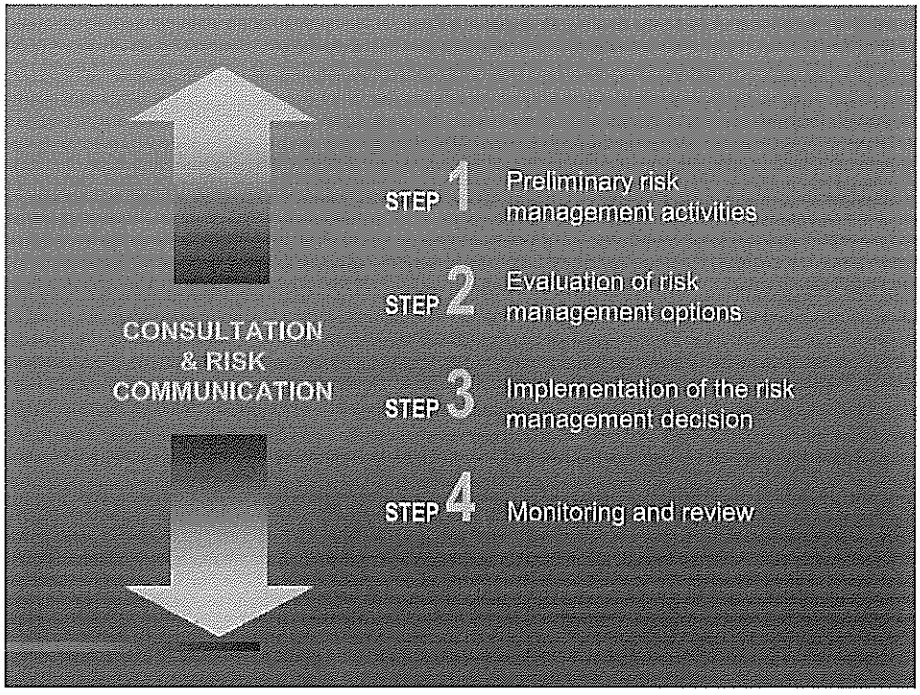
Ongoing comprehensive research

The New Zealand Food Safety Authority's (NZFSA) research programme on *Campylobacter* has been comprehensive and longstanding over greater than ten years, including involvement of the Ministry of Health and the Institute of Environmental Science and Research (ESR). This programme supports overseas findings that poultry is a primary pathway for the disease. However, it must be noted that as far as current knowledge indicates, poultry accounts for just over half of the identifiable infections. Therefore whatever is done to address the problem in poultry, will impact on only a proportion of the reported cases in New Zealand, albeit a significant one.

Risk management Framework

The NZFSA risk management framework (RMF) provides a systematic process whereby knowledge on risk and evaluation of other factors relevant to control of food hazards are used to choose and implement regulatory standards or other measures. The four generic steps involved in applying a RMF are shown in Figure 1. Effective risk management incorporates appropriate risk communication and stakeholder representation at all steps.

Figure 1: Components making up the risk management framework



Campylobacter risk management strategy working group

NZFSA has recently set up a dedicated *Campylobacter* risk management strategy working group to coordinate all completed and ongoing work relating to *Campylobacter* in poultry, and update the risk management strategy. The working group represents expertise from several of the business groups within NZFSA including Science, New Zealand Standards, Policy, Communications and the Verification Agency.

Risk communication

Communicating the risks inherent in food is an important part of the *Campylobacter* risk management strategy. NZFSA will widely and appropriately communicate the results of the higher order work undertaken by the *Campylobacter* risk management strategy working group, as well as develop communication strategies to assist the successful and effective implementation of *Campylobacter* reduction initiatives that result from this work.

Further information including press releases, reports, research and resources can be found at http://www.nzfsa.govt.nz/publications/news-current-issues/campylobacter.htm

Details of various ESR projects can be found at:

http://www.nzfsa.govt.nz/science/risk-profiles/index.htm

http://www.nzfsa.govt.nz/science/research-projects/projects-for-specific-foodborne-pathogens/page.htm#P3_41

4 Work Streams incorporated in the Strategy

This section sets out the work relating to *Campylobacter* that has been completed or is currently underway. This work is described under each of the main work streams:

4.1 Development and implementation of monitoring and surveillance activities;
4.2 Development and implementation of hazard based controls;
4.3 Development and implementation of risk based controls
4.4 Risk Communication;
4.5 International Collaboration; and
4.6 Other stakeholders.

For each of work streams 4.1 – 4.3, a short overview is given and the key objectives for the work stream are set out. Completed work associated with the particular work stream is then provided, giving a brief description of the work and identifying where any published reports can be located. The final sub-section for work streams 4.1 – 4.3 gives a description of the current work, including as relevant, key aspects of a particular project.

For the last three work streams, Risk Communication, International Collaboration and Other Stakeholders, a brief overview of the key objectives or the main components of the work stream is given.

The timeframe for the Strategy is the next three years, however given the acknowledged need for action this section also links to Annex 1 which identifies the hazard based interventions that will be evaluated in the next six months. It is our intention that this six monthly work programme will be regularly updated as the various work progresses.

4.1 Development and implementation of monitoring and surveillance activities

Baseline surveys, ongoing monitoring and targeted surveys for *Campylobacter* in poultry flocks and on carcasses are necessary to assess the effectiveness of risk mitigation strategies implemented on-farm and at the processor. NZFSA and industry require an ongoing robust national picture of on-farm *Campylobacter* carriage rates in order to develop and monitor performance targets, and to enable identification of areas needing improvement.

Surveillance of communicable diseases in New Zealand is the responsibility of the Ministry of

Health. NZFSA becomes involved when there is suspicion of food related causes of a case's illness. Campylobacteriosis is an important foodborne disease in New Zealand, having the one with the highest level of notifications. Because of this high incidence, campylobacteriosis is the largest contributor to the economic costs of foodborne diseases in New Zealand. The cause of the increasing incidence has not been determined to date. The issue of it being a surveillance artefact has been considered. However studies suggest this is not the case and further work is needed to clarify the issues associated with this trend.

4.1.1 Monitoring throughout the food chain

4.1.1.1 Key objectives

- Accurately determine the prevalence and level of *Campylobacter* in poultry (all species) in New Zealand considering each key stage of the food chain:
    - at point of slaughter (reflecting farm practices);
    - during processing;
    - at retail (one-off studies or intermittent)

4.1.1.2 Work completed

Detailed reports on completed scientific work can be found at:

www.nzfsa.govt.nz/publications/news-current-issues/campylobacter.htm

Campylobacter pathways discussion document

A review document identifying the relative importance of different transmission routes for *Campylobacter.*

Pathogen loading on freshly slaughtered chickens

Data on the prevalence and numbers of *Campylobacter* on freshly slaughtered chickens immediately after exsanguinations and before scalding

Microbiology of uncooked retail meat products

Multi-year survey of the prevalence of *Campylobacter* in retail meat products including poultry

4.1.1.3 Current work

***Campylobacter* monitoring databases**

These databases are being established to estimate on a national basis:

1. The prevalence of *Campylobacter* in flocks (sheds) of poultry at slaughter to enable;
    a. International comparison
    b. Identification of seasonal, geographic and demographic factors that impact on flock prevalence
    c. Identification of poor performing farms and sheds within a farm
    d. Development of national flock prevalence targets
    e. Continuous improvement (reduction) in flock prevalence, and reduction in the number of birds per flock that are infected.
    f. Reduction in human exposure, hence likelihood of human illness
    g. Assessment of the appropriateness of the monitoring scheme, and development of robust cost-effective ongoing monitoring programmes.
2. The prevalence and numbers of *Campylobacter* on poultry carcasses after processing and primary refrigeration to enable:
    a. International comparison
    b. Estimation of human exposure
    c. Assessment of the effect of interventions on human exposure
    d. Reduction in human exposure, hence likelihood of human illness
    e. Assessment of the appropriateness of the monitoring scheme, and development of robust cost-effective ongoing monitoring programmes

National typing database

A standardised, national, pulse-field gel electrophoresis (PFGE) microbial sub-typing database is being established to allow more effective linkages between human case isolates and food/environmental isolates of *Campylobacter* and other bacteria.

4.1.2 Surveillance of foodborne illness

4.1.2.1 Key objectives

- Accurately determine the incidence of foodborne human campylobacteriosis
- In cooperating with ESR and MoH implement an effective surveillance programme that will enable demonstration of long term trends
- To determine the relative importance of all sources of human campylobacteriosis under New Zealand conditions
- Implement food chain genotyping to assist source attribution.

4.1.2.2 Completed work

Detailed reports on completed scientific work can be found at:

www.nzfsa.govt.nz/publications/news-current-issues/campylobacter.htm

Campylobacteriosis in New Zealand: Results of the Magic Study

A multi-centre case-control analysis of gastroenteritis induced by *Campylobacter* carried out by ESR for Ministry of Health and Public Health Commission.

A systematic review of the aetiology of human campylobacteriosis in New Zealand

A systematic review of the available evidence around the aetiology of human campylobacteriosis in the New Zealand setting, including a consideration of the scientific quality of that evidence (particularly foodborne transmission).

Evaluation of the foodborne disease outbreaks/human health surveillance interface

An evaluation of current foodborne disease surveillance with the aim of improving the quality of epidemiological information that is gained from foodborne disease surveillance, investigation and reporting.

4.1.2.3 Current work

Acute gastro-intestinal studies (ESR 2006-2007)

A series of studies to estimate the burden of disease associated with acute gastro-intestinal illness in New Zealand and associated under-ascertainment in the surveillance process.

Enhancing surveillance of potentially foodborne enteric diseases in New Zealand (Massey University and MidCentral Health, 2006-2008)

Determining source attribution mainly through the comparison of *Campylobacter* profiles using MLST typing and trialling new methods and processes for public health management.

The relative contribution of food pathways to the burden of human campylobacteriosis in New Zealand (Massey University, 2005-2009)

A NZFSA funded PhD programme.

4.2 Development and implementation of hazard based controls

Development and implementation of hazard-based controls for *Campylobacter* in poultry will reflect a combination of the best available scientific evidence, consideration of international best practice, and practicality within the NZ situation. See **Annex 1** for evaluations of short-to-medium term interventions currently underway for reducing exposure to consumers from *Campylobacter*

4.2.1 Key objectives

- To decide and implement the most effective and practical intervention(s) to reduce the level of exposure to the consumer from *Campylobacter* in poultry
- To incorporate specific, hazard-based Good Operating Practice (GOP) and HACCP provisions into food control programmes (includes codes of Practice, Risk Management

Programmes, Food Safety Programmes, National Programmes and and future regulatory tools such as Food Control Plans) for control of *Campylobacter* in poultry

4.2.2 Completed work

Detailed reports on completed scientific work can be found at:

www.nzfsa.govt.nz/publications/news-current-issues/campylobacter.htm

Risk profiles

***Campylobacter jejuni / coli* in poultry**

A profile that discusses issues relating to *campylobacter* in poultry

Undercooked chicken livers as a vehicle for campylobacteriosis

A microbiological evaluation of chicken liver pate recipes, resulting in identification of optimal hygiene practice for preparation and provision of educational materials

The effect of refrigeration on *Campylobacter* survival on poultry meat

The effectiveness of temperature controls in the reduction of *Campylobacter* numbers achieved under standard industry practice and potential new chilling and freezing regimes is assessed.

4.2.3 Current work

Opportunities for reducing the prevalence of *Campylobacter* and the concentration on contaminated product can be classified as:

- Reduced proportion of infected chickens being submitted for slaughter
- Reduced proportion of contaminated chickens being produced and if positive a smaller number of organisms on/in the carcass and offal
- Improved techniques in the handling of poultry during further processing and at wholesale and retail premises reducing situations enhancing the transfer and/or replication of organisms

- Improved level of understanding of issues and controls by poultry handlers throughout the food chain
- Improved handling of poultry by consumers

Detailed options for reducing human exposure are explored in a paper that is currently under development. The various options are derived from the literature and expert opinion. The broad principles that are considered are outlined below.

NZFSA are evaluating the effectiveness of current risk management options with due consideration of relevance to the New Zealand situation, feasibility of application and public health impact. Selected options will then, in consultation with stakeholders be incorporated into NZFSA-approved Codes of Practice for grower flock management and processing, both of which incorporate best practice expected under NZ conditions.

Currently two risk profiles are nearing completion by ESR as commissioned by NZFSA:

- *Campylobacter* on red meat and poultry offal
- *Campylobacter* on uncooked bovine, ovine and porcine meat

Assessment of domestic food handling practices (ESR 2006-2007)

This project follows on from work in previous years. *Campylobacter* transfer rates are further investigated as are the risk of consuming foods that have been prepared by barbecuing.

Resuscitation of putative viable but non-culturable foodborne bacteria of significance to New Zealand (ESR 2006-2008)

The ability of foodborne pathogens (including *Campylobacter*) to enter into, and emerge from, a putative viable but non culturable state is assessed.

4.2.3.1 On-farm

It is internationally accepted that it is more difficult to keep *Campylobacter* out of a poultry flock than Salmonella. Nevertheless, continuous improvement of biosecurity should be considered to reduce the proportion of flocks that are positive at slaughter.

Objectives

- To investigate which biosecurity measures are currently in place.
- To evaluate the effectiveness of biosecurity measures and to implement those that are feasible to keep *Campylobacter* out of poultry flocks.

4.2.3.2 Slaughter

Current slaughter practices frequently lead to contamination of carcasses with their own gastro-intestinal tract contents and cross-contamination from other birds.

Objectives

- To evaluate measures to minimise contamination of carcasses from their own faeces and to implement those measures that are effective.
- To evaluate measures to prevent carcasses becoming cross-contaminated with faeces from other birds and to implement those that are effective.
- To evaluate measures to decontaminate product (eg Sanova, hyperchlorination) and implement those as appropriate for the processing plant in question.

4.2.3.3 Further Processing and retailers

The temperatures at which poultry is kept after slaughter are usually not conducive to multiplication. However, product is frequently wrapped while still wet and this promotes survival of *Campylobacter.* Cross-contamination may occur during further processing (e.g. needle injecting, or for breading, battered, value-added products) and in retail outlets including butcheries. Guidance for further processors and retailers will be developed in conjunction with implementation of the outcomes of the Domestic Food Review as these food sectors are required to have a food control plan.

Objectives

- To investigate options for reducing cross-contamination of other product by poultry after slaughter and implement those that are feasible.

4.2.3.4 Consumers and education

In recent weeks the link between poultry handling and campylobacteriosis has been extensively discussed in the media. Despite this publicity the incidence of human campylobacteriosis remains too high. In addition to identifying further means to reduce the *Campylobacter* load in poultry throughout the industry chain, there appears to be a need to identify more effective ways of influencing poultry handling habits by consumers. These should include prevention of temperature abuse and cross contamination, improved handling practices for defrosting and cooking

Objective

- To promote more effective ways of changing consumer behaviour with regard to handling poultry.

4.3 Development and implementation of Risk Based Controls

A quantitative risk assessment on *Campylobacter* in poultry is being developed by ESR. Currently it is being evaluated by Med-Vet-Net collaborators, together with a number of similar European models.

The intention of this model is to establish the most effective ways of reducing campylobacteriosis in the human population. The previous section discussed options that appear promising for reducing human exposure to *Campylobacter* but a quantitative linkage between specific interventions and their impact in terms of reducing food borne risks will e unknown.

Risk models can establish this linkage and thereby facilitate robust risk management decisions that take into account all available options and their relative value.

4.3.1 Key objectives

- To quantify the influence of specific controls at different steps in the food chain on risk estimates in NZ, and create a "menu" of such controls and the resulting risk estimates.
- To model "what if" scenarios for new controls that become available e.g. decontamination processes
- To demonstrate the most effective ways to manage the risk to the consumer from *Campylobacter* in poultry while ensuring practicality and feasibility of interventions

4.3.2 Completed work

Detailed reports on completed scientific work can be found at:

www.nzfsa.govt.nz/publications/news-current-issues/campylobacter.htm

Comparative risk model: *Campylobacter spp.* in red meat and poultry (ESR)

A computer based model has been constructed to estimate and compare exposures of New Zealanders to *Campylobacter* from three types of red meat (sheep, pig meat, beef) and poultry

Preliminary relative risk assessment for *Campylobacter* exposure in New Zealand (Enteric Zoonotic Disease Modelling Group)

Web link: http://www.zoonosesresearch.org.nz/

Two models have been developed, one of which explores the relative importance of four of the most commonly identified infection exposures and the other which explores the persistence of *Campylobacter* in a rural setting.

4.3.3 Current work

Various avenues are currently being explored to improve existing models.

Secondary Processing of Poultry (ESR 2006-2007)

To assist risk management of campylobacteriosis in New Zealand by improving the model for *Campylobacter* contamination through the poultry food chain; in particular by improving the modelling of secondary processing.

4.4 Risk communication

Effective communication is vital to the success of both the working group and the implementation any initiatives, controls and interventions that might result from its work. Risk communication is especially important in that it allows an issue to be considered in a context that assists individuals to assess relative value, cost and consequence of particular actions or behaviour. The key goal of good risk communication is to promote understanding of the reasons for situations, decisions and actions and in doing so empower people to make sound and valid decisions and judgments.

4.4.1 Key Objectives:

- To proactively inform interested parties (both public and industry) of major developments, milestones and decisions (and the reasons for those decisions)
- To communicate via multiple methods, where appropriate, to ensure that interested parties have every opportunity to get the information they need, in the way they need it, in a timely manner
- To develop a communication strategy for likely media interest on *Campylobacter* issues
- To use existing NZFSA publications as much as possible as communication vehicles (Food Focus, 4degreesC, Food Connect, industry newsletters, NZFSA website, media releases, fact sheets etc)
- To use new and targeted communication channels as required and appropriate in order to reach those not otherwise covered
- To work with associations and groups along the farm-to-fork continuum in order to use, where possible and appropriate, existing channels those associations and groups already have in place (including continuing to educate consumers on safe food handling behaviours in the home)

4.5 International Collaboration

NZFSA works closely with international counterparts to coordinate research, share and discuss scientific approaches and results in order to maximize the benefits of scientific knowledge on *Campyloacter* in poultry for inclusion into New Zealand's risk management strategy. Collaborative science projects are underway with international food safety agencies.

- **Med-Vet-Net.** The poultry model that has been developed by ESR is currently evaluated by Med-Vet-Net collaborators together with similar models.
- **Codex International standards.** The Codex Alimentarius is regarded as a key stakeholder for international standard setting activities. The Codex Committee on Food Hygiene is considering at its 38th Session, a proposal championed by New Zealand to develop an international risk-based standard for *Campylobacter* in poultry.
- **USDA-FSIS consumer handling.** This work is currently being scoped out.
- **FSANZ.** New Zealand is observing developments of the poultry primary production and processing standard and associated guidance material

4.6 Other stakeholders

NZFSA works closely with a variety of stakeholders in New Zealand in order to ensure understanding of the comprehensive risk management strategy and to share and obtain feedback on results from the work programme on an ongoing basis. The stakeholder base includes FSANZ, all industry sectors and their organisational groups, consumer advocate groups, academia, and scientific institutions. The Science Group administers the NZFSA Science Academy and the New Zealand Enteric Zoonoses Steering Committee.

- Enteric Zoonotic Disease Research Steering Committee
- Research institutions e.g. ESR
- Academia e.g. EpiCenter, Science Academy
- Territorial Authorities
- Associations covering Industry, retail and food service
- NZFSA's consumer's forum

Annex 1: Evaluation of Interventions for Control of *Campylobacter* in the Poultry Food Chain (to be updated six monthly)

NZFSA is currently evaluating short to medium term interventions for reducing exposure to consumers of *Campylobacter.*

On-farm Control

NZFSA is implementing a national broiler poultry flock monitoring programme that will identify poor performing farms. In conjunction with this programme, NZFSA has commissioned ESR (2006-2007) to evaluate implementation of on-farm biosecurity procedures in the context of New Zealand's unique agricultural environment. Similarly, molecular biotyping is being used in NZFSA-sponsored studies by Massey University and ESR to identify specific subtypes of *Campylobacter* associated with poultry meat and human cases.

The combined results of these three programmes may enable improvement in *Campylobacter* biosecurity controls at the farm level, and hence reduce the level of *Campylobacter* entering the food chain.

Processor Control

NZFSA has identified interventions at the processor level that in the short term could be implemented to reduce *Campylobacter* exposure.

Freezing: There has been considerable international research into the effects of freezing on *Campylobacter* survival in foods and its effect under usual processing conditions is well known. At present, consumers have expressed reluctance to have their choice limited to frozen chicken. Crust freezing (-2°C) has previously been reported to have little effect on *Campylobacter* survival. NZFSA has recently completed studies by ESR evaluating deep crust freezing (-2°C to -10°C), again with little effect on *Campylobacter.* Current research on freezing by NZFSA is evaluating the effect on *Campylobacter* of home freezing by the consumer (refer below).

Immersion chilling: Industry is currently evaluating the effect of, and focusing on control of, variable pH in immersion chiller baths on the effectiveness of added chlorine (current process) to reduce the level of *Campylobacter* on broiler carcasses. NZFSA have been fully

informed on trial design and results from the trials. If this intervention shows promise then the optimum set-up will be documented to aid its effective implementation.

Decontamination washes: There are several decontamination wash procedures approved internationally for poultry, but not necessarily validated for control of *Campylobacter*. Of those suitable for use in New Zealand, acidified sodium chlorite has proved most effective for reducing the level of *Campylobacter* on broiler carcasses in pilot trials and is currently being commercially trialled. NZFSA have been, and continue to be, informed on trial design and results. Again, this would lead to documented procedures to aid implementation.

Retail Control

The possible spread of *Campylobacter* to other foods and contact surfaces at retail and in the home has been attributed to leaking packages. NZFSA is implementing studies to assess this hazard pathway, and evaluating the feasibility of controls using leak-proof packaging, decontamination of the external surfaces of packages, and handling of packaging during preparation.

Consumer Handling

Preliminary results from an NZFSA/ERS study of domestic handling practices indicates that 64% of fresh chicken is frozen in the home prior to subsequent consumption. NZFSA is implementing studies to assess the effect of home freezing in New Zealand on survival of *Campylobacter*, and the effect of handling prior to freezing and after thawing on contamination of the kitchen environment. These trials, along with the above packaging trials, may facilitate control of exposure through improved procedures and educational campaigns.

Annex 2: Key milestones 2006-2007 (to be updated annually)

Development and implementation of Monitoring and Surveillance		
Activity	**Notes**	**Expected completion date**
• Hazard monitoring within the food chain - flock prevalence - carcass (NMD)	Start monitoring programme	February 2007
• Strengthen surveillance and establish baseline	Final report - Acute gastrointestinal illness study	31 August 2007
Development and implementation of hazard-based controls		
Activity	**Notes**	**Expected completion date**
Processors Code of Practice update	Finalise	June 2007
On-farm Code of Practice	Finalise	June 2007
ESR project " On farm risk factors for *Campylobacter* contamination of poultry"	Final report submitted	30 June 2007
ESR project "Secondary processing of Poultry"	Final report submitted	30 June 2007
Development and implementation of risk-based controls		
Activity	**Notes**	**Expected completion date**
Receive and analyse feedback from MED- VET –NET on risk model		February 2007

Risk communication		
Activity	**Notes**	**Expected completion date**
Update 2007 NZFSA Food Safety Conference	*Campylobacter* Strategy progress	Sept 2007