



Proceedings of the international meeting on *Campylobacter* reduction in chicken

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Park Plaza Riverbank, London

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Introduction

The FSA Strategy 2010-2015 includes the outcome that 'Food produced or sold in the UK is safe to eat'. A main priority for this is to reduce foodborne disease using a targeted approach, and tackling *Campylobacter* in chicken as a priority. FSA is developing a *Campylobacter* Risk Management Programme, working in partnership with stakeholders to achieve these aims by 2015. We are currently at the evidence gathering stage in our Programme and part of that process involves learning what has been effective in controlling *Campylobacter* in other countries. It is for this reason that we hosted an international meeting on *Campylobacter* control in chicken, held in London 30/31 March 2010 (see Annex 3 for Agenda). The meeting brought together representatives from the UK poultry industry, retailers, regulators and other government organisations, consumer representatives, and experts in *Campylobacter*. Evidence from a number of countries on what interventions have been effective in *Campylobacter* control was presented and the invited delegates discussed the interventions in terms of impact to the UK situation and the challenges to implement the interventions in the UK.

Summary of proceedings

The 2-day event was opened by FSA Chair Lord Rooker who focussed on why tackling *Campylobacter* was important for the FSA:

- As a cause of ill health: it is the most common cause of foodborne disease in the UK
- It sums up what the FSA stands for: Putting the consumer first - people expect the food they buy to be safe
- That we need to find a solution: it is not acceptable that so many people are falling ill

Lord Rooker stated that he was pleased with the commitment from the UK industry, but frustrated that not enough has been achieved so far. Progress would only be made through partnership working and identifying interventions based on robust science and evidence.

Campylobacter in the UK

FSA's Chief Executive, Tim Smith, explained that *Campylobacter* is the most commonly reported bacterial cause of gastrointestinal infection in the UK, responsible for 55,000 laboratory confirmed cases in the UK in 2008 with a more accurate estimate of 321,000 cases in England and Wales alone in 2008¹. *Campylobacter* accounts for a third of the cost of the burden of foodborne illness in England and Wales, estimated at 600 million annually². He stated that the most significant source of the *Campylobacter* with respect to human health is raw poultry meat; 60-80% of

¹ The number of reported laboratory confirmed cases of foodborne illness is known to be lower than the real number that occurs due to under-reporting of cases. To take account of this under-reporting, and provide a measure of the severity of disease caused, the HPA calculate annual estimates of the actual number of cases of food poisoning that occur in the community in England and Wales. This calculation is based on the number of laboratory-confirmed reported cases, adjusted to take account of the under-reporting of cases which is recognised to occur. Adjustment for under-reporting relies on data from outbreaks and special studies such as the Study of Infectious Intestinal Disease in England (IID study). Currently estimates can only reliably be calculated for England and Wales due to differences in reporting systems between UK countries and because the IID study was only carried out in England

² Where cost of illness includes the direct costs to the NHS and individuals in loss of earnings etc., as well as the indirect costs of pain, grief and suffering

cases of campylobacteriosis can be attributed to chicken³. FSA's survey of chicken on sale in the UK (food.gov.uk/news/newsarchive/2009/oct/chicksurvey) reported 65% of chicken at retail is contaminated with *Campylobacter*. He referred to the huge variation in the size of the problem in other countries, as highlighted by the recently published EFSA survey (see below) and that this isn't just a problem for the UK, or for Europe, it is on an international scale.

Retailers were reminded about their responsibility as businesses who sell food to their customers – people rightly expect the food they buy to be safe. Retailers could have significant impact by changing the specifications they agree with suppliers and using fiscal incentives to drive up standards – this was an element of the successful Danish approach. Tim Smith acknowledged that all this comes at a cost, increased investment may be required and this will impact on retail prices, but there can be no financial limit to ensure food is safe for consumers to eat. The UK needs to be realistic about the price to pay to achieve this.

***Campylobacter*: A major zoonoses in Europe: Frank Boelaert (EFSA)**

Frank Boelaert outlined EFSA's work in relation to food safety, referring to the annual collection and reporting of zoonoses data across Europe. He highlighted the scale of the *Campylobacter* problem for Europe, with 190,566 cases of campylobacteriosis reported in 2008.

EFSA's BIOHAZ activities in relation to *Campylobacter* were outlined – the first mandate is to assess the extent to which meat derived from broilers contributes to human campylobacteriosis. EFSA's report, published January 2010⁴, concluded that handling, preparation and consumption of broiler meat may account for 20% to 30% of human cases of campylobacteriosis and that 50% to 80% may be attributed to the chicken reservoir as a whole.

The second mandate is to identify and rank the possible control options within the broiler meat production chain, and to propose potential performance objectives and/or targets at different stages of the food chain in order to obtain (for example 50% and 90%) reductions of the prevalence of human campylobacteriosis in the EU caused by broiler meat consumption or cross-contamination. In order to estimate the prevalence of *Campylobacter*-colonised broiler batches, at EU level and per Member State, a survey was carried out in 2008. The survey, published March 2010⁵, reported that, on average, the bacterium was found in the intestines of 71% of chickens, indicating that they were already infected when alive, and on 76% of sampled carcasses, which suggests some further contamination during slaughtering. The UK had the 10th highest prevalence of *Campylobacter* contaminated broiler batches (75.3%) and the 6th highest prevalence of contaminated carcasses (86.3%).

Campylobacter were present at enumerable levels ($\geq 10\text{cfu/g}$) on 53.4% of the sampled carcasses. The number of *Campylobacter* found on broiler carcasses varied widely between the Member States. All Member States counted results between 1,000-10,000 cfu/g on some carcasses, and in at least 1% of the carcasses counts of $> 10,000\text{ cfu/g}$ occurred in samples from 18 Member States. It was noted that the use of parallel testing of broiler carcasses (neck and breast skin) by both detection and enumeration to determine prevalence has resulted in an increased probability of

³ Sheppard, S. K., Dallas, J. F., Strachan, N. J. C., MacRae, M., McCarthy, N. D., Wilson, D. J., Gormley, F. J., Falush, D., Ogden, I. D., Maiden, M. C. J. and K. J. Forbes (2009) *Clinical Infectious Diseases* **48**: 1072-1078

⁴ <http://www.efsa.europa.eu/en/scdocs/scdoc/1437.htm>

⁵ <http://www.efsa.europa.eu/en/scdocs/scdoc/1503.htm>

obtaining positive test results for *Campylobacter* in the broiler carcasses compared to single examination by either method alone.

About two-thirds of the *Campylobacter* isolates from the broiler batches as well as those from the broiler carcasses were identified as *Campylobacter jejuni*, while one-third was *Campylobacter coli*.

The results of the baseline survey support the view that broiler meat is likely an important food-borne source of human campylobacteriosis in the EU. Part B of the survey, an investigation of the effects of factors associated with the *Campylobacter*-colonised broiler batches will be published later in the year.

UK Poultry industry perspective: Dan Pearson, Vion UK Poultry

Dan Pearson described the UK poultry industry, a vertically integrated industry, concentrated into a few large companies, and with a short supply chain. The UK is predominately a fresh market, in response to consumer demand, with very few plants with the capacity to freeze to any great extent. The UK slaughters the greatest number of broilers in the EU, with over 800 million chickens slaughtered annually. Assured Chicken Production (ACP) covers 90% of the UK production.

There is an acceptance on the part of the UK poultry industry that *Campylobacter* needs to be reduced. The majority of the industry employs partial depopulation (thinning) which is recognised as a risk factor⁶ for *Campylobacter* colonisation of flocks and needs to be better managed. Biosecurity is accepted as a pre-requisite for control, but a clear message needs to be delivered to farmers and poultry catchers on the most cost effective biosecurity solutions. This is likely to be a step change and will require a standard system of measurement.

Good hygiene practice in the slaughterhouse is recognised as the key to controlling *Campylobacter*, and the industry is working closely with the FSA in the development and trial of a slaughterhouse hygiene tool as a means to measure and improve the performance of processing plants. In addition the UK industry is interested in the use of decontaminants such as lactic acid, which is currently not permitted on poultry carcasses in Europe. The industry continues to support the partnership approach in the UK, working with the Government, retailers and the research community, to find a solution to *Campylobacter*.

Risk assessment modelling and potential impact of interventions to reduce *Campylobacter*: Andy Hill, Veterinary Laboratories Agency, UK

Andy Hill described the *Campylobacter* risk assessments that are available, including those published by the UK, Denmark and the Netherlands. Microbiological risk assessment, and *Campylobacter* risk assessment, are still developing sciences and improvements in data and methodology are continuing; large uncertainties remain in both methods and data used, and so any results for intervention analysis must be interpreted with caution. Most risk assessments suggest that significant reductions can be achieved by targeting either (or both) prevalence of infection and load of infection/contamination. Given current knowledge and cost-benefit analysis, targeting the load on the carcass, as a short-term intervention measure, appears more achievable.

⁶ A UK national prevalence survey carried out in 2007 reported that thinning increases the risk of *Campylobacter* colonising a flock by a factor of 8: Powell L., et al., 2009. 15th International Workshop on *Campylobacter*, *Helicobacter* and related organisms. CHRO2009. Toki Messe, Niigata, Japan. September 2-5, 2005. Abstracts. p 48

However, current risk assessment results suggest logistic slaughter and removal of thinning practice do not achieve large reductions in human illness. The models also pointed towards intervening after evisceration (EV) as the EV process could potentially reduce the benefit of interventions earlier in the food chain. Freezing chicken could reduce the *Campylobacter* loading by 2 log reduction and models estimate this would lead to 80% reduction in human cases. At the consumer end the models suggest undercooking is not the problem and cross contamination is the big issue that needs to be tackled.

Codex Guidelines: Dr Judie Lee, New Zealand Food Safety Authority, and Lars Plym Forshell, National Food Administration, Sweden

It was stated that New Zealand and Sweden have the joint lead for production of Codex Guidelines for the control of *Campylobacter* and Salmonella in chicken meat. The Guidelines apply a risk management framework approach to control measures and build on general food hygiene provisions already established in the Codex system. The control measures cover the following:

- Good hygienic practice (GHP): generally qualitative in nature and are based on empirical scientific knowledge and experience
- Hazard control: developed from scientific knowledge of the likely level of control of a hazard at a step (or series of steps) in a food chain, have a quantitative base and can be validated as to their efficacy in hazard control

The Guidelines are supported by a detailed, up-to-date, semi-systematic review of scientific literature and consideration of the recommendations from a WHO/FAO Expert meeting convened in Rome, May 2009, to scrutinise the draft guidelines and their hazard-based controls. This Expert meeting also developed a web-based support tool to measure the effect of specific control measures on relative risk to the consumer.

The following examples of control measures based on quantitative levels of hazard control, which have been subjected to a rigorous scientific evaluation, were presented:

Process	Intervention for <i>Campylobacter</i> control	Log Reduction
Inside/outside wash	Carcass washing with Chlorine (25-35ppm)	0.5
Inside/outside wash	Carcass washing with acidified sodium chlorite (ASC)	1.3
On-line reprocessing	Carcass spraying with ASC and citric acid	2.1
Chill carcass	Forced air chilling	0.4
Chill carcass	Immersion chilling	1.1-1.3
Post chill applications	Carcass immersion with ASC(600-800ppm, pH 2.5-2.7, 15 secs)	0.9-1.2
Packing	Modified atmosphere (70% O ₂)	2.0 – 2.6 (over 8 days chilled storage)
Packing	Irradiation	Elimination
Chill/Freeze	Freezing	0.7-2.9
Chill/Freeze	Crust freezing	0.4
Retail or Food service	Cooking	> 7
Consumer	Cooking	>7

Delegates were advised that the inclusion of examples in the Guidelines (e.g. use of freezing) illustrates the value of a quantitative approach to hazard reduction at specific steps throughout the food chain and, where the web-based decision tool is applied, the likely level of public health protection that may result from choices of *Campylobacter* control measures applied at specific steps in the chicken meat food chain at the national level.

Evidence presented by Individual Countries

Annex A summarises in table format the key evidence presented by invited speakers, in terms of measures to control *Campylobacter* and in their expert opinion, what made a key impact. The full presentations are available at <https://registration.livegroup.co.uk/Campylobacter/>.

The short presentation by each country was followed by a discussion session by delegates at each table. Annex A also summarises the key points made by the delegates relating to (i) the likely impact of the intervention in the UK context and (ii) the scale of the challenge to implement this intervention in the UK.

Key interventions – impact/difficulty matrix

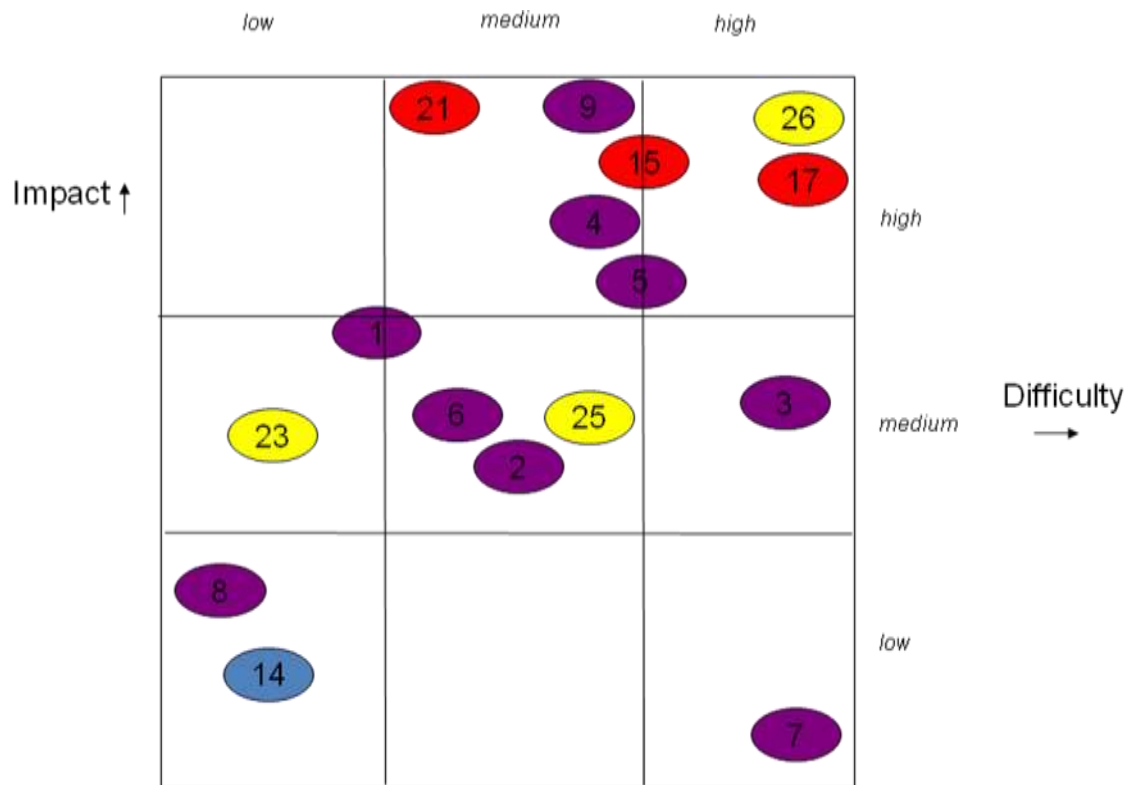
On the basis of evidence presented, delegates compiled a shortlist of key interventions to control *Campylobacter* that could have an impact in the UK, as follows:

1. Hygiene Barrier: Footwear
2. Hygiene Barrier: Outside of the farm
3. Financial Incentives for producers
4. EU Performance Objectives (Process Criteria Setting)
5. Vaccination
6. Fly Control
7. Earlier Slaughter Age
8. Water Treatment
9. Thinning
10. Testing Flocks
11. Labelling Positive Chickens
12. Leak-proof packaging
13. Labelling on proper handling and cooking
14. Packaging Environment (Oxygen)
15. Treatment of Carcass post EV – using legal, physical treatments or other decontaminating (e.g. chemical) treatments
16. Lower Chiller Humidity
17. Freezing Policy for Positive Stocks
18. E-beam irradiation
19. Education in Catering Establishments
20. More data
21. Evisceration (and other) processes
22. Data education – strain types that cause human disease
23. Education – farmers
24. Effective monitoring
25. Cleaning & Disinfection (C&D) e.g. on farms, transportation etc
26. Mandatory standards & targets
27. Scheduling flocks

From this list, delegates on each table were asked to choose two interventions and consider in more detail the potential impact of the interventions in the UK and the

barriers to implementation using a PESTLE analysis framework, i.e. political, economic, social, technological, legal, environmental, and any other barriers. Delegates then considered the enablers to implementation using the same PESTLE analysis framework. Group feedback was used to develop a Boston Matrix of the impact of chosen interventions against the difficulty of implementation in the UK:

Boston Matrix analysis of key interventions selected by delegates



Key to interventions selected and analysed:

On-farm (Purple)	Slaughterhouse (Red)	Retail (Blue)	Across the food chain (Yellow)
1. Hygiene Barrier (Footwear)	15. Treatment of Carcass – using legal (physical) or AMTs	14. Packaging Environment (Oxygen)	23. Education – farmers, processors, caterers, consumers
2. Hygiene Barrier (Outside of farm)	17. Freezing Policy for Positive Stocks		25. C&D on farms, transportation, etc
3. Financial Incentives for producers	21. Evisceration (and other) processes		26. Mandatory standards & targets
4. EU Performance Objectives (Process Criteria Setting)			
5. Vaccination			
6. Fly Control			
7. Earlier Slaughter Age			
8. UV Water Treatment			
9. Thinning			

Priority interventions to be taken forward in UK

In the final session delegates were asked to arrange themselves into groups representing the poultry industry, retailers, regulators (which included consumer organisations) and experts. Each of the groups were asked to choose two interventions from the shortlist above that, in their opinion and based on the evidence and discussion sessions, would make a major impact to *Campylobacter* reduction in UK chicken. The following key priorities were identified, and the proposed actions (suggested by delegates) for delivery in the short term (12 months) and medium term (1 – 3 years) are detailed in Annex 2:

- **Treatment of carcass post evisceration - 7 group votes**
- **Hygiene barrier/Footwear change - 5 group votes**
- **Evisceration process - 4 group votes**
- **Fly control - 4 group votes**
- **Mandatory target – 1 group vote**
- **Vaccination – 1 group vote**

FSA's Chief Executive, Tim Smith, highlighted some of the key actions proposed with taking the key interventions forward. He added that he considered the use of decontaminating washes for poultry carcasses in the slaughterhouse to be a medium term option and highlighted that FSA will work to understand consumers' views on the use of various treatments. He considered that retailers were likely to accept potential treatments, but there would be issues such as labelling to be resolved. Sensible lobbying should be encouraged as poultry carcass treatments will give consumers a real benefit.

For implementation of hygiene barriers, a trial in the UK was the first step, but it was clear from the evidence presented that such initiatives need to be linked to *Campylobacter* levels and incentives. Assured Chicken Production and similar schemes were the obvious routes to implementation, and these discussions should start as soon as possible. He noted that there was no fly-proof housing in the UK poultry sector. A trial was urgently required in the UK to determine the impact and feasibility of fly nets, and a short literature review would be necessary in the first instance. A Government funded grant scheme may be feasible, and investment would be necessary.

Tim Smith stated that it was obvious that an agreed standard was required to maintain and optimise evisceration equipment in the UK and this required industry investment. Mandatory standards and targets would need to be applied across the industry to be fair. It would be necessary to work with the European Commission on performance targets, and this would have a longer time frame. In relation to vaccination, it would be important to engage with consumers to avoid the kind of misunderstandings arising from use of Avian Influenza vaccine in the UK.

Close of Meeting

Tim Smith thanked the organisers of the event, The Live Group, and the FSA team (Gael O'Neill, Kathryn Callaghan and Tracey Smith) for organising a very successful event. Speakers were thanked for their input and delegates for their contribution to making it a success. He stressed that it was essential that the spirit of collaboration and cooperation should continue and that the UK needed to have a strong Government/industry/retailer partnership to tackle the problem and that each player needs to their accept responsibility and role in *Campylobacter* reduction in the UK.

Evidence presented by country on interventions to control *Campylobacter* in chicken with delegate feedback on impact and challenges to implementation in the UK

Denmark: Evidence presented by Dr Hanne Rosenquist

Danish Intervention	Likely impact in the UK	Scale of challenge to implement in UK
Biosecurity in and around the poultry houses, including limitation of partial slaughter (depopulation)	<ul style="list-style-type: none"> • Agree an important intervention but no consistency or standards in the UK – needs testing to work • Potential, but needs further evaluation in the UK to understand what can be realistically achieved • Farm aprons could have an impact 	<ul style="list-style-type: none"> • UK already has a high standard of biosecurity (low Salmonella levels), so the challenge is to improve further. ACP already in place • Cost of improvements – lots of sheds in the UK, many old sheds – major challenge to achieve the standards required, No money for investment • Challenge to manage thinning as not economically viable in the UK to stop the practice • Major challenge is farmer education to apply biosecurity consistently • Need proof (efficacy data)
Incentives Rewarding farmers for compliance with industry code of practice and for delivering <i>Campylobacter</i> free flocks	<ul style="list-style-type: none"> • Biosecurity coupled to paying a premium for keeping <i>Campylobacter</i> out (i.e. incentivising the farmers for complying could be effective – could achieve a 50% reduction in flock prevalence) • Biosecurity may be aided by reward schemes, need to understand more about behavioral changes 	<ul style="list-style-type: none"> • Who will pay? • Penalty system goes to company not the farmer • If producers on board then this should be achievable • Would need a rapid test to check levels • Low-medium challenge to implement
Fly screens in addition to other biosecurity measures at farm	<ul style="list-style-type: none"> • Promising intervention • Might make a contribution, but not the only pathway • Dependent on type of ventilation in UK • Dependent on type of flies • Effective if seasonal peak in birds – not seen in UK 	<ul style="list-style-type: none"> • Expensive for UK - Danish systems are more closed due to climate; cost of applying to the great number of sheds in UK • Maintenance, and cleaning issues (mainly for inlets) • Airflow problems which could lead to welfare issues

	<ul style="list-style-type: none"> • Could pilot on new housing to determine impact 	<ul style="list-style-type: none"> • Could lead to other issues such as clogging of vents
Scheduling of <i>Campylobacter</i> negative flocks to production of fresh chilled products	<ul style="list-style-type: none"> • Most promising intervention in the UK context • Requires simple and cheap information on flock status – works for Salmonella • Will only work where prevalence is low 	<ul style="list-style-type: none"> • Challenge is to reduce prevalence as simply not an option in the UK at the moment
Freezing <i>Campylobacter</i> positive flocks	<ul style="list-style-type: none"> • Potential intervention 	<ul style="list-style-type: none"> • Lack of consumer demand for frozen chicken
Reduce faecal contamination during slaughter and processing		
Physical decontamination (steam in combination with ultrasound, crust freezing)		
Marination		
Case-by-case risk assessment of domestic and imported foods in Denmark ⁷	<ul style="list-style-type: none"> • Difficult to judge impact (lack of data on levels in imported birds) • Inappropriate in UK context 	

⁷ Article 14 in the EU food law:

- i) Each member state is allowed to make a specific assessment of each food lot, and decide whether it poses a risk to the consumer or not
- ii) The decision should build on a scientifically based risk assessment
- iii) If the food lot is considered a problem to human health the food can be rejected by the member state.

France: Evidence presented by Dr Gilles Salvat, French Food Safety Agency

French Intervention	Likely impact in the UK	Scale of challenge to implement in UK
Implementation of biosecurity measures and mandatory monitoring	<ul style="list-style-type: none"> • Similar standards to UK therefore no major impact 	<ul style="list-style-type: none"> • Would need incentives to raise standards • Monitoring and feedback needs to take place in UK
Treatment of drinking water	<ul style="list-style-type: none"> • Low impact as UK is mains water and chlorine treatment already in place • All BPC members use water treatment already at similar levels to France but only monitor water twice a year and this could be increased and may have an impact • UV light treatment may have potential impact • Research has not shown any link with campylobacter prevalence and water in farm. 	<ul style="list-style-type: none"> • Low cost chlorine dioxide treatment of water could be implemented • Low cost disinfection achievable • UV light a cheap option to implement – initial set-up cost but then cheap to run
Organic acid treatment in drinking water	<ul style="list-style-type: none"> • Impact not known – conflicting data on <i>Campylobacter</i> reduction • UK producer tried 3 crop trials and could not detect a benefit 	<ul style="list-style-type: none"> • Biofilms on drinkers may be a challenge, will block pipe – are better biocides available? • Low pH to control biofilm build-up could lead to welfare issues • Palatability for birds
Antimicrobial treatment of chicks	<ul style="list-style-type: none"> • Not clear what this meant • No impact 	<ul style="list-style-type: none"> • Cost • Consumer acceptability issues (not morally acceptable to use antimicrobial treatments on chicks)
Dynamic dry air chilling	<ul style="list-style-type: none"> • Very clear potential, although UK poultry tends to be dry air chilled • Lower humidity in the air chiller could have an impact – impact on <i>Campylobacter</i> not known so need an industry trial to quantify 	<ul style="list-style-type: none"> • Reduced carcass weight – Cost to processor • Drier chicken will have consumer implications relating to visual appearance, quality issues

Finland: Evidence presented by Dr Terhi Laaksonen, Ministry of Agriculture and Forestry and Dr Eija Kaukonen, HK Ruokatalo Oy

Finnish Intervention	Likely impact in the UK	Scale of challenge to implement in UK
<p>Strict biosecurity measures in broiler holdings, in particular a hygiene barrier at the door of each poultry house</p> <ul style="list-style-type: none"> - change of the clothes / overalls - change of the boots - hand washing and disinfecting 	<ul style="list-style-type: none"> • Don't know the impact but feel it would be positive • Need efficacy study to compare hygiene pens to foot dips • Clear separation of clean and dirty areas very effective • <i>Campylobacter</i> reduced during Avian Influenza when biosecurity improved, therefore it is known that it results in a positive impact • Apron around house could have a positive impact, as well as site drainage improvements, drier litter etc. • Don't have data to link litter quality to <i>Campylobacter</i> levels – research need 	<ul style="list-style-type: none"> • Physically possible to implement a hygiene barrier • Would need to link to audit, incentives and farmer education to bring about behaviour change on their use – who would pay for this in the UK? • Cost as size of UK industry is huge compared to Finnish situation and more variable (with only 200 broiler farms and 3 slaughterhouses in Finland) • UK house type and fabric differs to Finland (a lot of old wooden houses in UK compared to concrete in Finland) so more difficult to implement some of the strict biosecurity measures (e.g. C&D) • Improved litter quality already linked to welfare scores and penalties in place • Supermarkets could drive the incentives (rather than a penalty scheme) • Better management of litter feasible – link to farm management practices
<p>If two consecutive positive flocks from the same holding:</p> <ul style="list-style-type: none"> - checking and improving of production hygiene in the holding, verified by Official Vet - flocks must be slaughtered at the end of the working day (continued until two negative flocks) 	<ul style="list-style-type: none"> • Positive impact 	<ul style="list-style-type: none"> • Cost of testing/ongoing monitoring (Danish approach - between June and October all broiler slaughter batches must be tested for <i>Campylobacter</i>, during other months random testing) – who would pay for this? • Could consider Official Vet visit incorporated into Salmonella testing at no extra cost • Relies on a rapid test – don't have this

Fly screens	<ul style="list-style-type: none"> • See Danish discussion 	<ul style="list-style-type: none"> • See Danish discussion • No ready-made easy to implement and use kit – many different house designs in UK leading to further costs implications
Marination - majority of broiler meat sold as meat preparations (meat in marinade sauce)	<ul style="list-style-type: none"> • Low impact as majority of chicken sold as fresh 	<ul style="list-style-type: none"> • Little consumer demand for marinated products • UK consumers prefer “fresh” chicken
Early slaughter (33-35 days)	<ul style="list-style-type: none"> • Potential impact 	<ul style="list-style-type: none"> • UK demand for larger birds
No thinning policy	<ul style="list-style-type: none"> • Thinning known to increase risk of <i>Campylobacter</i> in UK flocks by a factor of 8 • Not the main pathway for infection so impact may be limited 	<ul style="list-style-type: none"> • Cost – UK chicken would increase by 7p per chicken, (chicken is more expensive in Finland) • Stocking density means it would be difficult to remove thinning - welfare issues • Removing thinning would require many more farms in the UK, 25% more housing so not practical, and it would be difficult to secure planning permission to cover the extent of new farms/required • Pressure from UK retailers to thin • Consumer demand for range of bird sizes

Germany: Evidence presented by Daniel Windhorst, Lohmann Solutions, Lohmann Animal Health

German evidence	Likely impact in the UK	Scale of challenge to implement in UK
<p>Holistic approach – many factors to be considered</p>	<ul style="list-style-type: none"> • Useful approach • Approach offers basis for taking a targeted approach to improving hygiene and food safety management 	<ul style="list-style-type: none"> • Would need to educate farmers as “food businesses”
<p>Risk assessment of individual farms to identify weak points and sources. Implementation period, usually 2-3 cycles, to minimise risk and sources followed by surveillance and control of sustainability measures</p>	<ul style="list-style-type: none"> • Heavily focussed on consultancy solutions to individual farms – recognise the potential benefit of this approach • Could be quite effective and would be easier to measure impact on farms with higher levels 	<ul style="list-style-type: none"> • Risk assessment of individual farms could be done by the veterinary industry as part of the national Zoonoses Control Plan (everyone in an assurance scheme would already be visited), providing a more tailored assessment of improvement needs for that site • As many farms are part of assurance schemes there is a good basis to start from • Could link to positive incentives i.e. farmers doing well paid extra, those doing poorly are individually assessed • Reliant on farms investing in assessment and being willing to invest in rectification actions - unlikely to be taken up widely • Specific biosecurity measures designed for individual farms would be very difficult and costly to implement (many farms to assess). This system also appeared to rely on ongoing testing which would be easier to implement if a rapid reliable test was available

Belgium: Evidence presented by Dr Mieke Uyttendaele, Ghent University, Belgium

Belgium Intervention	Likely impact in the UK	Scale of challenge to implement in UK
Effective Food Safety Management Systems (FSMS) in place	<ul style="list-style-type: none"> • Definite potential for UK impact • Comparison of what different companies and different farms actually do would be very useful - data to pinpoint what works and why some farms have better results than others for their FSMS. • Would need to development a hygiene tool to correlate score with Campy reduction 	<ul style="list-style-type: none"> • Relies on a quick, cheap, available and practical test for <i>Campylobacter</i> within plant and on products • Could build on the slaughterhouse hygiene tool • Would need to have an incentive to work • Cost of testing to provide feedback information – who pays?
Set a process hygiene criterion for chicken	<ul style="list-style-type: none"> • Not sure of impact on <i>Campylobacter</i> but could drive up standards, would require clear targets 	<ul style="list-style-type: none"> • Process hygiene criteria of 100 could be possible as part of HACCP • Would implement as a national criterion – might be difficult to formulate and enact • Would need to have baseline levels first to allow target to be set. Could use for monitoring too (enumeration more reliable & useful and it's cheaper)
Freeze chicken	<ul style="list-style-type: none"> • Likely to have an impact 	<ul style="list-style-type: none"> • Not feasible, lack of consumer demand • Difficult to change consumer preference • Need to educate consumers – more could be done by retailers to promote value of frozen chicken
Use of prior heat-treated chicken in institutional settings	<ul style="list-style-type: none"> • May have an impact (had an impact on controlling AI) • Limited – UK already pre-heats a lot of chicken 	<ul style="list-style-type: none"> • Could further open markets to cheaper third country imports of precooked chicken • Cost may restrict wider use of precooked product (cooked at plant), less likely to be taken up by smaller (and more high risk) operators • Quality issues
Risk communication to consumers	<ul style="list-style-type: none"> • Consumer awareness of <i>Campylobacter</i> is important Note that no impact on Salmonella level when consumer education was targeted • More education and a minimum qualification for caterers (as required by food industry) might help 	<ul style="list-style-type: none"> • Very difficult to change consumer behaviour • Messages need to be continuous as impact is short lived

	• Could communicate the value of irradiation	
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Sweden: Evidence presented by Lars Plym Forshell, National Food Administration, Sweden and Dr Ingrid Hansson, National Veterinary Institute, Sweden

Swedish Intervention	Likely impact in the UK	Scale of challenge to implement in UK
<p>Control programme based on biosecurity - generally qualitative in nature The producers have been educated in the importance of hygienic barriers and biosecurity</p>	<ul style="list-style-type: none"> • Sweden has seen an impact on broilers but not in humans • Unlikely to see the same impact in UK due to larger scale and higher density 	<ul style="list-style-type: none"> • Not difficult to implement and very cost effective. Need efficacy data on what works best – trial • Challenge is farmer buy-in and commitment at all times • Would need clear guidelines to ensure cleanliness in ante room areas, need to keep areas dry etc. • Cost of ongoing monitoring
<p>The use of split slaughter (thinning) has been decreased</p>	<ul style="list-style-type: none"> • As above and thinning issues discussed for Finland 	<ul style="list-style-type: none"> • See response to Finland
<p>Channelling slaughter groups from high prevalence producers to freezing</p>	<ul style="list-style-type: none"> • Sweden estimates a decrease in the relative risk by 18% to 57% depending on scenario – trade off between effect and logistics • Promising intervention in the UK context • Requires simple and cheap information on flock status – works for Salmonella • Will only work where prevalence is low 	<ul style="list-style-type: none"> • Challenge is to lower prevalence as simply not an option in the UK at the moment • If all positive flocks are frozen would need to produce extra birds to cover short fall - Problems with security of supply
<p>Producers get a premium for <i>Campylobacter</i>-free flocks</p>	<ul style="list-style-type: none"> • Could have an impact 	<ul style="list-style-type: none"> • Cost (industry pays for this in Sweden) • Cost of ongoing monitoring • Need to have interventions/tools ahead of introducing incentives • Could be applied by retailers through targets for reduced levels of contamination • Higher UK prices could increase market for imports • Need retailer agreement on pricing and attitude to intra-community trade and imports

Iceland: Evidence presented by Sigurborg Daðadóttir, Food & Veterinary Authority of Iceland and Ruff Lowman, Epidemiology & Risk Mitigation, Canadian Food Inspection Service

Icelandic Intervention	Likely impact in the UK	Scale of challenge to implement in UK
Scheduling of <i>Campylobacter</i> positive flocks to frozen or heat treated production	<ul style="list-style-type: none"> • Likely impact • Driver to improve <i>Campylobacter</i> levels in Iceland came from market demand and premium for fresh chicken – could work in the UK • Impact likely if UK channelled positive flocks to precooked marinated products (suitable for BBQ season) • Could have negative impact - frozen poultry may lead to poor defrosting, undercooking, etc. • Could have negative impact as a result of increase in fresh imports with poorer standards than UK 	<ul style="list-style-type: none"> • Not practical in an open market where consumer demands fresh chicken (Iceland has a closed market) • UK hasn't the capacity to freeze large numbers, retailers do not have enough frozen storage, etc. – would require significant investment • Could seriously damage UK industry. Would drive price of frozen down to a non-sustainable level • Requires a robust monitoring policy to identify positive flocks • See also responses to Denmark, Belgium and Sweden discussion
Biosecurity and C&D between flocks	<ul style="list-style-type: none"> • Likely impact if implemented properly in UK 	<ul style="list-style-type: none"> • Need to link to incentives (or penalty to schedule to frozen/heat treated production) to work • Cost – who pays? • Challenge to educate farmers on strict biosecurity and C&D
C&D of live haul crates	<ul style="list-style-type: none"> • Potential benefit in doing better in UK 	<ul style="list-style-type: none"> • Serious cost implications
UV on water to flocks	<ul style="list-style-type: none"> • Likely impact where private water supply used • How much more effective than potable water? 	<ul style="list-style-type: none"> • Fairly easy to implement (but not sure of impact in UK)
Early slaughter-age during peak fly season & summer months to 34 days or less	<ul style="list-style-type: none"> • Low impact as many UK flocks positive by day 42 • Slaughtering at 35 days in the UK could significantly reduce flock prevalence levels • Moderate to high impact 	<ul style="list-style-type: none"> • Would take too many birds out of the market • Customer requirements - choice of bird size • Wouldn't work in summer season where high demand for portions and this needs larger birds
Fly netting – screen broiler house ventilation inlets	<ul style="list-style-type: none"> • Could have major impact if follows Icelandic example, possible 23% reduction in prevalence 	<ul style="list-style-type: none"> • Engineering challenges for different types of ventilation

	<ul style="list-style-type: none">• Good evidence for positive impact• Could work - need a UK trial to determine impact (on a farm which has all other relevant biosecurity measures in place)• May have lower impact in UK given high prevalence• Won't have an impact on other vectors	<ul style="list-style-type: none">• Cost of installation and maintenance – who pays• Need UK data on efficacy and cost/benefit• May lead to clogging of vents? Iceland reported no negative impact on airflow
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USA: Evidence presented by Dr Neal Golden Food Safety and Inspection Service, U.S. Department of Agriculture

USA Intervention	Likely impact in the UK	Scale of challenge to implement in UK
<p>Process control through HACCP, not prescriptive of interventions, verified by Salmonella testing post chill Developing a <i>Campylobacter</i> performance standard</p>	<ul style="list-style-type: none"> • Medium impact – has brought US prevalence down to 40% • Performance target would have an impact • Impact limited if don't also concentrate on getting the numbers down on birds arriving at slaughter • Target would have to be enumeration rather than presence/absence • Improvements in evisceration equipment could have an impact – zero faecal tolerance could be key 	<ul style="list-style-type: none"> • Low as already have HACCP in EU regulations and slaughterhouse hygiene to identify hazard based control • Performance target will only work if we have effective control interventions that industry can implement • UK consumers may not be interested in the “name and shame” approach used in US • High cost to replace evisceration equipment – driver is speed rather than reduce faecal leakage
<p>Chlorine wash (>90% industry use)</p>	<ul style="list-style-type: none"> • Lack of data presented • Impact may not be much greater compared to effective washing in potable water 	<ul style="list-style-type: none"> • Not permitted in EU – medium to high challenge to change regulations • Consumer acceptability issues (but already used to wash fruit and vegetables so not a major challenge?) • Issue of waste water management
<p>Chlorine in chiller and low pH</p>	<ul style="list-style-type: none"> • Lack of data presented • Medium – high impacts for antimicrobial decontaminating treatments (but lacked data) • Impact likely to be less in UK as would have to have a rinse step • We have to tackle from farm to fork because research suggests that poultry farms contaminate the environment so the use of decontaminating treatments on the product will not have enough impact 	<ul style="list-style-type: none"> • Not permitted in EU – medium to high challenge to change regulations • Consumer acceptability issues • Dry air chilling used in the UK rather than spin chilling so different application methods required for decontaminating treatments

	<ul style="list-style-type: none">• Impact on human cases?	
Post chill interventions – 70% use	<ul style="list-style-type: none">• No details presented• High reliance on processing misses impact of biosecurity interventions	

New Zealand: Evidence presented by Dr Judi Lee, NZ Food Safety Authority and Roy Biggs, Tegel Foods Ltd

New Zealand Intervention	Likely impact in the UK	Scale of challenge to implement in UK
<p><i>Campylobacter</i> performance target (regulatory measure, funded by industry in NZ)</p>	<ul style="list-style-type: none"> • Good driver for action – UK needs mandatory sampling at process level 	<ul style="list-style-type: none"> • Easier to monitor at end of processing than at retail • Cost of sampling – who pays? • More likely to work if linked to incentives • Could implement through EU performance target (if and when set) • Puts UK industry at a commercial disadvantage
<p>Optimise evisceration equipment (probably the most effective action)</p>	<ul style="list-style-type: none"> • Moderate impact – UK could improve equipment optimisation and maintain better (feed withdrawal not always practised) 	<ul style="list-style-type: none"> • Already highlighted for hazard control in the slaughterhouse hygiene tool • Need to have a better system of monitoring • Challenge to optimise equipment for different bird sizes • High cost to make the necessary changes
<p>Improved washing of carcasses – high rate water recirculation (in the context of immersion chilling)</p>	<ul style="list-style-type: none"> • Moderate • Immersion chilling is rare in the UK which would reduce the impact of this specific intervention 	<ul style="list-style-type: none"> • Cost and environmental impact of additional water • May raise water content of poultry meat
<p>Chlorine and decontaminating treatments (ACS) in the immersion chiller Properly run immersion chiller: 2.4-3.0log₁₀ reduction MLC (chlorine levels at 60-90ppm and pH 6.5 – 6.7) ASC using citric acid at pH 2.5 Concentration 400-500ppm a 1.4-1.6log₁₀ reduction Concentration 700ppm a 2.0log₁₀ reduction</p>	<ul style="list-style-type: none"> • High impact for decontaminating treatments, impact of chlorine more questionable • Impact of decontaminating treatments likely to be less in UK as would have to have a rinse step 	<ul style="list-style-type: none"> • Immersion chilling is not an option - UK retailers' insist on air chilling. Would have to use dip, or spray, or adapt air chillers • Decontaminating treatments not permitted in EU – medium to high challenge to change regulations • Consumer acceptability issues – could identify more acceptable decontaminating treatments e.g. lactic acid

Leak proof packaging	<ul style="list-style-type: none">• Moderate impact	<ul style="list-style-type: none">• Technology available to package portions<ul style="list-style-type: none">– low challenge to do for whole birds• Could be done quickly• Cost
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Australia: Evidence presented by Amanda Hill, Food Standards Australia New Zealand

Australian Intervention	Likely impact in the UK	Scale of challenge to implement in UK
<p>Primary production and processing standard</p>	<ul style="list-style-type: none"> • Not known – no data presented • No specific target so not sure how success will be measured • Need to know what works before mandating a standard • Moderate - outcome based approach could work • Not very prescriptive, therefore potential for inconsistencies 	<ul style="list-style-type: none"> • Minimum – already have hygiene legislation • Challenge is the tools to implement • Cost - In Australia the cost is borne by industry while benefit accrues to society - would UK industry be prepared to bear this cost or be able to pass this cost on to consumers through increase in prices? • Level of investment needed by industry • Cost of testing • Availability of low cost, quick and reliable tests • Training needs • Industry resistance to take up measures • EU model would make this more approach more difficult in UK • HACCP on farm would be difficult

Canada: Evidence presented by Ruff Lowman, Epidemiology & Risk Mitigation, Canadian Food Inspection Service

Canadian Intervention	Likely impact in the UK	Scale of challenge to implement in UK
Focus on biosecurity	<ul style="list-style-type: none"> • Low-moderate impact depending on how it is implemented • Voluntary implementation doesn't work in Canada - hasn't worked in UK • Need to have set standards, but impact may be limited 	<ul style="list-style-type: none"> • Challenge is to find a driver for biosecurity – link mandatory programmes to financial incentives • Challenge to monitor – who would police? • Need efficacy data on biosecurity – low challenge to fund research but may not provide definitive evidence • Adoption of evidence based standards consistently - changing farmer behaviour • Challenge to integrate all the supply chain in the standards and to take responsibility and for industry to lead e.g. in getting the hazard based controls into assurance standards
No thinning	<ul style="list-style-type: none"> • Expect a positive impact 	<ul style="list-style-type: none"> • Major challenge for UK (as noted in earlier discussions)
Not an intervention, but Canada has had a decrease in consumer demand for fresh chicken	<ul style="list-style-type: none"> • Downward trend reflects downward trend in campylobacteriosis 	<ul style="list-style-type: none"> • As for previous discussions on frozen chicken

Priority interventions identified to reduce *Campylobacter* in Chicken and proposed actions (suggested by delegates) for delivery

Treatment of carcass post evisceration - 7 group votes

Short Term Actions (12 months)

- Prepare a definition/opinion of currently allowed treatments and share with industry. Clear communication of options available today e.g. steam or hot treated water that remains potable, ultrasound with steam irradiation and UV.
- Support the submission of applications for approval of decontaminating treatments based on evidence from short-term trials. Ensure widespread communication of the output from the trials from legally available options e.g. steam hot water. Encourage uptake if results are positive.
- To operate in conjunction with consumer handling strategy. Highly dependent on legislative restrictions
- Consider implications for consumer labelling (retailers would be very reluctant to put labelling message relative to decontaminating treatments). Communicate minimal intervention
- Retailer agreement and Research & Development support for an industry trial to include cost details and cost benefit where not available and acceptability trials with consumers/retailers
- Trial carcass treatments using kitchen ingredients such as lactic acid, acetic acid or ascorbic acid (vitamin C) to reduce *Campylobacter*. Trials in UK to verify alternative treatment systems that are been used elsewhere and have been the subject of today's presentations.
- Industry to provide evidence of trial results to the EFSA biohazards group that demonstrate a reduction in *Campylobacter*. Propose use only in clean plants where microbiological counts are low and hygiene is maintained well. Efficacy data produced following the revised EFSA protocol
- To ask for Commission approval to progress the most promising low cost intervention that could deliver human reduction in the next year. We are developing industry base line data and we will also need retailer cross party support to use such interventions. We believe these should be defined as processing aids. Lobby EU for change to allow processing aids to be used on fresh products.
- Dispel the view of cleaning up dirty product with consumers - highlight potential benefits e.g. lactic acid. Draw attention to recent reports e.g. FAO/WHO active chlorine. Consumer acceptability research (FSA doing) drawing parallel with other products e.g. use of treatments for washing salads. As such carcass treatment is only one part of an overall process control system and cannot be seen as a substitute for good hygiene practices. Communicate aim to use minimum possible intervention and in conjunction with best practice throughout chain
- Establish impact to human cases (FSA/DH). Establish cost impact (*Campylobacter* working group). Trial work in chicken plant (BPC). Develop cross industry acceptance (BRC/BPC). Better understand view of consumer acceptance (FSA). Explore legislative restrictions at European level (FSA)
- Short term actions and investigations for options not available today e.g. organic acids and other things already approved in food use apart from unprocessed products.

Medium Term Actions (1-3 years)

- EU industry could begin to build a consensus lobbying in EU to influence current position, take account of WTO consideration, consider trial approaches to look at efficacy spray vs. immersion process for approving decontaminating treatments
- 3 years - change in legislation is required so use of lactic acid is permitted (European Commission) Government led consumer education campaign (FSA). Install new equipment - roll out over industry (if above successful) (BPC)
- European Commission should provide a legal basis for chemical treatment, taking WTO discussions into account.
- Research and industry should work together to provide a better evidence base for efficacy, to select agents that do have a significant effect.

Hygiene barrier/Footwear change - 5 group votes

Short Term Actions

- Measure effectiveness of biosecurity measures to convince industry of cost/benefit.
- Define key parameters of biosecurity and implement across supply chain (*Campylobacter* working group)
- Introduce incentives linked to implementing hygiene procedures.
- Set up monitoring of farms. Monitoring regime to ensure consistent application (technique to be determined)
- Implement footwear change/physical barriers in anterooms as an intervention study with a control group.
- Start talking with assurance standards to start the process incorporating these as a mandatory part of ACP.
- Work with suppliers to review existing ACP scheme requirements for hygiene (BRC/BPC/AFS)
- Supply chain to review compliance site risk assessment and identify areas for improvement
- monitor impact (BPC)
- Development of a rapid test to measure effectiveness of biosecurity measures and enable feedback to farmer on their actions
- Target poorer performers to bring them up to the standard.
- Training of personnel in 'good practice'

Medium Term Actions

- Promote a culture change, training, education ,
- Incorporation as a mandatory standard in ACP or other schemes.
- Maintain monitoring of farms as mandatory - both *Campylobacter* and adherence to the hygiene biosecurity protocol
- Implementation - use assurance schemes to implement improved biosecurity measures and ensure that they are carried out.
- Efficacy review of wet disinfectant process
- Review and implementation of applicable sections in Assurance Schemes
- Look at building design to make the hygiene barriers easier to implement
- Incentivise by sampling of caeca at abattoir - farms consistently negative would be rewarded.

Evisceration process - 4 group votes (where the aim is reduced faecal contamination through properly maintained and adjusted equipment)

Short Term Actions

- Organise a meeting of industry to identify best practice (similar sized birds and proper setting up of equipment)
- Assess current performance: Carry out a review of processing plant evisceration maintenance and adjustment process and washing equipment (based on HACCP). FSA inspectors can be asked to focus on this aspect for a period of time. Engineers could accompany inspectors to facilitate optimisation. Monitoring could be included during high focus period.
- Produce guidance on evisceration and how to optimise including better planning and operational management to adjust machinery and to better control feed withdrawal times and farmers' management of gut health so that intestines are less fragile
- Introduce training for visual inspection
- Develop a protocol for microbiological sampling & testing at evisceration point
- Determine baseline levels leading to benchmarks for the industry
- Additional measures, e.g. Identification of target areas for potential improvements – water sprays.

Medium Term Actions

- Industry to become more standardised in terms of bird size (by sex and weight) with lines that are prepared for specific bird sizes, e.g. sorting males and females. Retailers to accept more standardised weights
- Innovation/development of better evisceration machinery (liaising with machinery manufacturers) e.g. machinery that can identify faecal contamination (fluorescence), equipment that adjusts itself to the weight of individual birds (possibly combined with sorting of birds at the beginning of the line), automated systems to detect and remove faecally contaminated carcasses
- Develop a Code of Practice. FSA Operations Group to monitor and judge efficacy by looking at improvements in *Campylobacter* counts (sampling scheme will need to be set up)
- Identify plants where equipment needs to be updated to effect improvements. However, expensive to replace equipment so could engage with manufacturers.

Fly control - 4 group votes

Short Term Actions

- Given there is no consensus on the impact of fly control in the UK context we need an assessment of the impact of intervention on all the different housing systems. The purpose of a trial would be to test the efficacy of the proposed control and costs of installation, maintenance and impacts on hygiene.
- Work with industry and assurance schemes to pilot test over two years.
- Obtain UK data on the efficacy of fly controls on farms where very high biosecurity is already in place. There is a growing belief that flies are vectors to re-infect houses especially in spring and summer. We would wish to create multi-air lock personnel entry as well as fly screens to all inlets. The air inlets should be working on minimum ventilation in spring and summer to avoid fly entry this way.
- Investigate feasibility of using fly control in the UK and cost implications

- (government, industry)
- Carry out a literature review of this area e.g. are nets the only option (Government, researchers)

Medium Term Actions

- Dependent on impact assessment for year 1 may go voluntary or mandatory earlier than 2 years.
- Dependent on the impact then decide voluntary (assurance scheme) or mandatory approach (legislation). Consider ways of easing the cost burden e.g. Government aid to industry and/or financial incentives from retailers
- The trial should be broadened to take into account other insects. e.g. litter beetles.
- If evidence from trials - incorporation of fly netting into assured chicken standards (industry)

Mandatory target – 1 group vote

Short Term Actions

- Already have baseline EFSA report on interventions, this will assist development
- Communicate goal
- Characterise the risk reduction expected e.g. 50% reduction in foodborne campylobacteriosis attributed to cChicken carcass after chill
- Specify a method for enumeration (ISO method) Lab accreditation as per ISO17025
- Decide on application

Medium Term Actions

- Stepped Intervention strategy for non compliance (can't apply to imported product)
- Continuous review process

Vaccination – 1 group vote

Short Term Actions

- Through BRC we need to understand how close to a commercial vaccine the industry is
- Retailers should make it clear if further research funding should be available for vaccine (vaccine could have the advantage of covering free range birds too)
- Retailers can justify vaccination to customers as eggs already are. Communicate to customer that no residue exists in the meat
- FSA needs to maintain advice on good handling practice to consumers

International Meeting on Campylobacter Reduction in Chicken

Tuesday 30 March & Wednesday 31 March 2010

Park Plaza Riverbank, London

Tuesday 30 March 2010	
08:15	Registration
09:00	Welcome and introduction FSA Chair, Jeff Rooker
09:05	Objectives for the day: Focus on FSA Campylobacter Risk Management Programme FSA Chief Executive, Tim Smith
09:20	Introduction from Facilitator and fun fact quiz: <i>So you think you know about Campylobacter?</i> Facilitator: Kieron White
09:45	Campylobacter: A major zoonosis in Europe Frank Boelaert (EFSA)
10:15	UK poultry industry perspective Dan Pearson (Vion)
10:45	Coffee Break
11:15	International presentations 11:15 Denmark – Dr Hanne Rosenquist 11:30 France – Dr Gilles Salvat 11:45 Finland – Dr Terhi Laaksonen and Dr Eija Kaukonen 12:00 Table Discussions
12:30	Lunch
13:30	International presentations 13:30 Germany – Daniel Windhorst 13:45 Belgium – Dr Mieke Uyttendaele 14:00 Table Discussions
14:20	Afternoon tea
14:50	International presentations 14:50 Sweden – Lars Plym Forshell and Dr Ingrid Hansson 15:05 Iceland – Mrs Sigurborg Dadadottir and Dr Ruff Lowman 15:20 Table Discussions
15:40	Comfort Break
15:50	Risk assessment modelling and potential impact of interventions to reduce Campylobacter Andy Hill (VLA)
16:20	Codex guidelines on control of Campylobacter and Salmonella in broilers – Hazard based controls identified for Campylobacter Lars Plym Forshell and Dr Judi Lee

16:35	Review of the topline summary of interventions that have been identified
17:30	Close
18:30	Meet in Hotel Reception for coach transfer to Coq d'Argent Restaurant
19:30	Dinner
22:30	Return coach transfer from Coq d'Argent Restaurant to Park Plaza Riverbank

Wednesday 31 March 2010	
09:00	Introduction and objectives for Day 2 FSA Chief Scientist, Andrew Wadge
09:10	International presentations 09:10 USA – Dr Neal Golden 09:25 New Zealand – Dr Judi Lee and Roy Biggs 09:45 Table Discussions 10:05 Australia – Amanda Hill 10:20 Canada – Dr Ruff Lowman 10:35 Table Discussions
11:00	Coffee Break
11:20	Key Interventions Interactive Discussion on perceived barriers to interventions to control Campylobacter
12:30	Lunch
13:30	Feedback and interactive discussion on top 3 priorities and review of barriers identified on Day 1
15:00	Afternoon Tea
15:20	Signing up to commitment FSA Chief Executive, Tim Smith
16:30	Close