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The Control of *Campylobacter* in Irish Poultry

**Key external stakeholders:**  
Poultry farmers, Poultry processors, The Food Safety Authority of Ireland (FSAI), Department of Agriculture, Food and the Marine, Retailers, Safefood, Consumers

**Practical implications for stakeholders:**  
The main outcomes of this research are data that supports the argument that all birds harvested post first-thinning should be subject to Campylobacter mitigation activities and a combination technology that has the potential to kill between 10,000 and 100,000 *Campylobacter* per cm² on chicken carcasses.

**Main results:**
- Thinning introduces *Campylobacter* into broiler flocks; caecal counts in birds at second thinning are similar, regardless of flock status at first thinning and reducing the time between first and second thinning to a maximum of 4 days is not an effective control strategy. All post-first thinning birds should be considered to be high risk and subject to logistic slaughter and possibly carcass freezing.

- The sequential treatment of trisodium phosphate and capric acid in conjunction with ultrasonication at 80 kHz will kill 10,000 *Campylobacter* per cm² on chicken carcasses.

**Opportunity / Benefit:**  
Processors could improve the safety of poultry and poultry products by subjecting all post first thinning broiler carcasses to crust freezing.

Processors could significantly reduce Campylobacter on broiler carcasses using a combination of ultrasonication and chemical treatments. Although these are not currently permitted under EC legislation, the situation is under review and the data generated in this project should help inform a positive outcome.

**Collaborating Institutions:**  
UCD

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1. Project background:
Campylobacteriosis is the most frequent cause of gastroenteritis in Ireland and across the EU. Moreover, *Campylobacter jejuni* has been associated with the development of Guillain-Barre syndrome, a chronic and potentially fatal disorder of the peripheral nervous system. Poultry are the primary source of *Campylobacter*. The European Food Safety Authority (EFSA) recently reported that 98.3% of Irish poultry carcasses are contaminated and the levels of *Campylobacter* are the highest in the EU.

2. Questions addressed by the project:
- What effects do age and thinning practices have on the *Campylobacter* carriage rate and levels in broilers.
- What is the growth rate of Campylobacter in the caecum?
- Can ultrasonication enhance the decontamination effect of clean label ingredients on poultry carcasses?
- What virulence genes (genes associated with disease in humans) are found in Irish Campylobacter?
- What effect does oxidative stress have on the expression of virulence genes?

3. The experimental studies:
Chemical decontamination studies were undertaken in the laboratory as were growth experiments using cecal contents. Molecular methods were used to examine a range of Campylobacter isolates for the presence of known virulence genes and investigate their expression upon exposure to hydrogen peroxide.

4. Main results:
The main results are;
- Combining chemical decontaminants with ultrasonication can significantly (*p*<0.05) enhance reductions in bacterial populations compared to chemical treatments applied alone.
- *Campylobacter* grow rapidly in the caecum.
- The flaA gene is common in all *Campylobacter* isolates. The flaB gene is not essential for motility in some strains. An alternative secretion system to that encoded by flaH and flaB may be present in *C. coli*. Chemotaxis genes are common in *C. jejuni* but not in other species. The cdtABC genes were commonly distributed amongst *Campylobacter* strains while wlaN was rarely detected. The CmeABC efflux system is common in *Campylobacter* strains. The sodB gene was frequently detected in *C. jejuni* and *C. coli*.
- Oxidative stress can affect the virulence of *C. jejuni* in a strain-dependent manner.

5. Opportunity/Benefit:
The Knowledge and data generated here could inform a more effective *Campylobacter* control strategy in which the carcasses of all post first thinning birds are treated as high risk and subject to crust freezing. Moreover, with a change in legislation this project has delivered a technology that will kill most if not all of the *Campylobacter* on poultry.

6. Dissemination:
The data generated in this project was disseminated at several conferences and workshop including safefood Campylobacter Knowledge Network events and at the Global Food Safety-Solutions for Today and Tomorrow international conference, 23rd to 25th October 2012, Crowne plaza Hotel, Dublin 15.

Main publications:


**Popular publications:**

7. Compiled by: Dr. Declan J. Bolton