Project number: 5965
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Reducing *Campylobacter* on poultry carcasses and products

Key external stakeholders:
Poultry processors, poultry farmers, scientists, regulatory personnel, medical doctors, veterinarians, epidemiologists, microbiologists, consumers, EFSA

Practical implications for stakeholders:
This projects provides up-to-date information on poultry carcass treatments in the processing plant including cloacal washes and on the most appropriate MAP for reducing *Campylobacter* and extending shelf-life.

Main results:

Dip treatment of broiler carcasses with trisodium phosphate (TSP) will reduce *Campylobacter* levels by approximately 3 $\log_{10}$ cfu cm^{-2}. A cloacal wash with TSP, citric or lactic acid did not significantly affect carcass *Campylobacter* counts. The 40:30:30 CO2/O2/N2 modified atmospheric packaging (MAP) gaseous combination significantly increased shelf-life.

Opportunity / Benefit:

This project provides data for risk analysis that may be used to provide the scientific basis for permitting chemical carcass treatments in broiler plants. It evaluated and dismissed cloacal washes as ineffective and identified an MAP gaseous combination that could significant extend shelf-life, thereby reducing wastage and associated cost.

Collaborating Institutions:

University College Dublin and NUI Galway.

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Teagasc project team: Dr. Declan Bolton (PI)

External collaborators: Dr. Paul White (University College Dublin) and Professor Cyril Carroll (NUI Galway)

1. Project background:

Campylobacter is the most commonly reported food-borne bacterial pathogen in Ireland and in Europe and campylobacteriosis represents a considerable cost in terms of lost working days and medical treatment. As poultry is the primary source of *Campylobacter* there have been renewed efforts to identify carcass decontamination technologies that could be applied to reduce or eliminate this pathogen at the processing stage. This project evaluated chemical treatments and cloacal wash activities and investigated the most effective modified atmospheric packaging (MAP) gaseous combinations that would inhibit *Campylobacter* and extend shelf-life during storage.

2. Questions addressed by the project:

- What is the most effective chemical treatment for reducing *Campylobacter* on poultry carcasses?
- Does cloacal washing improve the microbiological status of the carcasses?
- What is the most effective MAP gaseous combination for inhibiting *Campylobacter* and extending shelf-life?

3. The experimental studies:

The effect of chemical decontaminants including tri-sodium phosphate (TSP), lactic acid (LA), citric acid (CA), peroxyacids (POA) and acidified sodium chlorite (ASC) at different concentrations using dip and spray treatments on poultry skin were evaluated for *Campylobacter*, TVC (psychrophiles), TVC (mesophiles), TEC, LAB, pseudomonads, moulds and yeasts. The two most effective decontaminants, 14% TSP and 5% CA, were applied in a commercial poultry processing plant, using dip and spray treatments to broiler carcasses immediately before chilling.

The effect of a range of MAP gaseous combinations including 90:10 N2/CO2, 70:30 N2/CO2, 50:50 N2/CO2, 30:70 N2/CO2, 10:90 N2/CO2, 80:20 O2/N2, 40:30:30 CO2/O2/N2 on poultry fillets was evaluated for *Campylobacte*r, TVC (mesophiles), TVC (psychrophiles), TEC, LAB and pseudomonads immediately and over time (storage at 4°C). A cloacal treatment on poultry carcasses was evaluated in a commercial processing plant, using a range of different chemicals at different concentrations. TSP (5, 10 & 20%), citric acid (1, 5 & 10%) and lactic acid (1, 5 & 10%).

4. Main results:

TSP and CA were the most effective treatments for reducing *Campylobacter* in poultry in the laboratory study. Dipping with 14% TSP was the most effective treatment in the in-plant studies, reducing *Campylobacter* by 2.83 $\log_{10}$ cfu cm^{-2}. In the MAP experiment, the 40:30:30 CO2/O2/N2 combination was the most effective MAP treatment. Although *Campylobacter* did not decrease, the shelf-life of the raw poultry fillets was increased by approximately 3-fold. The cloacal wash did not decrease carcass *Campylobacter* counts. TVC (mesophiles & psychrophiles) and TEC were similarly unaffected.

5. Opportunity/Benefit:

This research identifies the most effective chemical treatments to reduce *Campylobacter* on poultry carcasses in the laboratory and under the conditions encountered in commercial processing facilities. It also provides information on the most appropriate MAP gaseous combinations that should be used to extend shelf-life and protect public health. The data generated will be used to support ongoing initiatives aimed at effecting a policy change at European level, that would permit poultry carcass chemical decontamination.

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6. Dissemination:

To date, dissemination has been achieved through presentation at national and international conferences including:

Meredith, H., McDowell, D., Bolton, D. (2010). Chemical decontamination of poultry carcases. Research abstract and poster presentation at International Association of Food Protection Conference (IAFP), UCD, Dublin, 9 – 11 June 2010.

Bolton, D., Meredith, H., Walsh, D. and McDowell, D. (2011). Chemical decontamination of poultry carcasses. Research abstract and poster presentation at the 16th International workshop on *Campylobacter*, *Helicobacter* and related organisms. Vancouver. 28/08/11-01/9/2011.

Meredith, H., Cummins, E., McDowell, D. and Bolton, D. (2011). Quantitative risk assessment of chemical decontamination on *Campylobacter* on chicken skin. Research abstract and poster presentation at the 7th International Conference 2011, Predictive Modeling of Food Quality and Safety. Dublin, Ireland. 12-15/9/2011.

Meredith, H., McDowell, D. and Bolton, D. (2011). Chemical decontamination packaging technologies and cloacal treatments of poultry. International Conference and Demonstration Event: Strategies to Control *Campylobacter* in Poultry. Safefood *Campylobacter* Network. Ashtown Food Research Centre, Dublin, Ireland. 29/9/2011.

5 papers are currently being prepared for publication in peer reviewed journals.

Main publications:

7. Compiled by: Dr. Declan Bolton

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