

# Efficacy, practicality, and costs of using currently available intervention methods to reduce campylobacter contamination in slaughterhouses

Area of research interest: [Foodborne pathogens](#)

Study duration: 2011-02-01

Planned completion: 1 December 2013

Project code: FS121014A

Conducted by: Campden BRI

## Background

The information obtained was used to define the conditions for preliminary trials, leading to full scale tests on selected interventions, and a further investigation of the use of the 'best' interventions by industry.

Campylobacter is the most common cause of food poisoning in the UK and is found mainly in poultry. Reducing this cause of food poisoning requires interventions from the farm through to the consumer. This project considered the interventions that could be adopted by the poultry industry, if they adhered to regulations, to reduce Campylobacter numbers on chicken at the slaughterhouse.

## Research Approach

This project gathered and reviewed existing data, including unpublished work, on a range of interventions that could be used in poultry processing to reduce levels of Campylobacter, including:

- hot water steam
- electrolysed water, more commonly called electro-oxidised water
- ultra-violet radiation
- electro-oxidation of scald water
- chlorine/chlorine dioxide at permitted levels

The information obtained was used to define the conditions that were tested in preliminary trials. Full scale tests of these selected interventions were then carried out, followed by further investigation of the 'best' interventions by industry. Samples were tested for Campylobacter on the day of treatment and at the end of storage to examine whether any change (recovery) occurred during storage. Microbiological sampling and testing followed a common protocol developed with a parallel Agency-funded project examining existing interventions (FS121014B).

## Results

Data on the efficacy of selected interventions to reduce *Campylobacter* on whole chicken carcasses was obtained from many sources and presented in preliminary and final reports.

Apart from the use of UV, all trials were carried out at poultry processing sites using carcasses at pre-chill. The conclusions for each intervention are outlined below:

### Hot Water

Reductions in *Campylobacter* around 1-log have been reported in the literature but all studies, including evidence presented from two trials in this project, show changes in the appearance and elasticity of the carcasses after treatment.

### Steam

Published data on carcasses that have not been inoculated show around a 0.5-log reduction in *Campylobacter*. Several processors have tried using steam to achieve microbial reductions but they have all experienced unacceptable changes to the appearance and elasticity of treated carcasses.

### Electrolysed Water

No published data showed evidence of a significant reduction in *Campylobacter* on poultry carcasses that have not been inoculated. Four trials were carried out spraying plain water or electrolysed solutions of sodium chloride or sodium carbonate. The highest free chlorine concentration used in any of the solutions was 18 ppm. None of the treatments produced greater than a 0.3-log reduction in the numbers of *Campylobacter* on carcasses when tested one or seven days after kill and treatment.

### Chlorine/Chlorine Dioxide

Many poultry processors use chlorine dioxide to treat borehole water and use a free chlorine concentration of around 0.5 ppm. Published data indicate that, even at 50 ppm free chlorine, there is little effect of chlorine, when delivered as hypochlorite, on *Campylobacter* counts on carcasses. In the trial carried out in this project, chlorine dioxide at 1 ppm in water was applied to birds and then the chlorine dioxide application was stopped. However, the concentration in the water did not fall over the next hour and consequently it was not possible to test the effect of the chlorine dioxide.

### Electro-Oxidation of Scald Tank Water

One published paper reports that *Campylobacter* counts were reduced by up to 1.4-log in the water in a chiller by the use of electro-oxidation but counts on carcasses were not assessed. That research is not directly relevant to the UK where all birds are air chilled. One poultry processor reported that they had trialled the technology on scald tank water and found no reductions in microbial counts on carcasses and bad off-odours from the water. No trials were carried out with this technology within this FSA-funded project.

### Ultra-Violet Radiation

Large reductions in *Campylobacter*, 6 to 7-log, have been reported on agar plates and in liquid treated with ultra-violet radiation. However, much smaller reductions, 0.4 to 0.8-log, have been

reported on chicken breast meat and skin inoculated with Campylobacter. No data have been published on the effect of UV radiation on Campylobacter on carcasses that have not been inoculated. Concerns were expressed by industry that the use of UV might be restricted due to the difficulty of transmitting the UV to all parts of the carcass. Also, suppliers of UV systems advised keeping the UV lamps away from water such as splashing or sprays. A trial in this project found no evidence of an effect of UV treatment on the Campylobacter numbers on naturally contaminated skin-on breast portions.

Overall, none of the treatments described above produced large reductions in Campylobacter when applied under practical conditions to naturally contaminated carcasses or portions. For that reason, the costs of implementing the systems were not examined. Additional work, within a sister project (FS121014 B) considering other interventions, and by the industry, examined the effects of rapid surface cooling of carcass surfaces.

## **Published Papers**

1. Burfoot, D., Mulvey, E., Foy, E., Maguire, E., Bayliss, D., Jewell, K. (2013b) Efficacy, practicality, and Costs of Using Rapid Surface Cooling to Reduce Campylobacter Contamination on Chicken Carcasses at Slaughterhouses. (Additional Final Report on Food Standards Agency Projects M01058 and M01059.)
2. Burfoot, D., Mulvey, E., Foy, E., Turner, R., Maguire, E., Jewell, K., Allen, V., Harrison, D., Morris, V., Hutchison, M. (2013c) Report on Trial to Assess the efficacy of Rapid Surface Cooling for Reducing the Numbers of Campylobacter on Chicken Carcasses. (Additional Report on Food Standards Agency Project M01058.)

Research report

## **England, Northern Ireland and Wales**

PDF

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