

## Introduction

In December 2010, the Food Standards Agency announced a joint Government and Industry target to reduce the percentage of chickens produced in UK poultry slaughterhouses that have the highest level of contamination i.e. those with more than 1,000 colony forming units per gram of carcass neck skin samples, from a baseline of 27% in 2008 to 10% by April 2015. A UK-wide, stratified and randomised survey of chicken broiler flocks at slaughter began in March 2012 to monitor this target.

## Methods

- The survey design and sampling protocols were based on the EU technical specifications for EC decision 2007/516. Sampling schedule was randomised and weighted according to slaughter throughput:
  - Abattoirs (n=19) with a higher slaughter throughput were requested to sample more often than smaller scale abattoirs.
  - The abattoir, sampling date and batch to be sampled on a given date are randomly selected.
- One carcass per slaughter batch was sampled after chilling and before further processing. The samples were then transported to the laboratory for detection, quantification and speciation of *Campylobacter* spp. based on the methods described in ISO 10272:2006.
- The outcome in the descriptive univariable analysis was a highly contaminated *Campylobacter*-positive slaughter batch (> 1,000 cfu/g). The baseline group included all slaughter batches that were either negative for *Campylobacter* or had counts of 1,000 cfu/g or less.

## Results

- 992 slaughter batches were sampled between March 2012 and February 2014. Of these 951 (95.9%) were eligible for inclusion in the survey; the majority were excluded due to exceeding 80 hours between sampling and arrival at the laboratory.
- 751 (79.0%) of the carcasses were confirmed to be *Campylobacter*-positive (*C. jejuni* and/or *C. coli*). *C. jejuni* was the most frequently identified species (63.0%) and *C. coli* was identified on 16.0% of carcasses.
- Overall, 30.7% of the carcasses (n=292) were found to be highly contaminated with *Campylobacter* (>1,000 cfu/g).
- The timeline of prevalence of highly contaminated carcasses shows that the 2013 target was not met (Figure 1).



Figure 1: Prevalence of highly contaminated carcasses from monitoring results (Mar 2012 – Feb 2014)

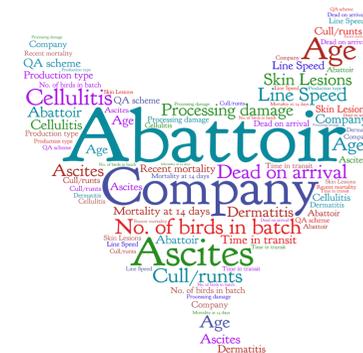
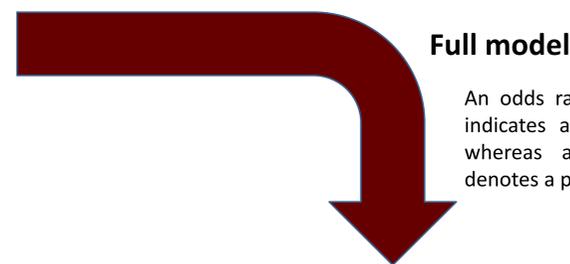


Figure 2: Significant univariate risk factors

- Forty-one variables were tested in the univariate analysis and 17 showed a significant association ( $p < 0.05$ ) with highly *Campylobacter*-contaminated carcasses (> 1,000 cfu/g) (Figure 2).
- The final model included results for 946 slaughter batches and consisted of six variables with a random-effect for abattoir (Table 1).



An odds ratio (OR) of >1.0 indicates an increased risk whereas an OR of <1.0 denotes a protective effect

Exposures	Odds Ratio	95% CI	P-value
<b>Age Category<sup>a</sup></b>			
38-40 days	1.53	0.95 - 2.47	0.079
41-45 days	2.07	1.24 - 3.47	0.005
≥ 46 days	2.40	1.34 - 4.29	0.003
<b>Line Speed<sup>c</sup></b>			
≥ 10,501	0.45	0.24 - 0.85	0.014
<b>Skin Lesions<sup>d</sup></b>			
Presence of skin lesions	1.81	1.18 - 2.79	0.007
<b>Processing damage<sup>e</sup></b>			
Presence of processing damage	0.60	0.40 - 0.88	0.009
<b>Dead on Arrival<sup>f</sup></b>			
≥ 0.080 %	1.83	1.32 - 2.52	<0.001
<b>Mortality at 14 days<sup>g</sup></b>			
>2.00 %	0.73	0.52 - 1.02	0.066

<sup>a</sup> Baseline - < 35 days  
<sup>c</sup> Baseline - < 8,501 birds slaughtered per hour  
<sup>d</sup> Baseline - Absence of skin lesions  
<sup>e</sup> Baseline - Absence of processing damage (overscalding, badly bled carcasses or machine damage)  
<sup>f</sup> Baseline - < 0.080 %  
<sup>g</sup> Baseline - < 2.00 %

Table 1: Risk factors associated with highly contaminated slaughter batches

## Conclusions

- The proportion of highly-contaminated carcasses has not reduced since the baseline survey in 2008.
- The risk for highly-contaminated carcasses increased with age of the slaughter birds, presence of skin lesions in the slaughter batch and increased proportion of dead-on-arrival. Protective factors were identified as linespeed of ≥10,501 birds slaughtered per hour, presence of processing damage (including overscalded, badly bled and machine damage) and >2% mortality at 14 days. Abattoir was included in the model as a random effect to account for clustering of the data as there was strong evidence to suggest that there was between-abattoir variation and within-abattoir clustering.
- The findings reported here provide a robust estimate of the percentage of chickens that are highly contaminated in the UK and the risks associated with *Campylobacter* contamination on broiler carcasses.