

Epidemiological analysis of Campylobacter data generated in an industry biosecurity study

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

Study duration: 2014-01-01

Planned completion: 1 April 2015

Project code: FS101114

Conducted by: The Royal Veterinary College

Background

An MSc project at the Royal Veterinary College originally undertook an initial analysis of data generated by industry. This was on Campylobacter colonisation of poultry batches originating from farms with enhanced biosecurity and from control farms with standard biosecurity generated up to the beginning of summer 2013. The project continued to generate more data, covering the 2013 summer peak. The FSA decided to provide funding to build on the preliminary analysis, which had indicated a possible improvement in the model farms compared to the control farms. There was also some evidence linking to specific risk factors. It was anticipated that an analysis of the complete data set would provide valuable information on the dynamics of colonisation, the impact in the slaughterhouse and the effect of biosecurity. It was expected that the outputs from the work would help industry to transfer the best practice developed by the model farms to the rest of the industry. The data generated were also seen as invaluable to the FSA for use in the refinement of the model used to calculate the reduction target.

The data were generated by a group of Industry representatives who have worked together to undertake a 2 year project with the aim of improving the control of Campylobacter colonisation on farm.

Research Approach

The aim of this study was to analyse the data generated by industry on Campylobacter colonisation of poultry batches originating from farms with enhanced biosecurity and from control farms with standard biosecurity. The data generated by the project have been analysed in order to achieve the following objectives:

- To test the hypothesis that biosecurity 'on-farm' contributes to a decrease in Campylobacter colonisation at high level (>123,000cfu/g in caeca), comparing batches grown in model farms in which biosecurity was enhanced with batches grown in control farms with 'standard' biosecurity
- To assess the relationship between selected husbandry factors and the likelihood of Campylobacter colonisation at high levels (>123,000cfu/g in caeca)
- To compare the results of assessing the status of batches by means of testing pooled caecal samples vs. pooled neck skin samples

The analysis was carried out using data from batches originating from 16 'model farms' with elevated biosecurity belonging to 3 companies and slaughtered in 10 slaughterhouses during the period September 2011 - August 2013. For comparison, data were also collected from:

- batches grown in farms with standard biosecurity and slaughtered in four processing premises between March 2012 and October 2013
- batches in five farms selected for having 'similar conditions' to five of the model farms for the period January 2013 – August 2013 and
- batches from farms selected for having 'similar conditions' to the other five of the model farms for the period September 2011 – August 2013

The level of *Campylobacter* spp. was measured in pooled caecal samples and pooled neck skin samples from each batch. Data were recorded at the slaughterhouse level and included information on husbandry factors for each batch. Two main analyses were carried out: firstly, the percentage of batches from 'model farms' with high levels (>123,000 cfu/g) of *Campylobacter* spp. was compared with the percentage of batches from 'control farms' with high levels of *Campylobacter* spp., after controlling for potential confounders. Secondly, risk factors for high levels of colonisation were explored, within the 'model farms'. In order to account for seasonality, batches from enhanced biosecurity and control farms were compared only when they were slaughtered during the same sampling period. A second, lower threshold >1,000cfu/g) was used and the main findings reassessed to confirm they were robust to changes in the criteria used to classify batches as highly colonised.

Results

Following the identification of two suitable control groups of farms with standard biosecurity from datasets provided by the industry, statistical analyses were carried out for one factor at a time (univariate); and adjusting for confounding factors (multivariate), to assess the relationship between selected 'on farm' factors and the probability that the batch was highly colonised. The findings support the following conclusions:

- A substantial risk of *Campylobacter* spp. infection is present on farm (i.e. in the beginning of the food chain), as a large proportion of all the poultry batches included in this study (58.6%) were colonised in caeca at high levels.
- The risk of batch colonisation exhibits seasonality, with a peak in summer when almost 90% of the studied batches were highly colonised.
- Enhancement of biosecurity in commercial poultry farms can contribute to the reduction of batch colonisation at thinning to 60.0% (123,000 cfu/g threshold) of the risk in control farms. Following thinning, the potential effect of increased biosecurity becomes much less apparent.

In addition to the season, husbandry factors such as the practice of partial depopulation (thinning), hybrid type and empty period between flocks in a shed were also associated with the probability of batch colonisation at high levels >123,000cfu/g. In farms with enhanced biosecurity, batches in which thinning had been previously carried out were significantly more likely to be colonised at >123,000 cfu/g in caeca than batches in which thinning had not been practised (66.6% vs. 48.4%). An empty period of less than one week between the flocks decreased the risk of colonisation at >123,000 cfu/g in caeca to the level of 51.2% compared with the risk 54.4% if empty period was 1-2 weeks. A prolonged empty period of >three weeks between the flocks increased the risk of high colonisation to 72.9%.

Published Papers

1. M Georgiev, W Beauvais & J Guitian (2017) - Effect of enhanced biosecurity and selected on-farm factors on *Campylobacter* colonization of chicken broilers - Epidemiology &

Infection Vol 145, issue 3, pp. 553-567.

2. M Crotta, M Georgiev & J Guitian (2017) - Quantitative risk assessment of Campylobacter in broiler chickens – Assessing interventions to reduce the level of contamination at the end of the rearing period – Food Control Volume 75, Pages 29–39.

Research Report

England, Northern Ireland and Wales

PDF

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