HOW UNDERSTANDING THE PATTERN OF BROILER FARM CONTAMINATION HAS SOLVED THE *CAMPYLOBACTER* ISSUE IN BROILERS

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A small area of the broiler house, for 5 different flocks, was sectioned off using Perspex sheeting. This 'biosecure cube' (BC) was populated with 25 to 125 chicks (test birds), a small subset of the general population of up to 30,000 (control) birds. The BC area incorporated the water and feed-lines. The birds were routinely tested for *Campylobacter* (faecal and/or caecal samples). Despite the general bird population being *Campylobacter* positive as early as 14 days, 4 of the 5 BC sub-populations remained negative while the fifth remained negative until day 35. It was therefore concluded that preventing direct contact between the farm staff and the broilers prevents *Campylobacter* infection in broilers.

Key Words – ***Campylobacter*, enhanced biosecurity, farm staff, broilers**

I. INTRODUCTION

Campylobacter spp. are microaerophilic, fastidious, zoonotic pathogenic organisms [1], which, although ubiquitous in the environment, preferentially colonise farmed poultry [2]. Campylobacteriosis is the most common gastroenteritis in the developed world and its incidence in the EU is conservatively estimated at 9 million cases per annum costing €2.4 billion (EFSA, 2011). Poultry are the primary source accounting for 50-80% of cases [3]. Approximately 83% of the 70 million broilers produced in Ireland each year are infected with *Campylobacter* [4]. The objective of this study was to test the hypothesis that farm staff are the primary source of *Campylobacter* transmission into broiler flocks and preventing direct contact between them and the birds using a 'biosecurity cube' (BC) would protect the flock against *Campylobacter* infection.

II. MATERIALS AND METHODS

This study was initially undertaken on one farm (farm 1) using 3 different flocks (flocks 1, 2 and 3) at different times. It was then extended to include 2 additional farms (farms 2 and 3) using one flock per farm (flocks 4 and 5). There were approximately 33,000 birds in flocks 1 to 3, 22,000 in flock 4 and 35,000 in flock 5. The broiler farms all used fan based controlled ventilation and each had between 2-5 broiler houses in close proximity on a single site with a tarmac apron. Thinning or partial depopulation of flocks was carried out once in each flock, typically between day 32 and 37, at which point the experiment was terminated.

The 'biosecurity cube' used was as described by Battersby et al. (2016). Samples were collected from each flock on the day of chick arrival and every 7 days during the broiler rearing period. These included; (1) 40 air Samples (tested for *Campylobacter* and Total Viable Count's (TVC)); (2) 100 faecal samples (10 pooled samples each containing 10 fresh faecal samples, collected directly from the broiler house floor; (3) 10 faecal samples collected from the floor of the BC; (4) 3 x 50g of feed from the feed auger supplying the feed line that included the BC; (5) 3 litres of the broiler house water supply and (6) 10 caecal samples, each collected once per week from 10 randomly selected 'control' birds. Once the flock tested positive for *Campylobacter* (or the flock reached 21 days), caecal testing was extended to include the birds within the BC (10 per week from flocks 1 to 3 and 5 per week from flocks 4 and 5. Campylobacter isolates, enumeration and confirmation was performed as described by Battersby et al. [5].

III. RESULTS AND DISCUSSION

Flock 1 (control birds) were *Campylobacter* positive after 21 days (4.5 $\log_{10}$ CFU/g) but the test birds in the biosecure cube remained *Campylobacter* negative until day 35 (1.5 $\log_{10}$ CFU/g). Two subsequent flocks (2 and 3) on the same farm also recorded *Campylobacter* positive faeces after 21 days (5.1 and 3.5 $\log_{10}$ CFU/g, respectively) but the test birds in the BC remained negative. This pattern was repeated on 2 other farms, with flocks 4 and 5 control birds infected with *Campylobacter* after 35 and 14 days, respectively, while the birds within the biosecure cube remained *Campylobacter* free. Interestingly, the birds in the BC were protected despite receiving the same feed

and water and breathing the same air. While all feed and water samples tested negative throughout these experiments, the air in the flock 1, 2 and 5 broiler houses was contaminated with *Campylobacter* as early as day 14 and reached levels as high as 4 $\log_{10}$ CFU/m^3. Weight gain in the test and control birds was also recorded. From day 21 to day 35 (the developmental phase) the test birds consistently showed greater weight gain than birds in the general population so that by day 35 the test birds were significantly heavier (P<0.05) (on average 400g) than the control equivalents.
Effective biosecurity protects broilers from infection with *Campylobacter* [6, 7]. However achieving this is very difficult. Racicot et al. [8] in an observational study in Canada, reported 44 different biosecurity breaches from 883 visits by 102 different individuals on broiler farms (an average of 4 non-compliances per visit). Overcoming the sporadic application or inadequacy in the design of biosecurity measures therefore requires the removal of the variable factor or human element as was achieved using the biosecurity cube.

IV. CONCLUSION

It was therefore concluded that preventing direct contact between poultry farm staff and broilers using the BC considerably enhanced biosecurity resulting in the production of *Campylobacter* free birds. Extending the 'biosecure cube' concept to the entirety of the broiler house would significantly improve food safety, animal welfare and productivity.

ACKNOWLEDGEMENTS

This study was funded by the Food Institute Research Measure administered by the Department of Agriculture, Food and Marine (Ireland) (Project 11/F/051). The authors acknowledge Ms. Paula Reid for statistical analysis of the data.

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