

Campylobacter contamination in fresh whole chilled UK-produced chickens at retail: August – December 2016

This report presents the latest results of the UK Survey of Campylobacter contamination in fresh chicken at retail. The figures in this report are based on a total of 1,492 chickens sampled during the period August to December 2016. The results in this report are weighted to reflect retailer market share¹.

As these estimates are based on a sample survey, there is a degree of uncertainty associated with them. All tables and charts include 95% confidence intervals which reflect the uncertainty present in the results. They provide a range of values within which the true value will lie 95% of the time.

During the previous survey year (Year 2), a methodological issue arose which meant that our measures were no longer providing a reliable indication of how levels of contamination in chickens at retail were changing over time, or providing like for like comparisons between retailers. This methodological issue is explained in the January-March 16 report: www.food.gov.uk/sites/default/files/campy-survey-report-jan-mar-2016.pdf.

Consequently the survey was suspended in April 2016 while alternative measures of contamination levels were considered, with the aim of restoring the robustness of the survey; www.gov.uk/government/statistics/announcements/uk-survey-of-campylobacter-contamination-in-fresh-retail-chicken-and-its-packaging-4th-quarterly-release-of-results.

After trialling a number of options in the final quarter of Year 2, a new procedure was developed to ensure the best possible sample was identified for the continued monitoring of Campylobacter. The survey resumed in August 2016. The new protocol uses 5-10g samples which are purely neck skin (compared to the 25g samples of neck skin topped up with breast skin used in the previous protocol). The details of the new protocol can be found at: www.food.gov.uk/science/research/foodborneillness/b14programme/b14projlist/fs102121

Based on the new protocol, neck skin samples were taken from a total of 1,680 chickens during the period August to December 2016. However, owing to the continued trimming of neck skin by the industry, 11% of these did not have sufficient neck skin remaining to meet the 5g threshold required by the protocol. Therefore the figures in this report could only make use of results from 1,492 chickens.

This survey follows on from Years 1 and 2 of the Campylobacter retail survey, which represent the periods from mid-February 2014 to mid-February 2015 and from July 2015 to March 2016 respectively. As such, the set of months for which there is data from all three surveys is August to December. However, due to the changes implemented in the testing protocol for Year 3, the results for Year 3 are not directly comparable to those from Years 1 and 2. More details on this issue are provided in the Methodological Annex (page 8).

¹ In all cases, the weighting is based on market share data provided by Kantar for the 52 weeks ending 1st February 2015.

The sampling of chicken packaging has ceased and no longer forms part of the protocol, because the levels found in quarter 3 of Year 2 were deemed sufficiently low.

Key Results

- The latest results show that in August – December 2016, 7.0 % of chickens had high levels of *Campylobacter* (over 1000 cfu/g), down from 11.6% over the same period the previous year.
- To compare the proportion of chickens with levels of *Campylobacter* above 1000 cfu/g between retailers, each was compared to the overall average (weighted by market share) among all other retailers:
 - The named retailers which had a significantly lower prevalence compared to the average among all other retailers were Morrisons (3.3%) and Sainsbury's (2.6%).
 - None of the named retailers had a prevalence estimate significantly higher than the average among all other retailers. However, the group 'Others', combining a number of smaller retailers and Butchers, had a significantly higher prevalence (19.7%) compared to the market average among all other retailers.

Background to the survey

Foodborne *Campylobacter* is estimated to make more than 280,000 people ill each year in the UK and is the biggest cause of food poisoning. An EFSA Opinion² stated that up to 80% of cases can be attributed to raw poultry meat and a tenfold decrease in the exposure levels from this source is likely to reduce the number of human *Campylobacter* cases by 50 to 90% across all Member States.

We report two summary measures of the extent of *Campylobacter* contamination in chickens at retail:

- The percentage of chicken skin samples positive for *Campylobacter*.
- The percentage of skin samples with a level of *Campylobacter* over 1000 cfu/g.

All chickens, regardless of which retail outlet they are bought from, are at risk of being contaminated with *Campylobacter*, which is why it is important for consumers to handle and cook their chicken safely. Effective cooking will kill any *Campylobacter* on the chicken.

The Food Standards Agency (FSA) and industry have together focused on reducing *Campylobacter* levels greater than 1000 colony forming units per gram, and a number of interventions have been trialled, introduced and refined in recent years.

² Scientific Opinion on *Campylobacter* in broiler meat production, control options and performance objectives and/or targets at different stages of the food chain: www.efsa.europa.eu/en/efsajournal/doc/2105.pdf

Levels of Contamination

The level of Campylobacter contamination on chicken skin is measured in terms of the number of colony forming units per gram of skin (cfu/g). Table 1 presents the levels of contamination found on chicken skin sampled during August-December 2016, showing the proportion of chickens in various bands of contamination. Only levels of 10 cfu/g and over are detectable.

Detectable levels of Campylobacter are split into three bands:

- 10-99 cfu/g
- 100-1000 cfu/g
- over 1000 cfu/g.

'Over 1000 cfu/g' is the highest band, and is the primary focus of attention.

Table 1 – Levels of Campylobacter (cfu/g) on chicken skin: Aug – Dec 2016

Chicken skin	Level of Campylobacter contamination (cfu/g)			
	Less than 10	10-99	100-1000	Over 1000
Percentage of chickens	44.2 (41.4 – 47.0)	27.8 (25.2 – 30.5)	20.9 (18.8 – 23.2)	7.0 (5.6 – 8.5)
No. samples	649	407	331	105

95% confidence intervals are shown in brackets. These reflect the uncertainty in the given estimate, providing a range of values within which the true percentage will lie 95% of the time. Like all other estimates in this report, the percentages are weighted according to the market share of each retailer.

- 55.8% of chicken skin samples were positive for Campylobacter and 7.0% of skin samples showed levels of Campylobacter over 1000 cfu/g.

Changes over time

Table 2 and Figures 1 and 2 present the latest results for the two summary measures of Campylobacter contamination in chickens at retail. They show both the latest results (Aug-Dec 2016) as well as those for the same period in the previous two years (Aug-Dec 2014 and Aug-Dec 2015). All three sets of results are weighted using the same data on the market share of individual retailers and therefore do not take into account any changes in market share that may have occurred over this time period.

The comparability of results over time is complicated by the change in the survey protocol, from August 2016 onwards. More details can be found in the Methodological Annex (page 8). Keeping these caveats in mind, Table 3 presents the estimated year on year changes and suggests that:

- There was a statistically significant reduction in the percentage of chickens with high levels of Campylobacter (over 1000 cfu/g) from 11.6% in Aug-Dec 2015 to 7.0% in Aug-Dec 2016.
- There was a statistically significant reduction in the percentage of chickens positive for Campylobacter from 65.7% in Aug-Dec 2015 to 55.8% in Aug-Dec 2016.

Table 2 – The overall prevalence of Campylobacter on chickens sampled: Aug – Dec; 2014, 2015 and 2016.

Time period	No. of samples	% skin samples positive for Campylobacter	% skin samples over 1000 cfu/g Campylobacter
Aug – Dec 2014	1,728	78.3 (76.1 – 80.3)	20.3 (18.3 – 22.6)
Aug – Dec 2015	1,696	65.7 (63.1 – 68.3)	11.6 (9.9 – 13.4)
Aug – Dec 2016	1,492	55.8 (52.9 – 58.5)	7.0 (5.6 – 8.5)

95% confidence intervals are shown in brackets. These reflect the uncertainty in the estimate and provide a range of values within which the true prevalence will lie 95% of the time.

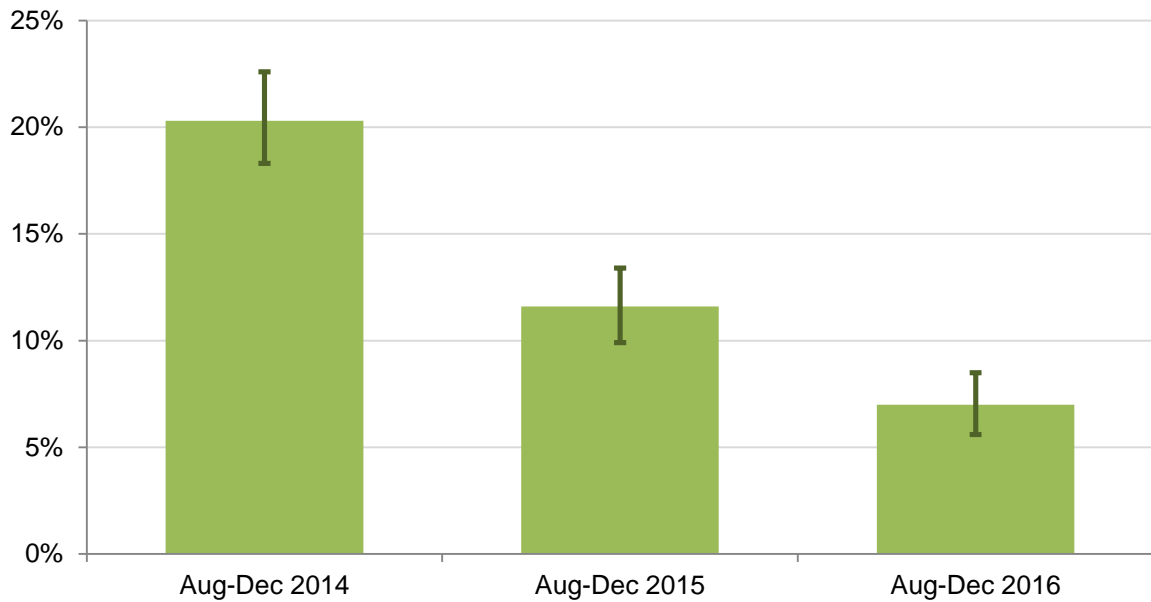
Table 3 – Year on year changes in the overall prevalence of Campylobacter on chicken skin samples: Aug-Dec; 2014, 2015 and 2016.

Percentage of samples with levels of contamination over 1000 cfu/g						
Aug – Dec	Prevalence			Percentage points change in prevalence (95% CI)		
	2014	2015	2016	2014 to 2015	2015 to 2016	2014 to 2016
	20.3	11.6	7.0	-8.7 (-11.5 to -6.0)	-4.6 (-6.8 to -2.3)	-13.3 (-15.9 to -10.7)
Percentage of samples positive for Campylobacter						
Aug – Dec	Prevalence			Percentage points change in prevalence (95% CI)		
	2014	2015	2016	2014 to 2015	2015 to 2016	2014 to 2016
	78.3	65.7	55.8	-12.6 (-15.9 to -9.2)	-9.9 (-13.8 to -6.2)	-22.5 (-26.1 to -19.1)

95% confidence intervals are shown in brackets. These reflect the uncertainty in the estimate and provide a range of values within which the true prevalence will lie 95% of the time.

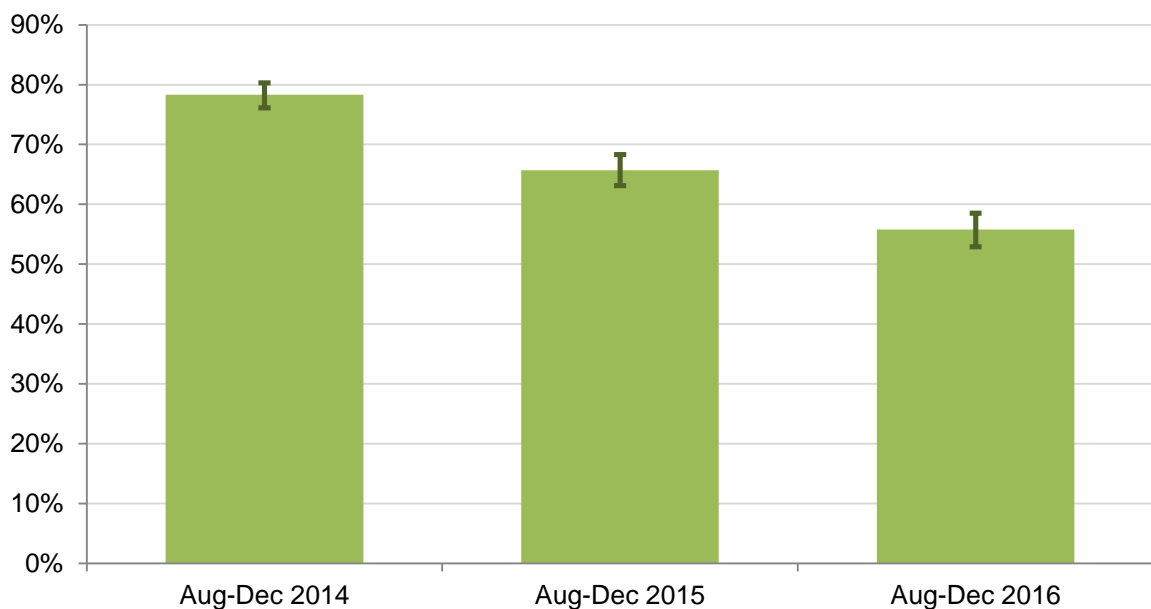
 Indicates a statistically significant decrease in contamination
 Indicates a statistically significant increase in contamination

Figure 1 - The proportion of chickens at retail with high levels of Campylobacter detected (over 1000 cfu/g): Aug-Dec; 2014, 2015 and 2016.



95% confidence intervals are shown as vertical bars. These reflect the uncertainty in the estimate and provide a range of values within which the true prevalence will lie 95% of the time.

Figure 2 - The proportion of chickens at retail positive for Campylobacter: Aug-Dec; 2014, 2015 and 2016.



95% confidence intervals are shown as vertical bars. These reflect the uncertainty in the estimate and provide a range of value within which the true prevalence will lie 95% of the time.

Results by retailer

Table 4 shows the latest results for the two summary measures of Campylobacter contamination in chickens at retail, by retailer. Figure 3 illustrates the percentage of skin samples with a level of Campylobacter over 1000 cfu/g, by retailer.

Both Table 4 and Figure 3 include 95% confidence intervals for each of the prevalence estimates (in Figure 3 these are represented as vertical bars). Where these overlap, this suggests that there may be insufficient evidence to draw firm conclusions about which may have the lower prevalence for the given summary measure.

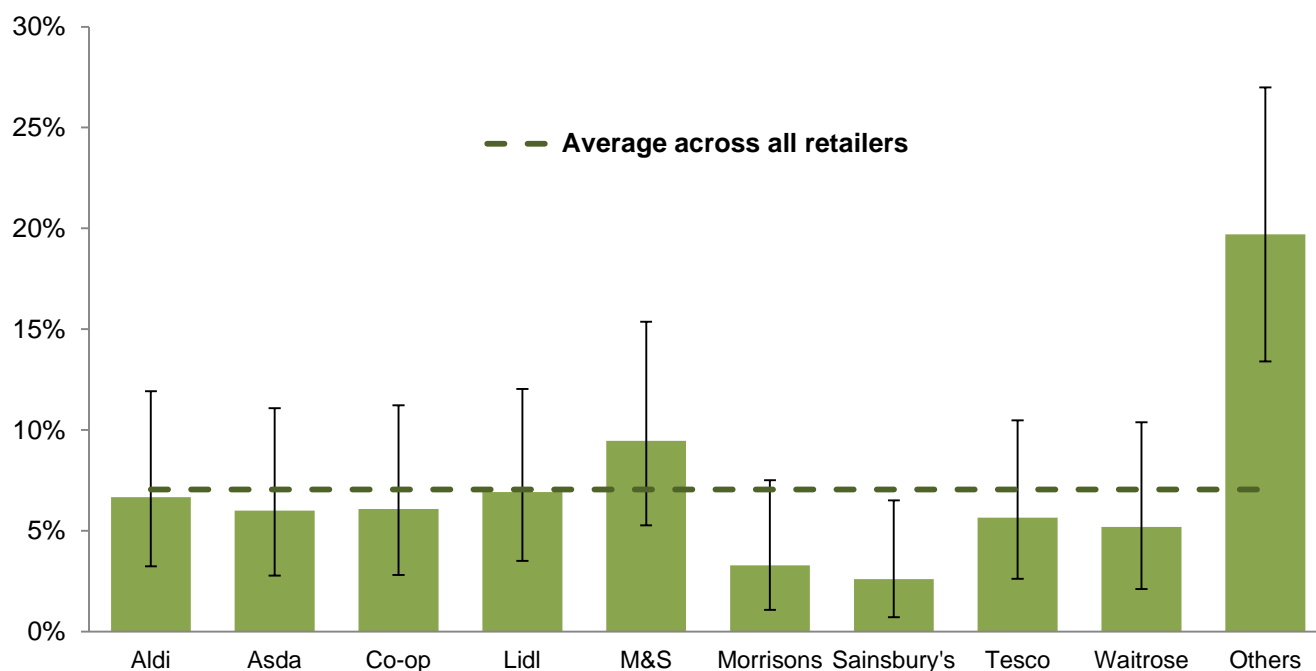
Table 4 - The overall prevalence of Campylobacter on chickens sampled, by retailer: Aug – Dec 2016

Retailer	No. of samples	% skin samples positive for Campylobacter	% skin samples over 1000 cfu/g Campylobacter
Aldi	150	60.0 (51.7 – 67.9)	6.7 (3.2 – 11.9)
Asda	150	55.3 (47.0 – 63.4)	6.0 (2.8 – 11.1)
Co-op	148	46.6 (38.4 – 55.0)	6.1 (2.8 – 11.2)
Lidl	159	56.6 (48.5 – 64.4)	6.9 (3.5 – 12.0)
M&S	148	71.6 (63.6 – 78.7)	9.5 (5.3 – 15.4)
Morrisons	152	53.6 (45.0 – 61.4)	3.3 (1.1 – 7.5)
Sainsbury's	154	48.7 (40.6 – 56.9)	2.6 (0.7 – 6.5)
Tesco	159	47.2 (39.2 – 55.2)	5.7 (2.6 – 10.5)
Waitrose	135	44.4 (36.3 – 52.6)	5.2 (2.1 – 10.4)
Others	137	82.5 (75.1 – 88.4)	19.7 (13.4 – 27.4)
All	1492	55.8 (52.9 – 58.5)	7.0 (5.6 – 8.5)

95% confidence intervals are shown in brackets. These reflect the uncertainty in the estimate and provide a range of values within which the true prevalence will lie 95% of the time.

- For the purpose of comparing the percentage of chickens with levels of Campylobacter above 1000 cfu/g between retailers, each retailer was compared to the overall average (weighted according to market share) among all other retailers:
 - Sainsbury's and Morrisons were the only named retailers with prevalence significantly lower than the average across the other retailers at 2.6% and 3.3% respectively.
 - Only the 'Others' grouping had a combined prevalence significantly higher than the average among the other retailers at 19.7%.

Figure 3 - The percentage of chickens with levels of Campylobacter over 1000 cfu/g by retailer: Aug – Dec 2016



95% confidence intervals are shown as vertical bars. These reflect the uncertainty in the estimate and provide a range of values within which the true prevalence will lie 95% of the time.

Additional notes

All chickens, regardless of which retail outlet they are bought from, are at risk of being contaminated with Campylobacter, which is why it is important for consumers to handle and cook their chicken safely. Effective cooking will kill any Campylobacter on the chicken.

There are other survey variables by which results could be disaggregated, e.g. to explore the possible differences associated with how close the chicken is to the use-by date or the weight of the chicken, among others. These associations are best looked at as part of a considered analysis that takes account of the correlations between all the variables involved. Such an analysis will be included as part of a more in-depth report, after the full 12 months of the current survey are complete, and the raw data from the survey will also be put into the public domain. The more in-depth final report and the raw data for Year 2 of the survey can be found at:

www.food.gov.uk/science/microbiology/campylobacterevidenceprogramme/retail-survey-year-2.

The final report and raw data for Year 1 of the survey can be found at:

www.food.gov.uk/science/research/foodborneillness/b15programme/b15projects/fs241044A.

Methodological Annex

Eligibility Criteria

Chickens eligible for inclusion in this survey are:

- Whole, chilled, raw, UK-produced standard, free range or organic chickens;
- Where contained in a package, it was unopened and undamaged;
- NOT frozen;
- NOT basted, herbed, stuffed, marinated or otherwise modified.

Samples are collected from retail premises (including both retailer own-brand and branded chickens) in the UK, and the information gathered includes temperature on receipt, the approved premises code of the poultry plant and use-by dates.

The comparability of results between the new and old protocols

The new protocol from August 2016 means that subsequent results are not directly comparable to those reported in previous years. The two main changes to the protocol, from August 2016 onwards, are:

- Samples must comprise 100% neck skin (topping up with breast skin is no longer permitted as it was previously);
- Samples are smaller (5-10g depending on the amount of available neck skin) compared to the 25g used previously

The first change was instituted to tighten up the protocol, because strong evidence had emerged that topping up with breast skin reduces the measured level of *Campylobacter* in the skin samples. Thus, the anticipated effect of this change is to increase the measured levels of *Campylobacter* contamination.

The second change was necessitated by the first change: in many cases it is only possible to secure a sample that is 100% neck skin by accepting a smaller sample size. So under the new protocol reported results are based on 5-10g skin samples. An attempt was made to indirectly estimate the effect of moving from 25g samples to samples of less than 10g, on the measured levels of contamination. While this provided no statistically significant evidence of such an effect, there was a large degree of uncertainty around this estimate.

Based on the available evidence, it seems reasonable to conclude that where we observe a reduction in *Campylobacter* prevalence, when comparing results under the new protocol with those under the previous protocol, it is likely to represent a genuine reduction. Indeed it is possible that the reduction is being underestimated (owing to the move to 100% neck skin samples). However, we do not have sufficiently robust evidence to entirely rule out the possibility that the new protocol may be less stringent than the old one. Hence, some care is required when interpreting the measured changes over time as they may have been impacted by the change in protocol.

Statistical features

This report includes prevalence estimates for the 9 retailers which have a market share greater than 4% - the 'named' retailers. All butchers and other smaller retailers are grouped together into an 'Others' category.

During Year 1 of the survey (mid-Feb 2014 – mid-Feb 2015), chickens were sampled from retailers to reflect their market share, with a planned 4,000 samples altogether and designed to estimate the overall mean prevalence of *Campylobacter* in fresh retail chickens in the UK over a 12-month period.

In Year 2, this was altered to give more robust prevalence estimates for the named retailers as well as to estimate the mean prevalence. An equal number of chickens were sampled from each of the named retailers (100 per quarter) and for butchers (50 per quarter) and smaller retailers (50 per quarter). Adopting this design has a negligible effect on the precision of estimate for the overall mean prevalence, while resulting in better comparability between retailers. As with the Year 1 survey, for each of the named retailers the split in terms of the types of chickens sampled (standard/ free-range/ organic) was based on the market share data. The current survey follows the same sampling design as the Year 2 survey.

To remove any bias from not sampling chickens according to market share, the survey data are weighted using the market share data. So the overall prevalence figures are a weighted average of the prevalence figures for each of the 9 named retailers, butchers and 'other small retailers'. The prevalence figure given for the 'others' category is a weighted average of the prevalence figures of butchers and the figures calculated for 'other smaller retailers'.

The market share data used were supplied by Kantar for the 52 weeks ending 1st February 2015. As these data are a snapshot of a fixed period of time, they may not reflect the dynamic nature of the market. These data fulfil several criteria:

- They are derived from a large UK-wide consumer panel.
- They are able to provide information specifically referring to chickens at retail which meet eligibility criteria for inclusion in the survey.
- They provide breakdowns by type of chicken (standard, free-range, organic).

Confidence intervals, for the estimated prevalence of individual retailers are exact confidence intervals. Since the estimates of the overall prevalence, and the estimates of prevalence for the 'Others' category are weighted averages, bootstrap confidence intervals are used for these estimates.

Laboratory testing

The testing laboratories were the five Public Health England (PHE) Food, Water and Environmental Microbiology Laboratories, as well as the Agri-Food Biosciences Institute (AFBI) Laboratory in Northern Ireland. Once samples reached the laboratory, testing was indicated within 24 hours, and certainly before 48 hours after sampling. Chickens were tested before or on their use-by dates. Sampling and laboratory personnel prevented cross contamination between samples and from the surrounding environment at all stages, e.g. by wearing gloves and changing them between handling each chicken, and the cleaning of equipment and work surfaces after each sample.

One sample consisting of 10g of neck-skin was analysed for each chicken. If 10 grams of neck-skin was not available, a range of 2 to 10g could be used and the weight was accurately recorded. Chickens with less than 5g of neck-skin available for testing must be re-sampled and tested. Chickens with neck-skin weights between 2 and 5g are analysed according to protocol but results not published.

The chicken samples tested were examined utilising the enumeration method based on that described in EN/ISO/TS 10272-2:2006 'Microbiology of food and animal feeding stuffs – Horizontal method for detection and enumeration of *Campylobacter* spp – Part 2: Colony-count technique'. Enumeration using direct plating with a detection limit of 10 colony forming units (cfu) per gram (g) of neck-skin was used.

Any isolates of *Campylobacter* species were sent to the PHE laboratory in Colindale for further speciation.

Further Information

Additional information on the survey design and testing can be found in the revised survey protocol (1st August 2016) at:
www.food.gov.uk/sites/default/files/retail_survey_protocol_year3.pdf.

We aim to meet the needs of our users. If you have any feedback on this publication please send it to chickensurvey@foodstandards.gsi.gov.uk.