Campylobacter contamination in fresh whole chilled UK-produced chickens at retail: January-March 2017

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 1,051 chickens sampled during the period January to March 2017. The results are weighted to reflect retailer market share[1].

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.

The figures in this report, which are based on the revised protocol introduced in August 2016, are not directly comparable with those referring to previous years. More information on why a new protocol was needed, and on the issues with making comparisons with previous years, can be found in the Annex.

Based on the revised protocol[2], neck skin samples were taken from a total of 1,111 chickens during the period January to March 2017. However, owing to the continued trimming of neck skin by the industry, 60 (5.4%) of these did not have sufficient neck skin remaining to meet the 5g threshold required by the new protocol. Therefore the figures in this report could only make use of results from 1,051 chickens.

Key Results

- The latest results show that in January-March 2017, 6.5% of chickens had high levels of Campylobacter (over 1000 cfu/g), down from 9.3% 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 M&S (2.5%), Morrisons (2.8%) and Waitrose (2.7 %).
    - 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 (16.9%) compared to the market average among all other retailers.

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

[2] https://www.food.gov.uk/science/research/foodborneillness/b14programme/b14projlist/fs102121

Background to the survey

Foodborne Campylobacter has been estimated to make more than 280,000 people ill each year in the UK and is the biggest cause of food poisoning[3]. An EFSA Opinion[4] 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 was 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 colony forming units per gram (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 cfu/g, and a number of interventions have been trialled, introduced and refined in recent years.

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 January – March 2017, 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" and 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: Jan-Mar 2017

Chicken skin	Level of Campylobacter contamination (cfu/g)			
	Less than 10	**10-99**	**100-1000**	**Over 1000**
Percentage of chickens (95% confidence interval)	51.2 (47.6 – 54.7)	23.7 (20.7 – 26.7)	18.7 (16.1 – 21.5)	6.5 (4.8 – 8.3)
No. samples	525	257	206	63

95% confidence intervals 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.

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[3] The Second Infectious Intestinal Disease Study (2014)
https://www.food.gov.uk/sites/default/files/IID2%20extension%20report%20-%20FINAL%2025%20March%202014_0.pdf
[4] 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

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 (Jan-Mar 2017) as well as those for the same period in the previous year (Jan-Mar 2016). Both 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. 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 9.3% in January to March 2016 to 6.5% in the same period in 2017. While we believe this is likely to be a genuine reduction, there are some caveats that should be borne in mind (see Annex for further details).

Table 2 – The overall prevalence of Campylobacter on chickens sampled: Jan-Mar 2016 and 2017.

Time period	No. of samples	% skin samples positive for Campylobacter	% skin samples over 1000 cfu/g Campylobacter
Jan-Mar 2016	1009	50.0 (46.5 – 53.5)	9.3 (7.3 – 11.3)
Jan-Mar 2017	1051	48.8 (45.3 – 52.4)	6.5 (4.8 – 8.3)

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: Jan – Mar 2016 and 2017.

Percentage of samples with levels of contamination over 1000 cfu/g			
Jan – Mar	**Prevalence**		**Percentage points change in prevalence (95% CI)**
	2016	**2017**	**2016 to 2017**
	9.3	6.5	-2.8 (-5.5 to -0.2)
Percentage of samples positive for Campylobacter			
Jan - Mar	**Prevalence**		**Percentage points change in prevalence (95% CI)**
	2016	**2017**	**2016 to 2017**
	50.0	48.8	-1.1 (-6.1 to 3.8)

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): Jan - Mar 2016 and 2017.
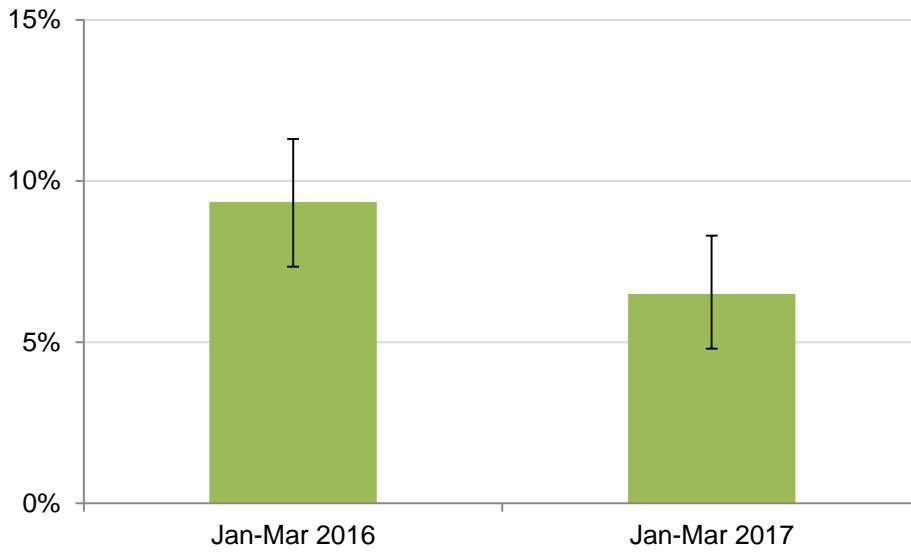
95% confidence intervals are shown as vertical bars. These reflect the uncertainty in the estimate and provide a range of values within which the true prevalence will lie 95% of the time.

Figure 2 - The proportion of chickens at retail positive for Campylobacter: Jan - Mar 2016 and 2017.
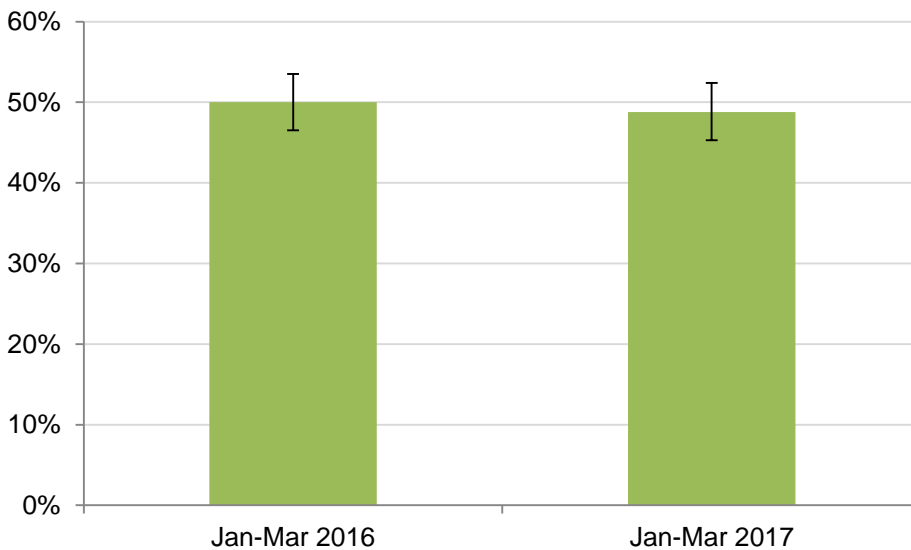
95% confidence intervals are shown as vertical bars. These reflect the uncertainty in the estimate and provide a range of value within which the true prevalence will lie 95% of the time.

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: Jan - Mar 2017

| Retailer	No. of samples	% skin samples positive for Campylobacter	% skin samples over 1000 cfu/g Campylobacter
Aldi	110	51.8 (42.1 – 61.4)	5.5 (2.0 – 11.5)
Asda	109	56.0 (46.1 - 65.5)	7.3 (3.2 – 14.0)
Co-op	94	63.8 (53.3 - 73.5)	4.3 (1.2 – 10.5)
Lidl	109	57.8 (48.0 – 67.2)	9.2 (4.5 – 16.2)
M&S	119	56.3 (46.9 - 65.4)	2.5 (0.5 – 7.2)
Morrisons	109	39.4 (30.2 – 49.3)	2.8 (0.6 – 7.8)
Sainsbury's	104	50.0 (40.0 – 60.0)	7.7 (3.4 – 14.6)
Tesco	104	41.3 (31.8 - 51.4)	3.8 (1.1 – 9.6)
Waitrose	110	28.2 (20.0 – 37.6)	2.7 (0.6 – 7.8)
Others	83	59.0 (47.7 – 69.7)	16.9 (9.5 – 26.7)
All	**1051**	**48.8 (45.3 – 52.4)**	**6.5 (4.8 – 8.3)**

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:
  - M&S (2.5%), Morrisons (2.8%) and Waitrose (2.7%) were the only named retailers with prevalence significantly lower than the average across the other retailers.
  - Only the 'Others' grouping had a combined prevalence significantly higher than the average among the other retailers at 16.9%.

- M&S was the only retailer to see a statistically significant change in its prevalence of highly contaminated chickens, compared to the preceding period (down from 9.5% in Aug-Dec 2016 to 2.5% in Jan-Mar 2017). It is possible that changes from the previous period may be partly explained by a seasonal effect.

All named, major retailers have achieved a lower prevalence of highly contaminated chicken than when the survey began in 2014. As a result, differences and changes, at individual retailer level, are becoming increasingly difficult to detect, over and above sampling variation. It could be argued that retailer results would be better presented pooled, over a longer period. This would lessen the impact of sampling variability, but has the disadvantage of reducing the responsiveness of survey estimates to the very latest trends.

Figure 3 - The percentage of chickens with levels of Campylobacter over 1000 cfu/g by retailer: Jan - Mar 2017
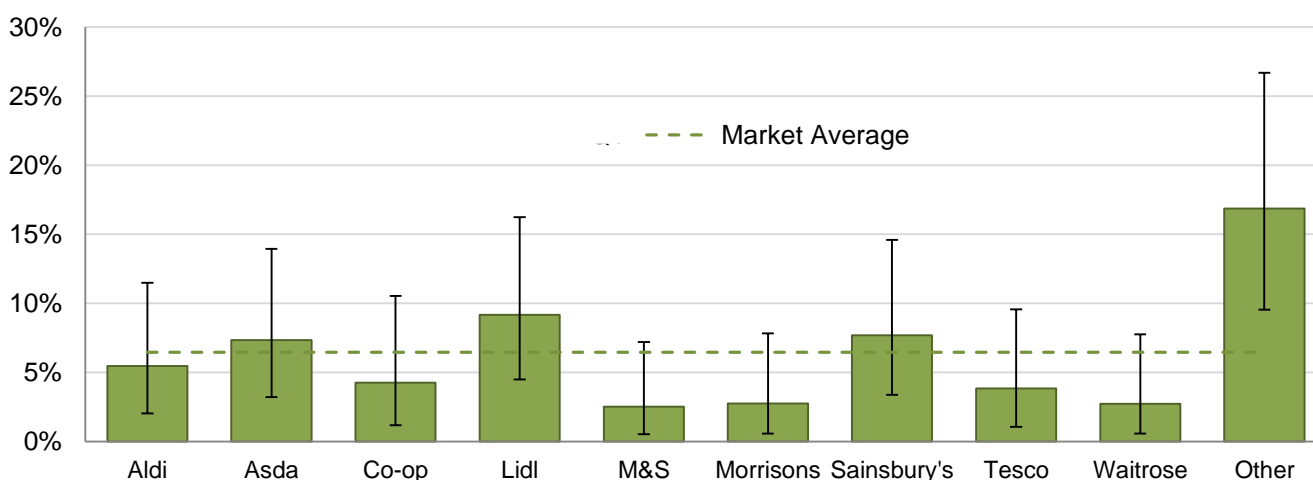
95% confidence intervals are shown as vertical bars. These reflect the uncertainty in the estimate and provide a range of values within which the true prevalence will lie 95% of the time.

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. 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 be put into the public domain. The final report and the raw data for July 2015 to March 2016 can be found at: www.food.gov.uk/science/microbiology/campylobacterevidenceprogramme/retail-survey-year-2.

The final report and raw data for February 2014 to February 2015 can be found at: www.food.gov.uk/science/research/foodborneillness/b15programme/b15projects/fs241044A.

Annex

Methodology

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 revised and old protocols

The methodological issue that caused the need for a revised protocol is explained in the January-March 2016 report: www.food.gov.uk/sites/default/files/campy-survey-report-jan-mar-2016.pdf. With the aim of restoring the robustness of the survey, alternative measures of contamination were considered before the new protocol was decided upon and the details are reported here: www.gov.uk/government/statistics/announcements/uk-survey-of-campylobacter-contamination-in-fresh-retail-chicken-and-its-packaging-4th-quarterly-release-of-results.

The revised 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[5] and breast skin was increasingly being used due to trimming of neck skin. 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 amended 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

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[5] FSA's Campylobacter Retail Survey Report January to March 2016:
https://www.food.gov.uk/sites/default/files/campy-survey-report-jan-mar-2016.pdf

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 revised 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 revised 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 the first 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 the second year (Jul 2015 to Mar 2016), 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 first 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 second survey (Jul 2015 – Mar 2016).

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 2g 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 2g and 5g are analysed according to protocol but results not published. These are instead analysed in order to gain further insight about how the weight of the neck skin may affect the contamination levels.

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.

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