

ADVISORY COMMITTEE ON THE MICROBIOLOGICAL SAFETY OF FOOD

A SURVEY OF *CAMPYLOBACTER* AND *SALMONELLA* IN RAW RETAIL CHICKEN AVAILABLE TO CONSUMERS IN WALES AND NORTHERN IRELAND

RESEARCH PROJECT SUMMARY REPORT

NOVEMBER 2001 – DECEMBER 2006

1. Dr Richard Meldrum from the National Public Health Service for Wales will give a presentation on a survey of *Campylobacter* and *Salmonella* in raw retail chicken available to consumers in Wales and Northern Ireland (presentation ACM/865a refers).
2. Members are invited to comment on the findings of this survey.

**Secretariat
September 2007**

**A Survey of *Campylobacter* and *Salmonella* in Raw Retail
Chicken Available to Consumers in Wales and Northern
Ireland**

Research Project Summary Report

November 2001- December 2006

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***On behalf of the Welsh and Northern Irish Local Authorities, NPHS for
Wales, NIPHL and the Welsh Food Microbiological Forum***

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1.0 Introduction

This report summarises the results from the five consecutive raw chicken surveys carried out in Wales and Northern Ireland between November 2001 and December 2006. Each annual survey has been reviewed separately in this report. The reason for this division is partly historical, relating to the way that the surveys were organised. Originally the project was to be a single survey of whole raw chicken, starting in November 2001 and finishing in December 2002. However, once the results of this survey were considered and after discussions with the FSA, it was agreed that it would be useful to continue the work in 2003. Subsequently, at the end of each of the annual surveys in 2003, 2004 and 2005, it was further agreed between the participating organisations and the FSA that the work should be continued. The project was finally finished at the end of December 2006.

The other reason for not comparing the annual data is that some of the methods were changed at the beginning of 2005. This was done to make the results collected in Wales and Northern Ireland directly comparable to a similar joint Health Protection Agency and FSA survey being carried out in England (CLASSP survey). However, in the five years of the survey the sample types, method of sampling and the general methodology (i.e. rinse and enrichment methods) have not changed.

The overall aim of all the individual surveys was to monitor the baseline prevalence of *Campylobacter* and *Salmonella* in whole raw chicken carcasses available at retail to consumers in Wales and latterly, Northern Ireland. The

survey was a multi-organisational project, involving a total of two public health bodies, five laboratories and approximately forty local authorities. Lead coordination was carried out by the National Public Health Service for Wales.

Data on the overall baseline rates for each pathogen, rates in fresh and frozen samples, rates in samples taken from retailers or from local butchers and information on country of origin and producer codes were collected during the survey. Annual survey data was subject to a range of statistical comparisons. Statistical analysis of the data involved the chi-square (χ^2) test for proportions, with an alpha (α) value of 0.05. The null hypothesis (H_0) was that there was no difference between the two rates under comparison and the alternative hypothesis (H_1) was that there was a difference in the two rates. A p-value of greater than 0.05 meant that the null hypothesis was not rejected and the conclusion was that there was not a statistically significant difference between the two rates. A p-value of less than 0.05 meant that the null hypothesis was rejected and that there was a statistically significant difference between the rates. The results from this statistical analysis can also be seen in the individual annual survey reports submitted to the FSA.

1.1 Survey Synopsis

1.1.1 First survey

This survey ran from November 2001 to December 2002 in Wales. In total 739 samples were taken. The positive rates were 70.8% for *Campylobacter* and 8.4% for *Salmonella*.

1.1.2 Second survey

This survey ran from March 2003 to December 2003 in Wales. In total 736 samples were taken. The positive rates were 73.1% for *Campylobacter* and 5.7% for *Salmonella*.

1.1.3 Third survey

This survey ran from January 2004 to December 2004 in Wales and Northern Ireland. In total 1033 samples were taken. The positive rates were 69.6% for *Campylobacter* and 3.9% for *Salmonella*.

1.1.4 Fourth survey

This survey ran from March 2005 to December 2005 in Wales and Northern Ireland. In total 877 samples were taken. The positive rates were 70.2% for *Campylobacter* and 4.0% for *Salmonella*.

1.1.5 Fifth survey

This survey ran from January 2006 to December 2002 in Wales and Northern Ireland. In total 860 samples were taken. The positive rates were 63.0% for *Campylobacter* and 3.6% for *Salmonella*.

2.0 Summary of results

2.1 Overall rates

A summary of the overall results found for the whole survey are presented in Table 1.

Table 1 Overview of results

	Total number of samples	Number of <i>Campylobacter</i> positive (%)	Number of <i>Salmonella</i> positive (%)	Number of <i>Campylobacter</i> and <i>Salmonella</i> positive (%)
2001/02	739	523 (70.8)	62 (8.4)	47 (6.4)
2003	736	538 (73.1)	42 (5.7)	37 (5.0)
2004	1033	719 (69.6)	40 (3.9)	28 (2.7)
2005	877	616 (70.2)	35 (4.0)	25 (2.8)
2006	860	542 (63.0)	31 (3.6)	16 (1.9)

2.2 Comparison of place sampled-overall

For samples purchased from retailers and butchers, the results in Table 2 and Table 3 were found.

Table 2 Comparison of *Campylobacter* positive rate in samples taken from retailers and butchers

Year	<i>Campylobacter</i> positive rate (%)		p value
	Retailers	Butchers	
2001/02	70.9	70.4	0.902
2003	73.6	71.3	0.555
2004	68.8	72.6	0.265
2005	70.5	69.2	0.725
2006	64.6	57.8	0.079

Table 3 Comparison of *Salmonella* positive rate in samples taken from retailers and butchers

Year	<i>Salmonella</i> positive rate (%)		p value
	Retailers	Butchers	
2001/02	9.1	6.8	0.316
2003	6.9	1.8	0.011
2004	4.2	2.7	0.301
2005	4.5	2.2	0.152
2006	4.1	2.0	0.149

2.3 Fresh and frozen samples-overall

For fresh and frozen samples, the results in Table 4 and Table 5 were found.

Table 4 Comparison of *Campylobacter* positive rate in fresh and frozen samples

Year	<i>Campylobacter</i> positive rate (%)		p value
	Fresh	Frozen	
2001/02	70.2	72.6	0.530
2003	73.5	71.9	0.657
2004	73.4	55.6	<0.001
2005	72.4	60.0	0.0026
2006	63.7	59.9	0.366

Table 5 Comparison of *Salmonella* positive rate in fresh and frozen samples

Year	<i>Salmonella</i> positive rate (%)		p value
	Fresh	Frozen	
2001/02	8.0	9.7	0.464
2003	4.4	9.4	0.01
2004	3.6	5.0	0.340
2005	4.0	4.0	0.990
2006	2.6	8.3	<0.001

3.0 Welsh data

For samples collected in Wales the results shown in Table 6 were found.

Table 6 Overall positive rates for samples collected in Wales

	Total number of samples	Number of <i>Campylobacter</i> positive (%)	Number of <i>Salmonella</i> positive (%)	Number of <i>Campylobacter</i> and <i>Salmonella</i> positive (%)
2001/02	739	523 (70.8)	62 (8.4)	47 (6.4)
2003	736	538 (73.1)	42 (5.7)	37 (5.0)
2004	753	517 (68.6)	37 (4.9)	26 (3.4)
2005	588	367 (62.4)	30 (5.1)	20 (3.4)
2006	587	338 (57.6)	24 (4.1)	11 (1.9)

3.1 Comparison of place sampled-Wales

For samples purchased from retailers and butchers in Wales, the results in Table 7 and Table 8 were found.

Table 7 Comparison of *Campylobacter* positive rate in samples taken from retailers and butchers in Wales

Year	<i>Campylobacter</i> positive rate (%)		p value
	Retailers	Butchers	
2001/02	70.9	70.4	0.902
2003	73.6	71.3	0.555
2004	68.4	69.4	0.810
2005	63.0	60.0	0.540
2006	60.7	47.9	0.007

Table 8 Comparison of *Salmonella* positive rate in samples taken from retailers and butchers in Wales

Year	<i>Salmonella</i> positive rate (%)		p value
	Retailers	Butchers	
2001/02	9.1	6.8	0.316
2003	6.9	1.8	0.011
2004	5.3	3.5	0.342
2005	5.8	2.5	0.146
2006	5.0	1.4	0.06

3.2 Fresh and frozen samples-Wales

For fresh and frozen samples, the results in Table 9 and Table 10 were found.

Table 9 Comparison of *Campylobacter* positive rate in fresh and frozen samples in Wales

Year	<i>Campylobacter</i> positive rate (%)		p value
	Fresh	Frozen	
2001/02	70.2	72.6	0.530
2003	73.5	71.9	0.657
2004	71.7	58.4	<0.001
2005	63.4	59.1	0.364
2006	56.4	61.6	0.279

Table 10 Comparison of *Salmonella* positive rate in fresh and frozen samples in Wales

Year	<i>Salmonella</i> positive rate (%)		p value
	Fresh	Frozen	
2001/02	8.0	9.7	0.464
2003	4.4	9.4	0.01
2004	4.6	5.8	0.548
2005	5.5	3.6	0.378
2006	2.6	9.0	0.001

4.0 Northern Irish data

For samples collected in Northern Ireland the results in Table 11 were found.

Table 11 Overall positive rates for samples collected in Northern Ireland

	Total number of samples	Number of <i>Campylobacter</i> positive (%)	Number of <i>Salmonella</i> positive (%)	Number of <i>Campylobacter</i> and <i>Salmonella</i> positive (%)
2004	280	202 (72.1)	3 (1.1)	2 (0.7)
2005	289	249 (86.2)	5 (1.7)	5 (1.7)
2006	273	204 (74.7)	7 (2.6)	5 (1.8)

4.1 Comparison of place sampled-Northern Ireland

For samples purchased from retailers and butchers in Northern Ireland, the results in Table 12 and Table 13 were found.

Table 12 Comparison of *Campylobacter* positive rate in samples taken from retailers and butchers in Northern Ireland

Year	<i>Campylobacter</i> positive rate (%)		p value
	Retailers	Butchers	
2004	69.6	83.0	0.05
2005	86.2	86.2	0.999
2006	72.8	81.7	0.161

Table 13 Comparison of *Salmonella* positive rate in samples taken from retailers and butchers in Northern Ireland

Year	<i>Salmonella</i> positive rate (%)		p value
	Retailers	Butchers	
2004	1.3	0.0	0.400
2005	1.8	1.5	0.893
2006	2.3	3.3	0.669

4.2 Fresh and frozen samples-Northern Ireland

For fresh and frozen samples, the results in Table 14 and Table 15 were found.

Table 14 Comparison of *Campylobacter* positive rate in fresh and frozen samples in Northern Ireland

Year	<i>Campylobacter</i> positive rate (%)		p value
	Fresh	Frozen	
2004	77.6	45.8	<0.001
2005	87.0	69.2	0.07
2006	77.1	50.0	0.003

Table 15 Comparison of *Salmonella* positive rate in fresh and frozen samples in Northern Ireland

Year	<i>Salmonella</i> positive rate (%)		p value
	Fresh	Frozen	
2004	0.9	2.1	0.454
2005	1.4	7.7	0.092
2006	2.4	4.2	0.603

5.0 *Salmonella* isolates

The *Salmonella* species isolated and identified by the Health Protection Agency (HPA) from submitted isolates are detailed in Table 16. No isolates were submitted in 2001/2002.

Table 16 *Salmonella* isolates

Identity	Number of isolates				Total
	2003	2004	2005	2006	
S. Agona	1	2	7	0	10
S. Bareilly	1	0	0	0	1
S. Blockley	3	0	0	0	3
S. Bredeney	1	0	1	2	4
S. Derby	6	1	1	0	8
S. Enteritidis PT4	1	0	0	0	1
S. Enteritidis PT7	1	0	0	0	1
S. Hader	0	1	0	0	1
S. Indiana	3	5	6	3	17
S. Kedougou	2	0	1	0	3
S. Kentucky	6	6	4	3	19
S. Liverpool	0	2	0	0	2
S. Livingstone	2	2	0	0	4
S. Mbandaka	2	1	3	2	8
S. Montevideo	0	0	0	1	1
S. New-brunswick	0	2	0	0	2
S. Ohio	3	4	5	9	21
S. Poona	0	1	0	0	1
S. Risen	1	0	0	0	1
S. Seftenburg	0	0	0	1	1
S. Stanley	1	0	0	0	1
S. Tuebingen	1	0	0	0	1
S. Thompson	3	3	3	0	9
S. Typhimurium	1	4	1	1	7
S. Unnamed	1	6	3	8	18
S. Virchow	1	0	0	0	1

6.0 *Campylobacter* isolates

The *Campylobacter* species identified by the HPA from submitted isolates are detailed in Table 17. It was agreed with the FSA that 25% of confirmed *Campylobacter* isolates would be submitted. No isolates were submitted in 2001/02 and 2003.

Table 17 *Campylobacter* isolates

Year	Number of isolates submitted	<i>C jejuni</i> (%)	<i>C coli</i> (%)	<i>C lari</i> (%)
2004	182	115 (63.2)	66 (36.3)	1 (0.5)
2005	157	86 (54.8)	71 (45.2)	0 (0.0)
2006	90	57 (63.3)	33 (36.7)	0 (0.0)

7.0 Overall conclusions

In total, 4245 samples were taken during these surveys, with 842 samples being taken in Northern Ireland during the three years of NIPHL participation and the remainder, 3403, being taken in Wales over the five years of consecutive surveys. A change in methods in 2005 meant that the annual rates for all five surveys were not directly comparable, but the general trend over the years is that there has been a significant decline in the prevalence of *Salmonella*, whilst *Campylobacter* has remained at more or less the same level since the start of the surveys.

8.0 Acknowledgements

The author would like to acknowledge and thank all the Local Authorities, the NPHS for Wales and the NIPHL, who contributed to the results presented in this report and the Food Standards Agency for funding the purchase of samples and consumables. The author would also like to thank Dr Ian Wilson, NIPHL, for coordinating and leading the work in Northern Ireland.

Appendix 1 List of publications and conference presentations

Peer reviewed journal papers

Meldrum RJ, Tucker D and Edwards C (2004) Baseline Rates of *Campylobacter* And *Salmonella* In Raw Chicken in Wales, U.K. in 2002. *J Food Prot* **67**: 1226-1228

Meldrum RJ, Griffiths JK, Smith RMM and Evans MR (2005) The seasonality of human *Campylobacter* infection and *Campylobacter* isolates from fresh, retail chicken in Wales. *Epidemiol Infect* **133**: 49-52

Meldrum RJ, Tucker D, Smith RMM and Edwards C (2005) Survey of *Salmonella* and *Campylobacter* contamination of whole, raw poultry on retail sale in Wales in 2003. *J Food Prot* **68**: 1447-1449

Meldrum RJ, Smith RMM and Wilson IG (2006) Three-year surveillance programme examining the prevalence of *Campylobacter* and *Salmonella* in whole, retail, raw chicken. *J Food Prot* **69**: 928-931

Meldrum RJ and Wilson IG (2007) *Salmonella* and *Campylobacter* in UK retail raw chicken in 2005. *J Food Prot* **70**: 1937-1939

Peer reviewed conference presentations

Meldrum R and Edwards C (2003) *Campylobacter* And *Salmonella* In Raw Chicken: Updated Baseline Figures For 2002. Poster presentation at IAFFP 90th Annual Meeting, New Orleans, USA, August 2003.

Meldrum RJ, Griffiths JK, Smith RMM and Evans MR (2003) Seasonality of human *Campylobacter* infection and *Campylobacter* isolates from retail chicken. Poster presentation at HPA 1st Scientific Conference, University of Warwick, UK, September 2003.

Meldrum RJ, Smith RMM, and Wilson IG (2005) Three-year surveillance programme in Wales and Northern Ireland examining the prevalence of *Campylobacter* and *Salmonella* in retail raw chicken. Poster presentation at HPA conference on The Prevention and Control of Zoonoses from Science to Policy, Liverpool, UK, June 2005.

Appendix 2 Laboratory accreditation and quality assurance

The five laboratories that participated in the survey are all UKAS accredited and participate in internal quality control and HPA external quality assurance schemes to ensure that media and methods are appropriate for use and are effective within each laboratory. No problems with either quality control or external quality assurance was reported during the duration of the survey.

External Quality Assurance for *Salmonella* and *Campylobacter*

The laboratories participated in the HPA Food EQA Standard Scheme, which consisted of 6 distributions of 2 samples sent to the laboratories throughout each year. These samples were tested for parameters specified by the organisers of the scheme and included both positive and negative samples of *Salmonella* and *Campylobacter*.

The routine laboratory methods were used for the examination of these samples. The samples were tested by all staff on a two-year rotation. Any unsatisfactory results (false positive or negative) were investigated and a repeat sample tested in duplicate by the person who tested the original sample and a second trained member of staff. The laboratory informed UKAS if unsatisfactory results were obtained in three consecutive rounds of the Food E.Q.A. Standard Scheme.

Internal Quality Assurance for *Salmonella* and *Campylobacter*

Once every 4 months a food sample was contaminated by spiking with known numbers of *Salmonella poona* and *Campylobacter jejuni*. A variety of foods were chosen to ensure that as wide as selection of food matrices was tested. From these results an ongoing assessment of the detection limits of the tests was made.