UK-wide Survey of Salmonella and Campylobacter Contamination of Fresh and Frozen Chicken on Retail Sale

Area of research interest: Foodborne pathogens
Study duration: 2001-04-01
Project code: B180002
Conducted by: ADAS
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Background

In 2000 our organisation set a target of reducing Salmonella contamination of retail UK- produced chicken by 50% in 5 years. To set a baseline against which a reduction could be measured, a national survey was undertaken between April and June 2001 and involved testing 4866 samples of fresh, frozen, whole and portioned chicken purchased from over 1500 retail outlets throughout the UK.

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Research Approach

Chicken samples were purchased from a representative cross section of retail outlets, including major retailers, butchers, grocers, market and farm stalls according to market share. Samplers were only permitted to take a maximum of 5 samples from any one store, and the samples were required to be different types of chicken.

Chicken samples were sent to one of three laboratories and tested for the presence or absence of Salmonella, and the presence or absence and numbers of Campylobacter. Samples from England and Wales were sent to a single, dedicated laboratory at ADAS, Wolverhampton and the Scottish and Northern Ireland samples were sent to the Scottish Agricultural College (SAC) laboratories at Aberdeen and Auchincruive respectively. All Salmonella isolates and a proportion of the Campylobacter isolates were sent to reference laboratories for serotyping, phage typing, screening for antimicrobial resistance and archiving.

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Results

Overall levels of contamination

The overall frequency of Salmonella contamination in retail chicken in the UK was 5.7%. This is only slightly different from the preliminary figure (5.8%) announced in August 2001 and is much

lower than in previous national surveys undertaken for whole chicken (ACMSF 1996). Although the frequency of contamination was low, there were significant differences between the four countries in the UK. Samples from Wales had the lowest frequency of Salmonella contamination (3.4%), with England and Northern Ireland both having a contamination rate of 5.5%. Scotland had the highest frequency of contamination (8.8%).

Salmonella contamination of fresh chicken (4.0%) was lower compared to frozen chicken (10.4%) but there was no difference in the frequency of contamination between whole (5.7%) and portioned chicken (5.7%). There was no significant difference in contamination frequency between wrapped and unwrapped chickens or between birds with or without giblets.

The overall frequency of Campylobacter contamination was 50%, which is the same as the preliminary figure announced in August 2001. However, there was a significant difference in the contamination rate when England and Wales were compared to Scotland and Northern Ireland. The latter two countries had a much higher frequency of contamination (76% average compared with a 44% average for England and Wales). This was recognised when the preliminary results were announced in August 2001. Further work has failed to identify a definitive explanation for these differences, although variation between laboratories is likely to be a factor. In addition, there was a trend over time in Campylobacter contamination rates for samples from England and Wales ranging from 30-40% in the first 5 weeks rising to 60-70% in the last 3 weeks of the survey. The frequency of Campylobacter contamination of fresh chicken (56%) was higher than for frozen chicken (31%). Whole chickens were more likely to be contaminated (57%) than portions (46%). There was no significant difference in contamination frequency between wrapped and unwrapped chickens or between birds with or without giblets.

Non-UK Chicken

The frequency of Salmonella contamination was lower in UK-produced chicken than in non- UK chicken and this difference was statistically significant for frozen samples (8.3% UK compared to 13.6% non-UK). The figures were not significant for fresh chicken due to the small number of fresh, non-UK samples. Salmonella contamination varied according to country of origin although this was not statistically significant in all cases and the number of samples was often small.

In contrast to Salmonella, the frequency of Campylobacter contamination was higher in UK produced chicken than in non-UK chicken. This difference was largely accounted for by whole chicken, as there was little difference in terms of fresh or frozen chicken portions.

Chicken Production Types

The samples purchased in the survey were based on market share and therefore the number of free-range, organic and corn-fed chicken samples was small in comparison to those from intensive production. Because of the limited numbers of samples of free-range, organic and corn-fed chicken, the differences in Salmonella and Campylobacter contamination that were seen between production types were small and not statistically significant.

Salmonella and Campylobacter strains

Salmonella Typhimurium was the most frequent of the 30 serotypes isolated, accounting for 14% of the total number of Salmonella isolates. All but one of the S. Typhimurium isolates were from UK-produced chicken and the majority of isolates were of phage type DT104 or DT104b. Salmonella Enteritidis accounted for only 7% of the isolates and was mostly associated with frozen, non-UK chicken portions. This finding is markedly different from previous national surveys of whole chickens, where S. Enteritidis has consistently been the most frequent serotype isolated. The other main serotypes isolated in the survey were S. Heidelberg, S. Infantis, S. Ohio and S. Thompson.

Campylobacter jejuni comprised 75% and Campylobacter coli 24% of the isolates characterised by the reference laboratory. Chicken purchased in Scotland was found to have a significantly higher proportion of C. jejuni than the other UK countries (83%). The most frequent of the 37 Heat Stable (HS) serotypes of C. jejuni was HS31 (15% of isolates), whilst for 16 HS serotypes of C. coli, it was HS56 (38% of isolates). Among the 47 phage types 3 (PT) of C. jejuni, PT1 predominated (32% of total isolates), whereas among the 15 phage types of C. coli it was PT44 (32% of isolates).

Antimicrobial Resistance

Of the 279 Salmonella isolates tested, 54% were resistant to at least one antimicrobial drug. Multiple resistance, that is resistance to four or more unrelated drugs, was found in 23% of the isolates, 75% of which were obtained from UK-produced chicken. The observed frequency of multi-resistance was largely due to the higher proportion of S. Typhimurium found in UK chicken, where 36 out of 38 strains (95%) were multi-resistant.

Fifty percent of the C. jejuni and 43% of the C. coli isolates were resistant to at least one antimicrobial drug. Multiple resistance was found in 0.6% of C. jejuni and 2% of C. coli isolates. Resistance to ampicillin was most frequent in C. jejuni (36% of isolates), and tetracycline resistance most frequent in C. coli (25% of isolates). Resistance to ciprofloxacin was seen in 13% of C. jejuni and 15% of C. coli isolates.

There was a significantly higher frequency of resistant Campylobacter isolates from frozen chicken (59% of samples) than from fresh chicken (46% of samples). Chicken sampled in Northern Ireland had a significantly lower frequency of antimicrobial resistant Campylobacter isolates (35% of samples) compared to other parts of the UK (54-55% of samples).

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Research report

England, Northern Ireland and Wales

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