EU Harmonised Survey of Antimicrobial Resistance (AMR) on retail meats (Pork and Beef/Chicken)

Area of research interest: Antimicrobial resistance
Study duration: 2015-01-01
Project code: FS102109
Conducted by: Sampling: Hall Mark Meat Hygiene Ltd, Testing: Animal and Plant Health Agency (APHA)

Objective and approach

The sampling regimes for this survey are outlined below:

- 300 beef and 300 pork retail samples to be collected/tested in 2015, 2017 and 2019.
- 300 poultry meat retail samples to be collected/tested in 2016, 2018 and 2020.

Sampling represents 80% retail market share and 80% population coverage of the four countries of the UK; sampled proportionally throughout the full year. Analysis requires initial isolation and enrichment of E. coli from all meat samples, prior to testing for AMR E. coli (i.e. Extended Spectrum Beta Lactamases (ESBLs), AmpC and Carbapenemase-producing). Analysis is performed in a step-wise process against a two-tier panel of antimicrobial agents depending on presence of positive isolates.

Results

Year 5 beef and pork results

In total, 315 beef and 313 pork samples were collected and tested between January and December 2019.

Only one of the 289 (0.35%) beef samples analysed were positive for AmpC-/ESBL/producing E. coli. Only three of the 285 (1.05%) pork samples analysed were positive for AmpC-/ESBL/producing E. coli. Levels of E. coli in all beef & pork samples were very low.

No carbapenemase-resistant and colistin-resistant E. coli were found in any beef & pork samples tested. These are considered critically important antibiotics.

Overall, results showed that less than 1% of retail beef & pork samples in the UK that were tested were positive for AmpC-/ESBL-producing E. coli. Results were very similar to previous UK surveys of 2015 and 2017.

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Results of previous surveys

Year 4 chicken results (2018)

In total, 309 samples of fresh chicken were collected and tested between January and December 2018.

The samples included whole chicken (125 samples), chicken breast (112 samples) and other cuts, i.e. quarters, legs, thighs & drumsticks (72 samples).

None of the E. coli samples were resistant to carbapenem, which is a class of antibiotics usually reserved for known or suspected multidrug-resistant bacterial infections. Whilst thirteen samples grew on agar with the antibiotic colistin, none of them were positive for plasmid-mediated colistin resistance genes mcr-1, mcr-2 or mcr-3.

Forty-two (13.6%) of E. coli samples were resistant to cefotaxime, a third generation cephalosporin. Of these, 23 were found to express ESBL-phenotype resistance, 16 were found to express AmpC-phenotype resistance and 3 expressed both ESBL- and AmpC-phenotype resistance.

The proportions of chicken samples with E. coli with ESBL- phenotype were higher for skin off rather than skin on samples in a statistically significant manner.

Isolates with an AmpC, ESBL or ESBL+AmpC-phenotype were resistant to an average of 6.3, 7.0 or 8.8 of 19 antimicrobials tested respectively, and as such the isolates with a combined ESBL+AmpC-resistance phenotype were on average resistant to more antimicrobials. None of the isolates were resistant to the antimicrobials azithromycin, meropenem, temocillin or tigecycline, as was previously observed in the 2016 survey of AMR E.coli in retail chicken meat.

Overall, the proportion of UK retail chicken meat samples positive for ESBL-producing E. coli fell from 65.4% in 2013/14 to 29.7% in 2016 and to 8.4% in 2018. Whilst the proportion of chicken samples positive for AmpC-producing E. coli was not determined for the 2013/14 study, the samples positive for AmpC-producing E. coli fell from 16.3% in 2016 to 5.2% in 2018. The proportion of samples that grew on agar containing cefotaxime also decreased in 2018 (13.6%) compared to 2016 (45.1%).

This reduction in the level of antimicrobial resistant E. coli on chicken meat since 2013/14 may be linked to the banning by the British Poultry Council of the use of third and fourth generation cephalosporins in flocks used for poultry meat production in the UK in 2012 as part of antimicrobial stewardship.

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Year 3 Retail Beef & Pork Results (2017)

A total of 314 beef and 310 pork samples were tested between January and December 2017. Only 3 (0.48%) of the 624 samples tested yielded E. coli colonies on MacConkey agar + 1mg/L cefotaxime (MCA-CTX). These samples comprised 2 (0.64%) beef and 1 (0.32%) pork sample. None of the samples were positive on carbapenem agar.

Two of the isolates from MCA-CTX (1 beef (0.32%), 1 pork (0.32%)) had an AmpC phenotype, whilst the remaining isolate (1 beef (0.32%)) had an ESBL phenotype. The two beef samples that were positive on MCA-CTX were also positive on CHROMagar ESBL (CA-ESBL) and the resulting isolates tested were found to be positive for CTX-M1 type ESBL gene. One additional pork sample not positive on MCA-CTX was also positive on CA-ESBL and the resulting isolate tested was found to be positive for blaTEM gene.

None of the isolates were found to be resistant to the last resort carbapenem antibiotics imipenem, ertapenem and meropenem. A single beef sample was found to be contaminated with mcr-1 plasmid-mediated colistin resistant E. coli, but E. coli with this resistance was not detected in any of the pork samples. All isolates were resistant to the beta-lactam antibiotic ampicillin and the ESBL isolate was resistant to the cephalosporin antibiotics cefotaxime and ceftazidime, but was sensitive to cefoxitin. Conversely, the two AmpC isolates were resistant to cefoxitin.

Overall, results showed less than 1% of retail beef and pork samples in the UK that were tested were positive for AmpC or ESBL-producing E. coli, and these results are similar to the previous UK survey in 2015. None of the meat samples were positive for carbapenem resistant E. coli and only one beef sample was positive for mcr-1 plasmid-mediated colistin resistant E. coli. The EU Summary Report (EUSR) on Antimicrobial Resistance for 2015 presents the results for all European countries, and results for the UK compared favourably with results from other countries.

England, Northern Ireland and Wales

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England, Northern Ireland and Wales

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