A project to establish whether carry-over of meat species occurs in UK meat processing plants during the GMP production of mince meat

Area of research interest: Innovative regulator
Study duration: 2013-03-01
Project code: FS102051B
Conducted by: Laboratory of the Government Chemist

Background

The horse meat incident in early 2013 impacted on the confidence in the UK food supply chain and showed an unacceptable presence of undeclared species in certain meat products

The incident, with the presence of horse and pork meat in processed beef products, raised a number of questions including whether carry-over, i.e. adventitious contamination of meat species, occurs during industrial production of meat products prepared according to good manufacturing practice (GMP).

Robust information was needed on levels seen and to distinguish adventitious contamination, from gross contamination or food fraud

A review of scientific literature showed that information on the carry-over of meat species during commercial processing was not available. As a consequence, our organisation and the Department for Environment, Food and Rural Affairs (Defra) commissioned the research study to assess whether and at what level, carry-over of meat species occurs during the industrial production of minced meat.

Research Approach

The project plan was devised by LGC with input from statisticians and was widely consulted on with industry groups and Defra's Authenticity Methods Working Group (AMWG) (Expert advisory group). The project focused on the mincing process with the objective of establishing whether carry-over of meat species occurred when mincing different species of meat through the same equipment sequentially when observing current GMP and if seen, at what levels.

Two commercial quantitative real time Polymerase Chain Reaction (PCR) kits were selected for use in the project; one for the analysis of carry-over of raw pork in raw beef meat samples and the other for the analysis of swab samples to test for the presence of pork.

It was established that there was no statistical difference between the results reported as a percentage of pork DNA and the actual percentage of pork present determined by mass, but a

consistent positive bias was observed. The results for this project are reported on a quantitative weight to weight basis and represent the ‘best case scenario’ in that the standards and samples were made from the same authentic lean meats.

The project was conducted in two phases:

- phase 1 was carried out in a commercial pilot plant under controlled conditions
- phase 2 trials were carried out in three working UK commercial plants - a total of 1032 beef samples and 390 swab samples were analysed

To check the effectiveness of the cleaning regimes used in commercial meat plants (deep chemical and water wash), three types of swabs were taken; adenosine triphosphate (ATP) (ATP is present in all organic material), protein and DNA swabs. Following a deep chemical clean, all three swabs gave equivalent negative results demonstrating that any one of the three swab methods may be used to check the effectiveness of cleaning.

Results

The project fulfilled its objectives and generated data that previously did not exist in the scientific literature. It established that when raw minced beef is produced according to GMP, either a deep chemical clean or a high pressure water wash between species is effective in preventing the carry-over of raw pork into raw beef with an associated limit of detection (LOD) of less than 0.1 % on a w/w basis Stakeholders now have the evidence to differentiate between adventitious contamination of raw pork mince in raw beef mince and deliberate fraud.

There should not be an expectation of adventitious contamination and the presence of low concentrations of undeclared species in relevant meat products, as this project has shown that it is possible to clean to <0.1 % pork w/w using GMP employed in UK meat processing plants.

The outcomes of this project are based on the determination of raw pork in raw beef only. Whilst it would not be unreasonable to assume the outcomes would be similar for other species of meat, the work needed to confirm this assumption was not within the scope of this project.

Research report

England, Northern Ireland and Wales

PDF
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