

Horse meat found in beef burgers — what went wrong?

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The discovery of horse DNA in beef burgers by the Food Safety Authority of Ireland has once again put the quality and authenticity of our food into the spotlight.

Foods are highly complex mixtures of functional ingredients which combine together to make interesting microstructures. This complexity however means that things can sometimes go wrong and, subsequently, the cause is not always obvious. In the case of beef burgers the main ingredient should of course be beef, with other meats not present unless they are declared on the label. If another meat is found, as in the recent case with horse meat, then clearly something has gone wrong.

To help manufacturers identify where production problems in general may occur, Leatherhead Food Research published a list of 'Top 10 Trouble-shooting Tips' which are summarised below. Certain of these tips can be useful in helping to identify whether or not a product contains horse meat and when and where things might have gone wrong.

Microscopy

Microscopy is all about studying the microstructure of foods, looking at a variety of structures and components, including in some cases specific markers of quality.

The muscle structure of meat can be visualised using light microscopy and an example of pork is given in Plate 1. It is unclear whether different meats differ in their muscle structure properties such that the differences can be quantified using light microscopy. In addition, the comminution process in making burgers may destroy some of the original muscle structure that was present. This technique, therefore, is unlikely to be suitable for identifying horse meat in beef burgers. It has however proved its worth in that

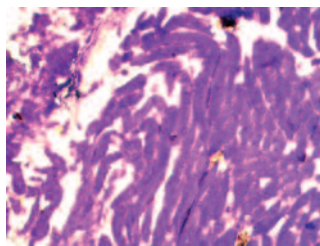


Plate 1. Minced pork.

other emotive topic in the meat industry, that of mechanically separated meat (MSM). Plate 2 is a light micrograph of MSM pork and the differences in structure between the two samples are readily visible.

Chemical analytical tests

There are several ways of verifying which meat species make up a raw material. Dipstick assays and ELISAs rely on the detection of specific proteins, whilst PCR assays detect the presence of DNA specific to the species being looked for.

Dipstick assays are fast, require little equipment and can be carried out outside the analytical laboratory; however, the limit of detection is higher than other methods, and the results are not quantitative.

ELISA assays require more equipment and more specialist expertise, but are relatively quick and can give a quantitative result. The limits of detection for ELISAs are better than dipstick-type assays, but for the most sensitive determination of meat speciation PCR assays are

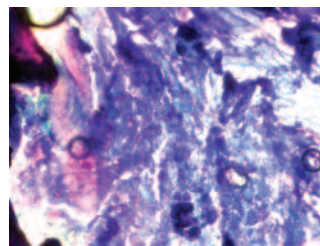


Plate 2. MSM pork.

used. These require very specific equipment and skilled analysts, and the selection of methods and interpretation of results requires a great deal of expertise. The results can be quantitative or semi-quantitative, depending on the technique used, and can detect even trace levels of DNA from the target species. PCR assays can therefore detect inadvertent contamination through handling different meats on the same line, whilst the dipstick and ELISA assays will tend to only pick up accidental contamination or adulteration.

What has changed

It is probably safe to assume that the beef burgers in question were not developed or first manufactured to a recipe that includes horse meat.

Therefore something has changed in the intervening years. It is also unclear at this stage whether the horse meat is present at a consistent level or has varied over time. In variable situations it is more difficult to determine what has changed because a single consistent factor

may not be at work. It is worth however considering the factors that may have contributed to the addition of horse meat to the beef burgers, and the physical form of the horse meat that may have been used.

Foods are constantly being reformulated for a variety of reasons, including quality improvements, the use of natural ingredients (for example colours and flavours), improving the nutritional profile (for example salt, fat and sugar reduction), and cost. It may be that a combination of beef and horse meat results in an improved beef burger texture but this is unlikely to have been a driver.

Cost reduction is often the most significant reason and, in this case, a squeezed supplier might have cut costs by using cheaply available horse meat.

Another scenario is that there may have been a change in the supply chain or manufacturing site for the beef burgers to a location at which horse carcasses are processed.

Therefore a simple error or lack of traceability may have resulted in the beef stocks becoming contaminated with horse, or malicious tampering might have occurred.

Labelling

The particulars that are mandatory for pre-packed foods across the EU include the name of the food and a list of ingredients. The ingredients list would also be required to include all the ingredients of the food, in descending order of weight, as recorded at the time of their use in the manufacture of the food.

The two immediate non-compliances following from the alleged horse meat in beef burgers might relate to an incorrectly stated beef content, and unlisted horse meat content.

In this case it is possible to speculate that the manufacturers failed to produce to the recipes specified by including horse-derived components in an ingredient blend for the beef burger or in the beef burger recipe itself. ■

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Top 10 trouble-shooting tips

- 1 Keep it simple with basic tests at first.
- 2 Microscopy is important but start with the eye.
- 3 Employ a range of analytical tests, both physical and chemical.
- 4 Compare the product with the correct standard or control.
- 5 Trend analysis is important even if in specification.
- 6 Find out what's changed – ingredients, processing, packaging.
- 7 Check if the product has been abused during storage.
- 8 Evaluate the likely impact of consumer misuse or malicious action.
- 9 Determine the source of the contaminant or cause of the problem.
- 10 Don't be afraid of a quick fix.