

MEAT SPECIES TESTING

High profile scandals remind us that the food supply chain is extremely complex, global and tracing the origin of ingredients near impossible. The horsemeat incident in 2013 has shown how important it is to check the safety and authenticity of meat.

Food Standards Agency (FSA) Recommendations

The FSA has recommended a two-level approach to the identification of undeclared meat in food products. The recommended threshold on a weight for weight basis is 1% of undeclared meat. A low level threshold of 0.1% of undeclared meat has also been recommended. This lower level is designed to show that good practices have been followed and demonstrates the absence of any carryover.

Testing Options Available at RSSL

RSSL provides semi-quantitative and qualitative DNA testing for 20 species of meat and 50 species of fish using either real-time PCR (Polymerase Chain Reaction) or PCR-RFLP (Restriction Fragment Length Polymorphism).

Our methods use either mitochondrial or nuclear DNA as a target. In general, it is considered that mitochondrial DNA is more sensitive, given the abundance of the mitochondrial genome in cells. However, the amount of mitochondrial DNA varies between species and even between tissue types within the same species. Therefore, for quantitative purposes, nuclear DNA is the recommended target and is used when employing real-time PCR methodology.

Real-time PCR for Semi-Quantitative Analysis

Real-time PCR involves extracting DNA from samples and amplifying a section of a gene from the target animal's nuclear DNA in the extract. Nuclear DNA is not susceptible to variation in copy numbers as is seen with mitochondrial DNA, meaning that it is suitable for quantification. Our Real-time PCR tests are ISO 17025/UKAS accredited and have reporting limits that meet the FSA's recommendations. We provide a number of multi-species tests:

Animal Speciation by Real-time PCR	Species
5 Species	Chicken, Cow, Horse, Pig and Sheep
Limit of detection is 0.1% except for chicken which is at 1%. UKAS accreditation is applicable to meat and meat products.	

Below is an example of how a semi-quantitative result will be reported on a certificate of analysis:

Analysis	Result
Equine DNA (Equus sp.) - Horse	Detected (>1 %)
Porcine DNA (Sus scrofa sp.) - Pig	Not Detected (<0.1 %)
Ovine DNA (Ovis sp.) - Sheep	Detected (≥0.1 % and <1 %)
<i>The analysis was calibrated to DNA extracted from raw meat muscle tissue at 1% and 0.1%. DNA from the sample was extracted and compared to these calibrators. Not all sources of DNA from different animal material will be directly comparable to the raw muscle tissue calibrator.</i>	



Cross-Reactivity Information

Please be aware that nuclear DNA tests may pick up other closely related species:

- The Bovine Nuclear DNA analysis also detects Bison
- The Porcine Nuclear DNA analysis also detects Wild Boar
- The Equine Nuclear DNA analysis also detects Donkey

PCR-RFLP for Qualitative Analysis

PCR with RFLP offers a highly specific, qualitative identification of animal DNA. This method is useful for identifying a variety of different animals. It is also available as confirmatory tests following real-time PCR tests if confirmation of single species is required.

Species Available by PCR-RFLP (Qualitative Analysis)
Buffalo, Cat, Chicken, Cow, Dog, Duck, Fallow Deer, Goat, Hare, Horse, Human, Kangaroo, Mouse, Ostrich, Pig, Rabbit, Rat, Red Deer, Roe Deer, Sheep and Turkey
Limit of detection is 1%

Results of PCR-RFLP will be reported as DNA either detected or not detected at defined levels. The method has a stated limit of detection of $\geq 1\%$. An example of how a result will be reported can be seen below:

Analysis	Result
<i>Buffalo (Bubalus bubalis) DNA</i>	<i>Not Detected</i>
<i>Conclusion: The sample contained no detectable Buffalo DNA.</i>	

Other Information

The more processed a product/ingredient is, the more denatured the DNA is likely to be and the less likely it is that any meat species will be detected by a DNA based method.

RSSL recommend that if the source of contamination is not raw muscle meat and/or has been highly processed then the potential carry-over material should be tested first to ensure DNA can be detected in it.

If you require additional information or advice, please contact our Customer Services team on +44(0)118 918 4076 or email enquiries@rssl.com, you will then be put in touch with a RSSL Technical Specialist who would be happy to discuss the analysis with you in more detail.