Recent advances in benchtop Nuclear Magnetic Resonance (NMR) mean that it is suitable as a fast and easy technique for assessing suspected edible oil contamination/adulteration and meat speciation. The Pulsar™ system can be used to discriminate between different oil types and provide quantitative information for mixtures. The NMR spectra of triglycerides contain valuable information indicating what the meat species is.

**Benchtop NMR for Meat Speciation***
- Meat authentication problems include:
  - Product recall; brand damage; drop in sales
  - Loss of consumer confidence
- Example:
  - Substitution of beef meat with undeclared horse meat
- The fatty acid component of triglycerides found in animal tissue is known to differ between species.

At 60MHz, using Pulsar we can clearly "see" this difference in the $^1$H NMR spectrum as differences in the size of the olefinic resonances (5 to 5.8 ppm), which are a measure of the total unsaturated fat content.


**Why use benchtop NMR as a screening tool?**

<table>
<thead>
<tr>
<th></th>
<th>60MHz $^1$H NMR</th>
<th>DNA test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>Minutes</td>
<td>Up to several days</td>
</tr>
<tr>
<td>Complexity</td>
<td>Can be carried out by non-scientists; no need to be in lab environment</td>
<td>Requires sophisticated labs and experienced personnel</td>
</tr>
<tr>
<td>Cost per sample</td>
<td>&lt; £20; mid-size retailer will spend &lt;£80,000/year</td>
<td>£90-£500; mid-size retailer will spend £0.5-1m/year</td>
</tr>
</tbody>
</table>


The Business of Science*
Example of data analysis

Principal Component Analysis (PCA)† can be used to classify different meat types.

Bencktop NMR for Hazelnut Oil Adulteration

- Adulteration of Extra Virgin Olive oil with lower cost and poorer quality oils is a known problem.
- This is a challenge for other techniques, such as FTIR, as the olive oil and hazelnut oil spectra are extremely similar.
- However, their NMR spectra show sufficient differences to allow better levels of detection of the adulterant.

Calculated mono- and poly-unsaturated composition of a set of 30 pure olive and hazelnut oils from Pulsar NMR spectra

† PCA is not part of the standard Pulsar software package

Contact us today for a demonstration.
We offer remote demonstrations or you can send us your samples.

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