

# Joint Research Centre (JRC)



## NIRM method: Identification of Markers

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<http://www.jrc.ec.europa.eu/>

- **Why we need analytical methods for MBM?**
- **The NIRM method**
- **The selection of NIR markers**
- **The proof of concept**

**Prohibited by ABPs Regulation 1774/2002 Ban of Cannibalism**

**PERMANENT BAN**

**Prohibited by TSE Regulation 999/2001 recently amended by Regulation EC (No) 1923/2006**

**PERMANENT BAN**

**Ext. feed ban (Reg. 1234/2003 amending TSE Regulation) due to the lack of animal specific methods**

**INTENDED FOR**

**PAPs FROM**

	Ruminants	Pigs	Poultry	Fish
Ruminants				
Pigs				
Poultry				
Fish				

## Partial lift of the feed ban while maintaining a high level of prevention is possible when certain conditions are met

Mammalian proteins treated at  
133°C, 3 bar, 20 min

Fulfilled

Document control  
traceability

Fulfilled

Marker for ABPs that must  
NOT enter the feed/food chain  
(Category 1 and Category 2)

Fulfilled

Analytical methods  
for Category 3 materials

Not yet available

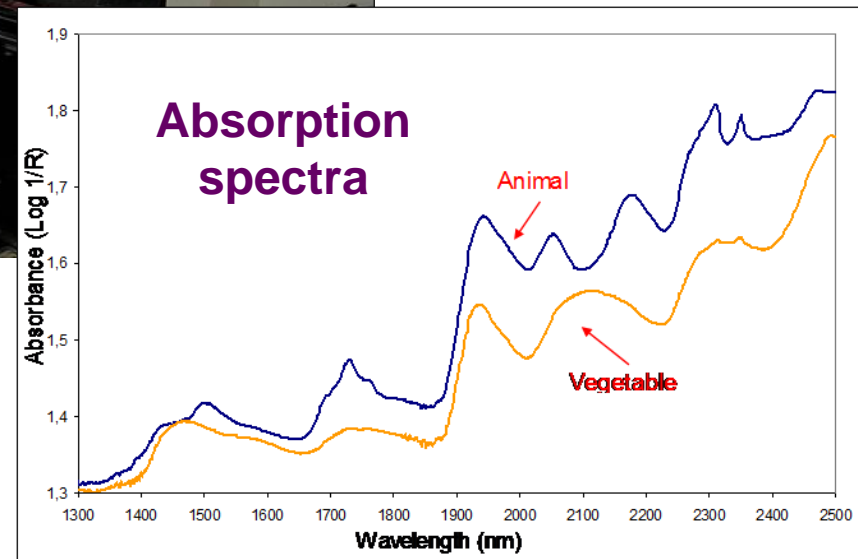
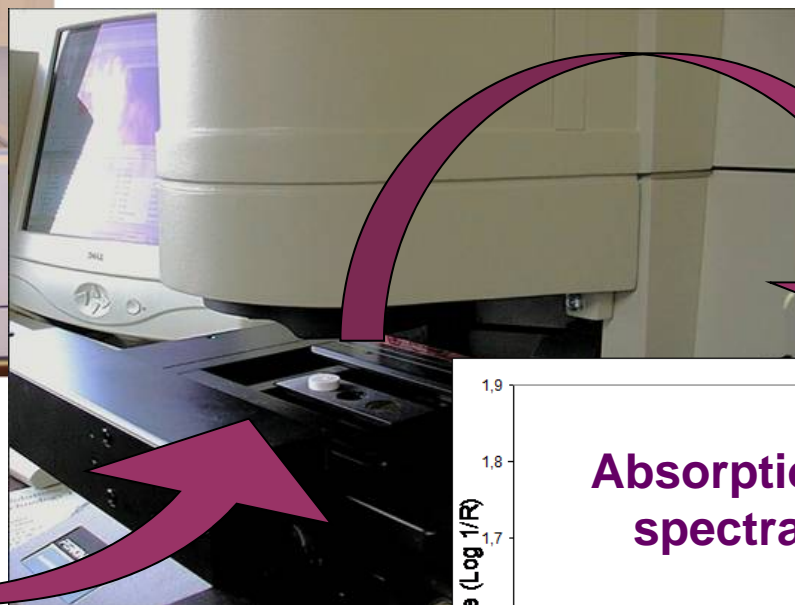
- No legal limit for MBM in feed – Zero Tolerance
- Microscopy is currently the only official EU method  
*Commission Regulation (EC) No 152/2009*

....but, the method is not species specific

- Prevent intra species recycling: porcine and poultry test
- Prevent use of ruminant PAPs: ruminant specific test
- Control methods for ruminant feed

**Species specific analytical methods are needed**

**NIR spectroscopy is based on the absorption of energy by molecules in the NIR domain**



**NIR spectra of individual particles:  
fingerprints  
based on the chemical composition**

Anal Bioanal Chem (2005) 382: 149–157  
DOI 10.1007/s00216-005-3193-5

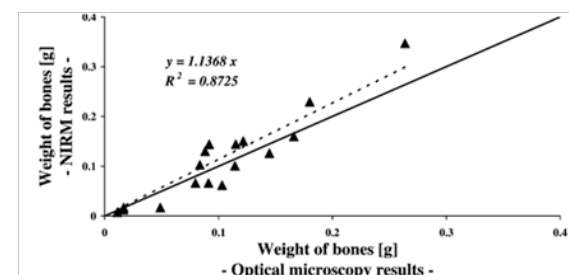
## ORIGINAL PAPER

Vincent Baeten · Christoph von Holst · Ana Garrido  
Jeroen Vancutsem · Antoine Michotte Renier  
Pierre Dardenne

### Detection of banned meat and bone meal in feedstuffs by near-infrared microscopic analysis of the dense sediment fraction

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© Springer-Verlag 2005

- Detection of 0.05% MBM in feed
- NIRM vs CM equivalent results



Anal Bioanal Chem (2008) 392:313–317  
DOI 10.1007/s00216-008-2232-4

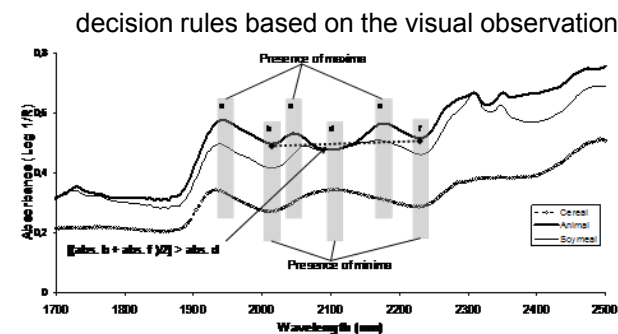
## TECHNICAL NOTE

### Transferability study of a near-infrared microscopic method for the detection of banned meat and bone meal in feedingstuffs

Christoph von Holst · Vincent Baeten ·  
Ana Boix · Boleslaw Slowikowski ·  
Juan Antonio Fernández Pierna ·  
Salvatore Tirendi · Pierre Dardenne

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- Transferability of a NIRM for the detection of MBM

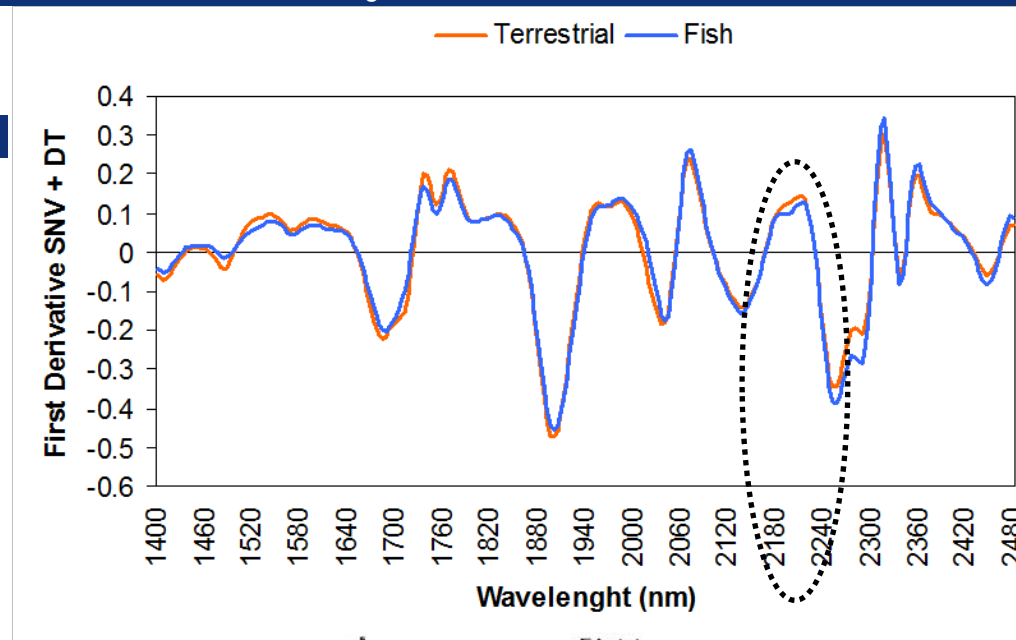


*A NIR marker* is a substance that is present in one of the two classes of animal meals concerned and which causes a significant difference of the measured NIR spectra at specific wavelengths

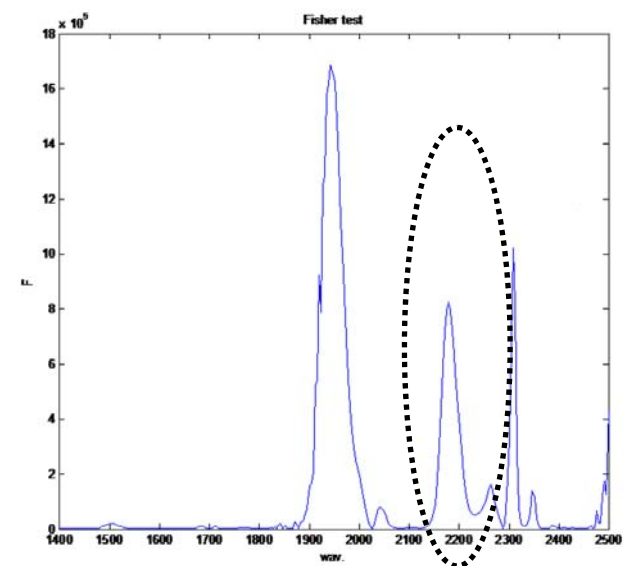
## **NIR bands useful for discrimination purposes between animal species**

- Terrestrial animal meal vs Fish meals
- Same spectral data set
- Three NIR microscopes (UCO – CRA-W – IRMM)
- Two different approaches

## ■ Application of different signal pre-treatments



## ■ Application of Fisher Test



## Sample Set: Terrestrial Animal Meals Fishmeals

**NIRM**

**Fat Extraction**

**Transesterification**

**GC-FID**

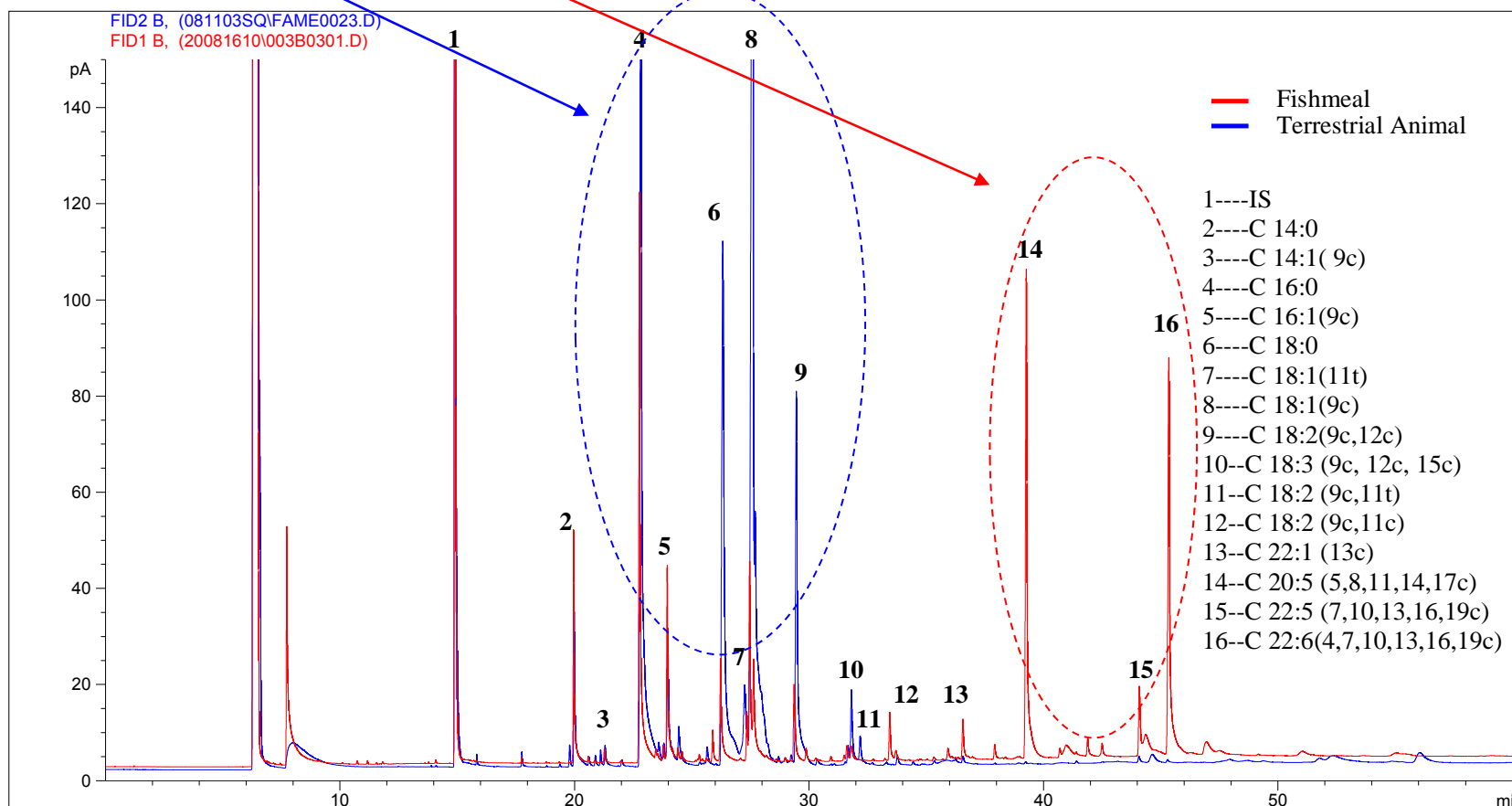
**NIRM**

**Chemometrics**



**Fishmeal: PUFA not present in terrestrial meals**

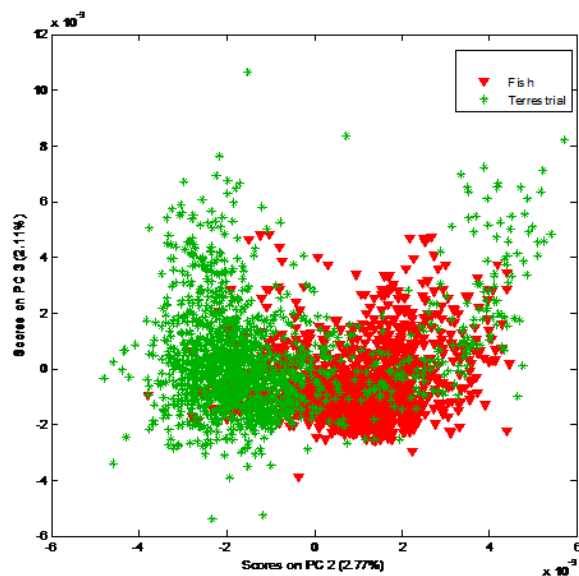
**Terrestrial meals: richer in MUFA**



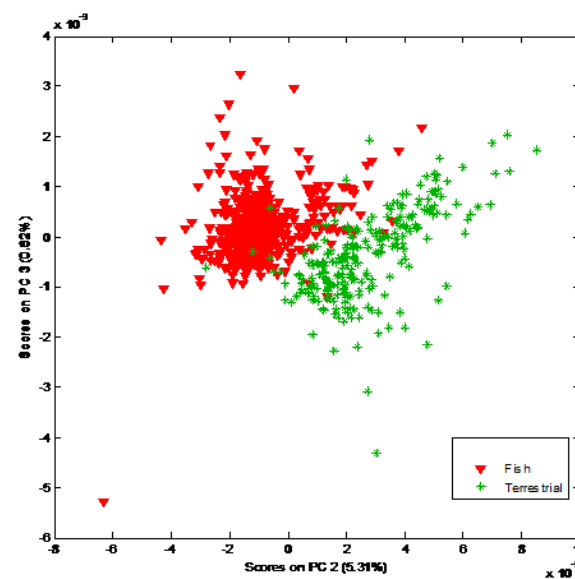
## NIRM analysis of 300 particles per sample

### PCA of **Terrestrial** vs **Fish**

Before defatting

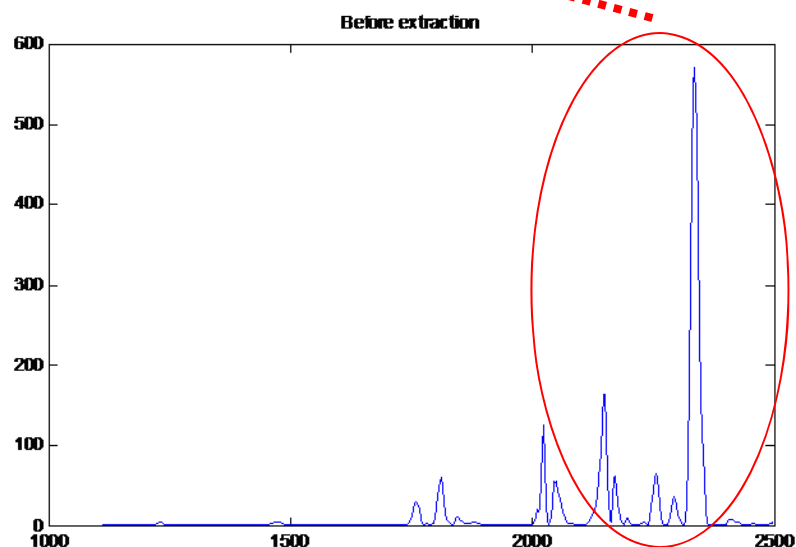


After defatting



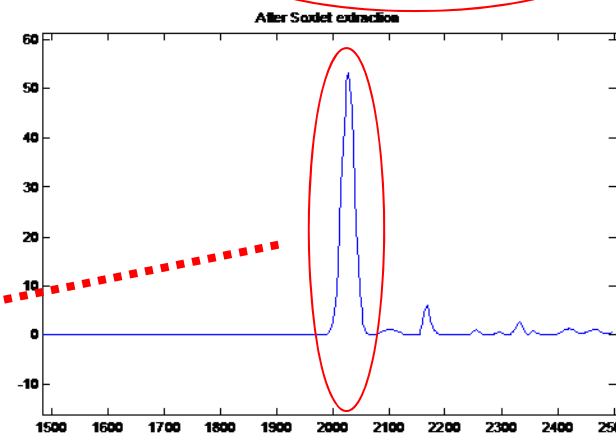
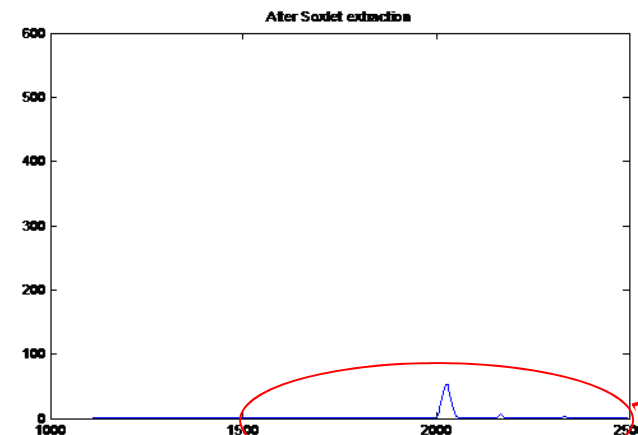
## Before defatting:

### NIR bands characteristics of fat absorption



**NIR band at 2020-2040 nm can be the key for discrimination**

## After defatting:



- **A new approach based on the combination of NIRM and GC analysis has been applied for the chemical interpretation of the NIR Makers.**
- **GC analysis demonstrated the different FA profile of terrestrial animal meals and fishmeals that highly contributes to the discrimination of the two classes.**
- **An important band in the O-H band region has to be further investigated.**

## Acknowledgements

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# Thank you for your attention