

Last developments in a NIR Microscopy method for the Quantification of MBM in animal feed

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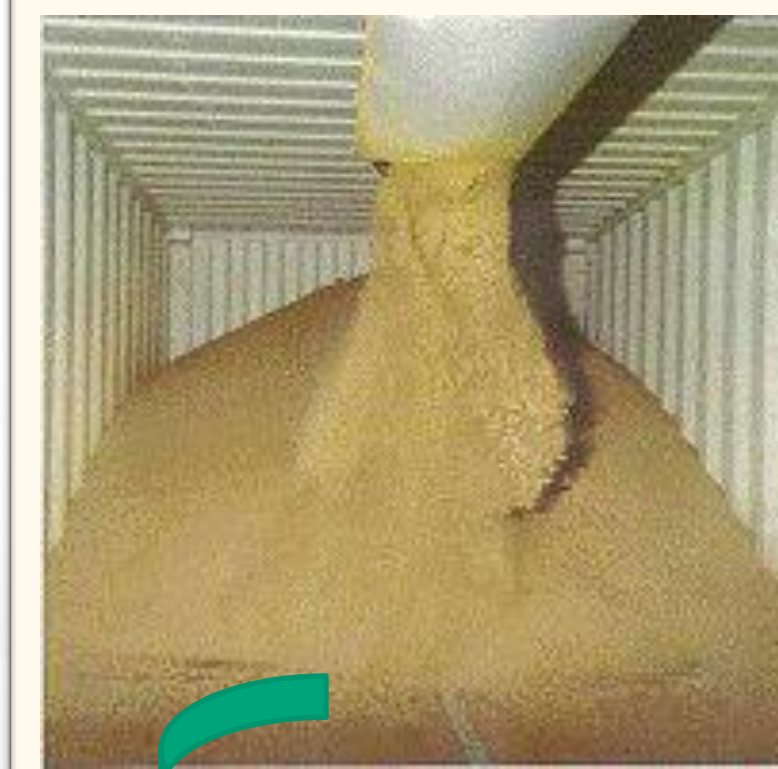
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Bovine Spongiform Encephalopathy (BSE) is a transmissible, neurodegenerative, fatal brain disease of cattle. Epidemiological studies have associated BSE to animal contaminated feed. In fact, contaminated ruminant protein has entered the feed chain mainly in the form of meat and bone meals (MBM). The European commission prohibited processed animal proteins from rations destined for farmed animals that are used for food production. It was then necessary to control the composition of feed regarding these illicit compounds. The detection of banned meat and bone meal (MBM) in feed has already been developed¹ by using the near infrared reflectance microscopy (NIRM) method applied to the dense sediment fraction^{2,3}.

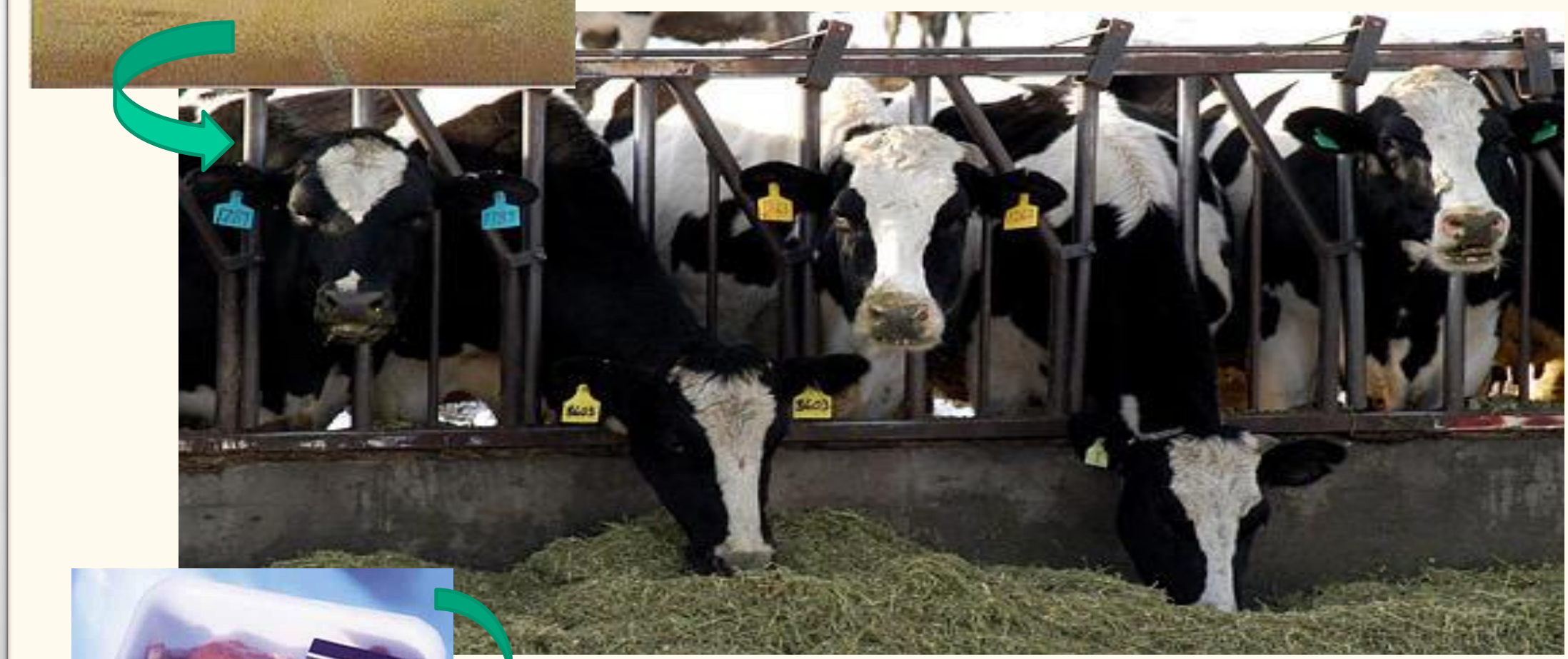
¹Fumière O., Veys P., Boix A., von Holst C., Baeten V. (2009), *Biotechnol. Agronom. Soc. Environ.*, 13(S), 59-70.

²Baeten V., von Holst C., Garrido A., Vancutsem J., Renier A.M., Dardenne P. (2005), *Anal. Bioanal. Chem.*, 382, 149 – 157.

³von Holst C., Baeten V., Boix A., Slowikowski B., Fernández Pierna J.A., Tirendi S., Dardenne P. (2008), *Anal. Bioanal. Chem.*, 392, 313-317.



How they will proceed to ensure the safety of our feed?

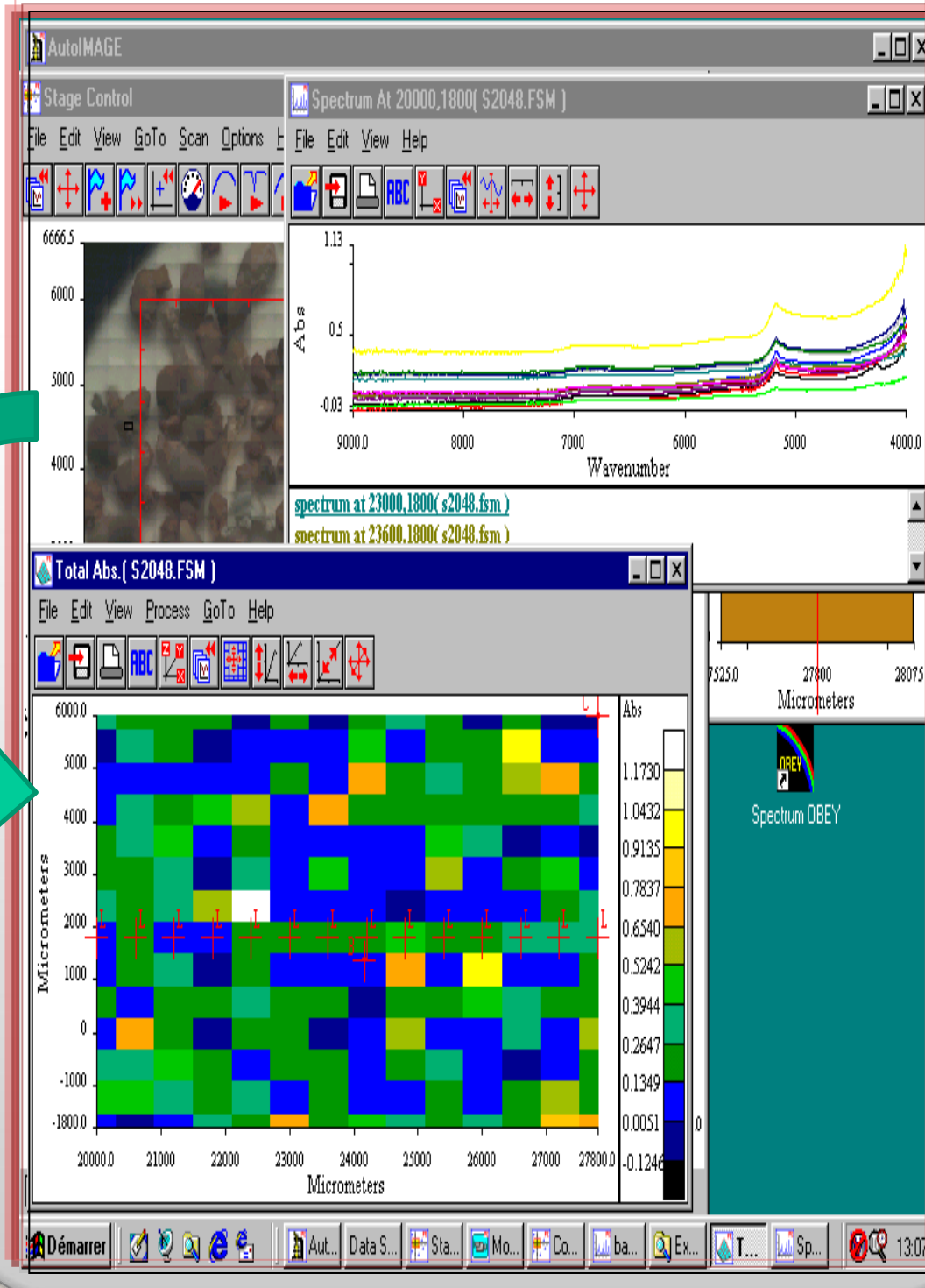


First developments: Qualitative study

The combination of NIRS and a microscope allows collecting high quality spectra for small (50 – 1000 µm) feed particles.

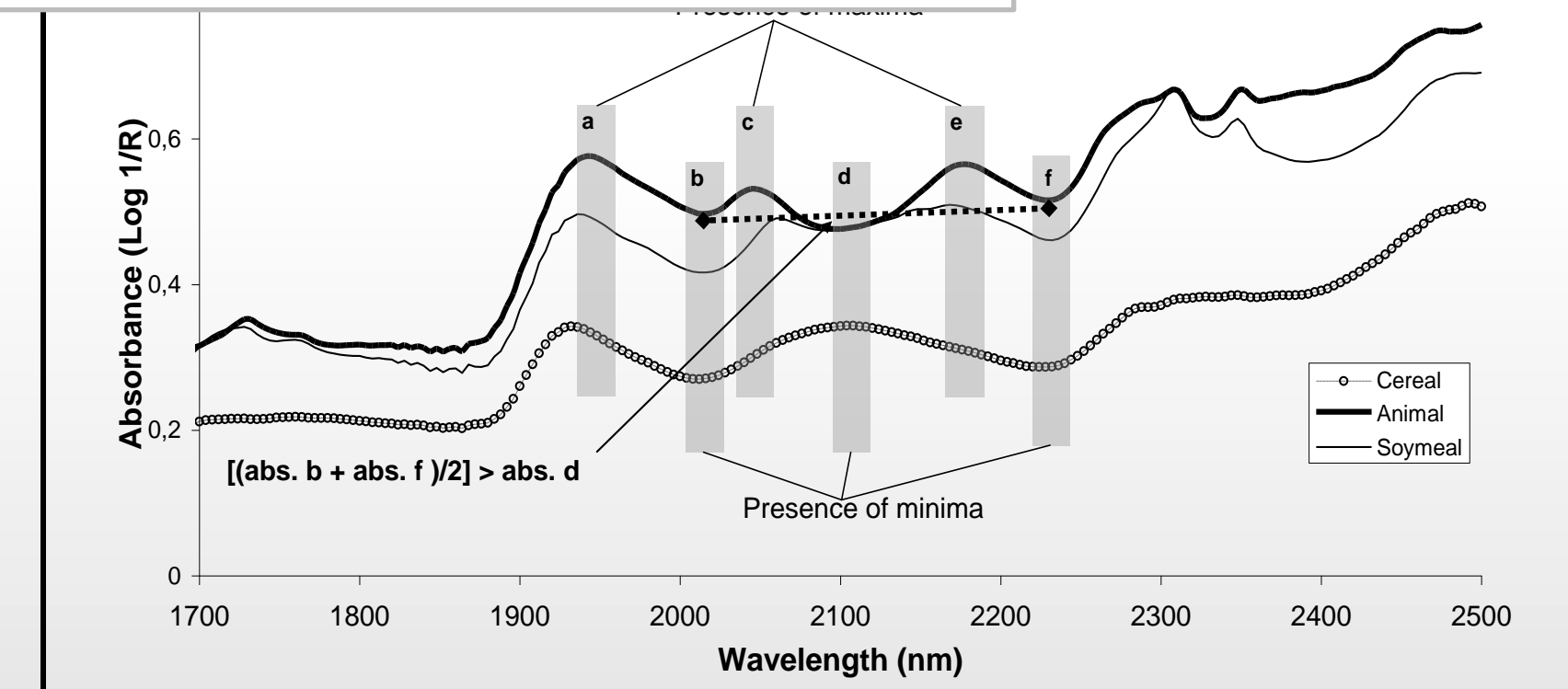


Collection of spectra



Interpretation of spectra

Based on visual observation



Mathematical discrimination

Chemometric models like Partial Least Squares (PLS) and Support Vector Machines (SVM) have been developed in order to determine the origin of the animal particles.

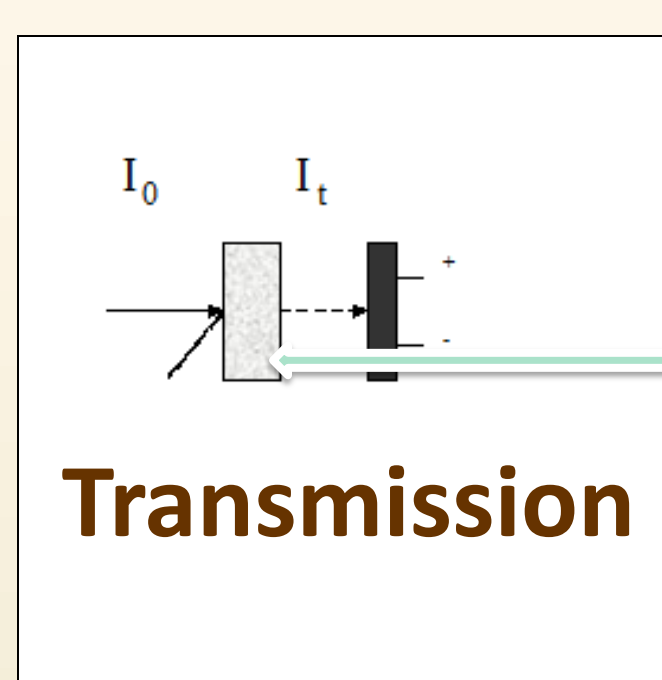
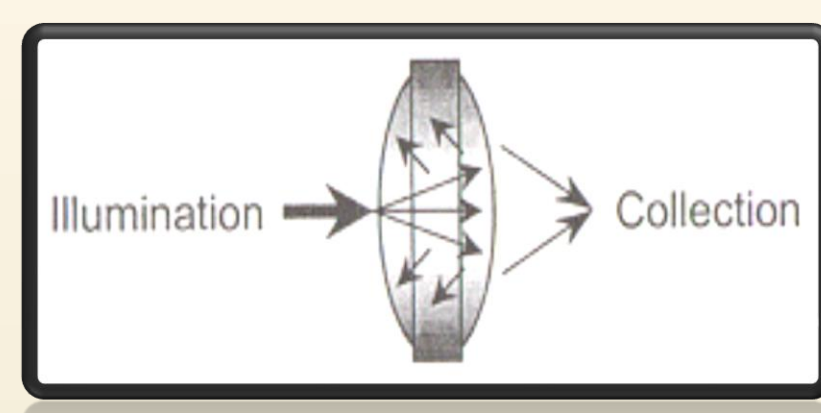
Studies undertaken in the framework of the activities of different projects have demonstrated the high potential of the NIRM method combined with chemometrics to detect animal particles in feedingstuff at concentrations as low as 0.1 %.

Last developments: Quantitative study

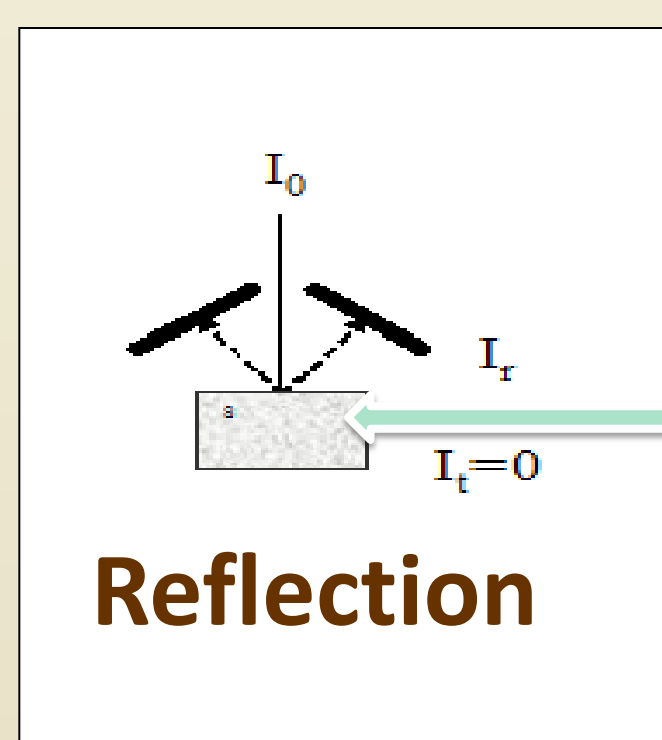
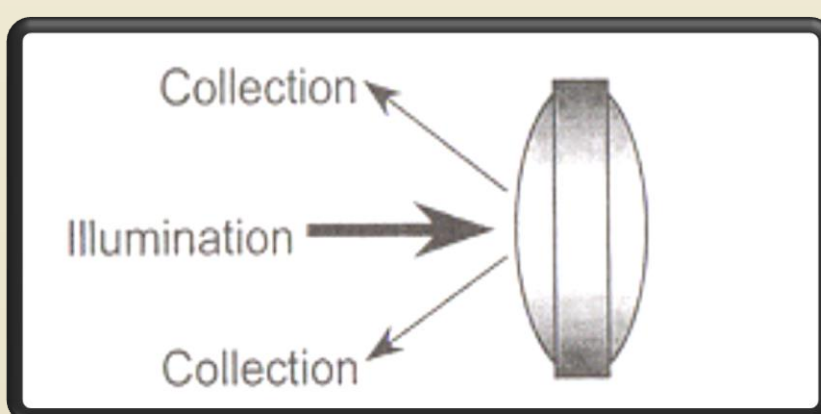
The capacities of the NIRM method have been improved:

- the sample is analyzed as is it.
- both the fine and the gross fractions of the samples are considered
- the acquisition parameters are optimized: use of transmission and reflection mode

a) Transmission mode



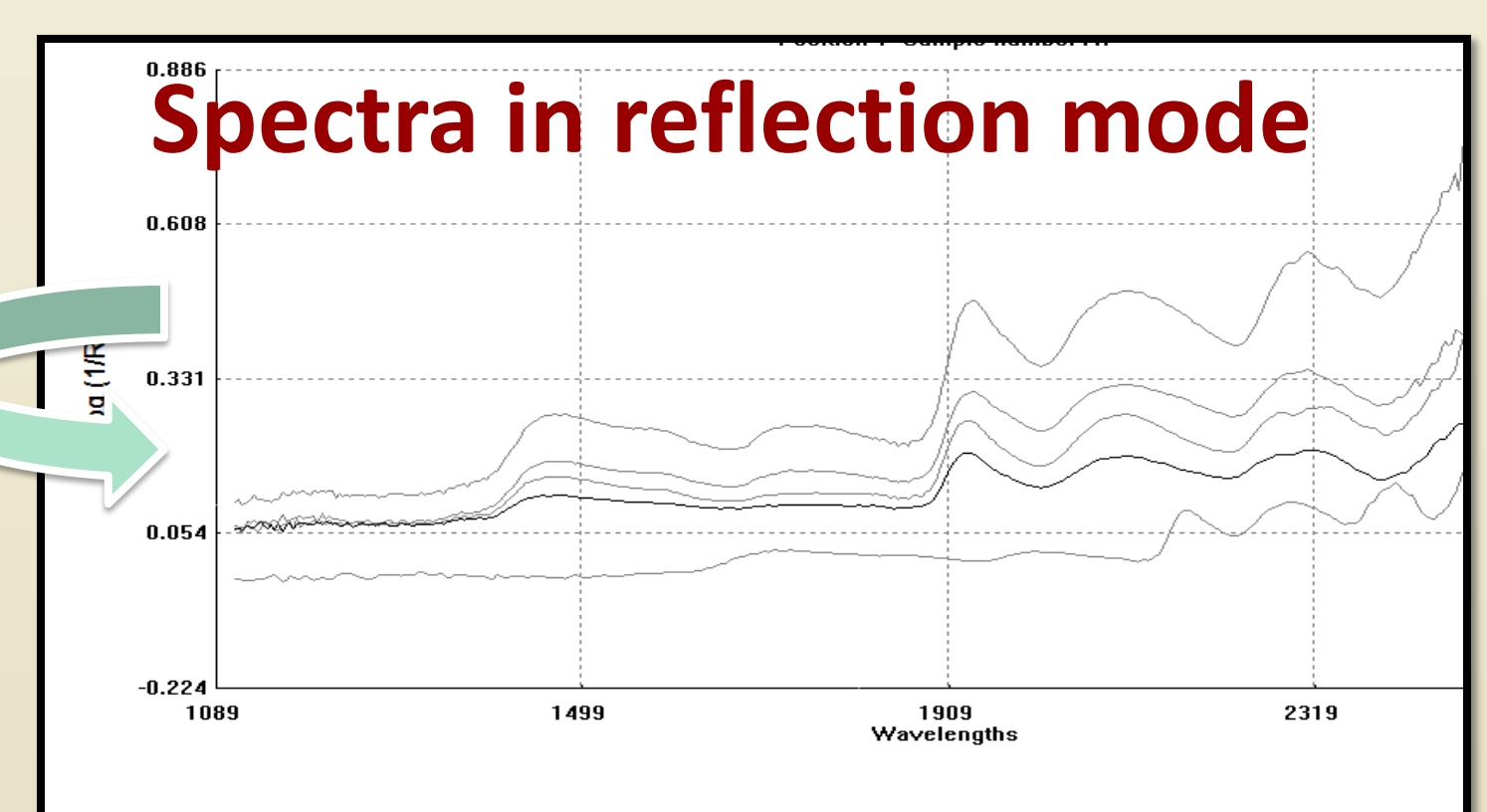
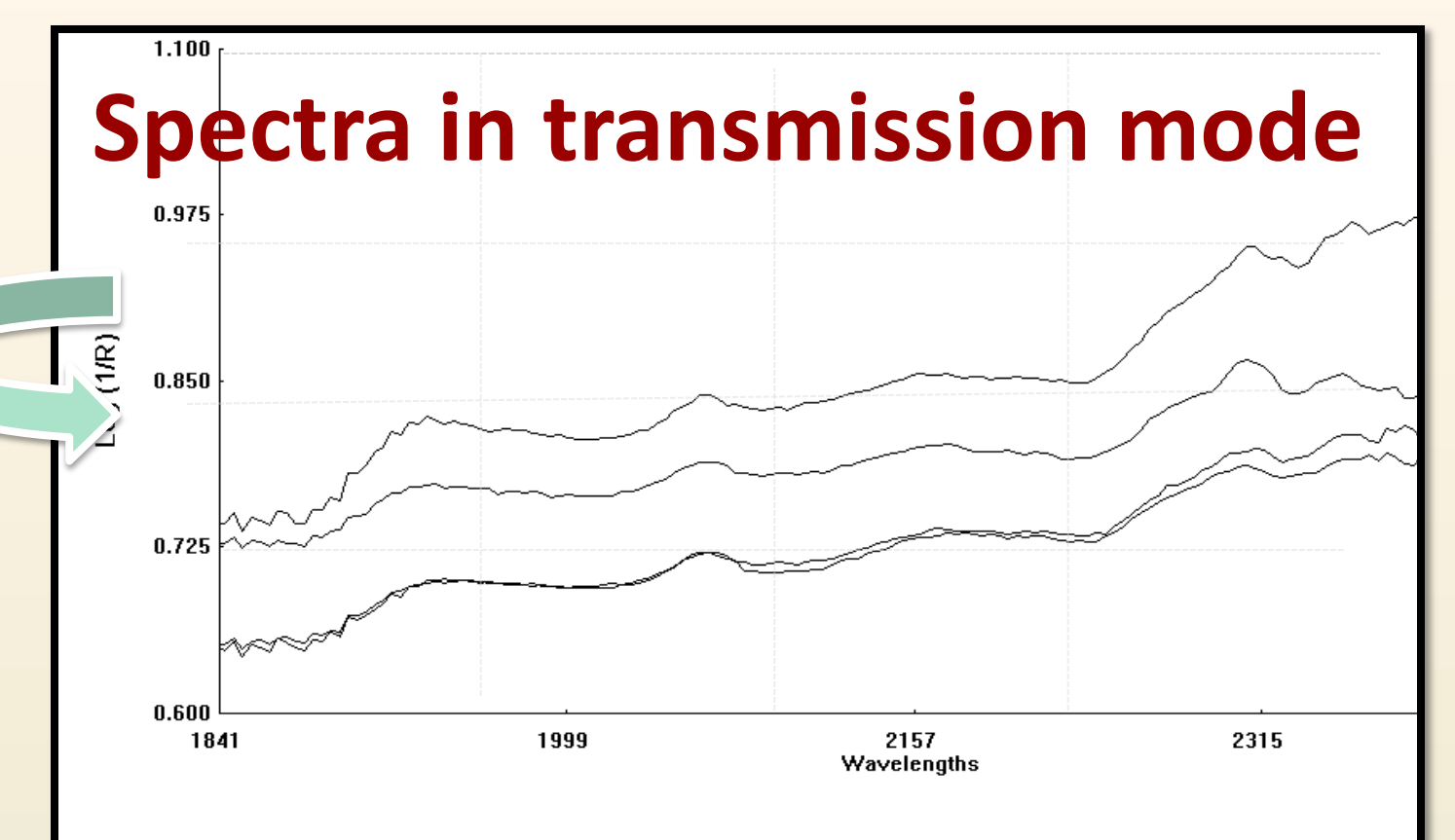
b) Reflection mode



The fine fraction on the slide (<250 µm)

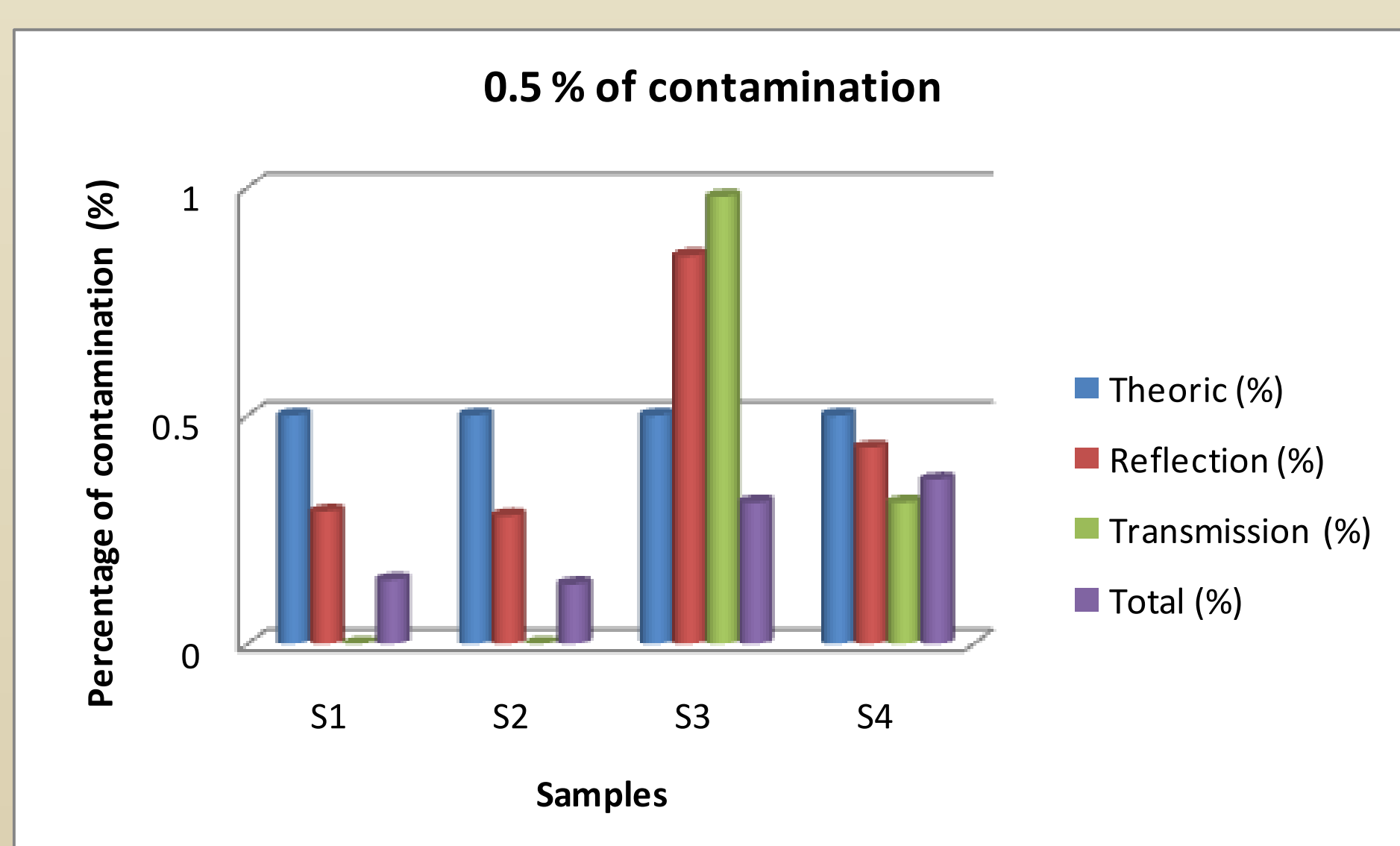
NIRM spectra

The gross fraction on the spectralon (>250 µm)

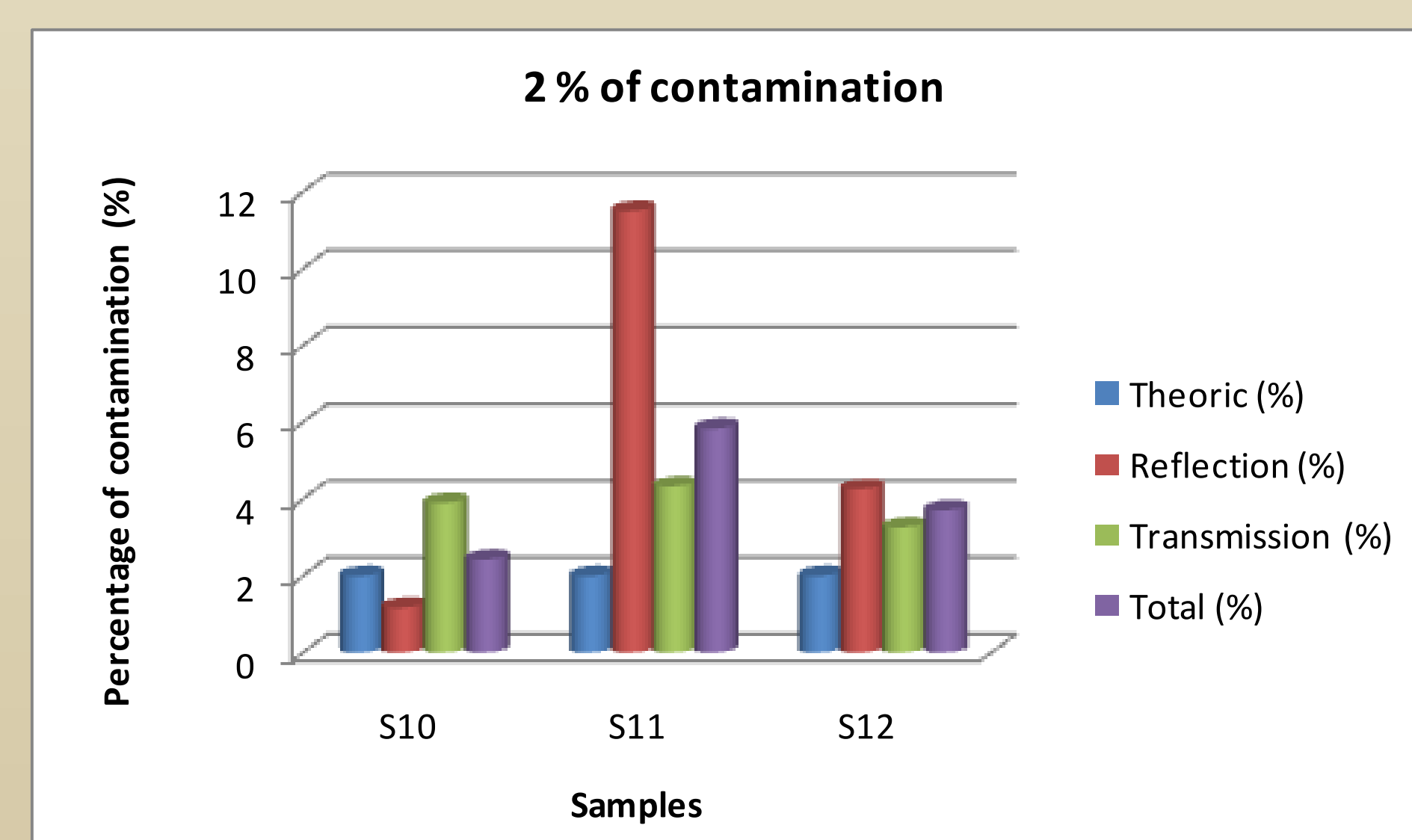


Several factors were considered when developing one method of quantification:

- the theoretical percentage,
- the percentage obtained with the reflection mode,
- the percentage obtained with the transmission mode,
- the percentage of each fraction in the sample, and
- the total percentage of adulteration.



The results indicate that the experimental percentage of the adulteration has to be calculated on the basis of the total of percentages obtained with the gross and the fine fraction.



NIR microscopy could play a useful role in the quantification of MBM in animal feed in the combat against the fraud in feedstuff.