Specac

Application Note

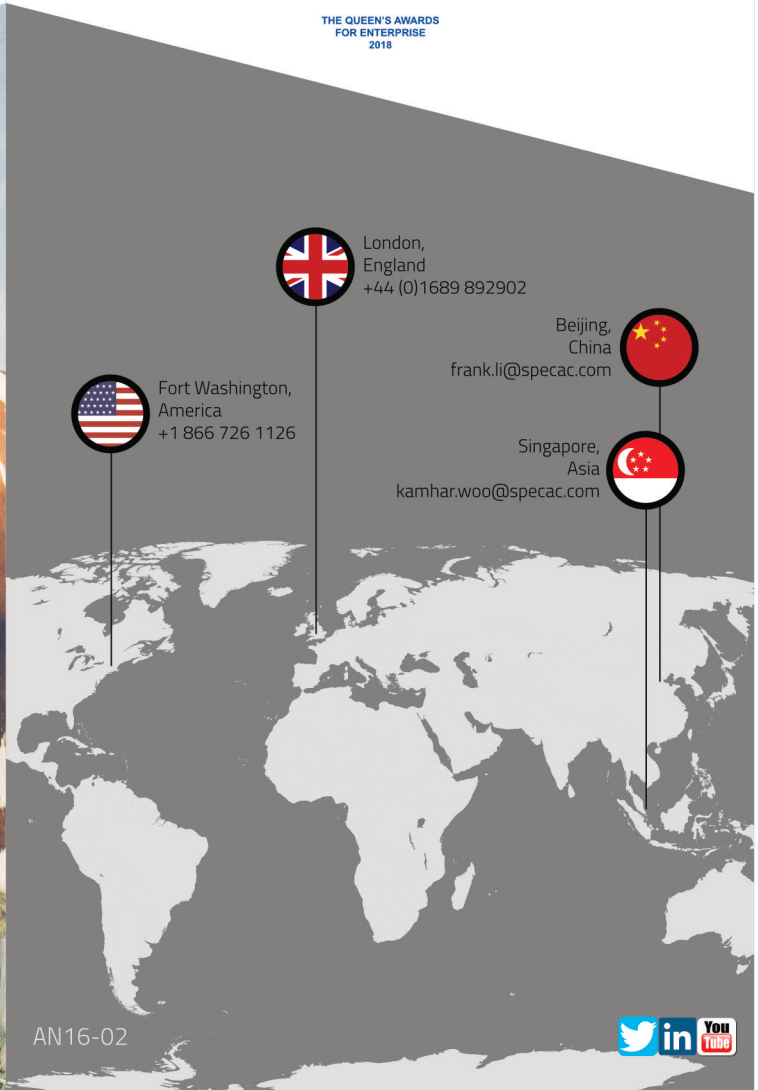
UK: +44 (0) 1689 892902 US: +1 866 726 1126

WWW.SPECAC.COM

Contact us for more information

Analyzing Milk with the Pearl™

THE QUEEN'S AWARDS FOR ENTERPRISE 2018



AN16-02

Analyzing milk to meet quality control standards is fast and easy with the Pearl™ FTIR transmission accessory.

In 2010, ~10% of the world's milk was produced by the USA and accounted for 13% of the food industry turnover in Europe. Monitoring the health of livestock and quality of milk is valuable to the dairy industry.

FTIR spectroscopy is a non-destructive way to determine purity of dairy samples. Whilst traditional methods can be time intensive, the Pearl™ accessory is designed for rapid throughput. Sample loading is easy and requires little user-training, saving time and money.

Specac's Liquid Transmission Accessory, The Pearl™

Acknowledgement

The spectra presented here were obtained by John Coates of Coates Consultancy LLC.

Method

Store-bought milk samples of varying fat and lactose concentrations were tested. Each sample was dropped onto a CaF_2 window and a consistent pathlength formed by closing the upper window over the top. The Pearl™ was placed into a commercially available spectrometer to record the spectra shown.

The water content of milk is >85% and significantly influences its spectrum, so a water background subtraction has been applied to the data.

Results and Discussion

The flavour and aroma of fats, like milk lipids, affect the palatability of food and is also important for suckling calves.

Figure 1 shows the spectra of fat free, low fat, semi-skimmed and whole milk, which correspond to 0, 1, 2 and 3.5% fat, respectively. The sharp absorption bands at 2920, 2850 and 1750 cm^{-1} (highlighted with arrows) indicate dairy fats, and increase in intensity with greater fat concentration

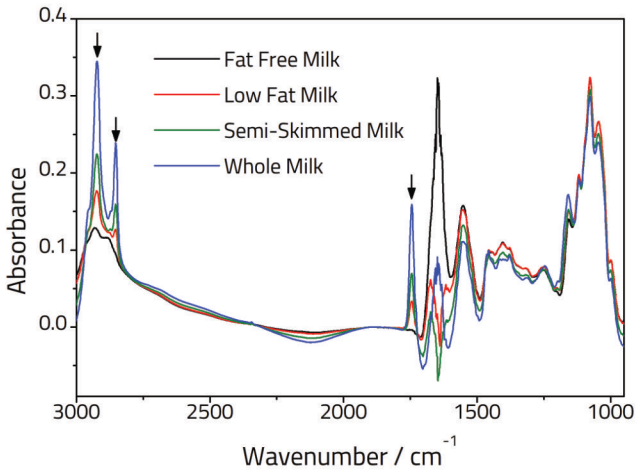


Figure 1: Spectra of variable fat content milk types.

Lactose is the principal carbohydrate, accounting for roughly 5% of the weight content in milk. Quickly identifying the percentage of lactose in hundreds of milk samples can be done cost-effectively.

By comparing the intensity of the lactose absorption band at 1045 cm^{-1} (Fig. 2) with the known % of lactose, an easy-to-use calibration curve can be made, as shown in Figure 3.

The calibration curve can be used to accurately determine lactose content of milk samples. Table 1 shows the lactose content of the milk samples shown in Figure 1 determined from our calibration.

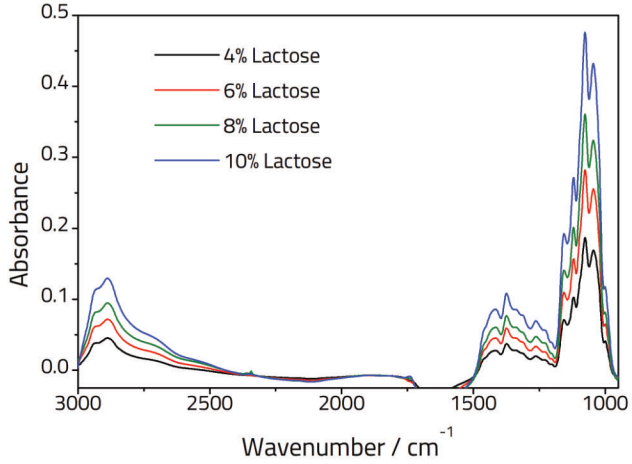


Figure 2: Spectra of lactose in water at variable concentration.

Conclusion

Spectral analysis of milk to determine fat and lactose content is simple and fast when using the Pearl™ liquid transmission accessory.

Spectral analysis of milk to determine fat and lactose content is simple and fast when using the Pearl™ liquid transmission accessory.

Whether checking retail milk quality or ensuring the health of newborn calves, FTIR analysis is an invaluable technique for monitoring a herd's milk production, as well as fertility and even CH_4 emissions [1].

The ease, speed and accuracy of this technique contributes to a cost-effective dairy management system and encourages healthy cows and high quality dairy products for consumers.

For complementary IR analysis techniques on solid dairy products like cheese and yoghurt, why not look at our ATR accessory?

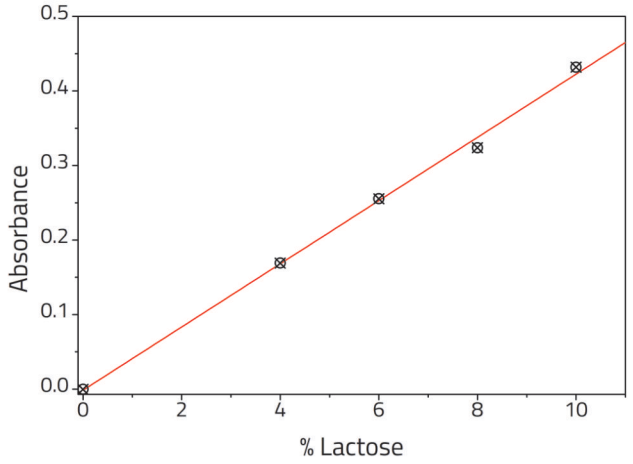


Figure 3: Calibration of lactose vs. absorbance .

Milk	Lactose Content (%)
Fat Free	6.3
Low Fat	6.3
Semi-Skimmed	6.0
Whole Milk	5.7

Table 1: Lactose content determined from the spectra shown in Figure 1.

References

[1] van Gastelen, S. et al., *J. Dairy Science*, **101**, (2018), 5582 - 5598