



Application Note AN-NIR-019

# Human stool analysis by near-infrared spectroscopy

## Determination of moisture, fat, and nitrogen

Several diseases like pancreatic insufficiency or hepatic disorders cause malabsorption or maldigestion. The resulting changes in stool composition (e.g., in moisture, nitrogen content, or fat content) provide important information for medical diagnostics.

Time-consuming lab methods which require a

significant amount of sample preparation can be replaced by near-infrared spectroscopy (NIRS) for fast screening of human stool samples with no sample preparation. The NIRS method is easy to use – no chemicals are required and results are given for several parameters within one minute.

## EXPERIMENTAL EQUIPMENT

522 human stool samples were analyzed on a Metrohm DS2500 Solid Analyzer with a modified DS2500 Holder for petri dishes (**Figure 1**). Stool samples were positioned into the petri dishes for the analysis in diffuse reflection mode. Reference values for moisture, fat, and nitrogen content were obtained with the respective primary methods.



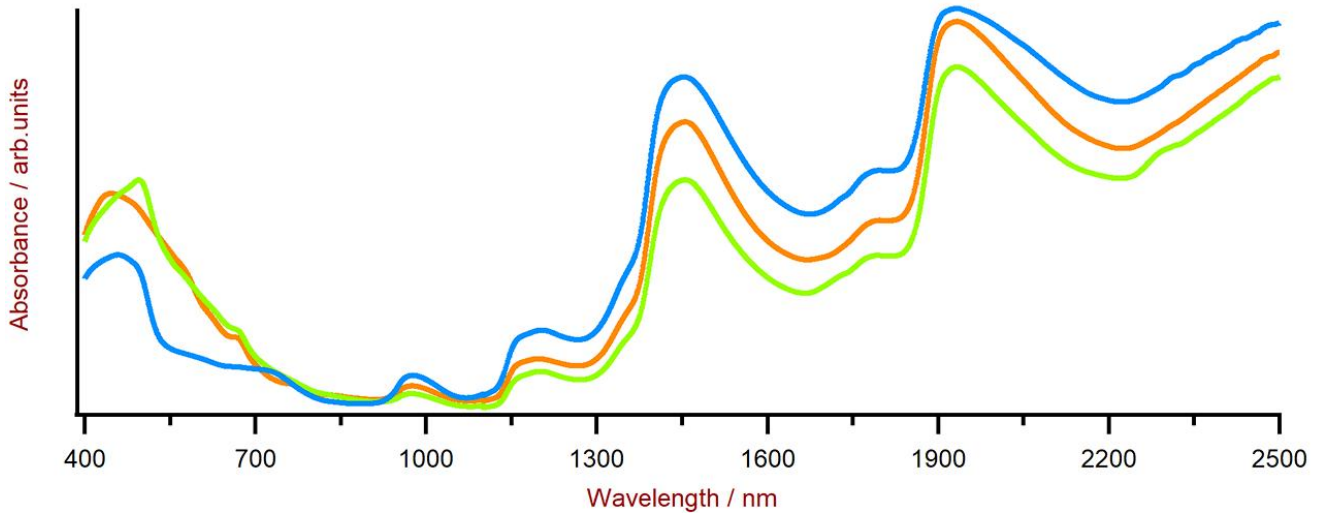
**Figure 1.** DS2500 Solid Analyzer with human stool samples.

Equipment	Metrohm number
DS2500 Solid Analyzer	2.922.0010
DS2500 Holder	6.7430.040
Vision Air 2.0 Complete	6.6072.208

## RESULTS

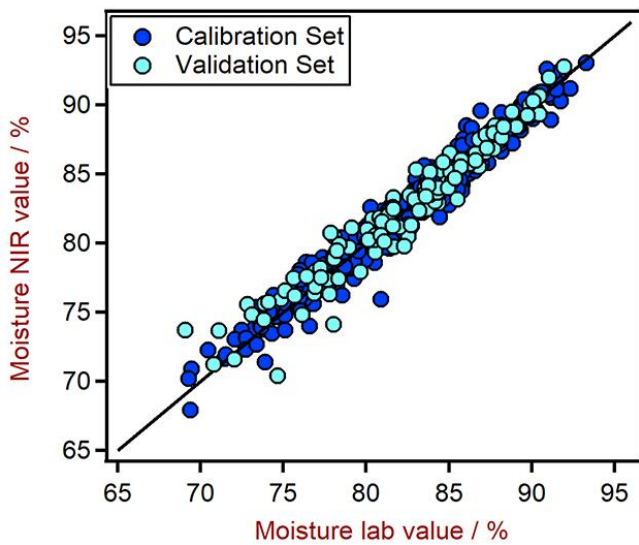
The obtained Vis-NIR spectra (**Figure 2**) were used to create prediction models for the different reference parameters. The data set was split into calibration and validation sets to verify the quality of the prediction models. Correlation

diagrams which display the relation between the Vis-NIR prediction and the reference values are shown in **Figures 3–5** together with the respective figures of merit (FOM).



**Figure 2.** Selection of Vis-NIR spectra of human stool samples. Data was obtained with a DS2500 Solid Analyzer.

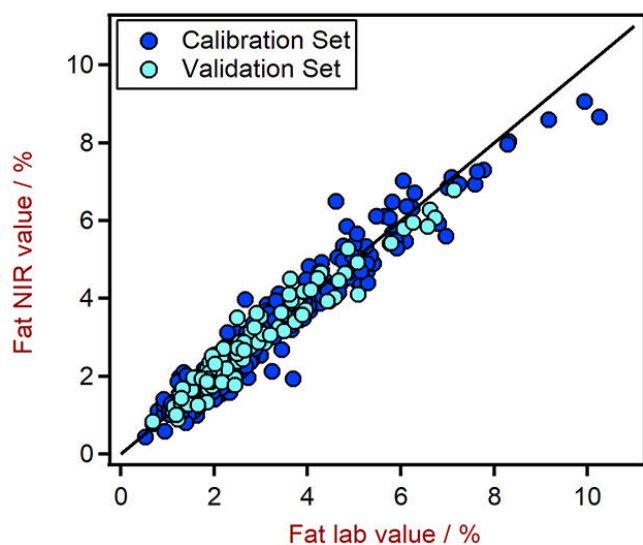
## RESULT MOISTURE IN HUMAN STOOL



Figures of Merit	Value
$R^2$	0.962
Standard Error of Calibration	0.979%
Standard Error of Cross-Validation	1.103%
Standard Error of Prediction	1.266%

**Figure 3.**

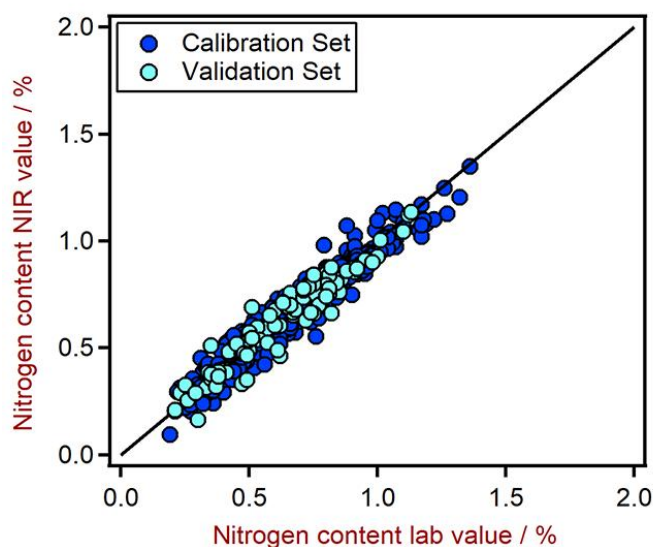
## RESULT FAT IN HUMAN STOOL



Figures of Merit	Value
R <sup>2</sup>	0.942
Standard Error of Calibration	0.3696%
Standard Error of Cross-Validation	0.3811%
Standard Error of Prediction	0.3523%

Figure 4.

## RESULT NITROGEN IN HUMAN STOOL



Figures of Merit	Value
R <sup>2</sup>	0.936
Standard Error of Calibration	0.057%
Standard Error of Cross-Validation	0.060%
Standard Error of Prediction	0.061%

Figure 5.

## CONCLUSION

This Application Note shows the feasibility of NIR spectroscopy for the analysis of moisture, fat, and nitrogen content in human stool samples by

NIRS, which can be conducted without chemicals or sample preparation.

## CONTACT

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## CONFIGURATION



### DS2500 Solid Analyzer

固耐用的近外光,用于生境和室中的量。

DS2500 分析是的活解决方案,用于整个生程中的固体、乳膏和液体行常分析。其固耐用的使 DS2500 Analyzer 分析不受灰、湿度、振和温度波影,因此非常用于在劣的生境中使用。

DS2500 涵盖了从 400 到 2500 nm 的整个光范,并能在不到一分内提供准和可再的果。DS2500 Analyzer 足制行的要求,并由于操作便而能助用完成其日常工作任。

由于与完美匹配,附件可以承受任何具有挑性的品型,例如:粒料之的粗粒固体或乳膏之的半固体品,可得最佳果。量固体的候,使用 MultiSample Cup 可以提高生率,可以自批量最多 9 个品。



### DS2500

本支架使用搭配:

- 小品容器 (6.7402.030)
- DS2500 Iris (6.7425.100)



## Vision Air 2.0 Complete

### Vision Air – 通用的光分析件。

Vision Air Complete 是用于管范境的先易用的件解决方案。

Vision Air 点一:

- 独特的件用和配的用界面保了直的操作方式
- 操作程的建与方式
- SQL 数据,可安全且地管理数据

Vision Air Complete (66072208) 版本包含所有用于可近外光分析量保程的用:

- 器和数据管理用
- 方法用
- 常分析用

其它 Vision Air Complete 解决方案:

- 66072207 (Vision Air Network Complete)
- 66072209 (Vision Air Pharma Complete)
- 66072210 (Vision Air Pharma Network Complete)