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Non-Destructive Analysis of Personalized 3D-Printed Furosemide Tablets Using Near-Infrared and Raman Spectroscopy at the Point-of-Care

Background and importance

3D printing enables production of tablets for an individual patient.

Non-destructive analytical methods are needed for quality control.

Aim and objectives

To investigate the use of **near-infrared (NIR)** and **Raman spectroscopy** as **non-destructive** analytical methods for the quantitative assessment of furosemide **drug content** in personalized **3D-printed tablets**

Materials and methods

Tablets of various sizes containing 15 – 25% *w/w* furosemide were 3D-printed using semi-solid extrusion.

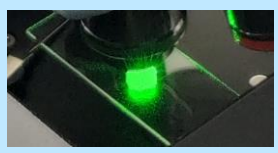
← *3D-printed tablets*

Content was assessed with HPLC-UV conform Ph. Eur. 2.9.40.

Spectra were collected using near-infrared (NIR) and Raman spectroscopy, linked to measured content, and partial least squares (PLS) regression models were trained.

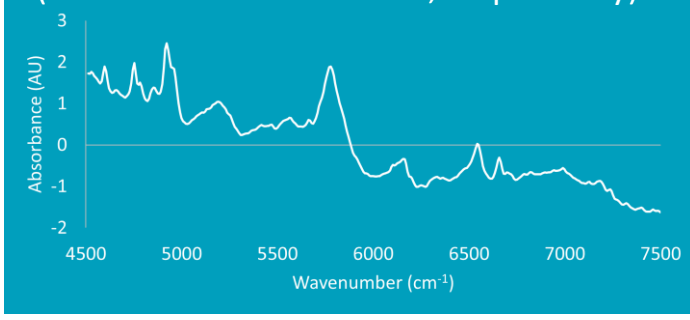
NIR

Raman



Results

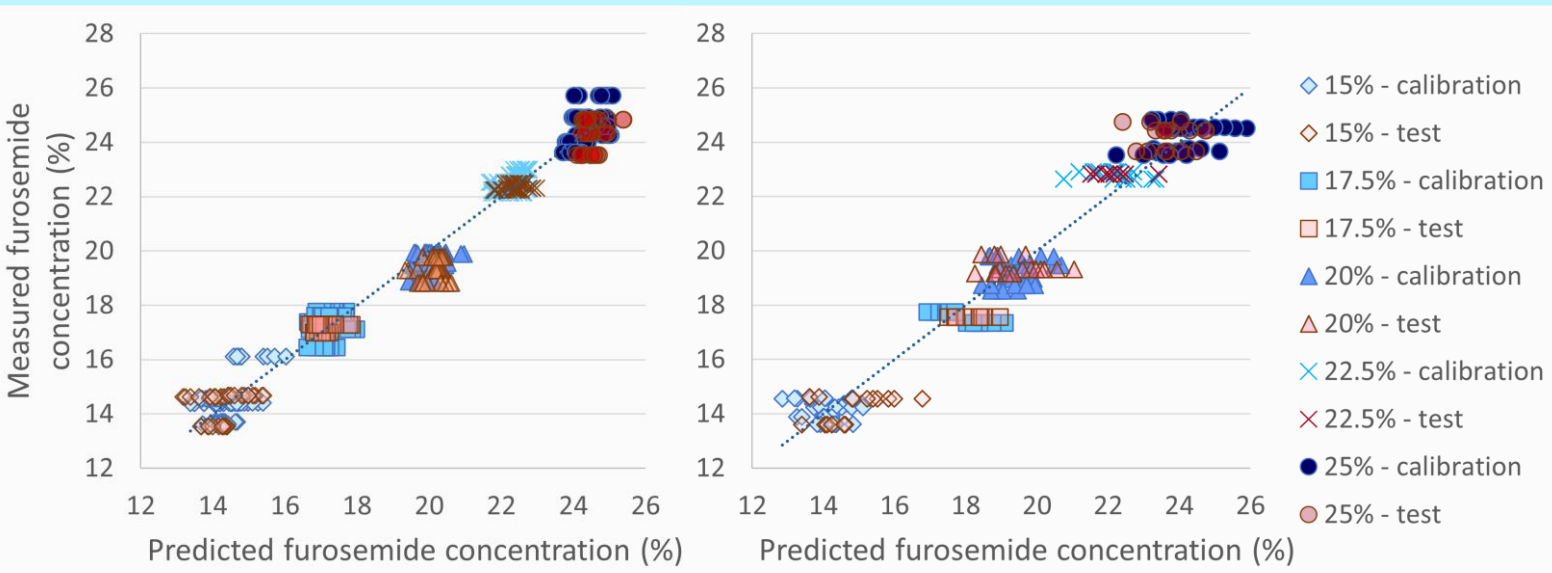
Both the NIR and Raman model (**figure 1**) present **good correlation** with HPLC-UV (R^2 = 0.973 and R^2 = 0.956, respectively).



Both the NIR and Raman model present **good predictive performance** (root mean square error of prediction [RMSEP] = 0.62% and RMSEP = 0.88%, respectively).

← *Example of NIR spectrum (furosemide 25% w/w 3D-printed tablet)*

Figure 1. Partial least squares (PLS) regression models build from NIR (left) and Raman (right) data



Conclusion

Both NIR and Raman spectroscopy are suitable for the non-destructive analysis of personalized 3D-printed tablets containing furosemide, with NIR being the favorable technique in this context.

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