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FORMULATION AND NON-DESTRUCTIVE CONTROL OF IMMEDIATE RELEASE 3D-PRINTED AMITRIPTYLINE TABLETS

BACKGROUND AND IMPORTANCE

- **3D printing** enables **precise and flexible dosing** for patients who require tailored dosage strengths.
- For **amitriptyline**, flexible dosing is clinically important due to withdrawal risks and CYP2D6 variability.
- **Non-destructive analytical methods** are needed to perform quality control testing whilst avoiding substantial loss of dosage units.

AIM AND OBJECTIVES

- To optimize an **immediate-release** SSE formulation for **3D-printed tablets** with amitriptyline as a model drug.
- To assess how formulation variations and the use of pure API versus API from crushed tablets (**repurposing**) affect printability and tablet quality.
- To develop a **non-destructive NIR model** for measurement of amitriptyline in gelucire/glycerol matrix.

MATERIALS AND METHODS

Formulation

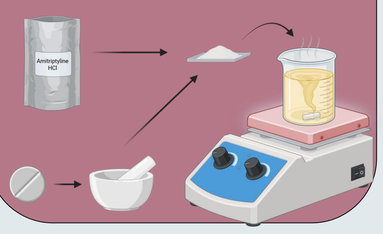
- **Matrix: Gelucire® 48/16**

Pure API:

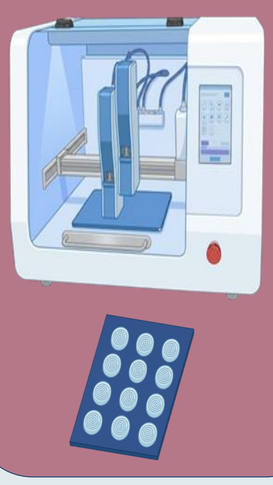
- Amitriptyline HCl: 5, 10, 15 % (w/w)
- Glycerol: 0, 5, 10 % (w/w)

Repurposing:

- 25 mg crushed commercial amitriptyline tablets → 5 %
- Uncoated and coated tablets



SSE printing (DoseRx®)



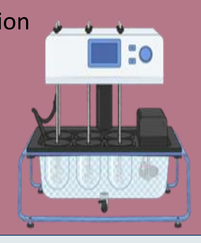
Quality control

Uniformity of mass

FT-NIR-spectrometer

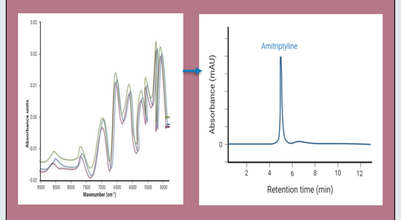
Content uniformity

Dissolution



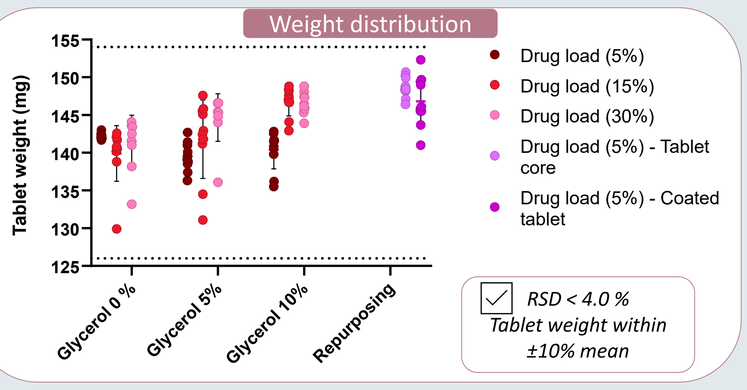
NIR model

- Link NIR spectra with measured content HPLC
- Training partial least squares (PLS) regression model



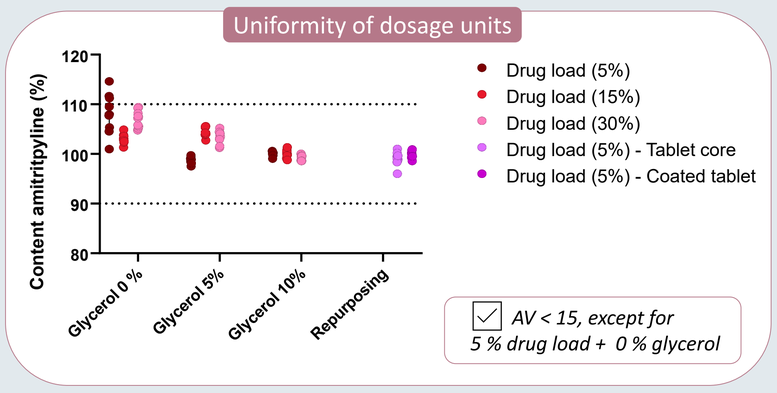
RESULTS

Weight distribution



☑ *RSD < 4.0 %*
Tablet weight within ±10% mean

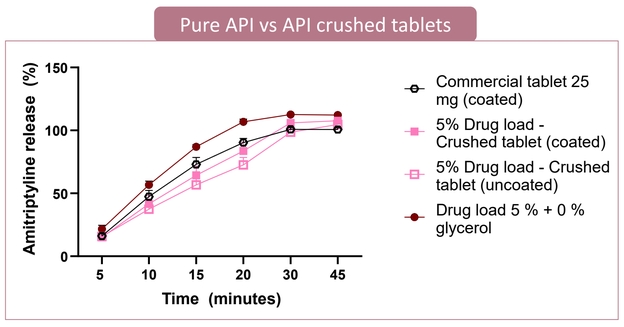
Uniformity of dosage units



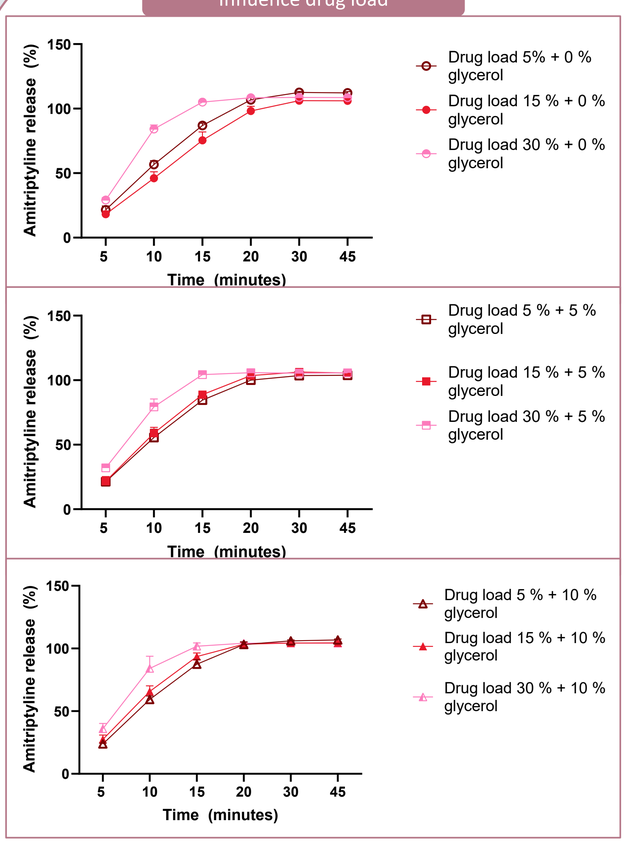
☑ *AV < 15, except for 5 % drug load + 0 % glycerol*

Dissolution

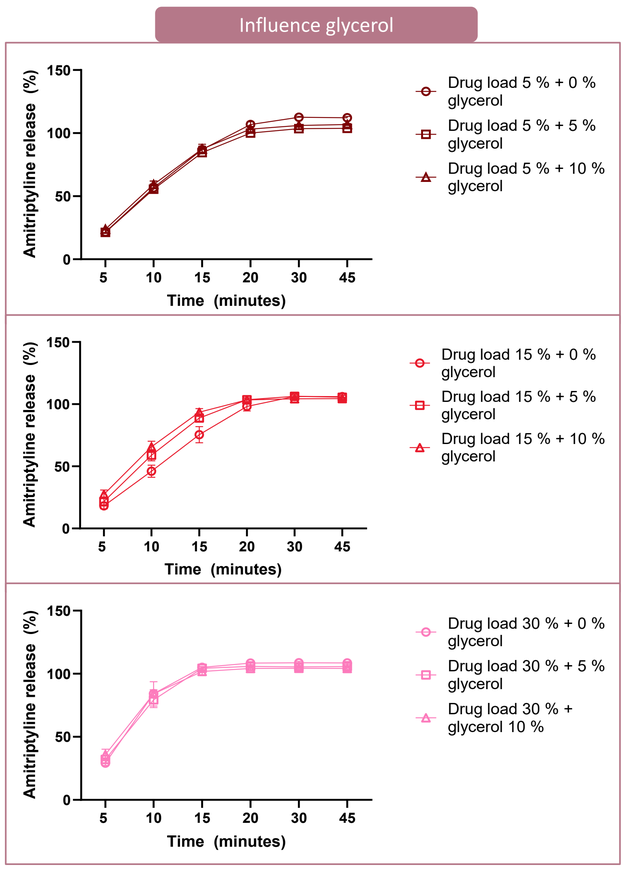
Pure API vs API crushed tablets



Influence drug load

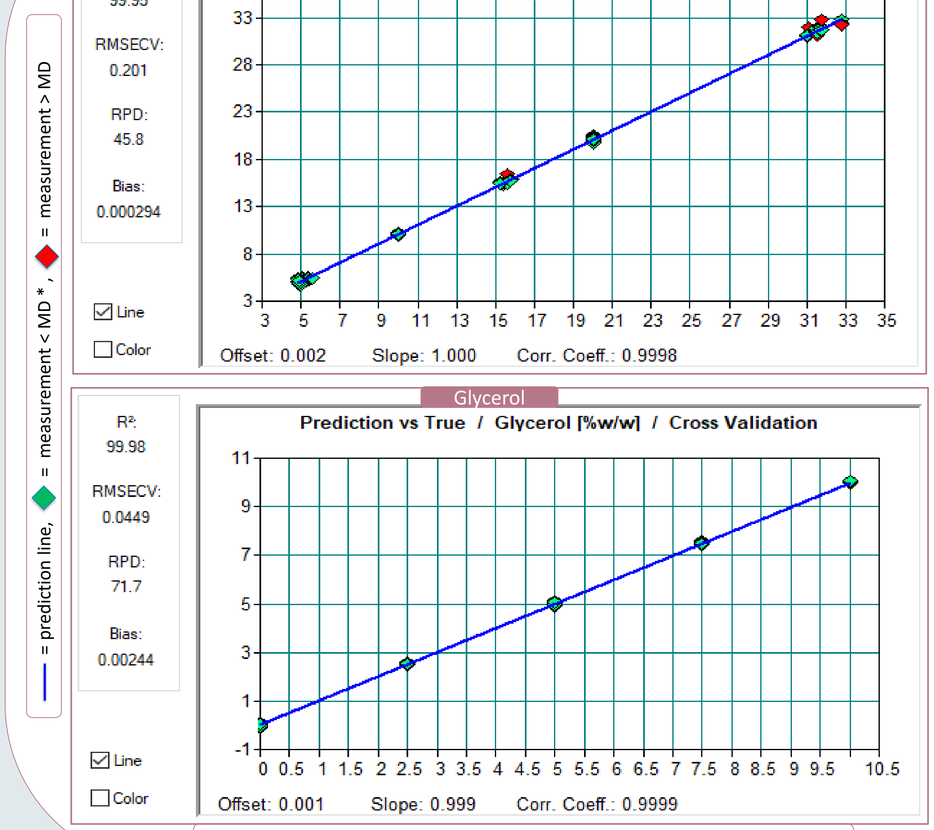


Influence glycerol



☑ *≥ 80% release within 30 minutes*

NIR model



**MD= Mahalanobis Distance (MD) : Amitriptyline = 0.49, Glycerol= 0.58*

CONCLUSION

- Amitriptyline was successfully 3D-printed using a Gelucire® 48/16matrix.
- Dissolution: all formulations met the immediate-release tablet requirements. No influence glycerol; use of higher drug load and pure API led to faster dissolution.
- The NIR model enabled semi-quantification of amitriptyline and glycerol, supporting non-destructive QC.

References

- Hicks, J. K., Sangkuhl, K., Swen, J. J., Ellingrod, V. L., Müller, D. J., Shimoda, K., Bishop, J. R., Kharasch, E. D., Skaar, T. C., Gaedigk, A., Dunnenberger, H. M., Klein, T. E., Caudle, K. E., & Stingl, J. C. (2017). Clinical pharmacogenetics implementation consortium guideline (CPIC) for CYP2D6 and CYP2C19 genotypes and dosing of tricyclic antidepressants: 2016 update. Clinical pharmacology and therapeutics, 102(1), 37–44. https://doi.org/10.1002/cpt.597
- Created with BioRender.com.

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Ayna Analytics DOSER OFIMEDICINE

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