

Technical University of Denmark



Microcontainers as an oral drug delivery system.

Nielsen, Line Hagner; Keller, Stephan Sylvest; Jacobsen, J.; Rades, Thomas; Boisen, Anja; Müllertz, A.

Publication date:
2014

Document Version
Peer reviewed version

[Link back to DTU Orbit](#)

Citation (APA):

Nielsen, L. H., Keller, S. S., Jacobsen, J., Rades, T., Boisen, A., & Müllertz, A. (2014). Microcontainers as an oral drug delivery system.. Abstract from Globalization of Pharmaceutics Education Network biennial meeting, Helsinki, Finland.

DTU Library

Technical Information Center of Denmark

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Microcontainers as an oral drug delivery system

Line Hagner Nielsen^{a,b}, Stephan Sylvest Keller^b, Jette Jacobsen^a, Thomas Rades^a, Anja Boisen^b,
Anette Müllertz^{a,c}

^aDepartment of Pharmacy, Faculty of Health and Medical Sciences, University of Copenhagen, Copenhagen, Denmark

^bDepartment of Micro- and Nanotechnology, Technical University of Denmark, Kongens Lyngby, Denmark

^cBioneer:FARMA, Department of Pharmacy, Faculty of Health and Medical Sciences, University of Copenhagen, Copenhagen, Denmark

Objective. The purpose of this study was to evaluate microcontainers *in vitro* and *in vivo* as an innovative oral drug delivery system for the poorly water-soluble drug, furosemide.

Methods. Microcontainers, with an inner diameter of 223 μm , were fabricated in SU-8 through two steps of photolithography. The microcontainers were filled with amorphous sodium salt of furosemide (prepared by spray drying). Subsequently, a 10 μm layer of Eudragit[®] L100 was spray coated on the cavity of the drug-filled microcontainers. The release of the drug from the microcontainers was evaluated in a biorelevant gastric medium (pH 1.6) and a biorelevant intestinal medium at pH 6.5. The intestinal permeability of the amorphous furosemide salt loaded into the microcontainers was evaluated using a Caco-2 cell model. Furthermore, drug-filled and Eudragit-coated microcontainers were dosed orally to rats and blood samples were taken over 24 h.

Results. The release experiments revealed that the Eudragit[®] layer prevented drug release in the gastric medium, while an immediate release of the amorphous furosemide salt was seen in the intestinal medium. The Caco-2 cell studies showed a fast permeability of the amorphous furosemide salt with no significant differences between the microcontainers ($P_{\text{app}} 1.79 \cdot 10^{-5} \pm 0.068 \cdot 10^{-5}$ cm/s, mean \pm SD, n=11) and powder of amorphous furosemide salt ($P_{\text{app}} 1.62 \cdot 10^{-5} \pm 1.04 \cdot 10^{-5}$ cm/s, mean \pm SD, n=11). The rat study demonstrated that the amorphous furosemide salt dosed in microcontainers showed an oral relative bioavailability of 220.2 \pm 43.2% (mean \pm SEM, n=6) compared to amorphous furosemide salt filled into capsules and coated with Eudragit[®] L100.

Conclusions. Microcontainers show considerable potential as a future oral drug delivery system.