

Microcontainers as an oral drug delivery system

Petersen, Ritika Singh; Nielsen, Line Hagner; Marizza, Paolo; Keller, Stephan Sylvest; Rades, Thomas; Müllertz, Anette; Boisen, Anja

Published in:

Book of Abstracts. DTU's Sustain Conference 2015

Publication date:

2015

Document Version

Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

Citation (APA):

Petersen, R. S., Nielsen, L. H., Marizza, P., Keller, S. S., Rades, T., Müllertz, A., & Boisen, A. (2015). Microcontainers as an oral drug delivery system. In Book of Abstracts. DTU's Sustain Conference 2015 [Q-5] Lyngby: Technical University of Denmark (DTU).

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

Ritika Singh Petersen*¹; risi@nanotech.dtu.dk, Line Hagner Nielsen¹, Paolo Marizza¹, Stephan Sylvest Keller¹, Thomas Rades², Anette Müllertz², Anja Boisen¹,

¹Department of Micro and Nanotechnology, Technical University of Denmark, Kgs. Lyngby, Denmark

²Department of Pharmacy, Faculty of Health and Medical Sciences, University of Copenhagen, Copenhagen, Denmark

Oral delivery is the preferred administration route for drugs. Advanced drug delivery (ADD) systems help in achieving targeted and/or sustained delivery in the gastro-intestinal (GI) tract after oral administration. Micro fabricated drug delivery devices have been proposed as an ADD system being able to increase the oral bioavailability of drugs [1]. Of these micro devices, microcontainers are suggested as especially promising [2]. Primarily, this is due to the fact that the size and shape of the microcontainers can be controlled very precisely and therefore, polydispersity as seen for example for micro- and nanoparticles is avoided [3]. Microcontainers are polymeric, cylindrical devices in the micrometre size range (Figure 1) [4]. A major advantage is that these devices allow for unidirectional release, as only one side of the microcontainers is open compared to microparticles where release can occur over the whole area of the particle [5].

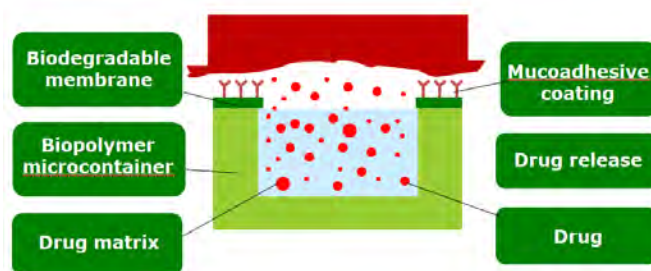


Figure 1. Conceptual design of microcontainers for oral drug delivery

SU-8 microcontainers were fabricated using lithography, whereas PLLA microcontainers were prepared by hot embossing. In terms of drug filling, the SU-8 microcontainers were filled with polyvinylpyrrolidone (PVP) by inkjet printing followed by supercritical CO₂ impregnation of ketoprofen into the PVP matrix. As an alternative filling method, the powder furosemide (p-Furo) were filled into the SU-8 microcontainers. The PLLA microcontainers were filled with drug formulation by embossing the microcontainers into a polycaprolactone (PCL) and furosemide layer. For the p-Furo filled microcontainers, an pH-sensitive lid of Eudragit L100 was spray coated onto the cavity of the microcontainers. Release of p-Furo from the coated microcontainers was investigated using a μ -Diss profiler in simulated intestinal medium. A fast release of ASSF was facilitated from the SU-8 microcontainers. *In-vivo* rat studies were performed showing high oral bioavailability.

REFERENCES

- 1.Chirra, H.D. and Desai, T.A. Multi-Reservoir Bioadhesive Microdevices for Independent Rate-Controlled Delivery of Multiple Drug., *Small*, 8, 3839–3846 (2012).
- 2.Chirra, H.D.; Shao L.; Ciaccio, N.; Fox, C.B.; Wade, J.M.; Ma, A. and Desai, T.A. Planar microdevices for enhanced in vivo retention and oral bioavailability of poorly permeable drugs. *Adv. Healthc. Mater.*, 3, 1648–1654 (2014).
- 3.Randall, C.L.; Leong, T.G.; Bassik, N. and Gracias, D.H. 3D lithographically fabricated nanoliter containers for drug delivery, *Adv. Drug Deliv. Rev.*, 59, 1547–1561 (2007).
- 4.Nielsen, LH; Keller, SS; Gordon, KC; Boisen, A; Rades, T, and Müllertz, A. Spatial confinement can lead to increased stability of amorphous indomethacin. *Eur J Pharm and Biopharm.*, 81, 418-25 (2012)
- 5.Eaimtrakarn, S.; Itoh, Y.; Kishimoto, J.; Yoshikawa, Y.; Shibata, N. and Takada, K. Retention and transit of intestinal mucoadhesive films in rat small intestine, *Int. J. Pharm.*, 224, 61–67 (2001).