



## Microcontainers improve oral bioavailability of furosemide

Nielsen, Line Hagner; Melero, A.; Keller, Stephan Sylvest; Rades, T.; Müllertz, A.; Boisen, Anja

*Publication date:*  
2015

*Document Version*  
Peer reviewed version

[Link back to DTU Orbit](#)

*Citation (APA):*

Nielsen, L. H., Melero, A., Keller, S. S., Rades, T., Müllertz, A., & Boisen, A. (2015). *Microcontainers improve oral bioavailability of furosemide*. Abstract from CRS Nordic Chapter, Edinburgh, United Kingdom.

---

### 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 improve oral bioavailability of furosemide

Line Hagner Nielsen<sup>1\*</sup>, A. Melero<sup>2</sup>, S. Sylvest Keller<sup>1</sup>, T. Rades<sup>3</sup>, A. Müllertz<sup>3</sup>, and A. Boisen<sup>1</sup>

<sup>1</sup>Department of Micro- and Nanotechnology, Technical University of Denmark, Denmark

<sup>2</sup>Department of Pharmacy and Pharmaceutical Technology, University of Valencia, Spain

<sup>3</sup>Department of Pharmacy, University of Copenhagen, Denmark

## Introduction

For oral drug administration, it can be necessary to introduce drug delivery systems to facilitate an improvement in bioavailability. Micro fabricated devices have been proposed as promising oral drug delivery systems<sup>1</sup>. Microcontainers are polymeric, cylindrical devices in the micrometer size range. They allow for unidirectional release, and the drug can be protected inside the cavity of the microcontainer until release is desirable<sup>2</sup>.

## Aim

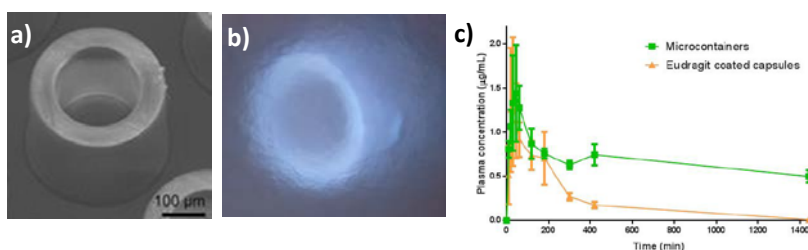
The purpose of this study was to investigate interactions between the microcontainers and the small intestine *in situ* and furthermore, to evaluate the oral *in vivo* performance in rats of the microcontainers filled with amorphous sodium salt of furosemide (ASSF).

## Method

Microcontainers (diameter of 223  $\mu\text{m}$ ) were fabricated in SU-8 (Fig 1a). The microcontainers were filled with ASSF, and the cavity was spray coated with Eudragit L100 or chitosan. *In situ* intestinal perfusions were performed in rats<sup>3</sup>. The microcontainers were dosed to the small intestine, and at the end of the study, the small intestine was harvested from the rat and imaged under microscope. For the *in vivo* studies, the rats were dosed orally with capsules containing drug-filled microcontainers coated with Eudragit L100. As control, capsules were filled with the powder of ASSF and the capsules were coated with Eudragit L100.

## Results

The microscope images of the small intestine after the perfusion studies showed that the microcontainers interacted with the mucus in the small intestine, and the microcontainers were engulfed by the intestinal mucus (Fig 1b). The oral bioavailability study showed that the relative oral bioavailability of ASSF in microcontainers was found to be  $220\pm 43\%$  when comparing to drug-filled capsules coated with Eudragit (Fig 1c).



**Fig 1** a) SU-8 microcontainer with a diameter of 223  $\mu\text{m}$ . b) Microcontainer in intestinal mucus following *in situ* intestinal perfusion. c) Plasma concentrations of microcontainers filled with ASSF coated with Eudragit L100 and filled into capsules and ASSF dosed in capsules with Eudragit coating after orally dosing to rats

## Conclusion

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

## References

1. Chirra H. D. *et al.* Adv Healthcare Mater. (2014) 3: 1648-1654
2. Ainslie K.M. *et al.* Small (2009) 5: 2857-2863
3. Doluisio JT *et al.* J Pharm Sci. (1969) 58: 1200-1202