Electronic Supplementary Material (ESI) for Biomaterials Science.


Supplementary Information

# Colorectal distribution and retention of polymeric nanoparticles following incorporation into a thermosensitive enema

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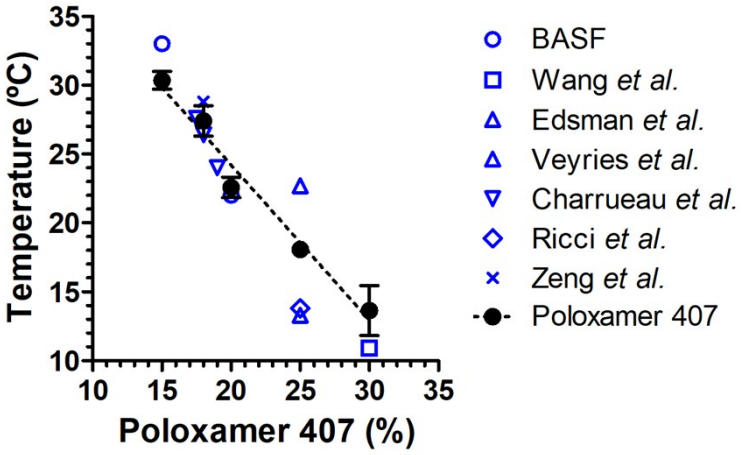


**Figure S1.** Sol-gel transition temperature for different concentrations of poloxamer 407 in water as determined by rheological measurements. Results are presented as mean ± SD (*n*=3). Dashed line represents linear regression from data for poloxamer 407 in water. Blue symbols included in the graph are for mean values previously reported in the literature, namely by BASF,[1] Wang *et al*.,[2] Edsman *et al*.,[3] Veyries *et al*.,[4] Charruea *et al*.,[5] Ricci *et al*.,[6] and Zeng *et al*.[7]

**Table S1.** Sol-gel transition temperature and time for poloxamer 407 at 15% (*w/v*) in plain water or in presence of different buffers/excipients. Results are presented as mean ± SD (*n*=3). No significant differences were found when comparing with the polymer at 15% (*w/v*) in plain water ($p<0.05$).

| Composition | Sol-gel transition temperature (°C) | | Sol-gel transition time (min) |
|---|---|---|---|
| | Magnetic bar immobilization | Rheological measurements | |
| P407 + water | 29 ± 2 | 29.9 ± 1.1 | 3.1 ± 0.3 |
| P407 + citrate buffer [a] | 29 ± 1 | 28.2 ± 0.3 | 3.1 ± 0.7 |
| P407 + NaP buffer [a] | 30 ± 1 | 28.1 ± 0.5 | 2.9 ± 0.7 |
| P407 + water + 2% (*w/v*) glycerin | 30 ± 3 | 28.4 ± 0.6 | 3.3 ± 0.3 |
| P407 + water + 5% (*w/v*) glycerin | 29 ± 2 | 28.0 ± 0.6 | 2.6 ± 0.2 |
| P407 + water + 0.1% (*w/v*) sorbic acid | 29 ± 1 | 28.7 ± 0.9 | 3.2 ± 0.8 |
| P407 + NaP buffer [a] + 5% (*w/v*) glycerin | 29 ± 1 | 28.9 ± 0.8 | 3.2 ± 0.3 |

P407: poloxamer 407; NaP: sodium phosphate; [a] 10 mM, pH 7.0.

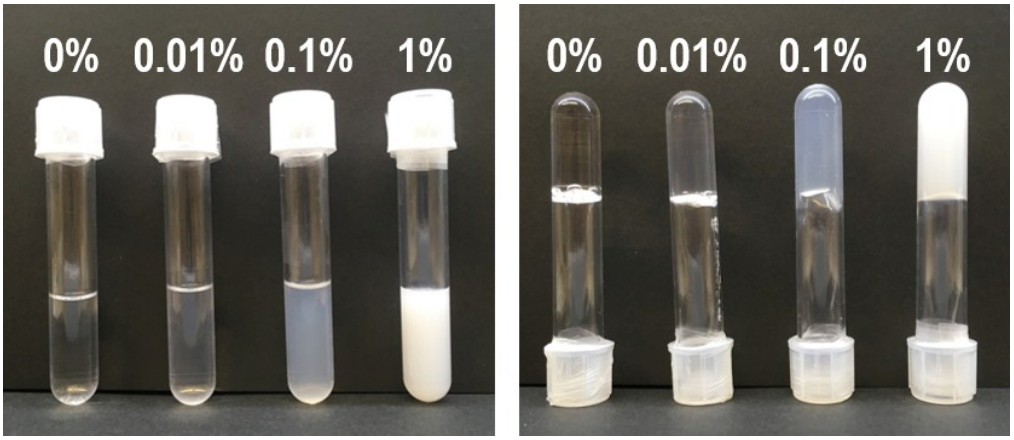


**Figure S2.** Appearance of NPs-in-thermo containing different concentration of plain PLGA NPs (*w/w*) at 20 °C (left) and 37 °C (right). Tubes in the right image were flipped in order to highlight the consistency of formulations at body temperature.

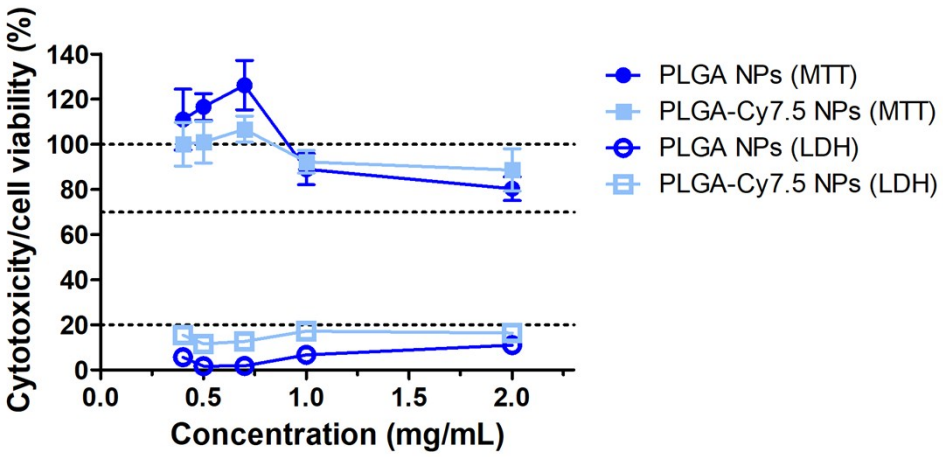


**Figure S3.** Toxicity potential of PLGA NPs and PLGA-Cy7.5 NPs to Caco-2 cells as tested using the LDH release assay and the MTT reduction assay. Data presented as mean ± SD (*n*=3). Dotted horizontal lines at 20%, 70% and 100% were included for reference.

**Table S2.** Properties of DPV-loaded NPs-in-thermo (1% (*w/v*) in particles and 0.04% in drug (*w/v*)), DPV-in-thermo (0.04% in free drug (*w/v*)), and NPs-in-thermo containing 0.2% (*w/v*) Cy7.5:NPs (total of 1% (*w/v*) in particles). Results are presented as mean ± SD (*n*=3).

| Properties | Thermosensitive enemas formulations | | |
|---|---|---|---|
| | Dapivirine-loaded NPs | Free dapivirine | Cy7.5:NPs |
| Sol-gel transition temperature (°C) | | | |
| Magnetic bar immobilization | 27 ± 1 | 31 ± 3 | 28 ± 1 |
| Rheological measurements | 28 ± 2 | 30 ± 5 | 29 ± 1 |
| Sol-gel transition time (min) | 1.5 ± 0.2 | 2.1 ± 0.3 | 1.8 ± 0.3 |
| Viscosity (mPa.s) | | | |
| @20 °C/shear rate=40 $s^{-1}$ | 26 ± 6 | 37 ± 11 | 19 ± 3 |
| @37 °C/shear rate=40 $s^{-1}$ | 1,729 ± 435 | 1,433 ± 609 | 1,638 ± 322 |
| Osmolality (mOsm/kg) | 478 ± 7 | 459 ± 12 | 441 ± 8 |
| pH | 7.1 ± 0.1 | 7.0 ± 0.2 | 7.1 ± 0.1 |

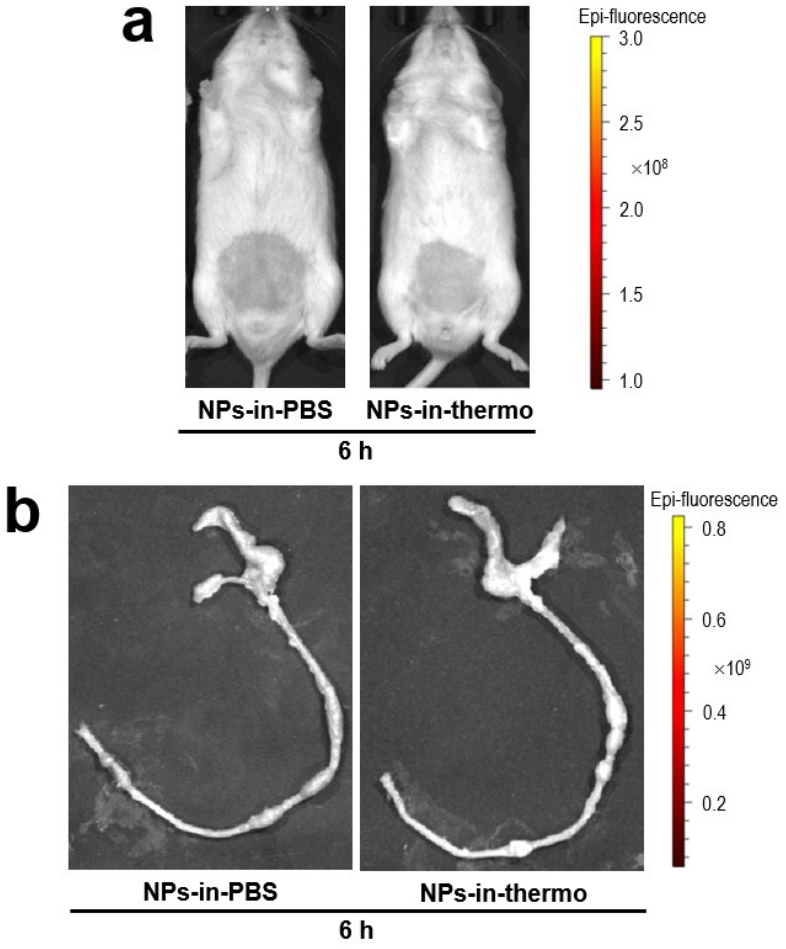


**Figure S4.** Fluorescence signal obtained from **(a)** full body, live animals in supine position, and **(b)** excised colorectal tissues at 6 h following administration. All images presented as the superimposition of black & white photos and NIR signal distribution. Values in heat map scales are presented in $p.cm^2.s^{-1}.\mu W^{-1}$.

## Supplementary references


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