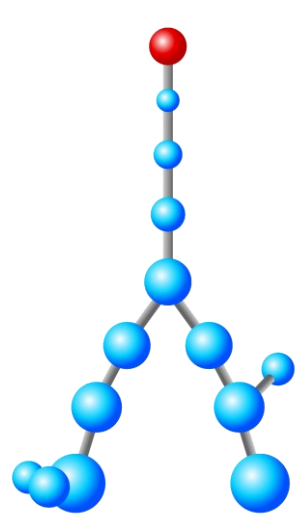




Ultrasmall solid lipid nanoparticles by the phase inversion temperature

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Ultrasmall PS-PIT SLN

Polysorbate-sorbitan (PS) - Phase inversion temperature (PIT) Solid lipid nanoparticles (SLN)
Patent WO 2020/254934, EP3982941A1 issued to R Bio Transfer srl

Biocompatible SLN composition:
solid lipid, sorbitan, polysorbate, water

PS-PIT obtaneid owing to
repeated heating & cooling
cycles in the same vessel

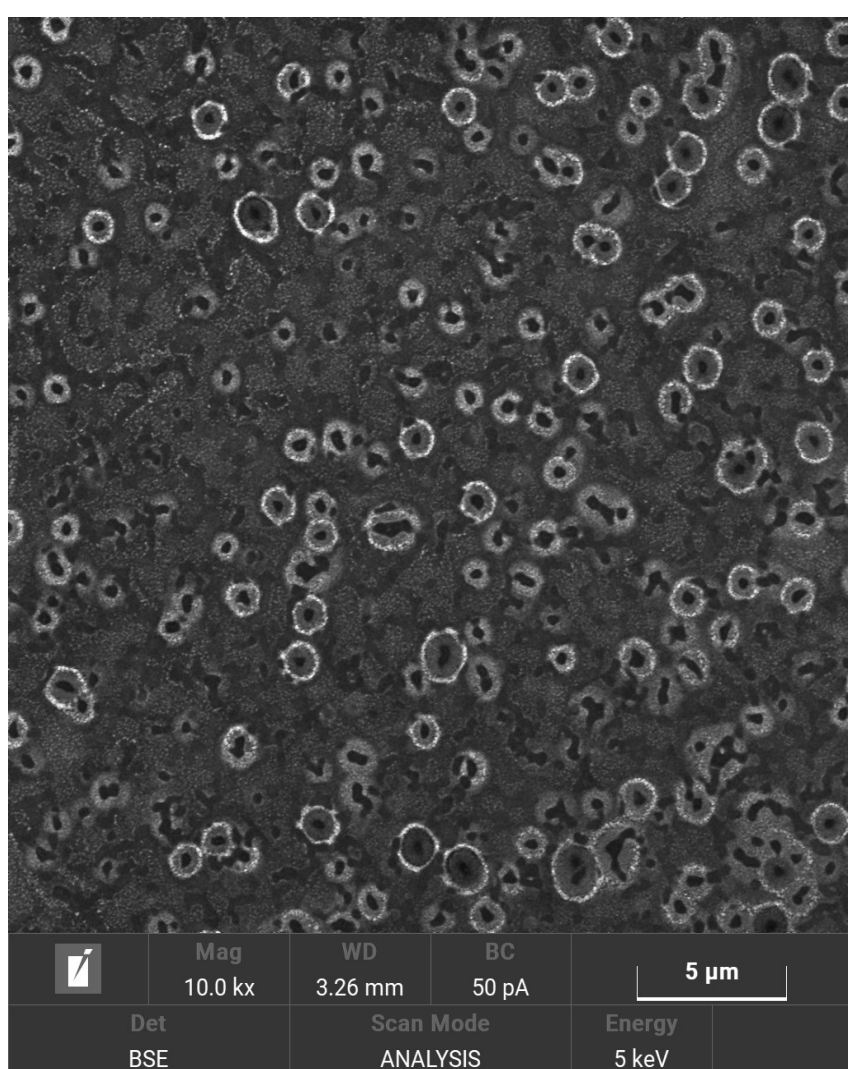
Advantageous process:
- solvent free
- low energy consuming
- easy to scale up (1 vessel)

Unique technical features:
- ultrasmall size (<100nm)
- sterilized by filtration
- able to load multiple drugs

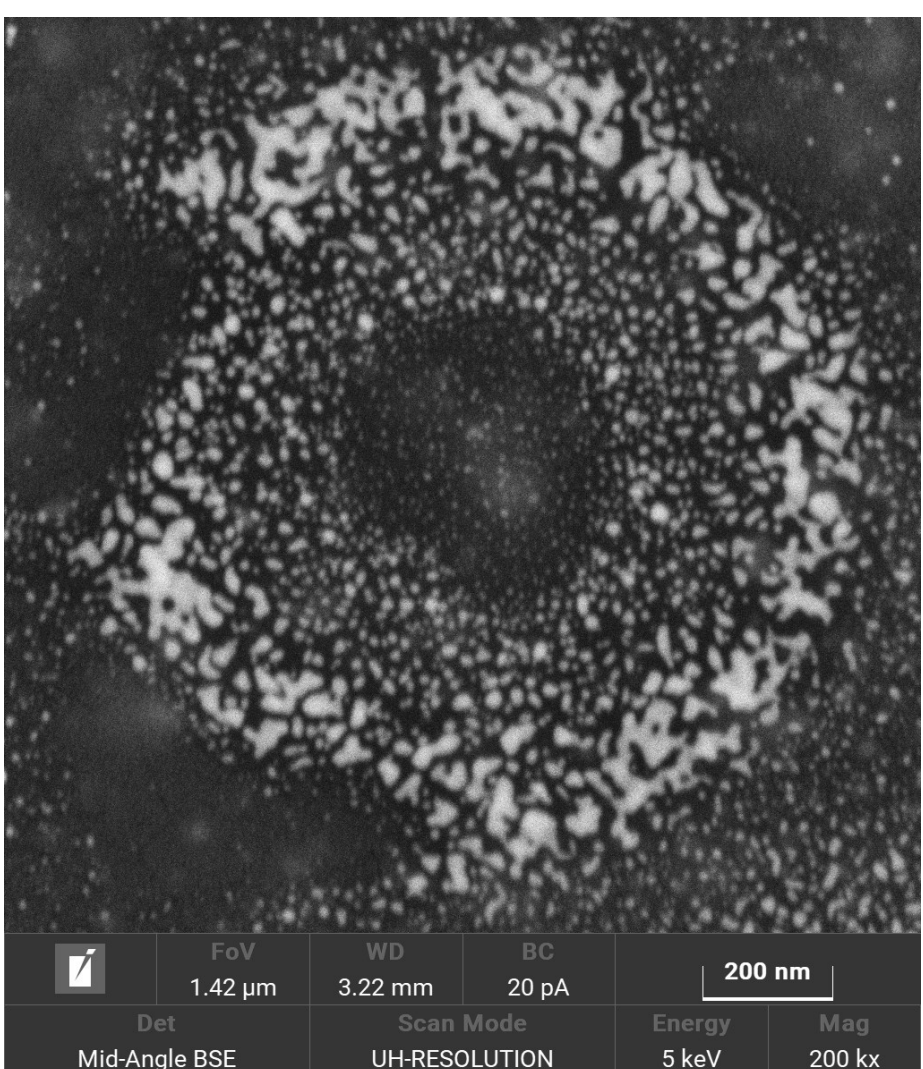
Improved biological performance:
- long-time circulation
- biological barrier overcoming (i.e. BBB)

Tunable size and shape by lipid, surfactant, drug encapsulation

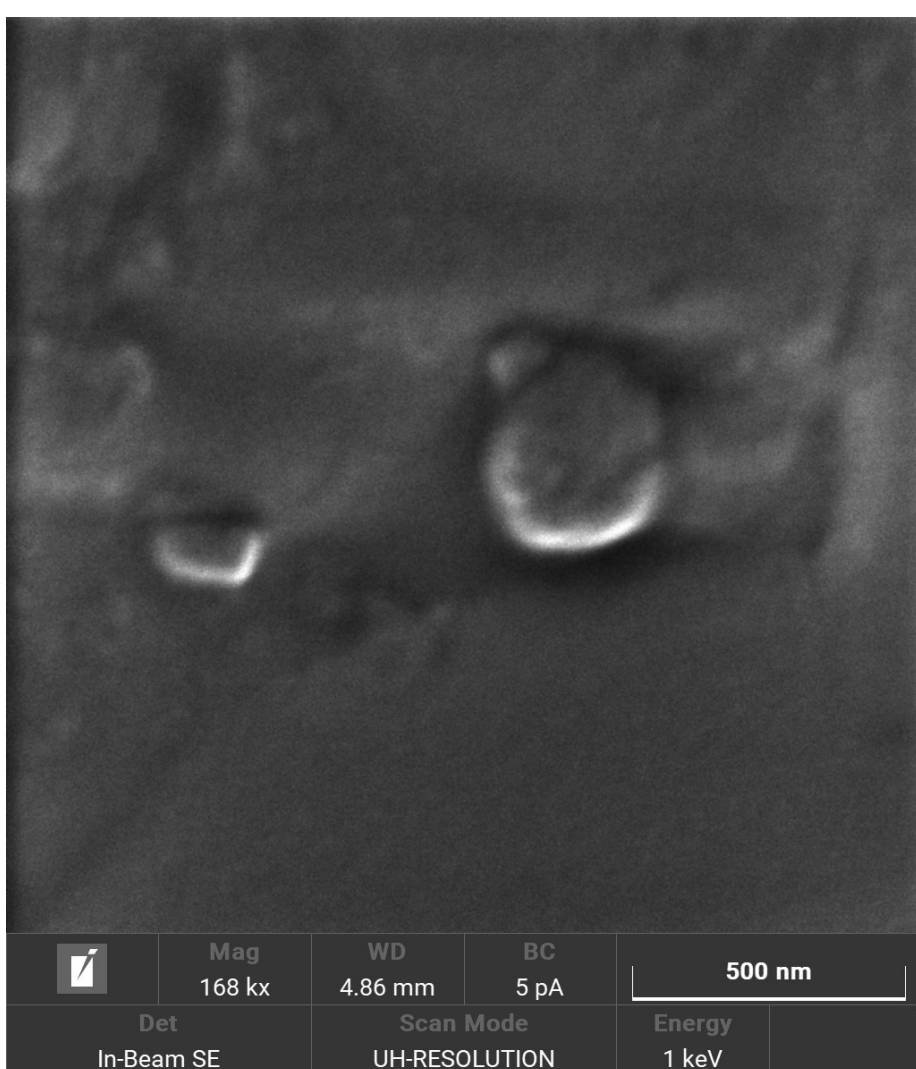
Transmission
electronic
microscopy
(TEM)



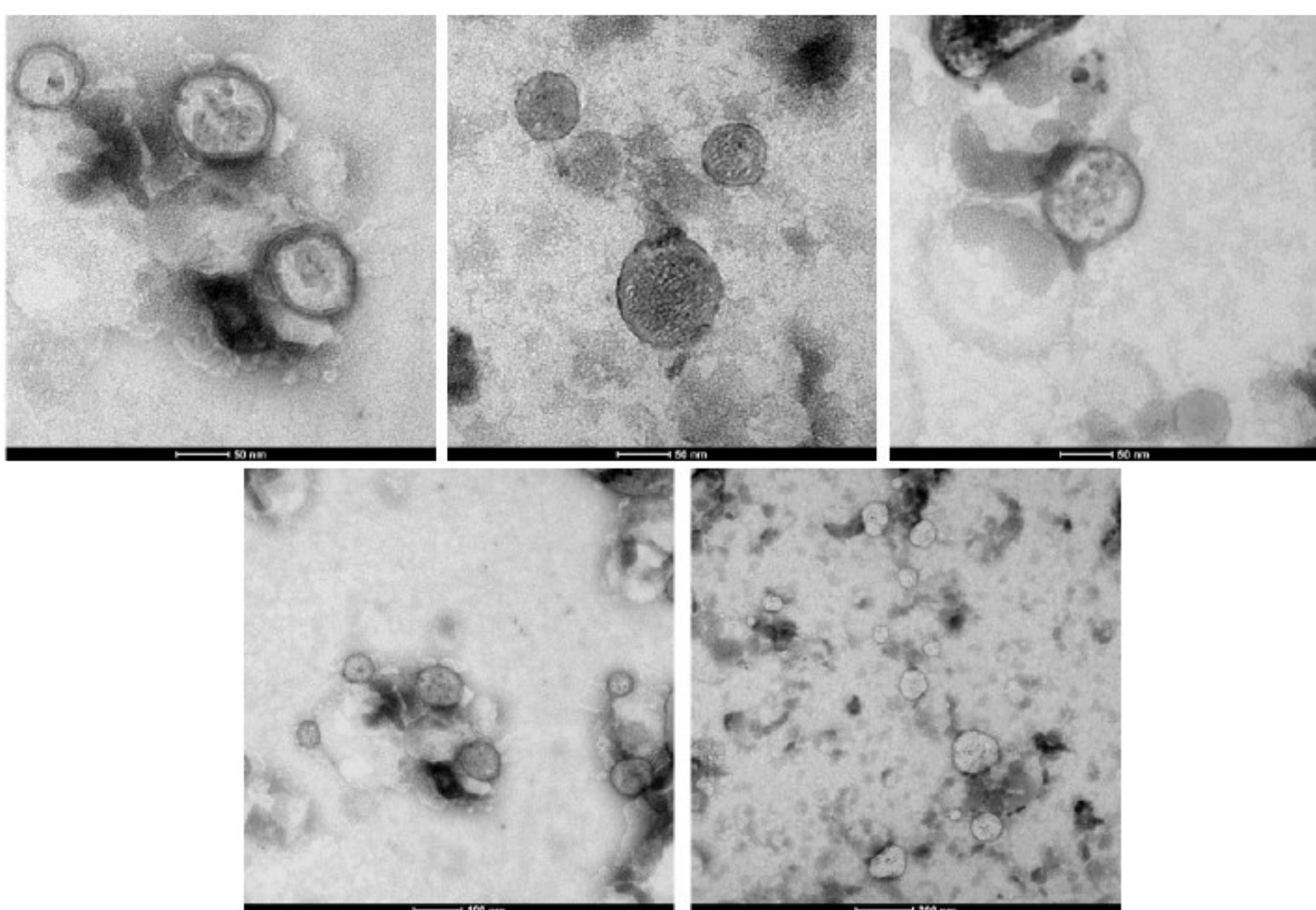
Blank tripalmitin SLN



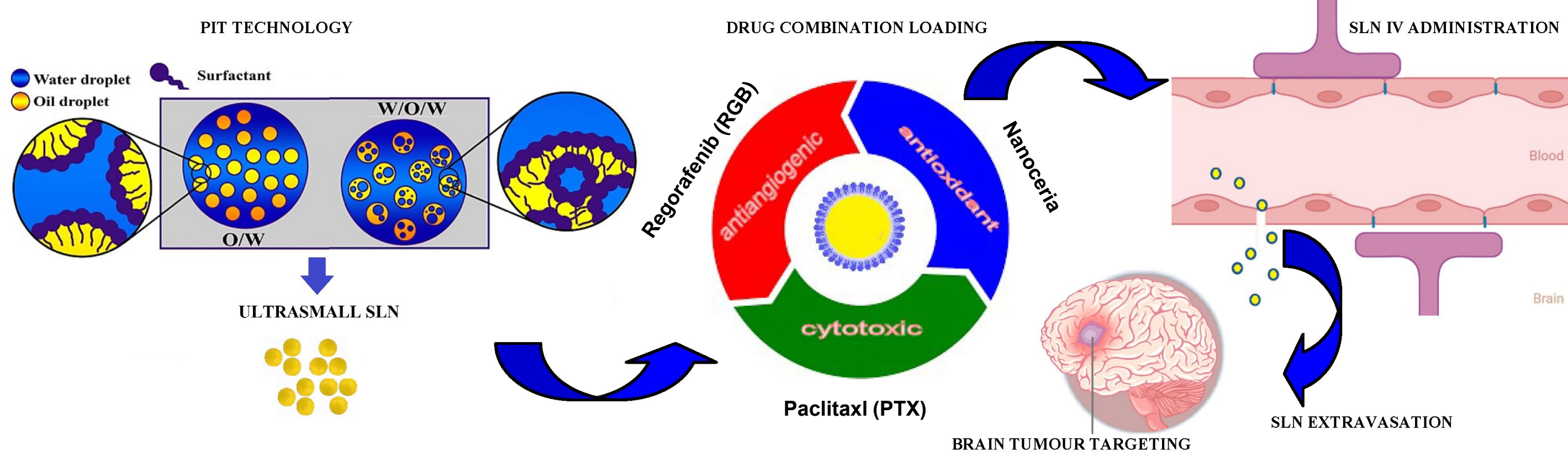
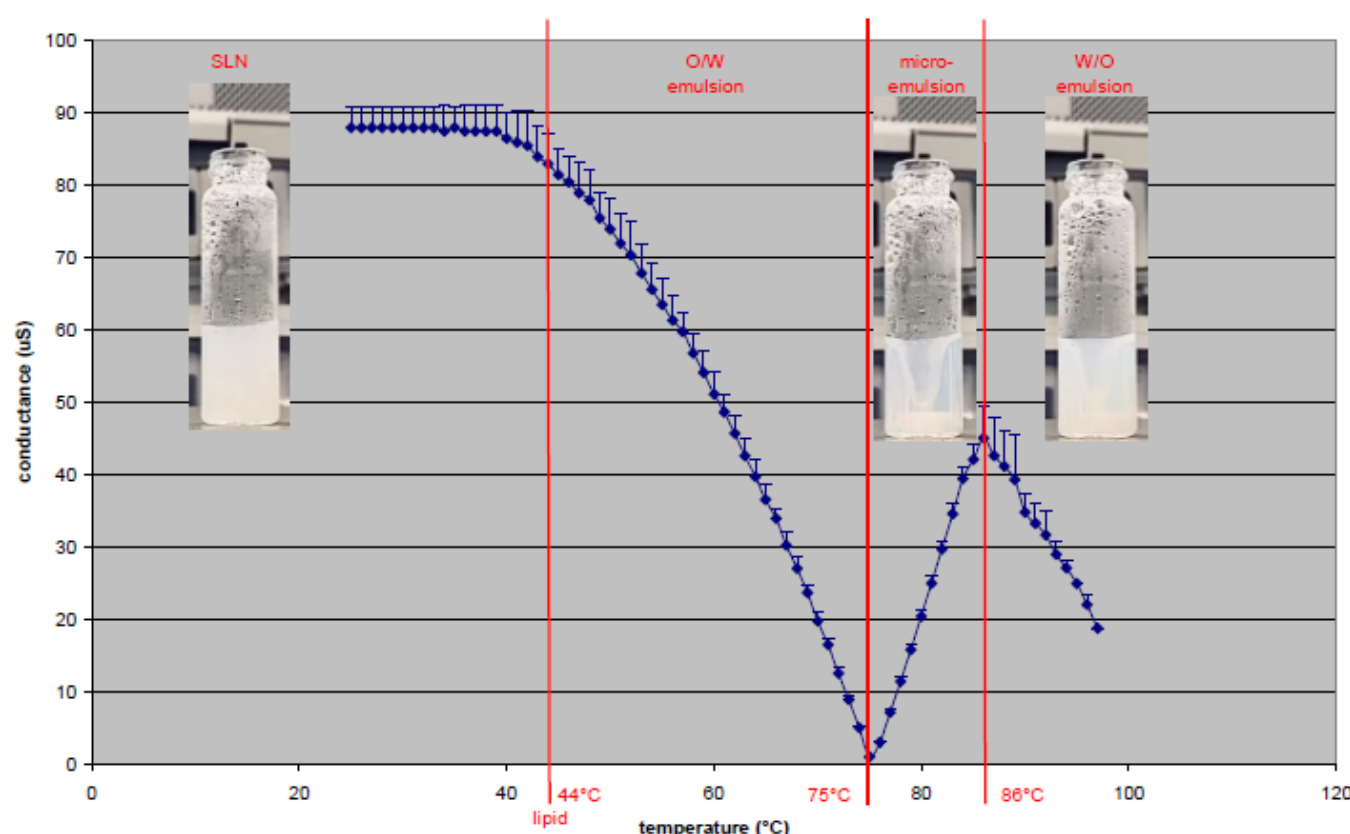
Blank cetylpalmitate SLN



Tocopherol (TOCO) loaded
cetylpalmitate SLN

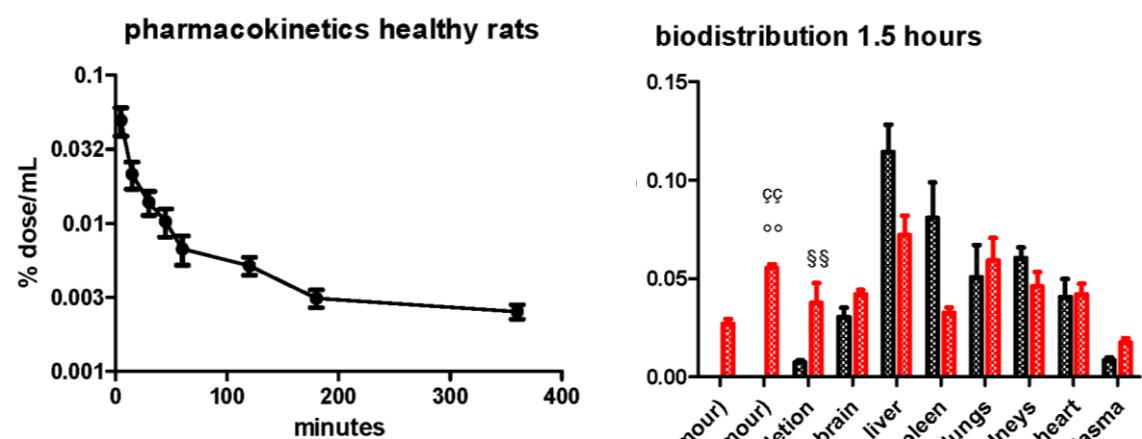


Process governed by phase transition, easy loading of drug combinations, overcoming of biological barriers

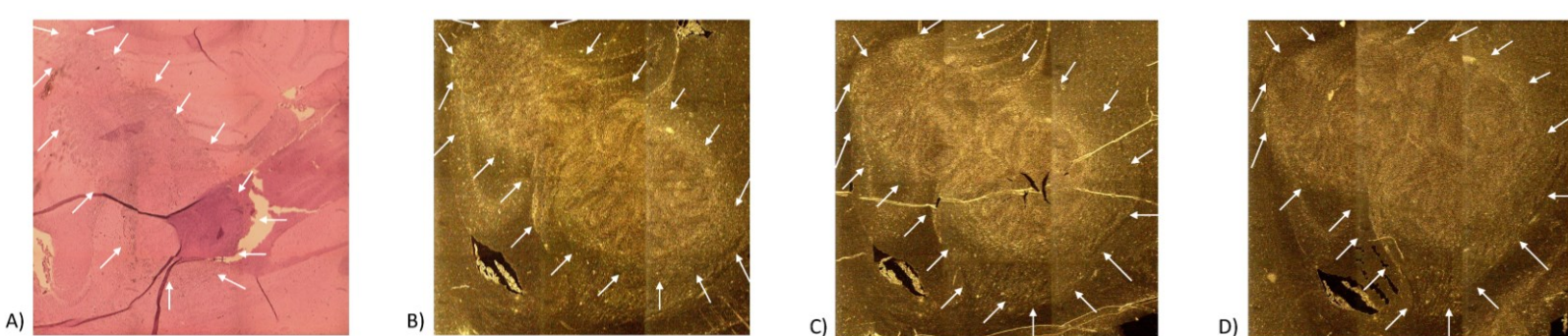


In vivo sound evidences in glioma models

Biodistribution and pharmacokinetics in rats: 6-coumarin fluorescently labelled SLN

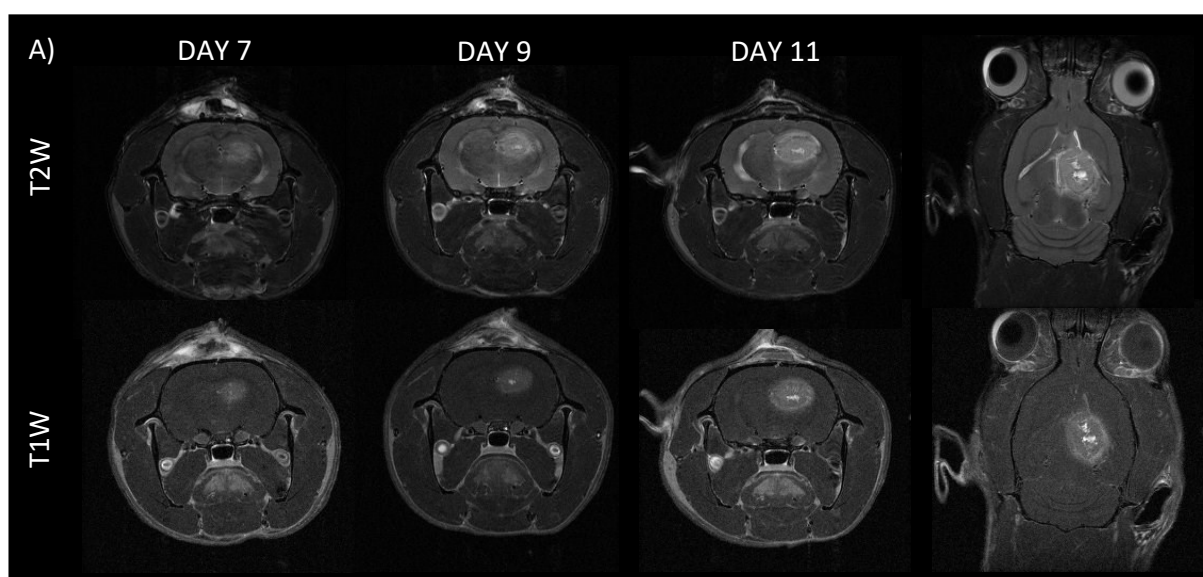


Histological evidences in the glioma site (Fischer-F98 rat models)

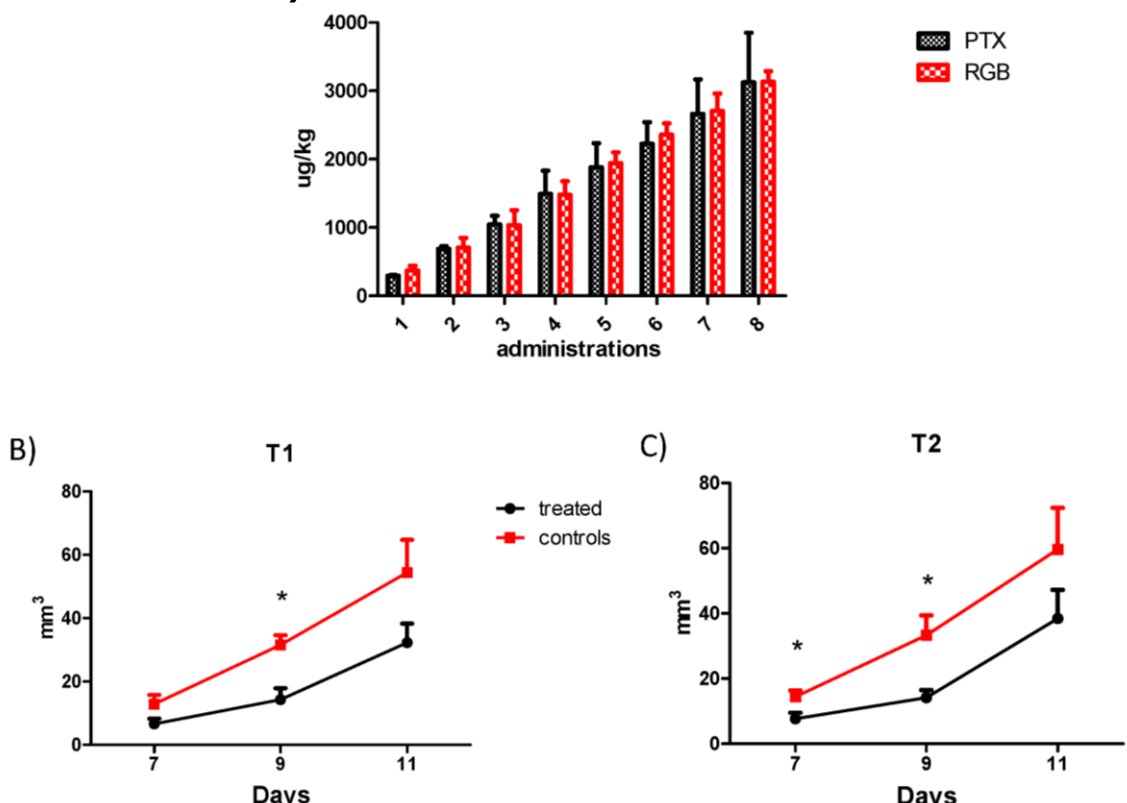


Efficacy towards glioma growth in syngeneic Fischer-F98 rat models (PTX-RGB loaded SLN)

Highly aggressive and reproducible glioma growth, detectable by T1 and T2-weighted MRI



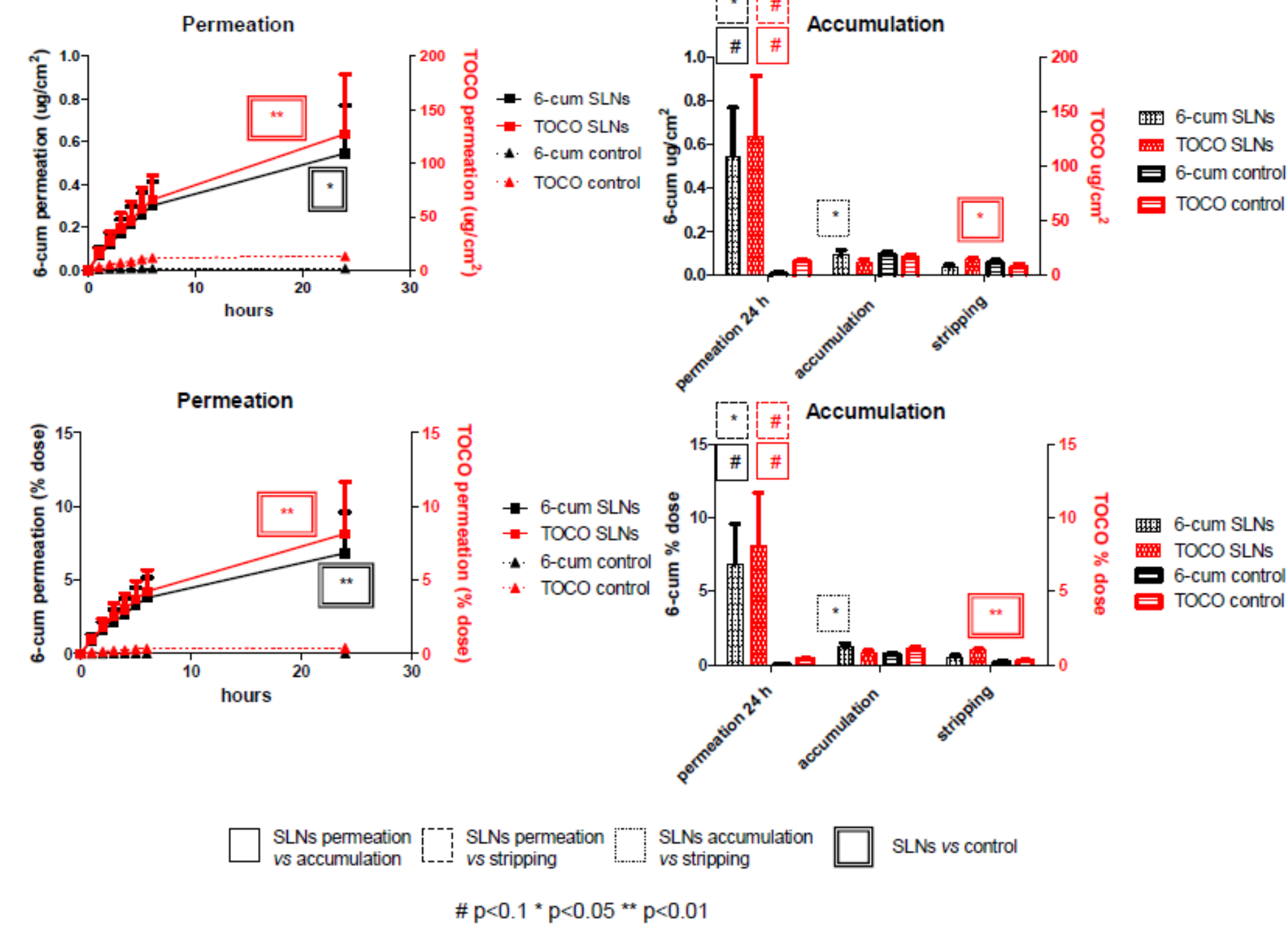
Cumulative dose administered



Doi:10.1080/17435889.2024.2434452

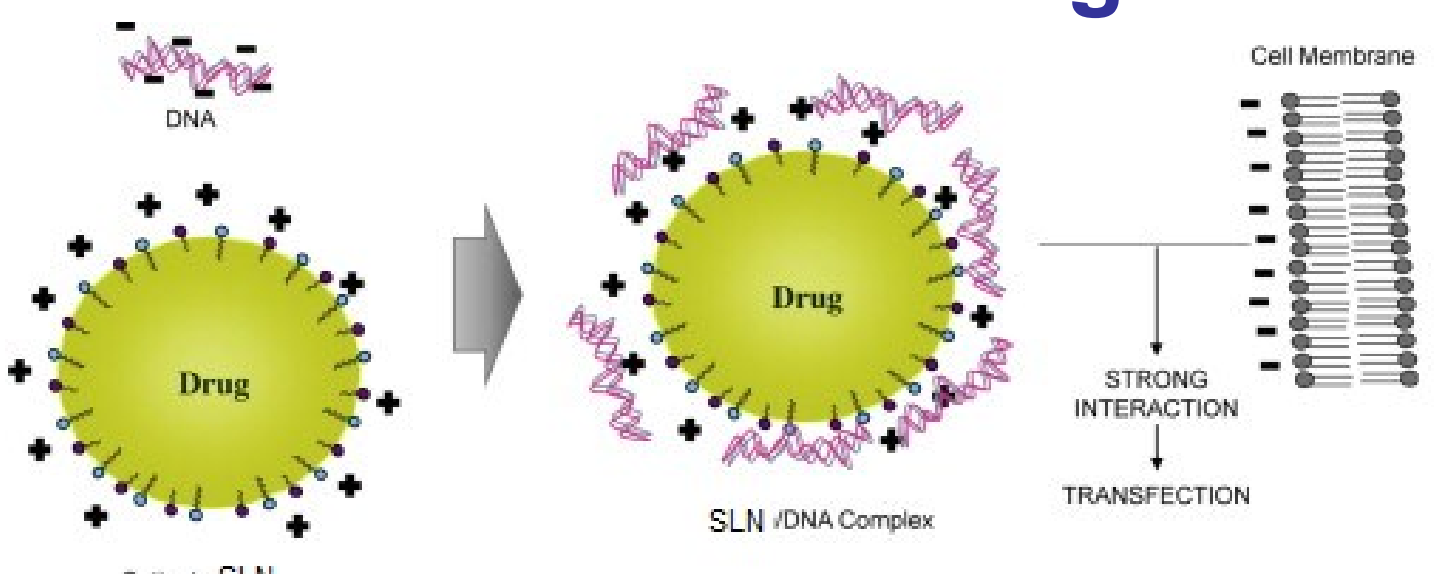
Efficient TOCO skin permeation enhancer in vitro

TOCO loaded and 6-coumarin (6-cou) fluorescently labelled SLN



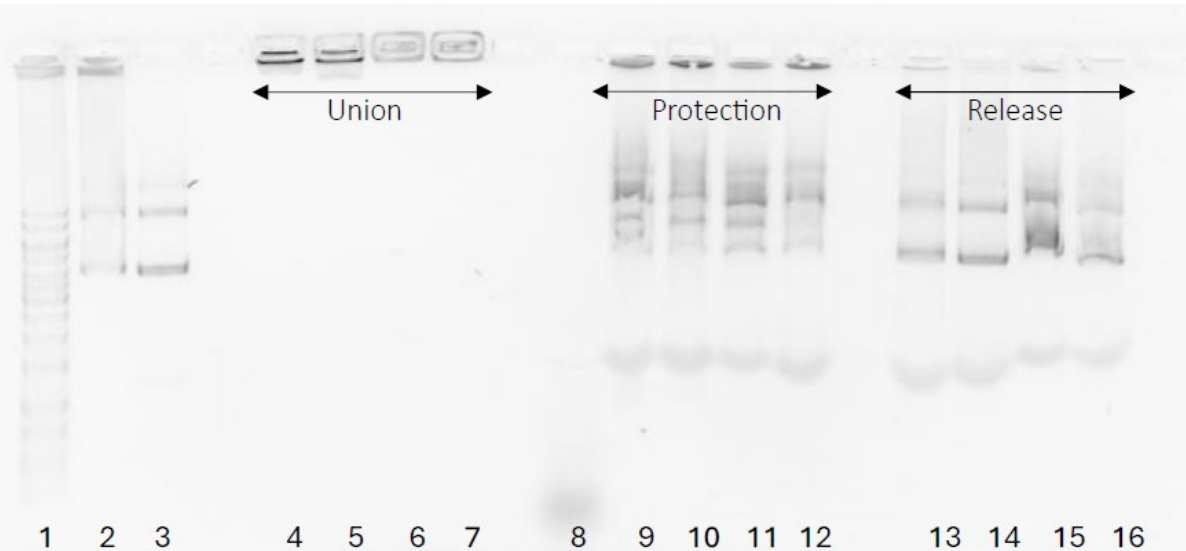
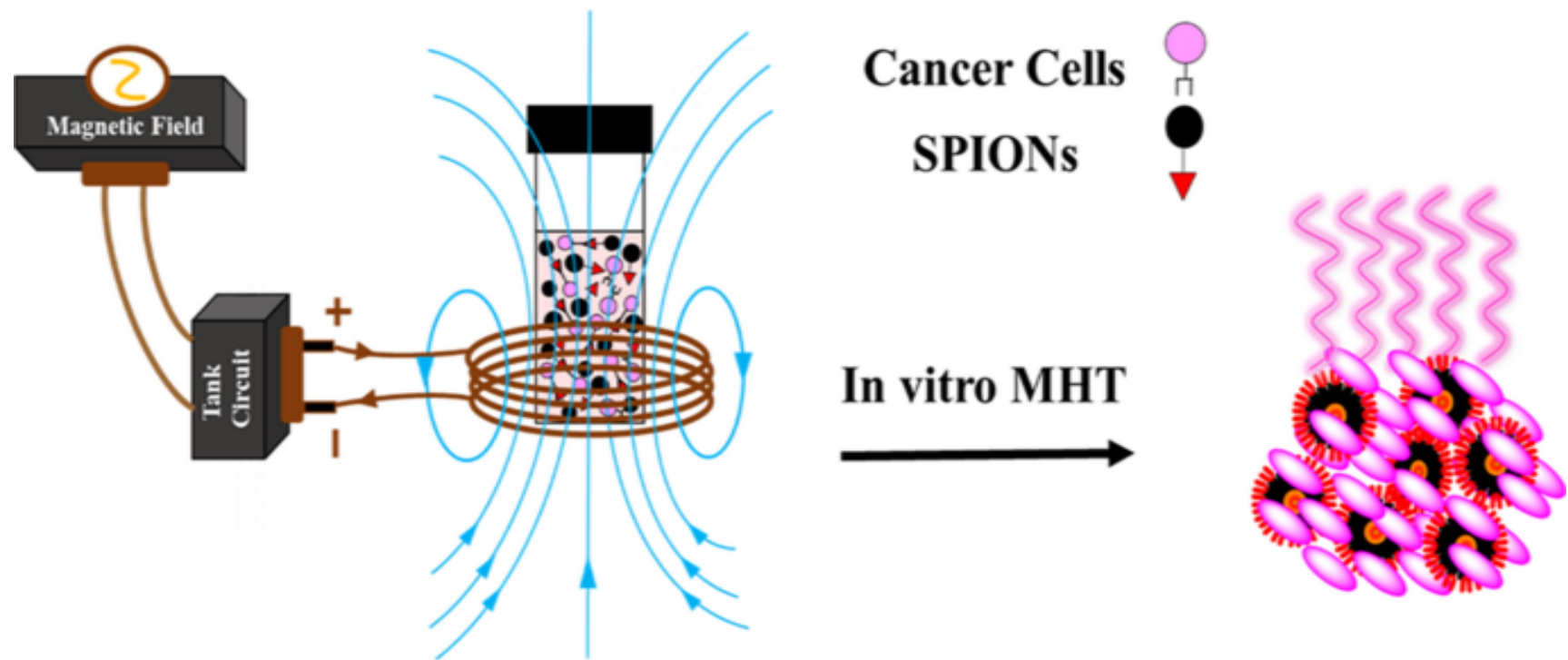
Doi:10.3390/pharmaceutics15071962

Cationic SLN as vectors for gene delivery



Potential new
applications

SPION loaded SLN for magnetic hyperthermia (MHT)



1 - Molecular Weight
2 - GFP pDNA
3 - GFP pDNA + SDS
4 - Vector 1 - Stearylamine 3:1:25
5 - Vector 2 - Stearylamine + lactic acid 3:1:25
6 - Vector 3 - Oleylamine 3:1:25
7 - Vector 4 - Oleylamine + lactic acid 3:1:25
8 - GFP pDNA + SDS + DNase
9 - Vector 1 - Stearylamine + DNase + SDS 3:1:25
10 - Vector 2 - Stearylamine + lactic acid + DNase + SDS 3:1:25
11 - Vector 3 - Oleylamine + DNase + SDS 3:1:25
12 - Vector 4 - Oleylamine + lactic acid + DNase + SDS 3:1:25
13 - Vector 1 - Stearylamine + SDS 3:1:25
14 - Vector 2 - Stearylamine + lactic acid + DNase + SDS 3:1:25
15 - Vector 3 - Oleylamine + SDS 3:1:25
16 - Vector 4 - Oleylamine + lactic acid + SDS 3:1:25

Type of SLNs in the vector	Size	PDI	Z-Potential
V1 - Stearylamine	101,57 ± 0,91	0,23 ± 0,04	34,48 ± 0,84
V2 - Stearylamine + lactic acid	80,88 ± 0,79	0,31 ± 0,02	33,73 ± 0,82
V3 - Oleylamine	143,70 ± 1,25	0,25 ± 0,01	29,73 ± 1,14
V4 - Oleylamine + lactic acid	112,27 ± 0,59	0,42 ± 0,01	43,25 ± 3,44



SPION loaded SLN fluorescence microscopy

SPION loaded (mg/mL)	Size (nm)	PDI	EE%
0,5	100.5±3.7	0.143	93
0,2	81.7±2.6	0.088	101
0,1	66.4±0.6	0.146	91

EE%: SPION entrapment efficiency,
measured by KSCN titration