

Suspension Stability of 200x200x200 nm PRINT® Nanoparticles in the Presence of Various Classes of Excipients



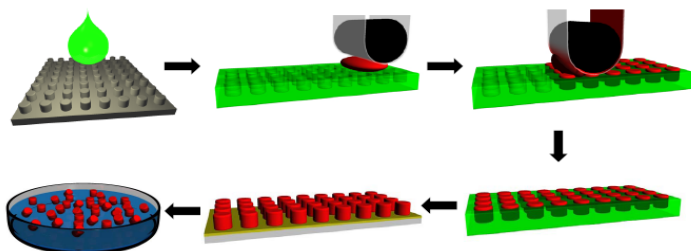
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Background

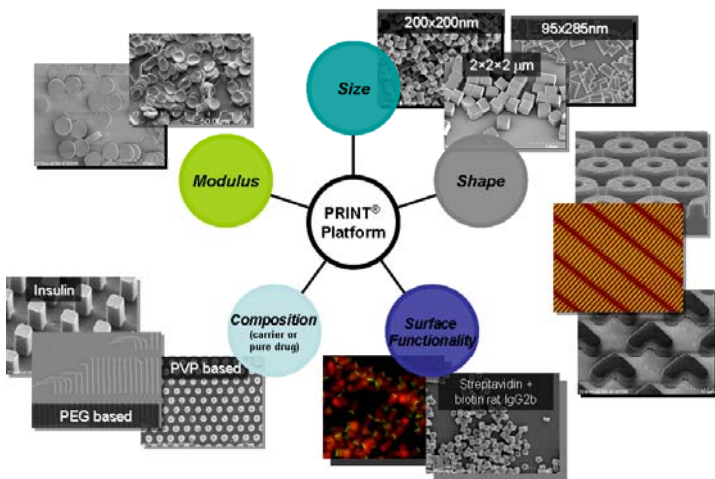
Next generation nanoparticle technologies will require flexible, scalable systems that can enhance the efficacy of drug delivery. The PRINT® (Particle Replication in Non-wetting Templates) platform leverages the precision of micro-electronics to create molded nanoparticles with absolute control over particle size, shape, composition and surface chemistry in a uniform, controlled, and scalable manufacturing process.

PRINT Platform

- Particle Replication In Non-wetting Templates**
- Brings the precision and control of semiconductors to life sciences and other markets
 - Proprietary design and manufacturing platform to produce particles and films
 - Monodisperse feature morphology designed into master template
 - Readily scalable using proven roll-to-roll manufacturing process



PRINT Platform: Independent Tunability



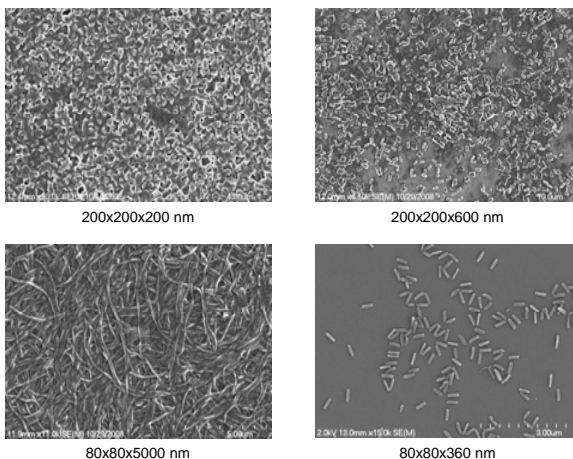
Objective

To investigate the different classes of excipients necessary to achieve ideal dispersion of PRINT™ nanoparticle suspensions for parenteral use.

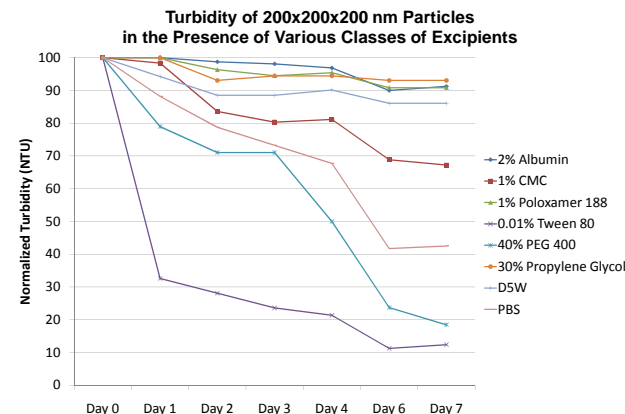
Methodology

The PEG hydrogel material was fabricated through the PRINT™ process with 80x80x360, 200x200x200, 200x200x600 and 80x80x5000 nm molds. 200x200x200 nm particles were suspended (0.3 mg/mL) in solutions containing different classes of excipients approved for parenteral use. The classes included a viscosity enhancer (1% carboxymethyl cellulose), co-solvents (40% PEG 400 and 30% propylene glycol), a protein (2% albumin), surfactants (0.01% Tween 80 and 1% poloxamer 188), a sugar (5% dextrose) and a buffer (PBS). The suspensions were dispersed by probe sonication (Sonicator 3000 from Misonix). The suspension was stored at 4 °C for 1 week. The sample was analyzed by turbidimetry (Orbeco-Hellige turbidimeter) and Dynamic Light Scattering (90 Plus Particle Size Analyzer from Brookhaven Instruments Corporation) at each time point.

SEM Micrographs of PEG Hydrogel Particles



Results



Particle Size and Poly Dispersity Index of 200 x 200 x 200 nm Particles in the Presence of Various Classes of Excipients

	Initial		Day 7	
	Particle Size (nm)	PDI	Particle Size (nm)	PDI
2% Albumin	333	0.014	388	0.005
1% CMC	358	0.292	380	0.188
1% Poloxamer 188	543	0.145	532	0.175
0.01% Tween 80	493	0.139	484	0.183
40% PEG 400	363	0.087	351	0.017
30% Propylene Glycol	399	0.15	365	0.349
D5W (5% Dextrose)	409	0.008	383	0.056
PBS	451	0.101	576	0.266

All the samples were probe sonicated prior to measurement by dynamic light scattering.

Conclusions

1. The suspensions of the PRINT™ nanoparticles maintained a narrow, monomodal distribution in 2% Albumin and D5W for the study period (1 week).
2. The PRINT™ nanoparticles tended to aggregate in the other vehicles studied. The aggregation intensified with the time, but the aggregation was reversed by probe sonication.
3. Stable narrow, and monomodal distributions of PRINT™ nanoparticle suspensions were achieved for parenteral use.

References

Rolland JP, Hagberg EC, Denison GM, Carter KR, DeSimone JM. High-resolution soft lithography: enabling materials for nanotechnologies. *ACIEE* 2004; 43: 5796-5799.

Rolland JP, Maynor BW, Eullis LE, Exner AE, Denison GM, DeSimone JM. Direct fabrication and harvesting of monodisperse, shape-specific nanobiomaterials. *JACS* 2005; 127: 10096-10100.

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