

Aerosol Delivery of Polyelectrolyte Surfactant - Antimicrobial Nanoparticles to the Lungs

Yadiel Varela Soler¹, Amanda S. Padilla-López^{2,3}, Sughosha Rao², Leonardo Calderon⁴, Gediminas Mainelis⁴, Olga Garbuzenko⁵, Tamara Minko⁵, David I. Devore^{2,6}, and Charles M. Roth^{1,2,*}

¹Department of Chemical and Biochemical Engineering, Rutgers University, Piscataway, NJ 08854, USA

²Department of Biomedical Engineering, Rutgers University, Piscataway, NJ 08854, USA

³Biotechnology, University of Puerto Rico, Mayaguez, PR 00680, USA

⁴Department of Environmental Sciences, Rutgers University, New Brunswick, NJ 08901, USA

⁵Department of Pharmaceutics, Rutgers University, Piscataway, NJ 08854, USA

⁶Graplon Technologies, LLC, Langhorne, PA 19047, USA

*Correspondence: Department of Biomedical Engineering, 599 Taylor Road, Piscataway, NJ 08854, USA; cmroth@rutgers.edu

Supporting Information

Shear-Viscosity of Artificial Mucus

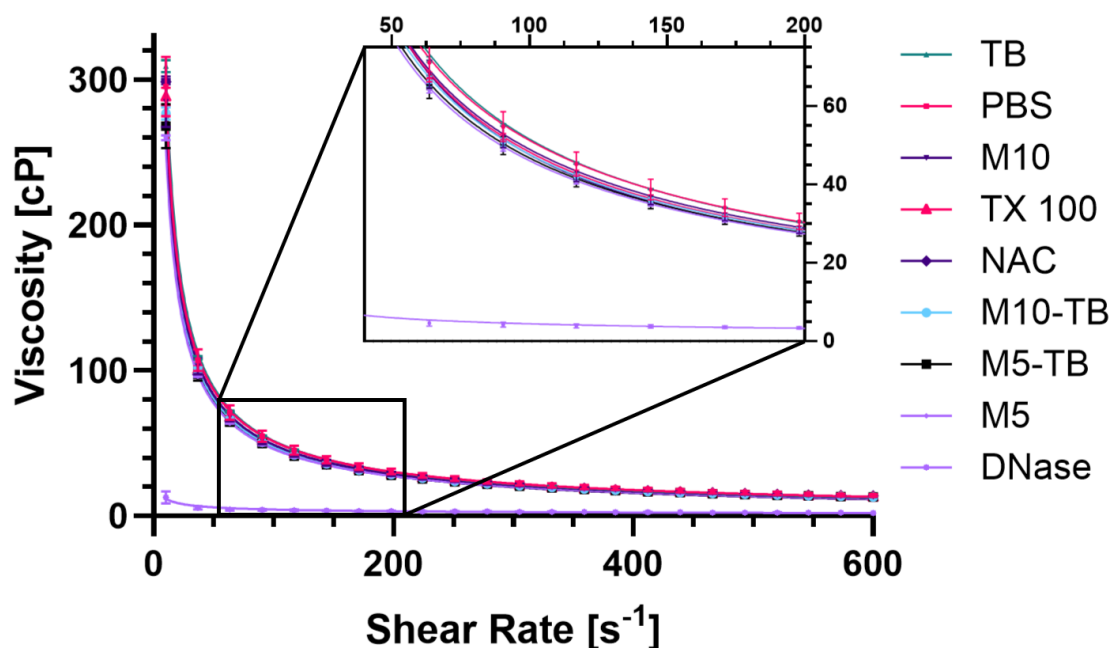


Figure S1. Shear thinning behavior of artificial mucus model when combined with different treatment conditions. Briefly, artificial mucus (1 mL) was combined with different treatment formulations (0.1 mL) and exposed to a shear ramp (10-600 s⁻¹) at 37°C. Treatment solutions included: phosphate buffered saline (PBS), 800 µg/mL tobramycin (TB), 8 mg/mL PMAA-g-10%J (M10), 8 mg/mL PMAA-g-5%J (M5), 10 %v/v Triton X-100 (TX 100), 10 %w/v N-acetylcysteine

(NAC), and 200 U/mL DNase I. M5-TB and M10-TB stand for TB loaded nanoparticles with each respective polymer prepared with a charge ratio of 0.5; their concentration was adjusted so that polymer concentration in the formulation was 8 mg/mL. Curves represent fits of the data to a power law using non-linear regression.

Mass Recovery Following Nebulization

Table S1. Mass-based recovery percentage after nebulization.

	Drug	PMAA-g-10%J
M10+TB	51(±8)%	34(±2)%
M10+PB	70(±9)%	17(±3)%

Relative Distribution of Formulations

Table S2. Relative detected fluorescence for each tissue following administration.

		Liver	Lung	Heart	Kidney	Spleen	Brain
Inh	M10	2.9 ± 11 %	68 ± 52 %	8 ± 10 %	6.0 ± 7.4 %	8.1 ± 16 %	6.8 ± 6.7 %
	M10-TB	0.3 ± 4.6 %	96 ± 69 %	1.6 ± 2.8 %	1.1 ± 3.6 %	0%*	0.9 ± 2.2 %
IP	M10	65 ± 38 %	1.7 ± 1.7 %	0.9 ± 0.5 %	11 ± 6 %	20 ± 14 %	0.6 ± 0.5 %
	M10-TB	53 ± 34 %	4.0 ± 2.8 %	1.5 ± 1.3 %	9.5 ± 6.0 %	31 ± 31 %	1.2 ± 0.5%

* Fluorescence was equal or below to that of the blank.

Inh and IP stand for Inhalation and intraperitoneal injection.

M10 is Cy5.5 tagged PMAA-g-10%J alone, while M10-TB is nanoparticles loaded with tobramycin.