



Biological Risk Evaluation and Threat Hazard Effects (BREATHE)

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(U) Introduction

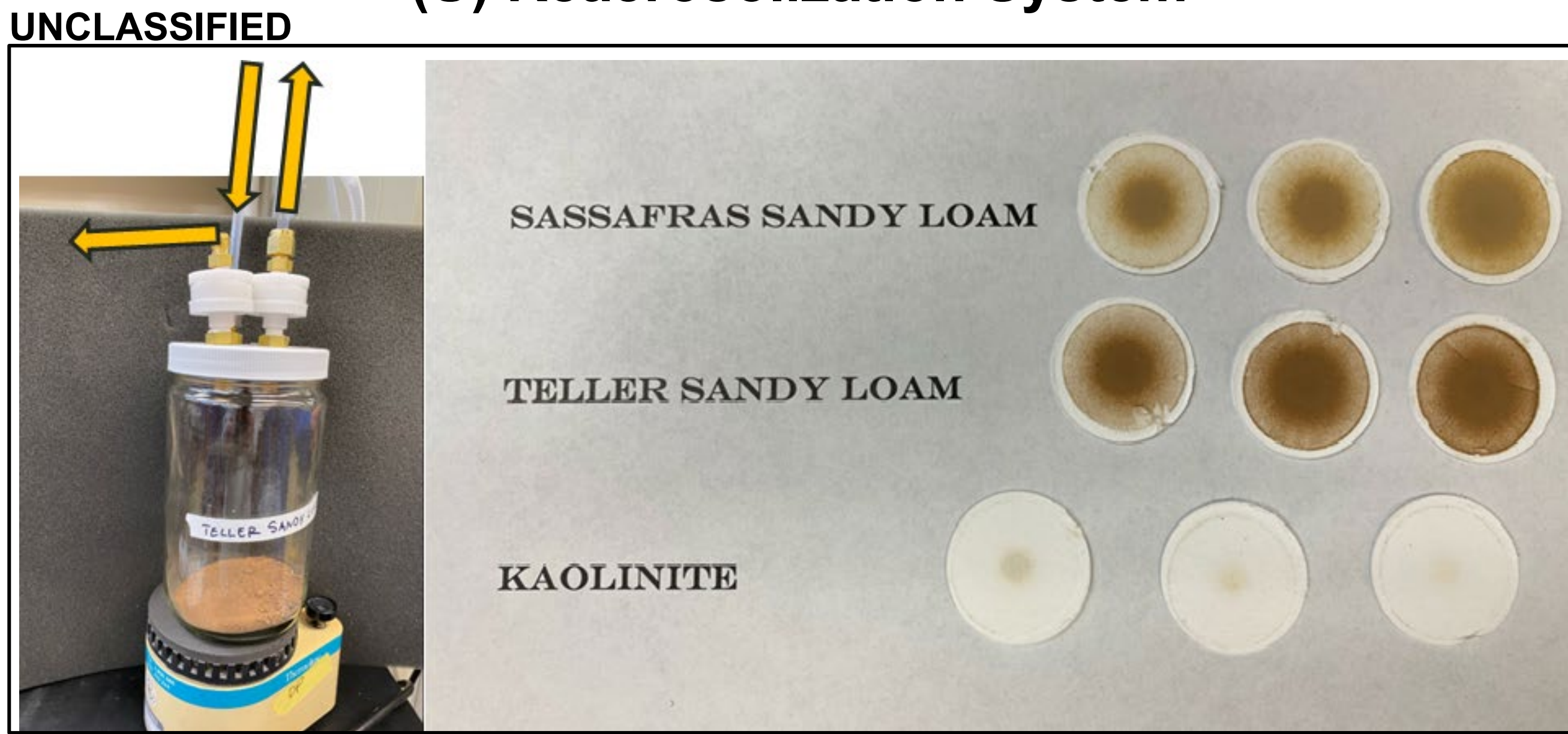
(U) Aerosolization of pharmaceutical based agents (PBAs) are an established concern however the completely feasible threat of PBA reaerosolization is unknown and requires further research to characterize the potential threat following an initial aerosolization event. Aerosols have been the tried-and-true delivery method for efficient exposure to both biological and chemical warfare agents for over a century however a thorough examination of all aspects pertaining to aerosolization including a threat post aerosolization is required to characterize PBAs as a persistent threat. Reaerosolization is the reintroduction of particles into the air that have settled onto a surface. Persistent and hydrophobic compounds present a unique risk that could be two-fold. First there is the initial threat of the aerosol followed by the potential threat of reaerosolization for months following the initial event. Adrenergic and opioid compounds were investigated for reaerosolization binding to receptors. The investigation determined an initial aerosol deposition (depending on agent) sufficient to reach an EC₅₀ for adrenergic and/or opioids.

(U) Conclusion/Future Work

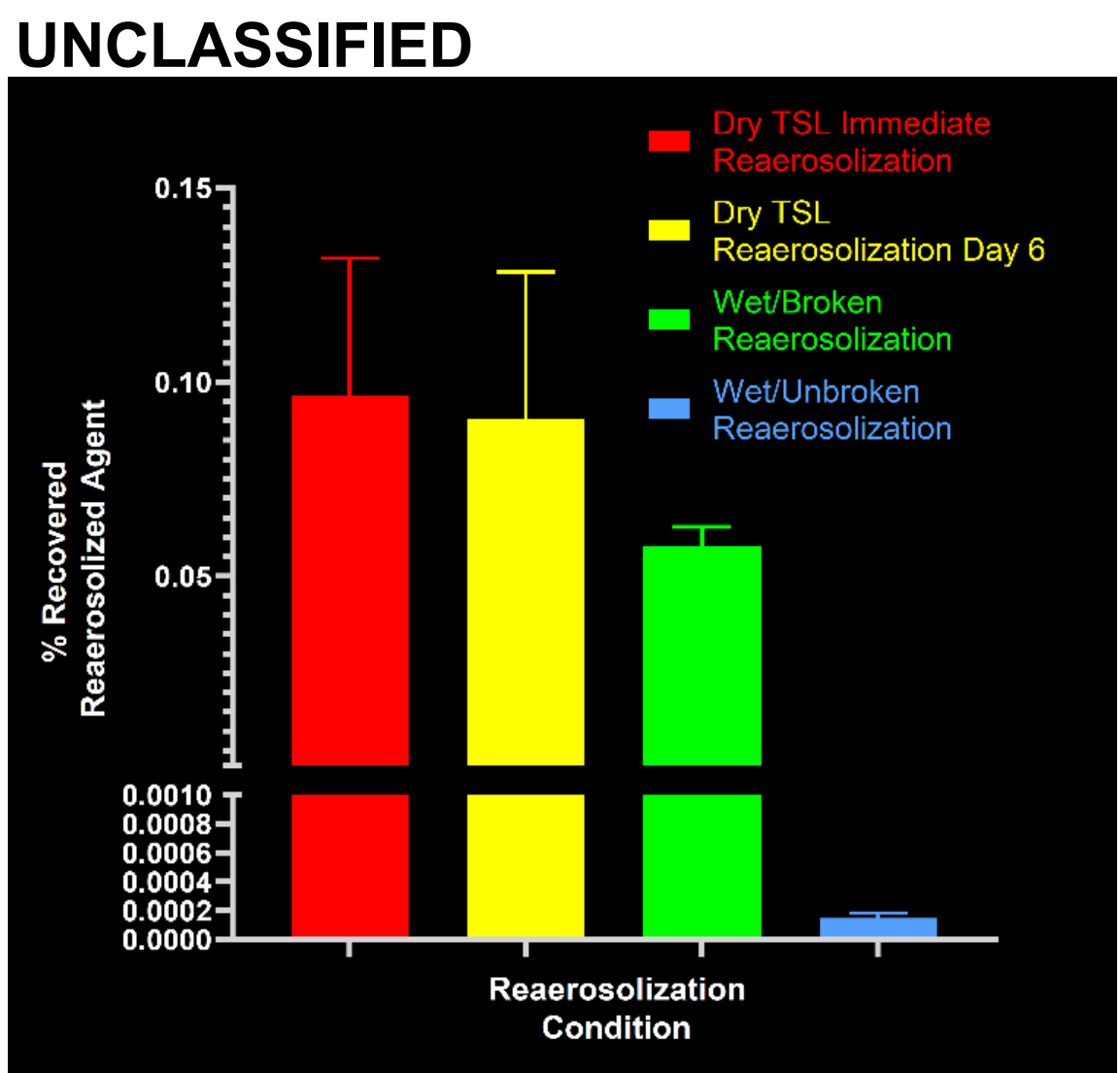
(U) This project highlights the need to consider PBA reaerosolization a threat to the warfighter following the initial aerosol dissemination. The technology exists to deposit grams of agent per a meter squared on a surface. This report considered the worst-case scenario for maximum likelihood of reaerosolization i.e. dry & dusty environment, aerosol particle profiles that are <10 µm, exposure to high amounts of dust, no protective equipment, etc. Future investigations will need to expand by addressing a diverse range of soil types, environments, temperatures, humidity, aerosol particle profiles, aging, and combinations of these conditions.



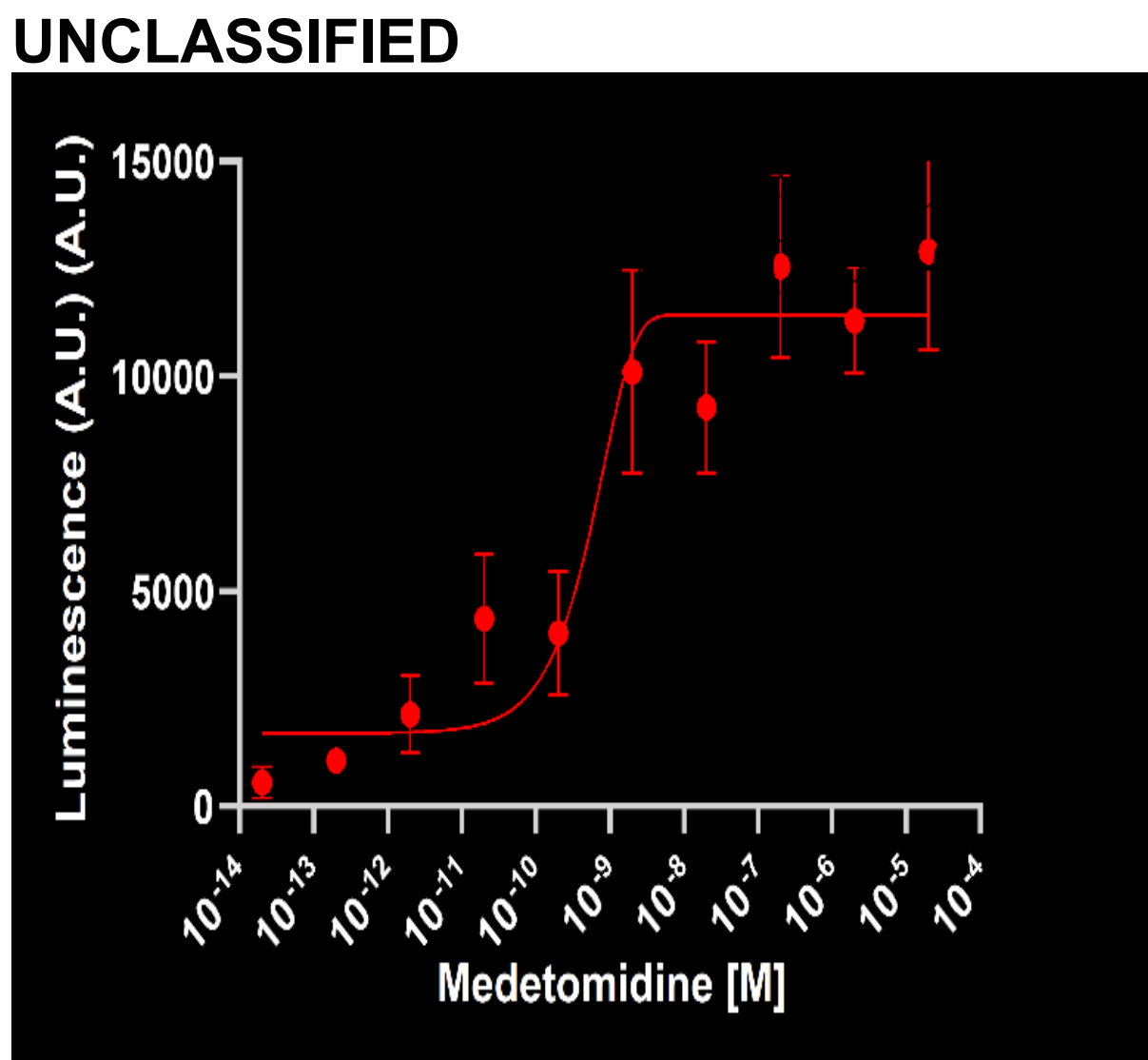
(U) Reaerosolization System



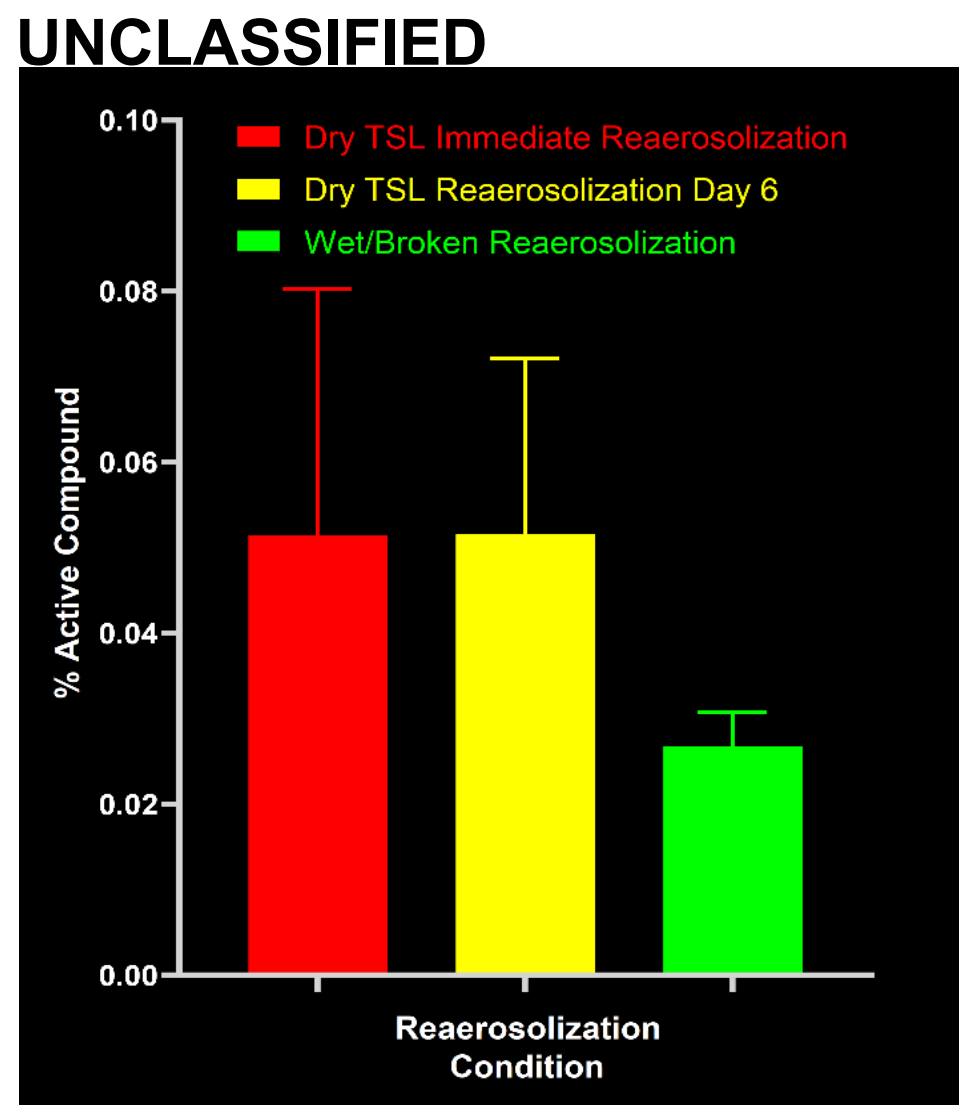
(U) Percent Recovered Reaerosolized Compound by Mass



(U) PRESTO-Tango Dose Curve



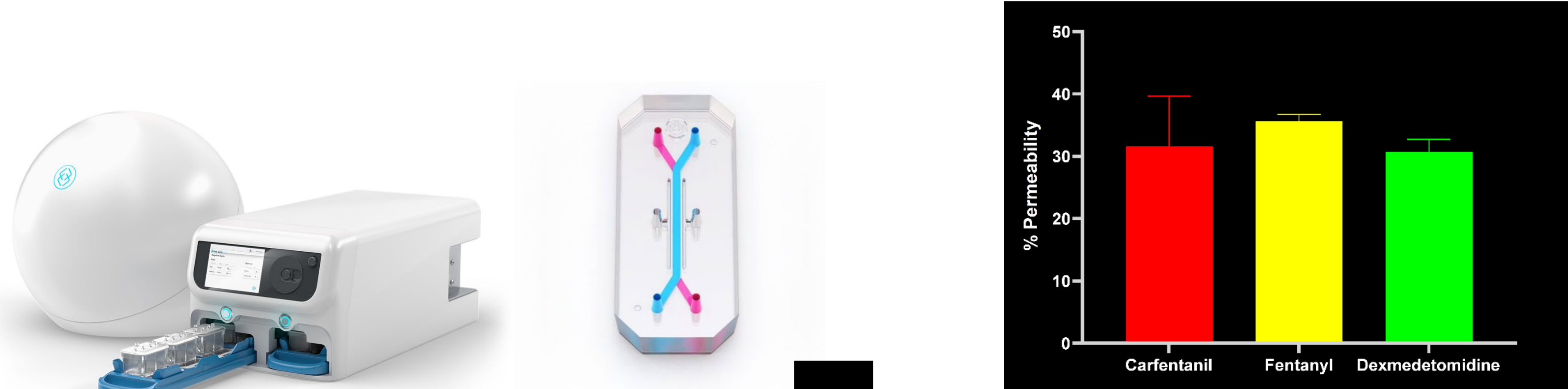
(U) Percent of Active Reaerosolized Compound



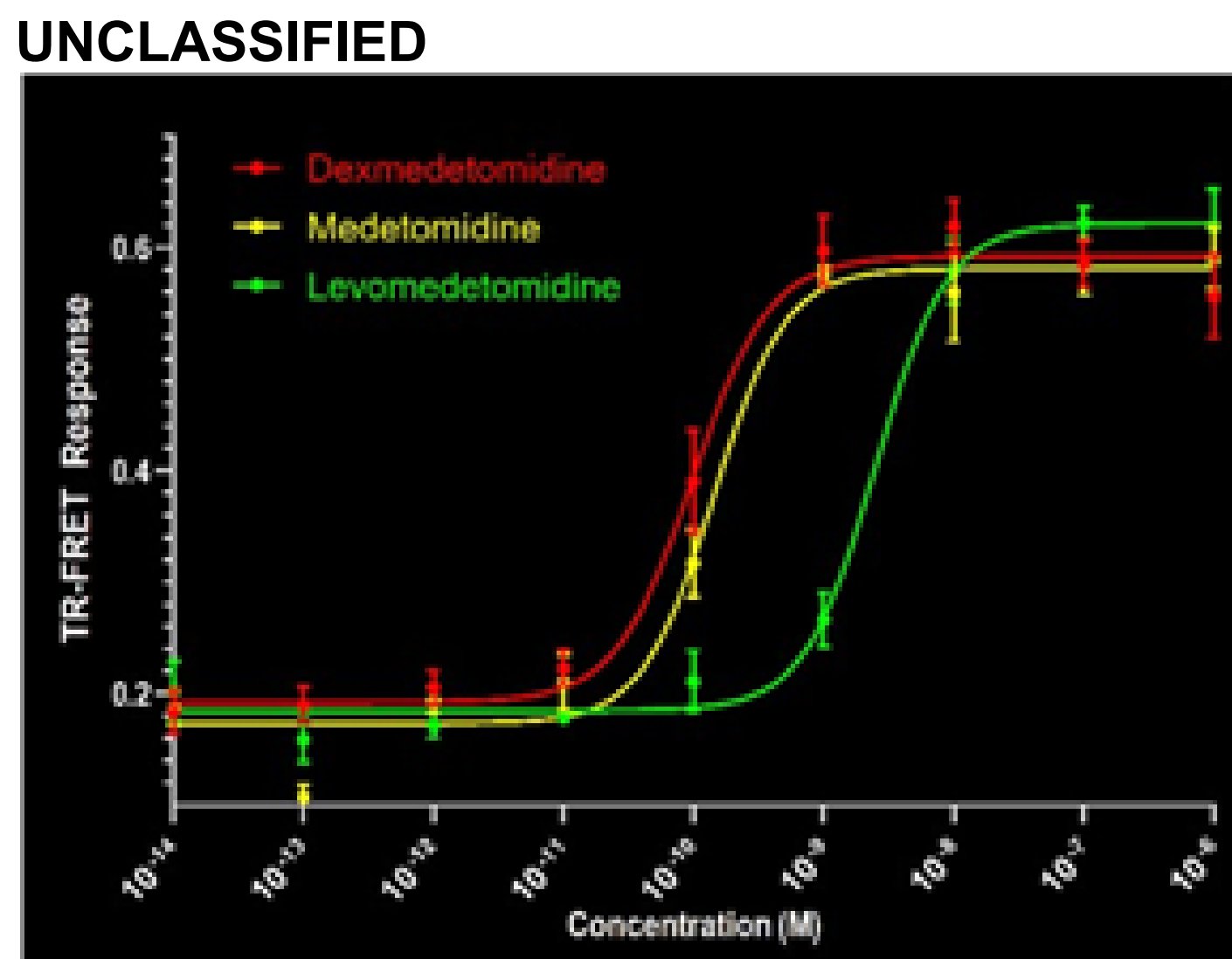
(U) Percent of Reaerosolized Compound

Fraction of Recovered in Reaerosolized Agent			
Dry TSL Immediate Reaerosolization	Dry TSL Reaerosolization Day 6	Dry disturbed Reaerosolization	Dry Undisturbed
0.0963%	0.0904%	0.0577%	0.0001%
Fraction of Active Reaerosolized Agent			
Dry TSL Immediate Reaerosolization	Dry TSL Reaerosolization Day 6	Dry/Disturbed Reaerosolization	Dry Undisturbed
0.0515%	0.0516%	0.0268%	0.0268%

(U) Emulate OOC System to Determine Lung Permeability



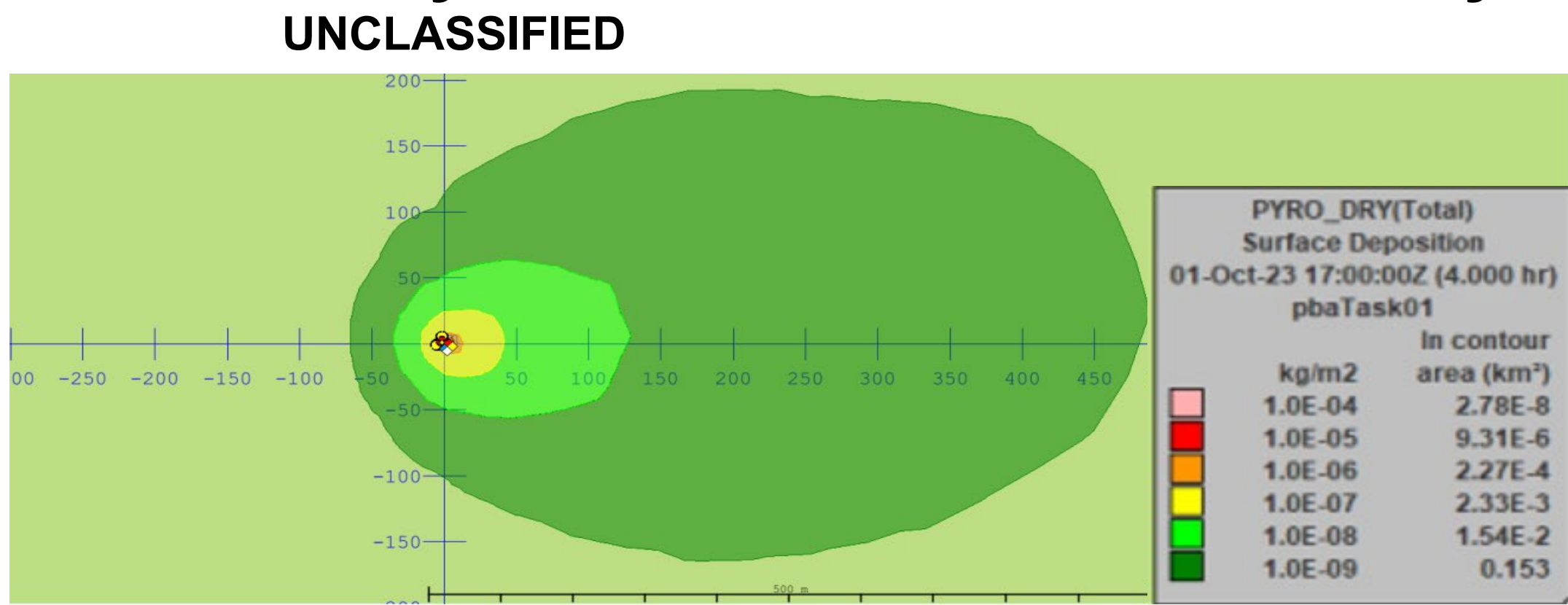
(U) Dose Curves for Adrenergic Agents



(U) Medetomidine Reaerosolization EC₅₀ Response at the ADRA A2 Receptor Site

Dexmedetomidine				
	Dry TSL Immediate	Dry TSL Reaerosolization Day 6	Dry/Disturbed	Dry Undist
Aerosol Deposition (g/m2)	Reaerosolized Active Fraction (M)	Reaerosolized Active Fraction (M)	Reaerosolized Active Fraction (M)	Reaerosolized Active Fraction (M)
1.00E+01	1.98E-10	1.86E-10	6.17E-11	1.57E-11
2.00E+00	3.96E-11	3.72E-11	1.23E-11	3.14E-12
4.00E-01	7.92E-12	7.44E-12	2.47E-12	6.28E-13
0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

(U) Simulated Pyrotechnic Dissemination of Dry PBA



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