

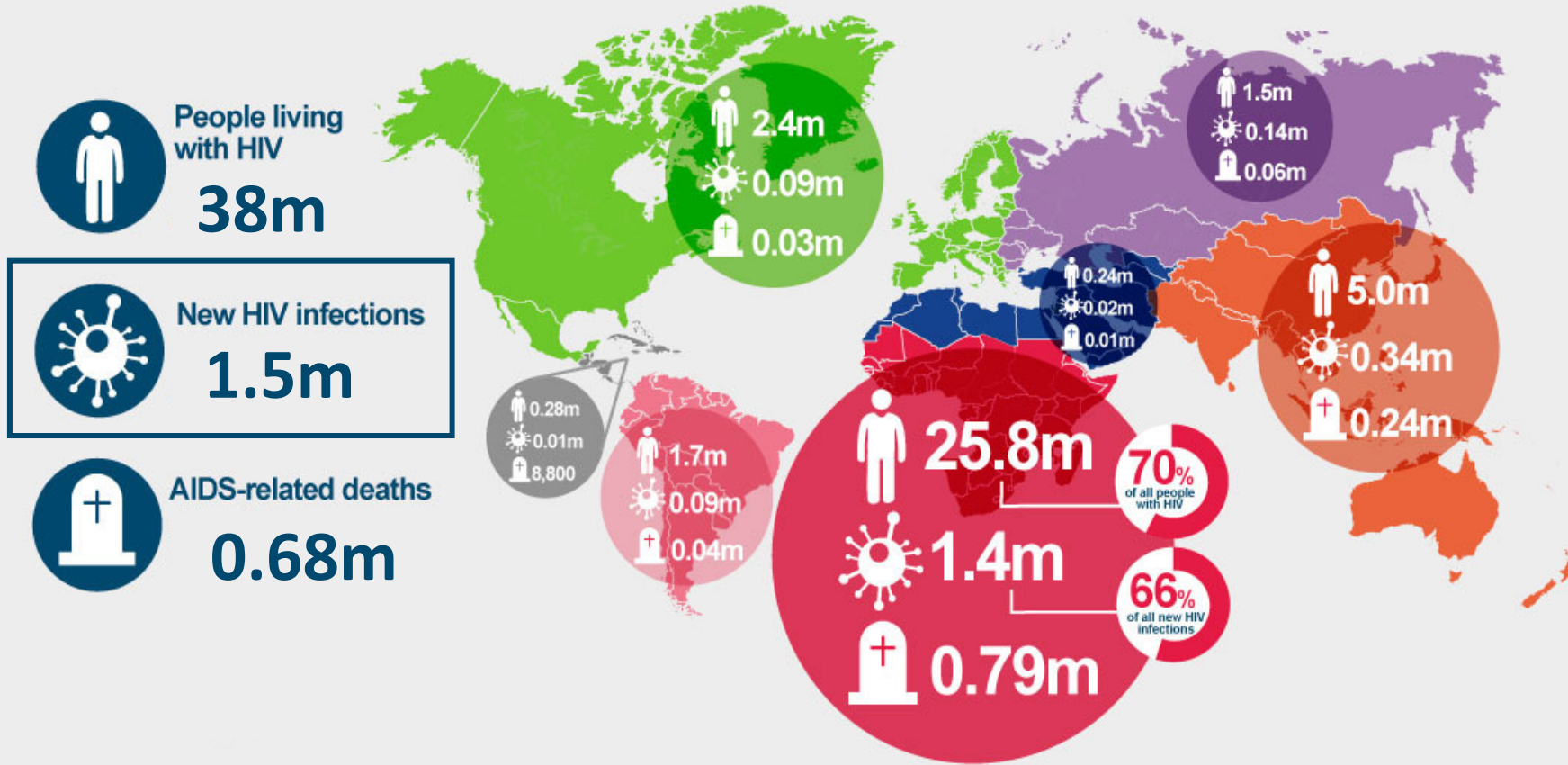
New and Emerging Technologies for Drug Delivery

Transcutaneously refillable nanofluidic implant achieves complete protection against SHIV in non-human primates

Nicola Di Trani, PhD

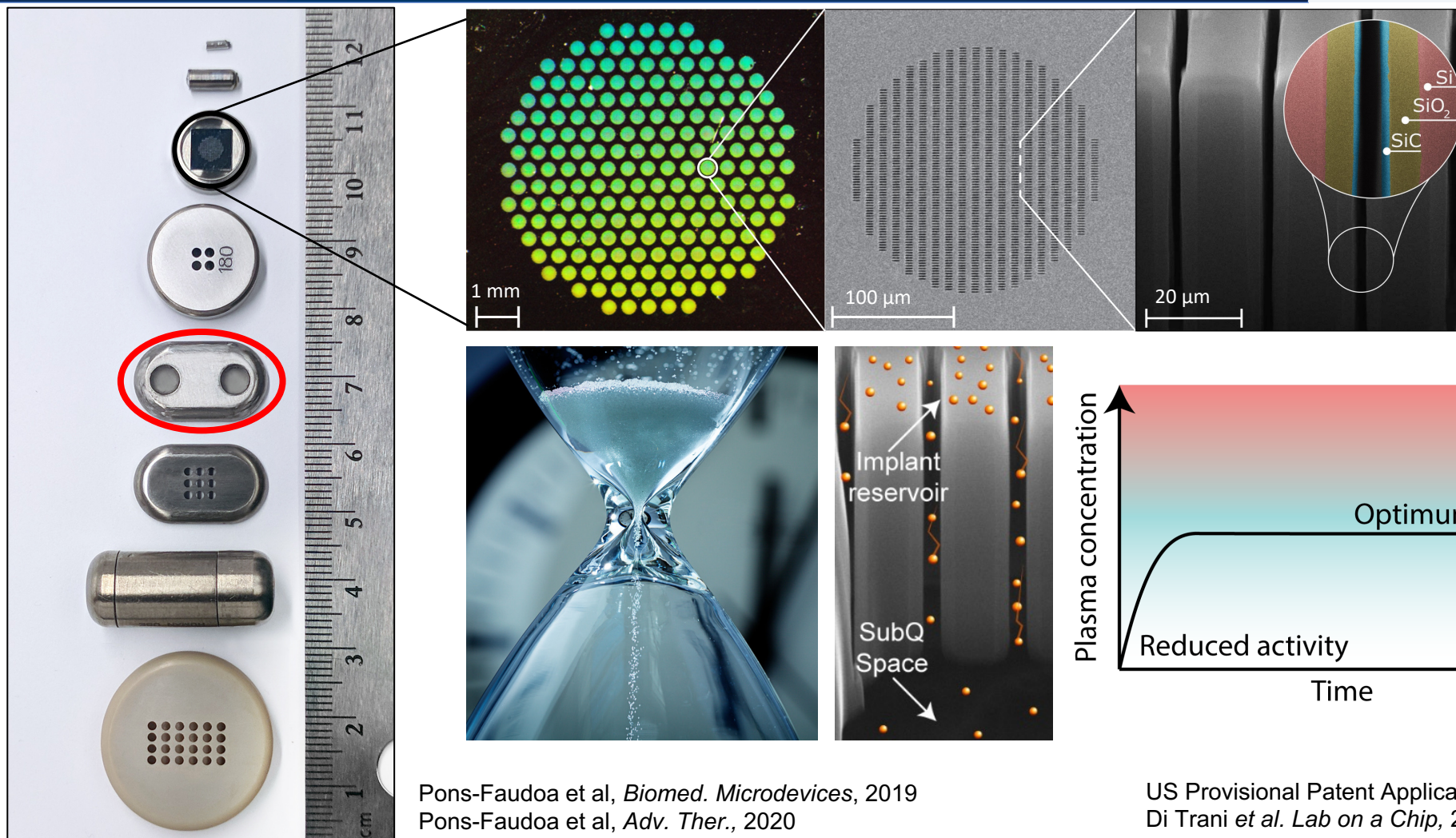
Dr. Alessandro Grattoni's Laboratory

Global HIV rates (2021)



UNAIDS, 2021

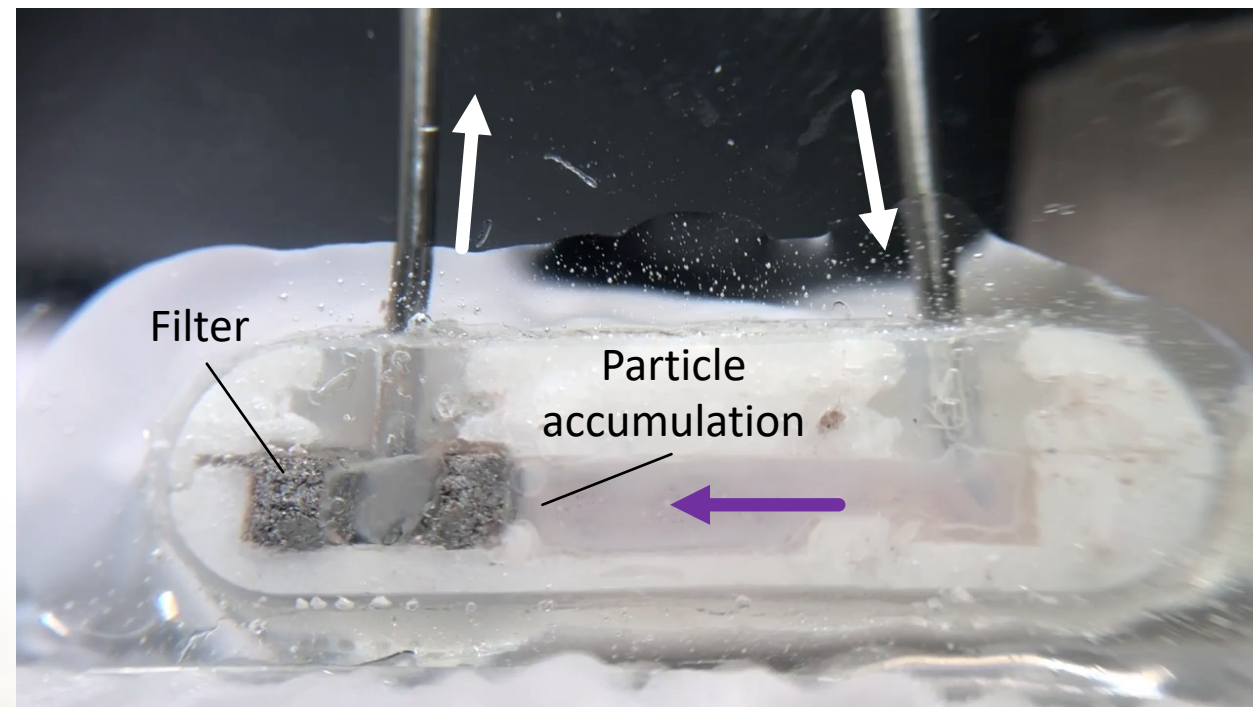
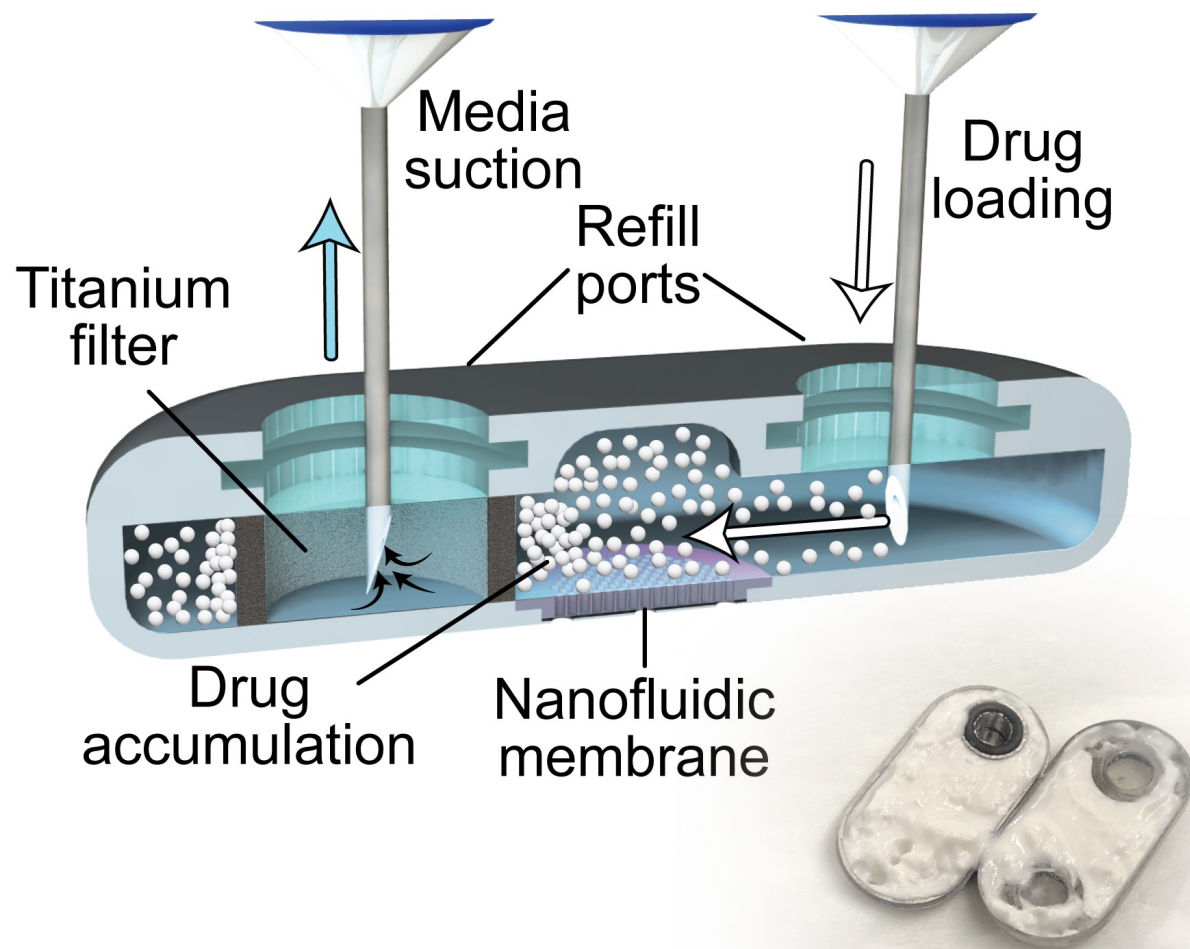
nanochannel Delivery System (nDS) for sustained drug release



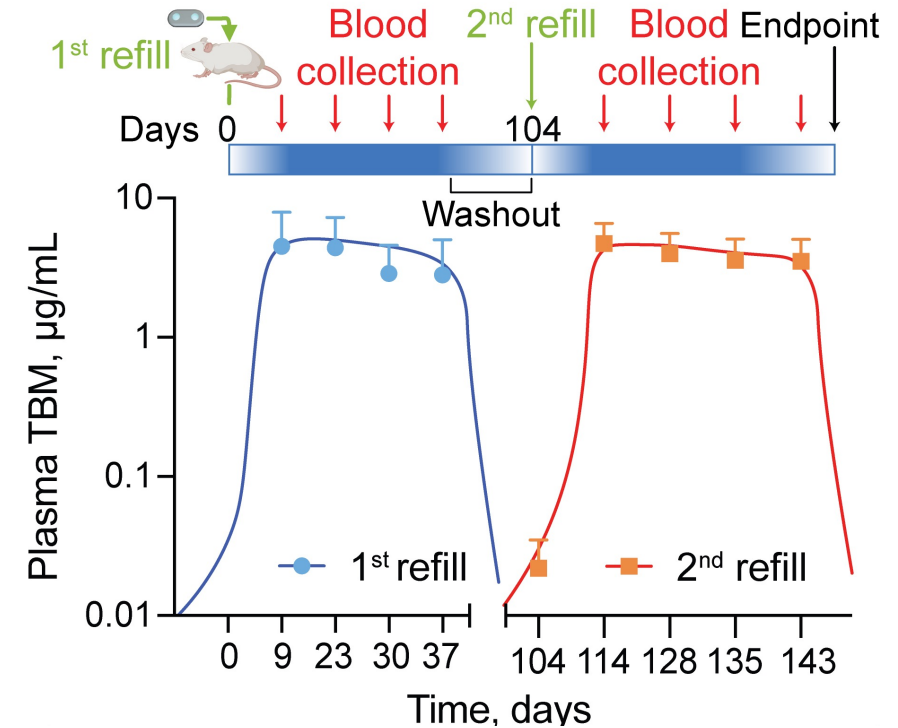
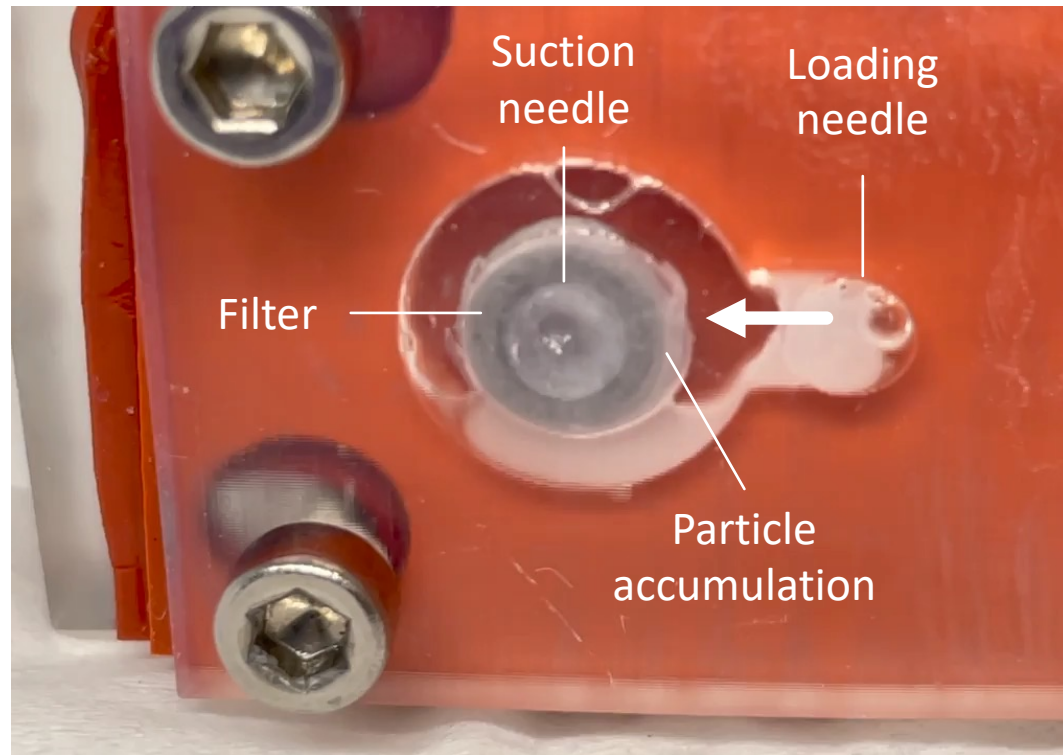
Pons-Faudoa et al, *Biomed. Microdevices*, 2019
Pons-Faudoa et al, *Adv. Ther.*, 2020

US Provisional Patent Application 62/961,437, Jan 15th, 2020
Di Trani et al. *Lab on a Chip*, 2020

Solid refilling



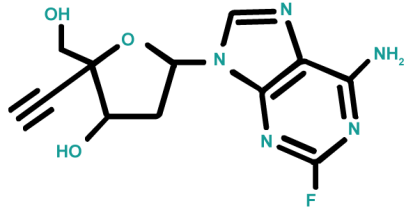
U.S. Provisional Pat. Ser. No. 62/943,993, 2020
Di Trani, Pons-Faudoa *et al.* *Adv. Ther.*, 2022



Drug	Solubility mg/mL	Packing efficiency mg/mm ³	Loaded amount mg	Loading capacity increase
Tolbutamide	~0.62	0.60 ± 0.12	345 ± 69	975
Tenofovir alafenamide	~4.94	0.66 ± 0.11	378 ± 65	84

Di Trani, Pons-Faudoa *et al.* *Adv. Ther.*, 2022

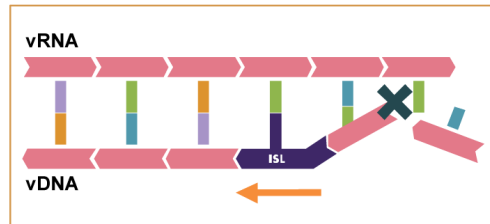
Nucleoside Reverse Transcriptase Translocation Inhibitor (NRTTI)



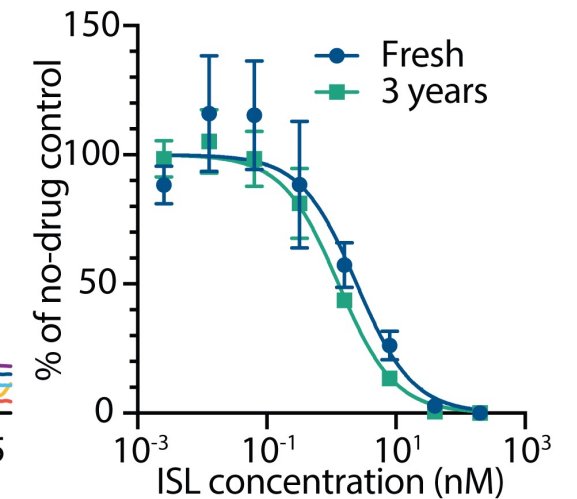
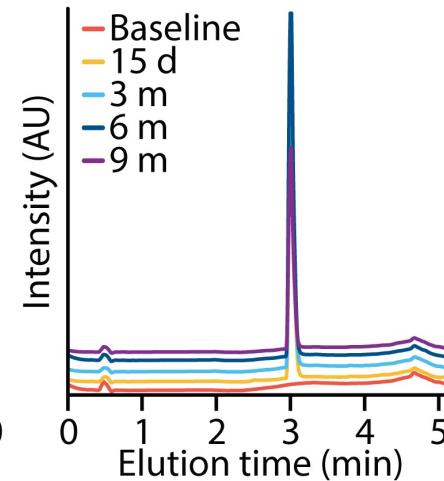
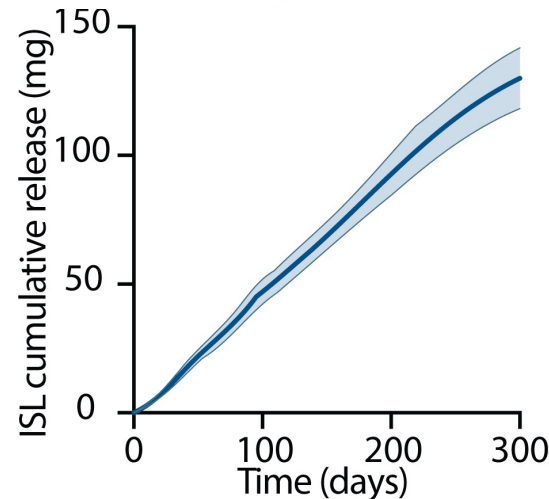
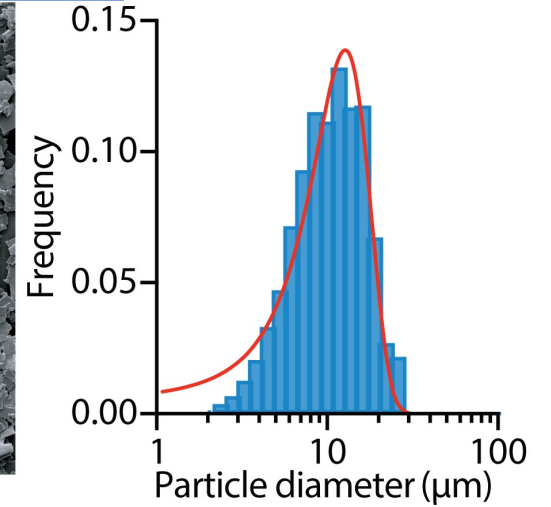
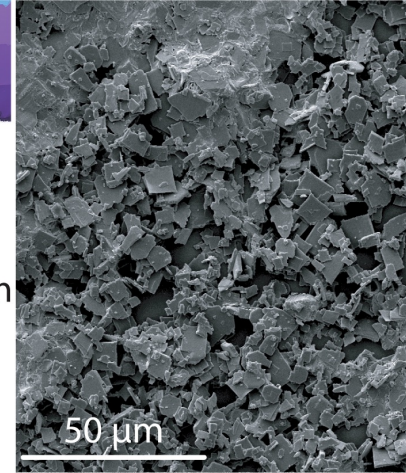
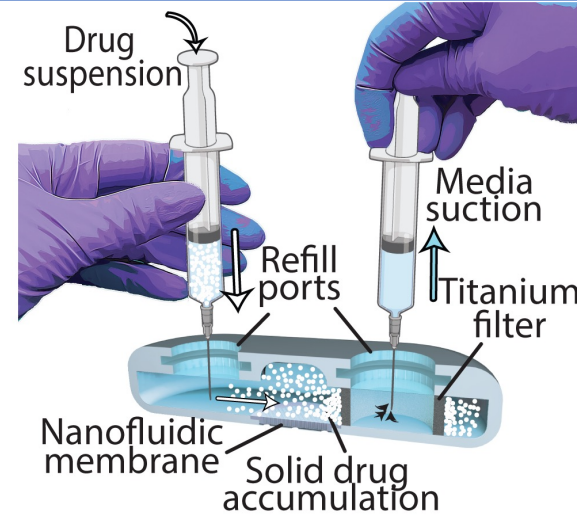
Translocation Inhibition



Delayed Chain Termination

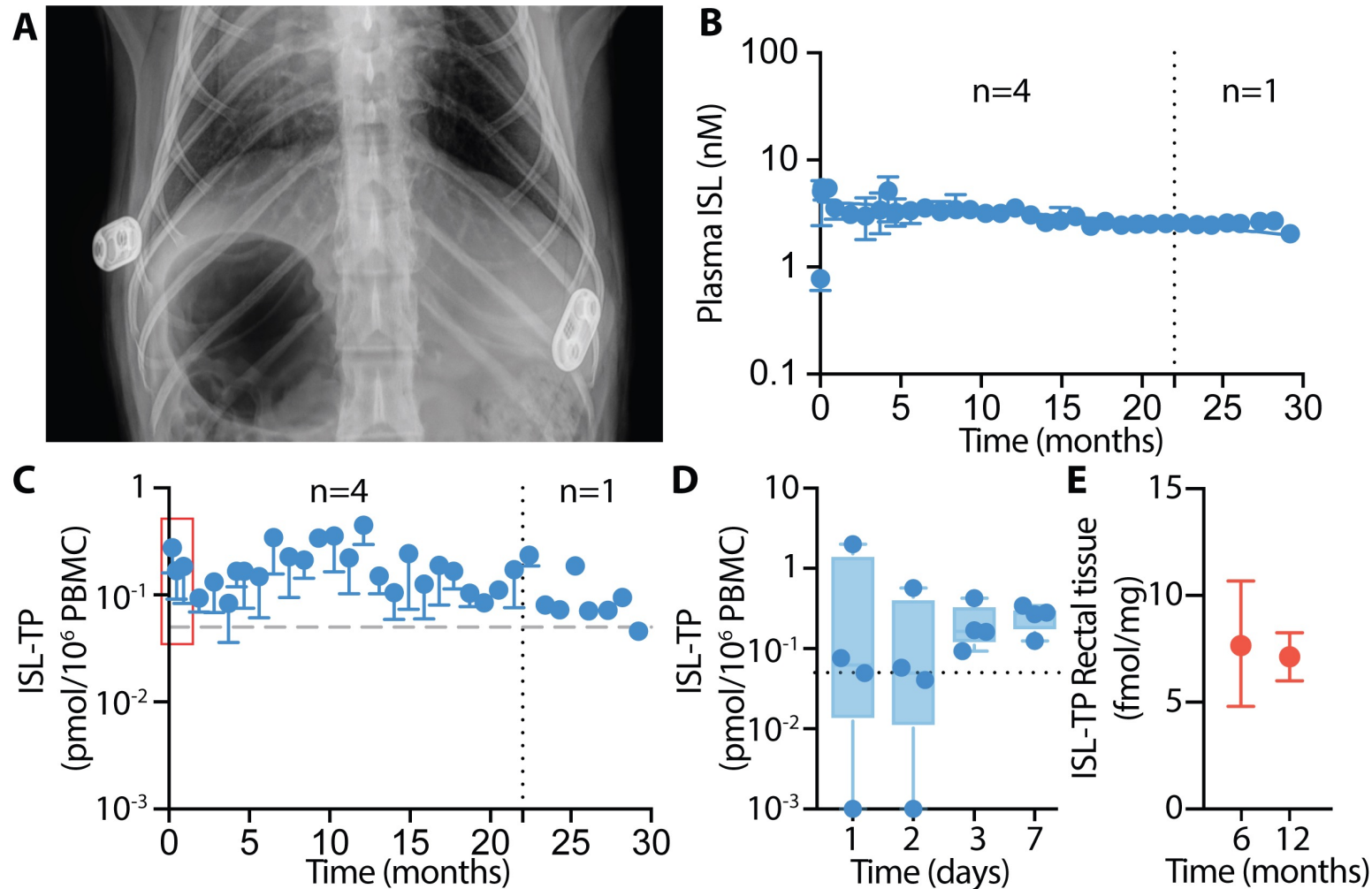


Multiple mechanisms contribute to the high potency of ISL against HIV-1 and its high barrier to resistance



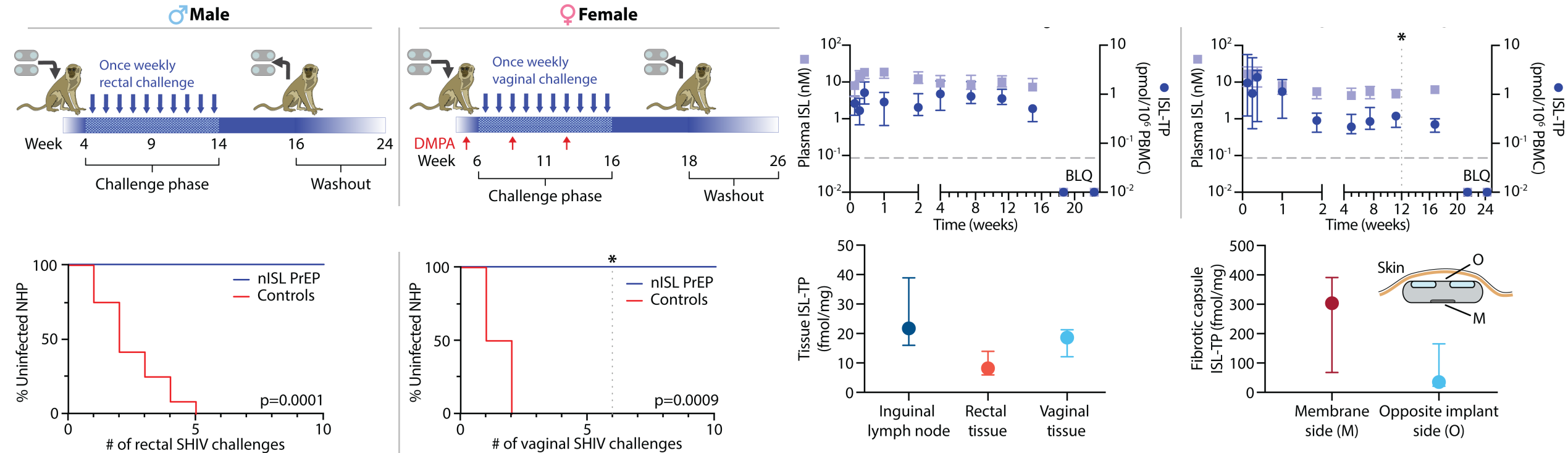
Pons-Faudoa, Di Trani, *et al. Science Translational Medicine* 2023 (Accepted May 2023, In Press)

Long term PK in NHP



Pons-Faudoa, Di Trani, et al. *Science Translational Medicine* 2023 (Accepted May 2023, In Press)

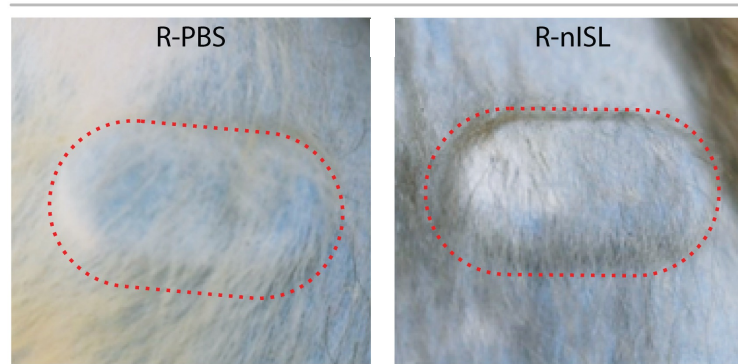
PrEP efficacy in NHP



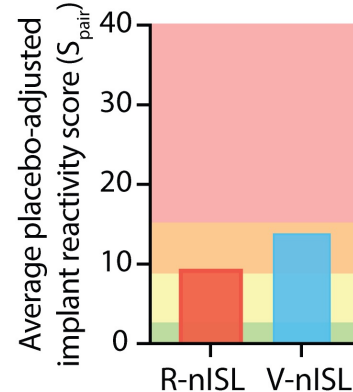
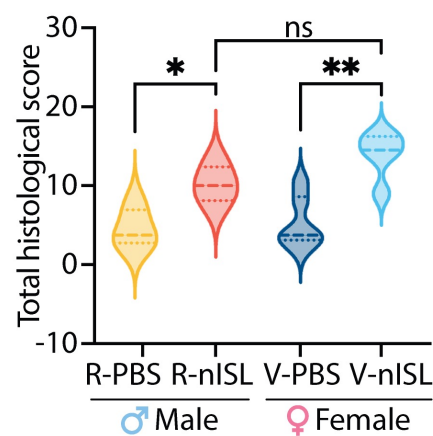
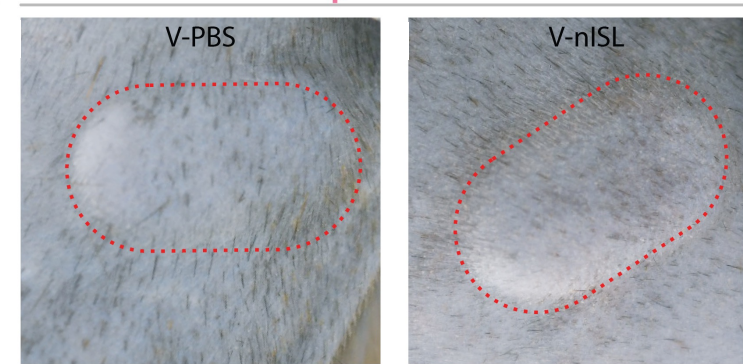
Pons-Faudoa, Di Trani, et al. *Science Translational Medicine* 2023 (Accepted May 2023, In Press)

Implantation site reaction

♂ Male



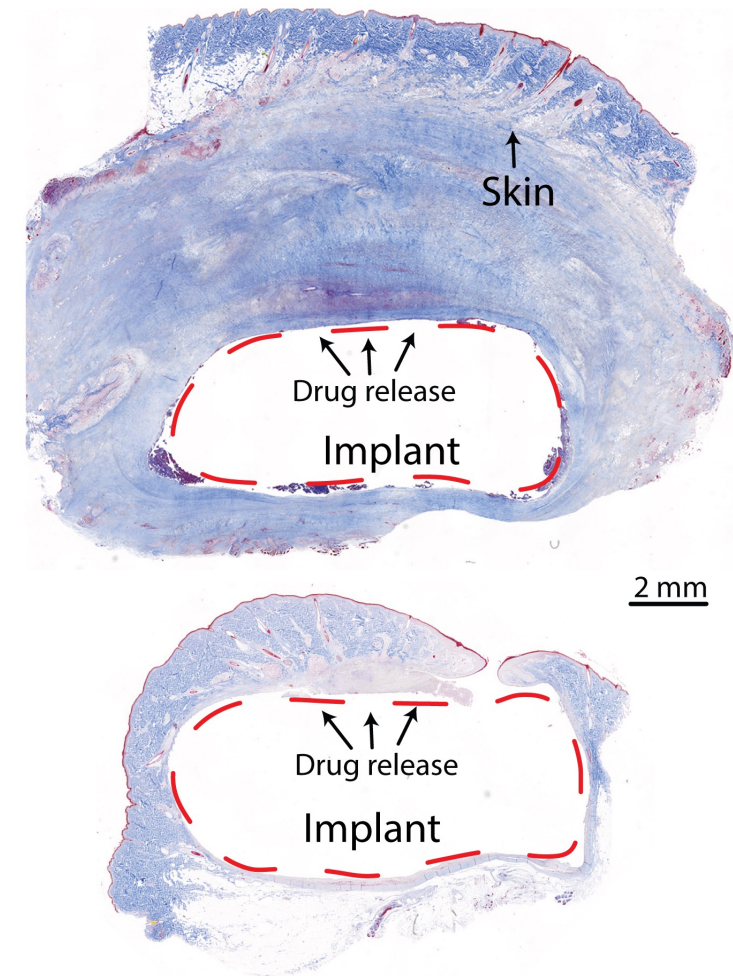
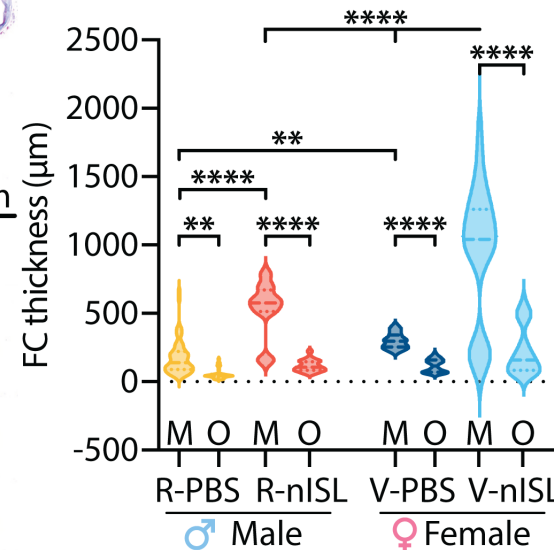
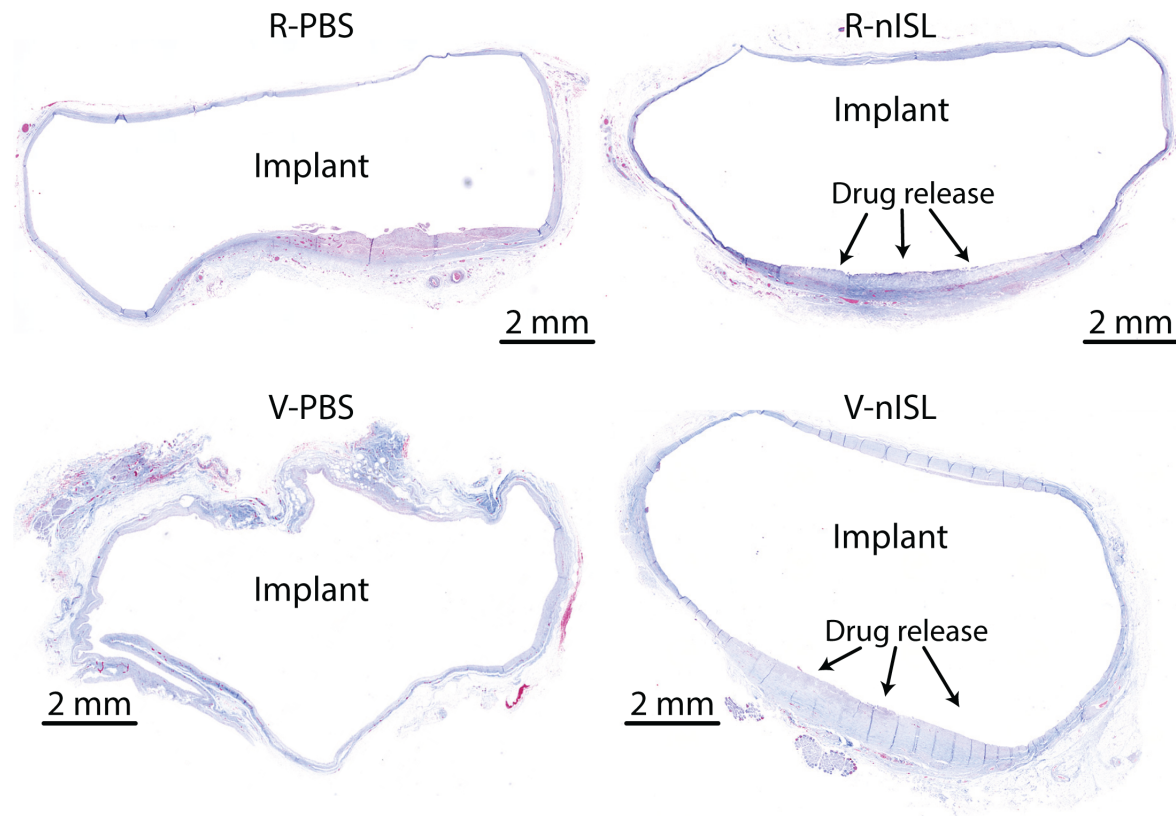
♀ Female



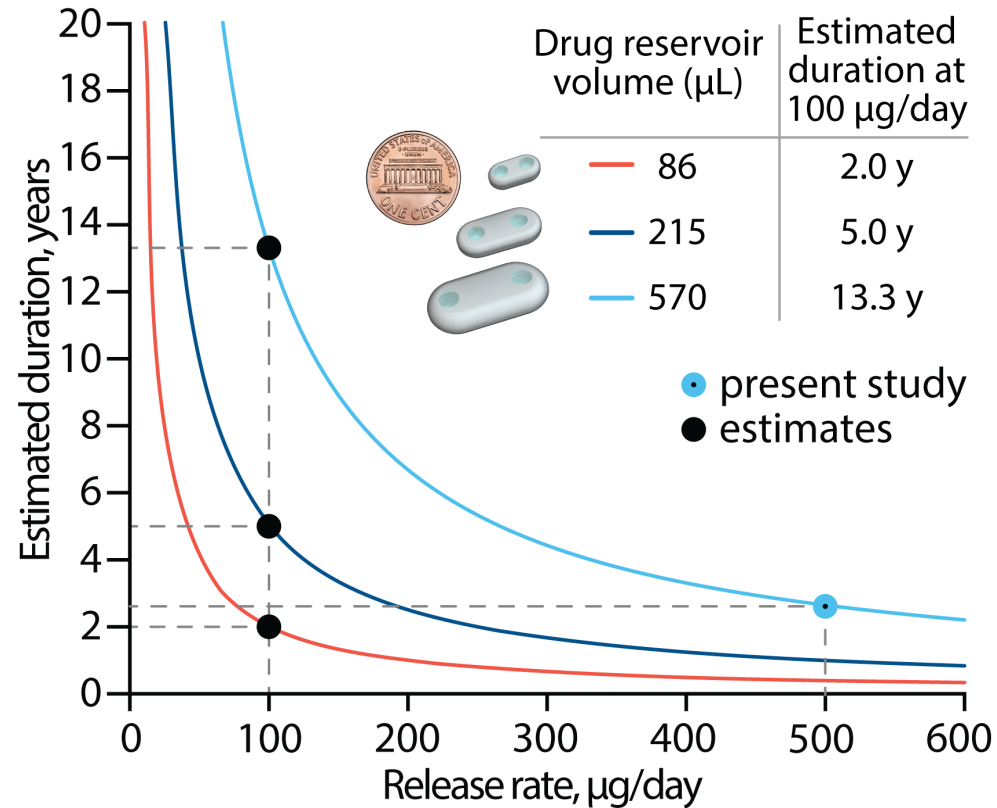
Implant	# of implants	Total histological score (0-32)	Average implant reactivity score (0-56)	Average S_{pair}	Reactivity grade
R-PBS	6	4.54 ± 2.40	7.13 ± 4.2	—	—
R-nISL	6	10.17 ± 2.33	16.33 ± 4.55	9.21	Moderate
V-PBS	6	5.25 ± 3.27	8.25 ± 5.26	—	—
V-nISL	5	14.00 ± 2.28	22.30 ± 5.48	14.05	Moderate

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Implantation site reaction



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Acknowledgments

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Alessandro Grattoni's Laboratory

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- Lorenzo Argano, MS student
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