Dry and Temperature Stable mRNA vaccine presentation

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Stability of mRNA vaccines

In 2021/2022 approved COVID vaccines:

Company	How effective	Storage temp
University of Oxford AstraZeneca	62-90%	Fridge
Pfizer BioNTech	95%	-70c
moderna	92%	-20c
NOVAVAX	86-89%	Fridge
Johnson & Johnson	66%	Fridge

Vaccine	Spikevax® (Moderna)	Comirnaty® (Pfizer/Biontech)
Distributed concentration	200 µg/mL	500 µg/mL
No of doses per vial	10	6
Dilution required?	No	Yes (5-fold)
Applied dose	100 µg (500 µL)	30 µg (300 µL)

Ideal vaccine presentaion would be pre-filled syringe, lyophilized vial containing single dose or a MAP stored at 2-8°C

Storage temperature requirements severely impact:

- Transport
- Distribution
- Costs of mRNA vaccines

Distribution as multi-dose vial at high concentration requires:

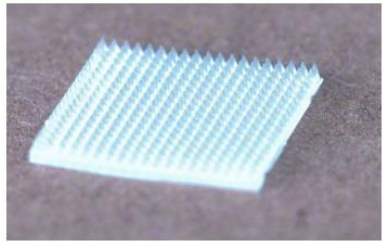
- Parallel vaccination of patients
- Prior dilution of potent vaccines

→ Feasible for mass vaccination, but not in post-pandemic market

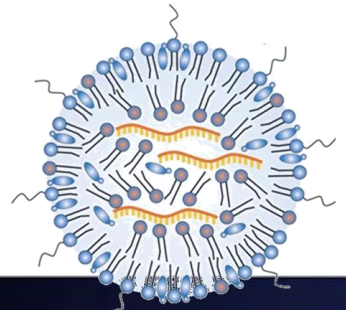
LNP Optimization is needed for MAPs

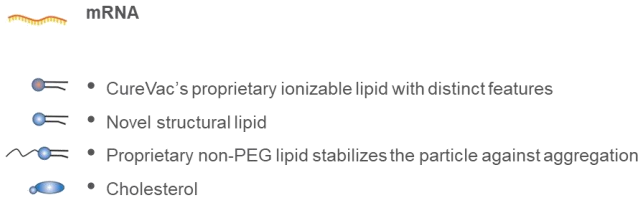
MAP for i.d. application

- Vaccine located in 300-600 needles (length: 100-1000 µm)
- Self-administration using applicator on the skin
- Delivery to the epidermis region
- Dose distribution without “bleb”
- No stimulation of nerves
- No harm to blood vessels

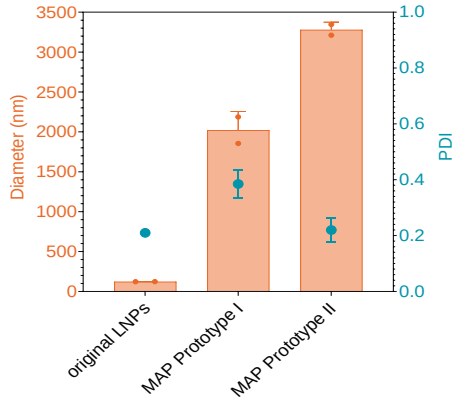


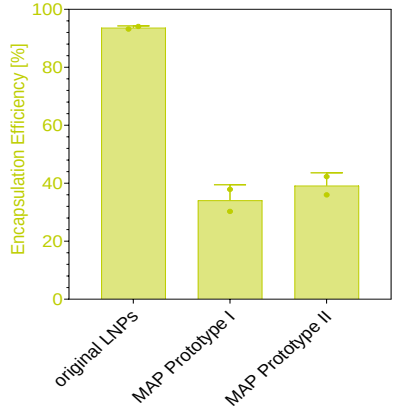
Not every LNP is compatible with MAP ingredients and production process! Certain LNPs show aggregation of particles, mRNA leakage and slightly reduced mRNA integrity

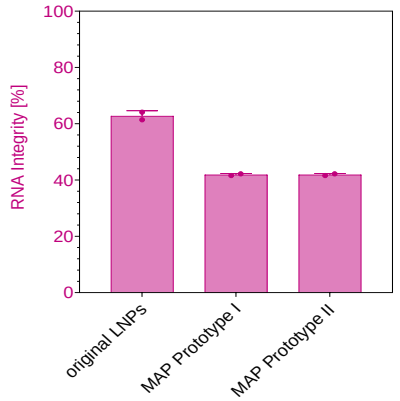




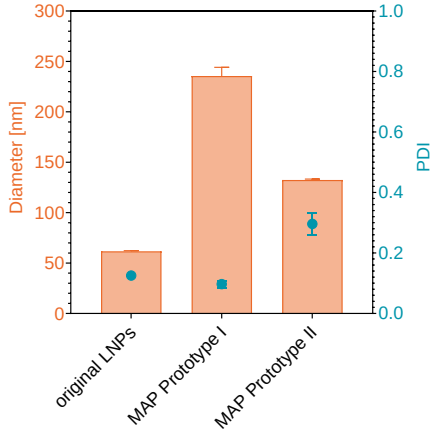
Example LNP in MAPs

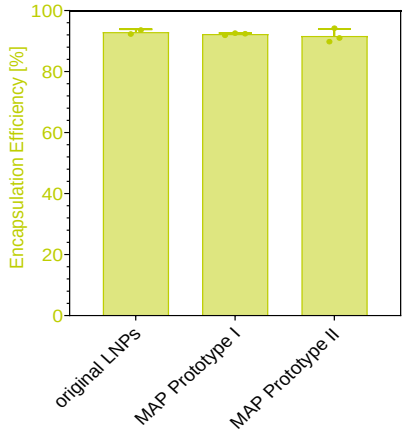


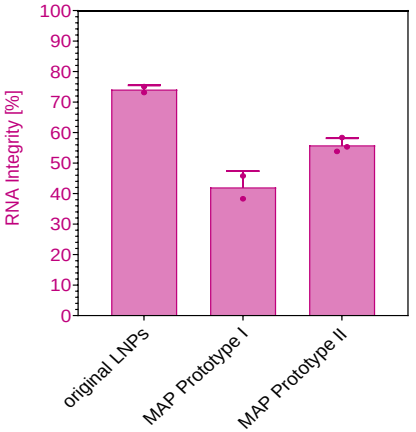




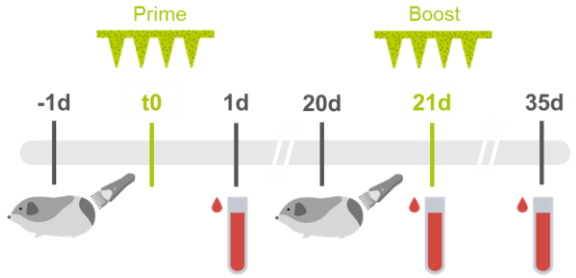
CureVac’s LNP in MAPs



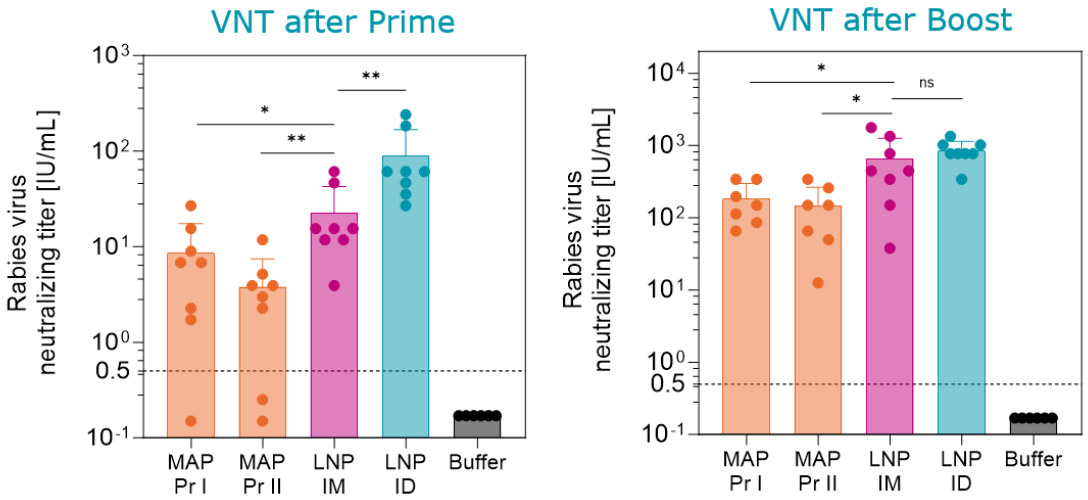




Vaccination study in guinea pigs shows protective titers



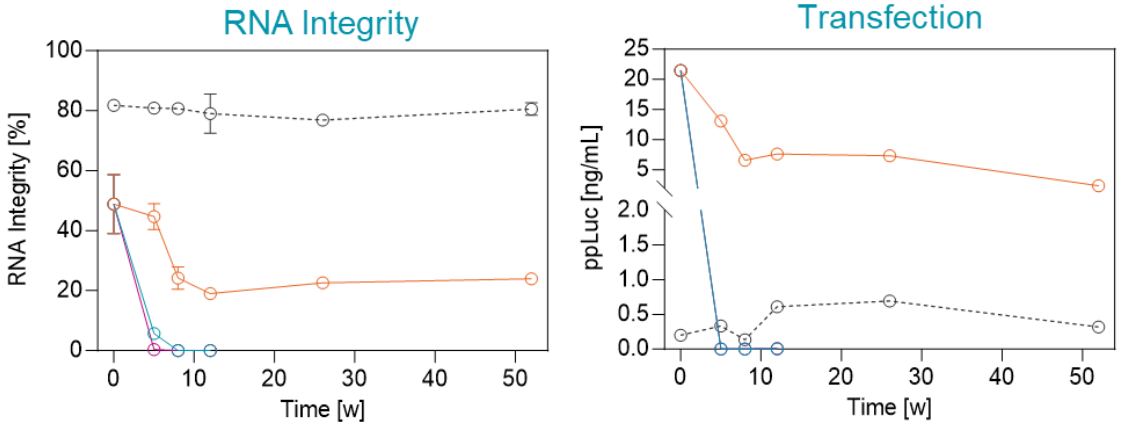
- 1µg Rabies virus glycoprotein encoding RNA per MAP
- Comparison of two MAP prototypes with CureVac's original mRNA-LNP applied ID or IM



- All groups showed mean titers > 0.5 IU/ml
- CureVac's LNPs showed similar titers when applied IM or ID
- Both MAPs showed similar VNTs, but 4-5-fold lower compared to optimized LNPs
- Boost/prime ratio suggests that MAPs were effective and proper dosing at prome could result in comparable titers to IM/ID

MAPs are stable for at least 1 year

MAP Prototype I

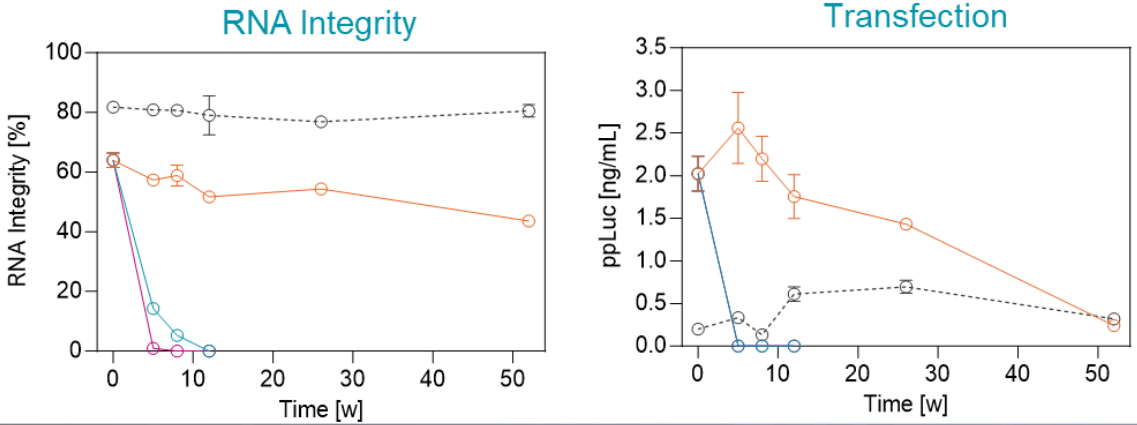


2-8°C 25°C 40°C

Liquid LNP at -80°C

No change in size, PDI and encapsulation effiency at all tested temperatures and timepoints (data shown on **poster 1109**)

MAP Prototype II



- It needs optimization of LNP to be compatible with MAP technology
- In vivo study in guinea pigs shows protective titers
- Stability of MAPs shown at least 6 months for Prototype II s at 2-8°C

Thank you

CureVac´s technology team

LTS Lohman

Preclinis

Meet me at poster number **1109**