














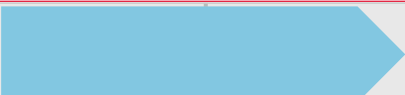








Prophylactic vaccines – Phase 1 datasets

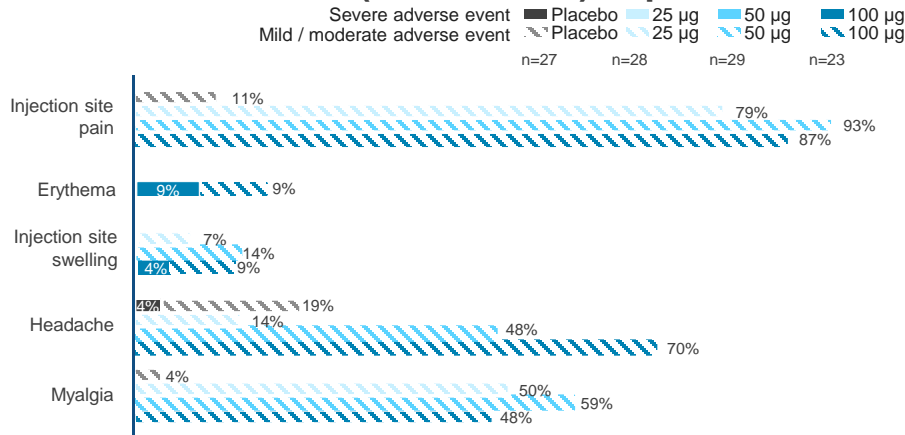
Last updated: December 6, 2018

Modality	Program #	Program		Preclinical development	Phase 1	Phase 2	Phase 3 and commercial	Moderna rights
 Prophylactic Vaccines – Commercial programs	mRNA-1777	RSV vaccine						Merck to pay milestones and royalties
	mRNA-1647	CMV vaccine						Worldwide
	mRNA-1653	hMPV+PIV3 vaccine						Worldwide
	mRNA-1278	VZV vaccine						Merck to pay milestones and royalties
 Prophylactic Vaccines – Global health programs	mRNA-1440	Influenza H10N8 vaccine						Worldwide <i>Advancing subject to funding</i>
	mRNA-1851	Influenza H7N9 vaccine						Worldwide <i>Advancing subject to funding</i>
	mRNA-1325*	Zika vaccine						Worldwide <i>BARDA funded</i>
	mRNA-1893	Zika vaccine						Worldwide <i>BARDA funded</i>
	mRNA-1388	Chikungunya vaccine						Worldwide <i>Advancing subject to funding</i>

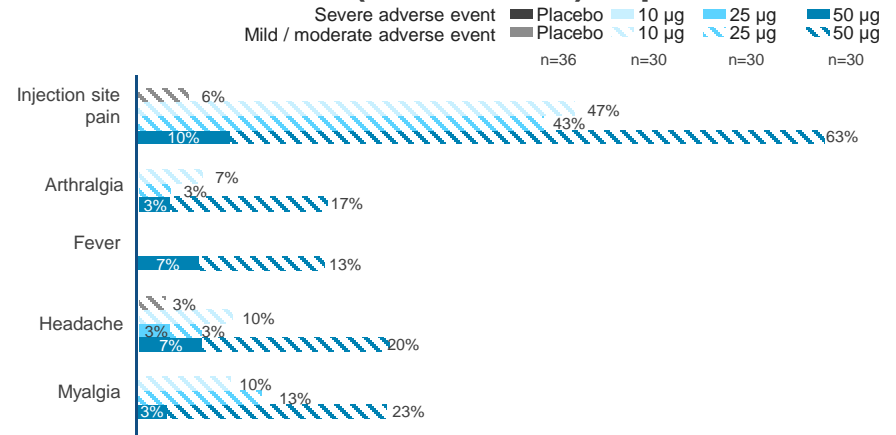
Prophylactic vaccines

Clinical safety data from four Phase 1 trials

H10N8 vaccine (mRNA-1440) Top 5 AEs¹



H7N9 vaccine (mRNA-1851) Top 5 AEs¹

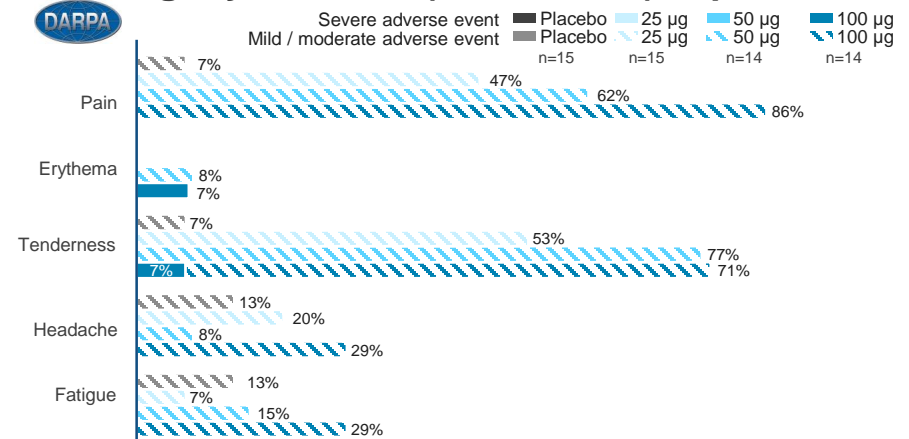


RSV vaccine (mRNA-1777) safety summary



- *Interim safety data as of September 2018:*
 - mRNA-1777 was well-tolerated at first three dose levels in younger and older adults
 - The highest dose arm (dose four) in the older adult cohort was not as well tolerated but did not result in significant safety concerns
 - No treatment-related SAEs or TEAEs

Chikungunya vaccine (mRNA-1388) Top 5 AEs¹



All vaccines tested in Phase 1 to date have generated safety data to permit dose escalation

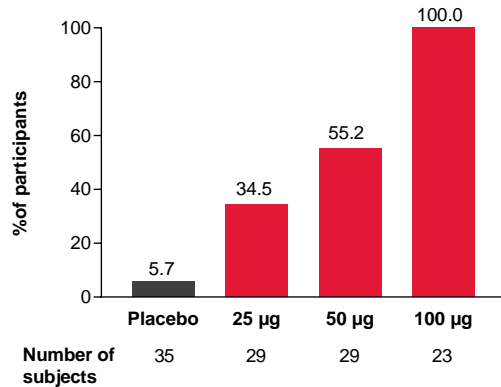
¹ Adverse events shown after Dose 2, top 5 selected based on cumulative severe adverse event prevalence across cohorts, then by cumulative overall adverse event prevalence across cohorts

Prophylactic vaccines

Clinical immunogenicity data from four Phase 1 trials

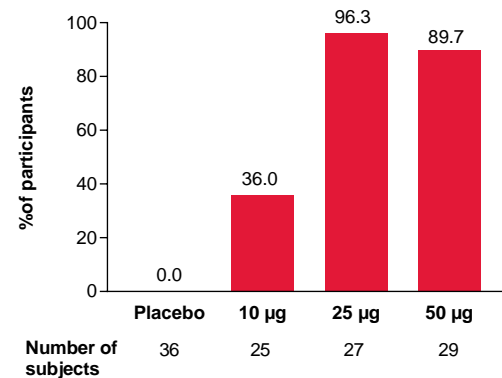
H10N8 vaccine (mRNA-1440) immunogenicity

Percent of subjects with HAI \geq 1:40 with H10N8 vaccine (mRNA-1440) in Phase 1 clinical trial at day 43



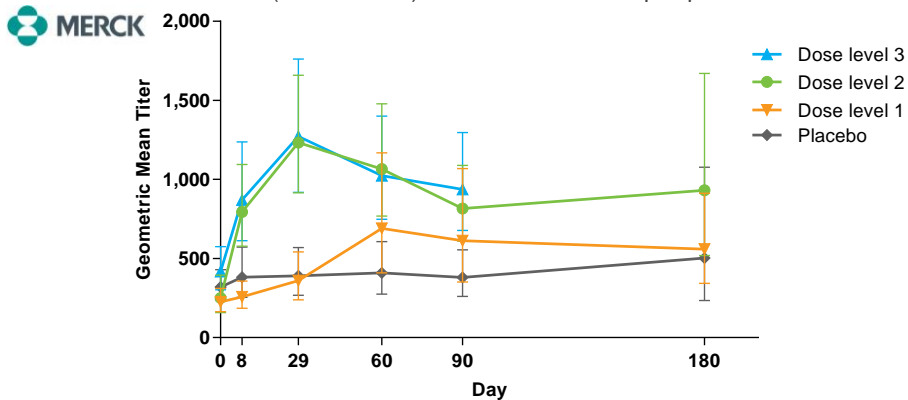
H7N9 vaccine (mRNA-1851) immunogenicity

Percent of subjects with HAI \geq 1:40 with H7N9 vaccine (mRNA-1851) in Phase 1 clinical trial at day 43



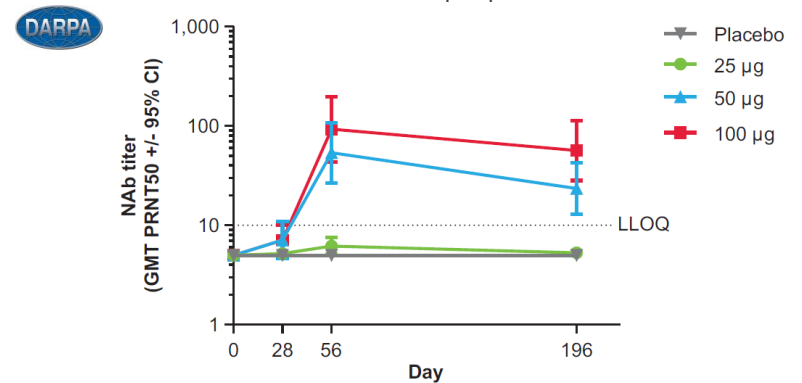
RSV vaccine (mRNA-1777) immunogenicity

Neutralizing antibody titers in healthy older subjects [Ages \geq 60 and \leq 79 years] in RSV vaccine (mRNA-1777) Phase 1 clinical trial per-protocol set¹



Chikungunya vaccine (mRNA-1388) immunogenicity

Neutralizing antibody PRNT50 GMT with Chikungunya vaccine (mRNA-1388) in Phase 1 clinical trial per-protocol subset¹



4 positive readouts to date – immunogenicity & dose responses observed



Prophylactic vaccines datasets: Comparator data

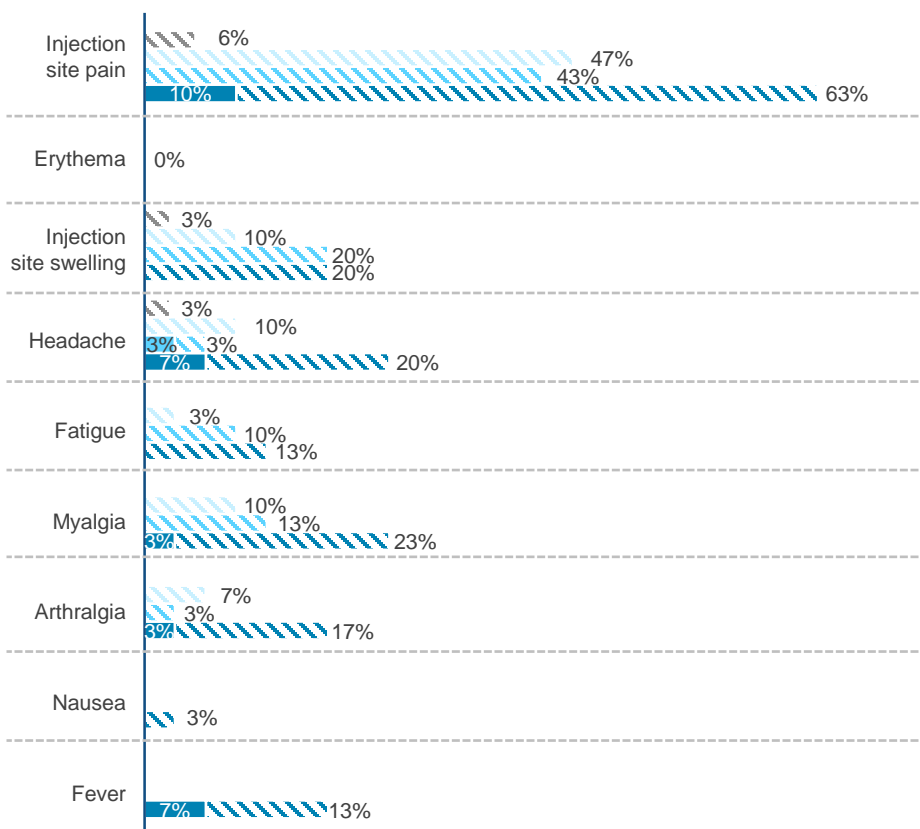
H7N9 vaccine (mRNA-1851)

Phase 1 data

H7N9 vaccine (mRNA-1851) safety data

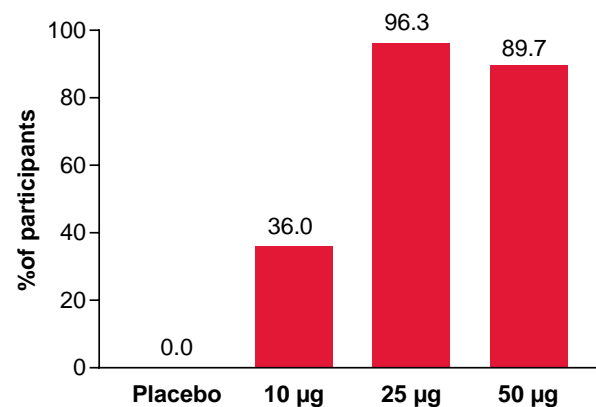
Post-dose 2

Severe adverse event: Placebo (n=36), 10 µg (n=30), 25 µg (n=30), 50 µg (n=30)
 Mild / moderate adverse event: Placebo (n=36), 10 µg (n=30), 25 µg (n=30), 50 µg (n=30)



H7N9 vaccine (mRNA-1851) immunogenicity

Percent of subjects with HAI \geq 1:40 with H7N9 vaccine (mRNA-1851) in Phase 1 clinical trial at day 43



Number of subjects

Placebo: 36, 10 µg: 25, 25 µg: 27, 50 µg: 29

H7N9 vaccine clinical comparators

All 2 doses, 3-4 weeks apart	Subunit Flu No adjuvant 45µg, (N=95)	Subunit Flu AS03 adjuvant 15 µg, (N=96)	Subunit Flu MF59 adjuvant 15 µg, (N=94)	mRNA-1851, No adjuvant, 25µg, (N=27)
HAI antibody, % \geq 40	9%	84%	57%	96.3%
HAI antibody, GMTs	7.6	103.4	29.0	103.4
MN, % \geq 20	19%	92%	74%	100%
MN, GMTs	15.7	118.6	52.2	89.8

MN: microneutralization; GMT: geometric mean titer

Note: Cross-trial comparison inherently difficult due to differences in assays, study design, etc., the reported data shown above should not be used to draw definitive conclusions

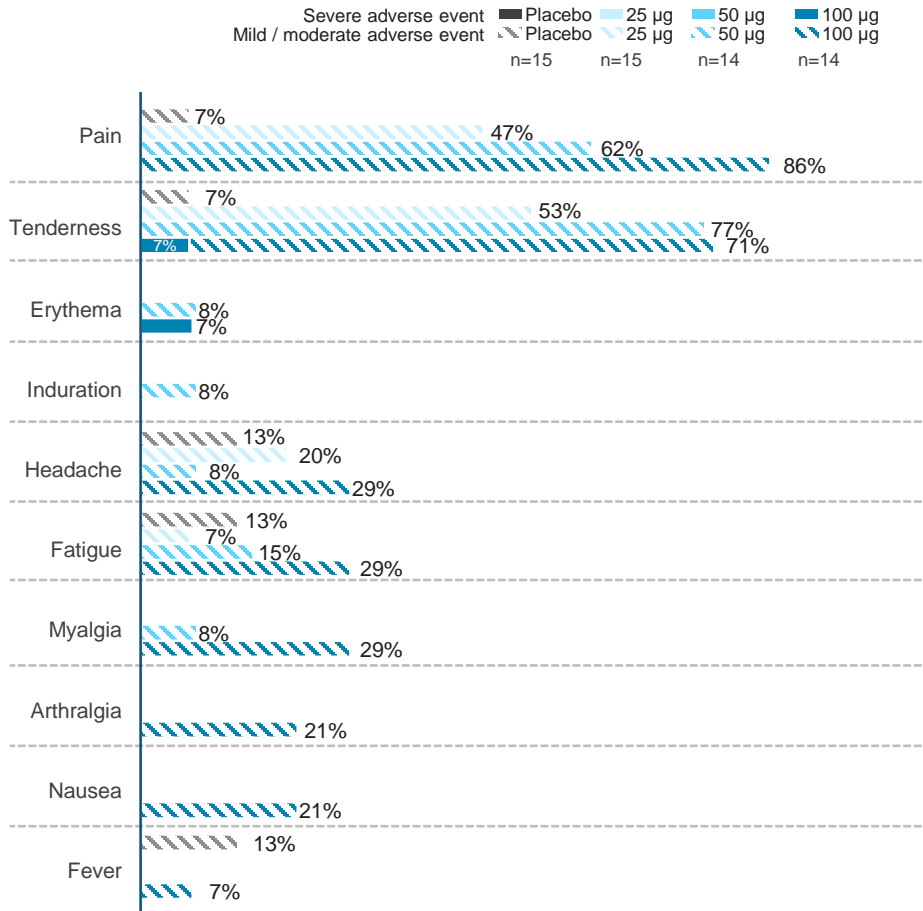
Source: Lisa Jackson et al. JAMA. 2015;314(3):237-246. doi:10.1001/jama.2015.7916

Chikungunya vaccine (mRNA-1388)

Phase 1 data

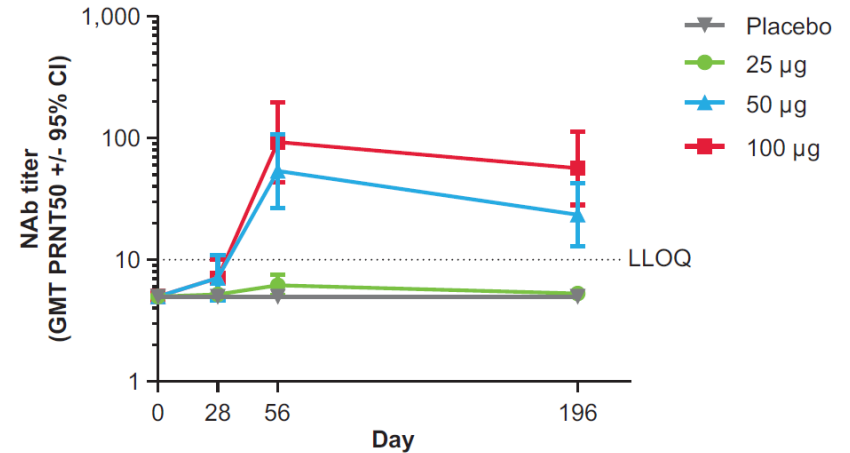
Chikungunya vaccine (mRNA-1388) safety data

Post-dose 2



Chikungunya vaccine (mRNA-1388) immunogenicity

Neutralizing antibody PRNT50 GMT with Chikungunya vaccine (mRNA-1388) in Phase 1 clinical trial per-protocol subset



Chikungunya vaccine clinical comparators

Institution Approach	Clinical phase	Dose level	Neutralizing Ab titer post dose 2	% sero-conversion post dose 2	Neutralization assay technical details
Moderna mRNA encoding CHIKV VLP	Phase 1 (interim)	25 µg	7	36%	PRNT50 (LLOQ=10)
		50 µg	46	80%	
		100 µg	93	100%	
Themis Measles vector encoding CHIKV VLP	Phase 1	1.5x10 ⁴ TCID50	73	100%	PRNT50 (LLOQ=10)
		7.5x10 ⁴ TCID50	150	100%	
		3.0x10 ⁵ TCID50	433	100%	
PaxVax/VRC subunit VLP	Phase 1	10 µg	2688	100%	GFP-expressing chimeric Semliki Forest virus encoding CHIK structural proteins (OPY1 strain). Flow cytometry assay. IC50 endpoint. (LLOQ=50)
		20 µg	1775	100%	
		40 µg	7246	100%	

Note: Cross-trial comparison inherently difficult due to differences in assays, study design, etc., the reported data shown above should not be used to draw definitive conclusions

Sources: 1. Yoon, I et al. (2015) High rate of subclinical chikungunya virus infection and association of neutralizing antibody with protection in a prospective cohort in the Philippines. PLOS Neg Trop Dis. 9(5):e0003764. doi: 10.1371/journal.pntd.0003764; 2. Ramsauer, K et al. (2015) Immunogenicity, safety, and tolerability of a recombinant measles-virus-based chikungunya vaccine: a randomised, double-blind, placebo-controlled, active-comparator, first-in-man trial. Lancet Infect Dis. 15:519-27; 3. Chang, L et al. (2014) Safety and tolerability of chikungunya virus-like particle vaccine in healthy adults: a phase 1 dose-escalation trial. Lancet. 384:2046-52. PaxVax acquired by Emergent BioSolutions.

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