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Pediatric respiratory syncytial virus (RSV) vaccine

Last program update: February 26, 2020

Modality	ID #	Program	Preclinical development	Phase 1	Phase 2	Phase 3 and commercial	Moderna rights
Prophylactic vaccines	mRNA-1647	Cytomegalovirus (CMV) vaccine					Worldwide
	mRNA-1893	Zika vaccine					Worldwide *BARDA funded*
	mRNA-1172/ Merck V172	Respiratory syncytial virus (RSV) vaccine					Merck to pay milestones and royalties
	mRNA-1177	Respiratory syncytial virus (RSV) vaccine					
	mRNA-1653	hMPV/PIV3 vaccine		Phase 1 (healthy volunteers)	Phase 1b (Age de-escalation) Seropositives		Worldwide
	mRNA-1345	Pediatric respiratory syncytial virus (RSV) vaccine *Future respiratory combo*					Worldwide
	mRNA-1189	Epstein-Barr virus (EBV) vaccine					Worldwide
	mRNA-1851	Influenza H7N9 vaccine					Worldwide *Advancing subject to funding*
	mRNA-1273	Novel coronavirus (SARS-CoV-2) vaccine					Worldwide *CEPI funded*

Pediatric respiratory syncytial virus (RSV) overview

- RSV is the leading cause of unaddressed severe lower respiratory tract disease and hospitalization in infants and young children worldwide
- **Disease burden:** Major cause of hospitalization due to respiratory infection
  - Hospitalization rate in children <5 years old in the U.S.: ~3:1000[1]
  - Annually over 2 million medically attended RSV infections in children <5 years old in the U.S., more than 86,000 are hospitalized
  - Globally it is estimated over ~33 million episodes of acute lower-respiratory tract infection, 3.2 million hospitalizations and as many as 118,000 deaths per year
  - We estimate pediatric RSV results in ~$2 billion in annual medical costs in the U.S.
- **Target population:** Young children
- **Unmet need:** No approved RSV vaccine

RSV infection	
Infancy, childhood, adulthood	• Fevers • Nasal congestion Breathing difficulties • Wheezing • Chest congestion • Bronchiolitis • Pneumonia

[1]Williams JV, Edwards KM, Weinberg GA, et al. Population-based incidence of human metapneumovirus infection among hospitalized children. *J Infect Dis*. 2010;201(12):1890-8.

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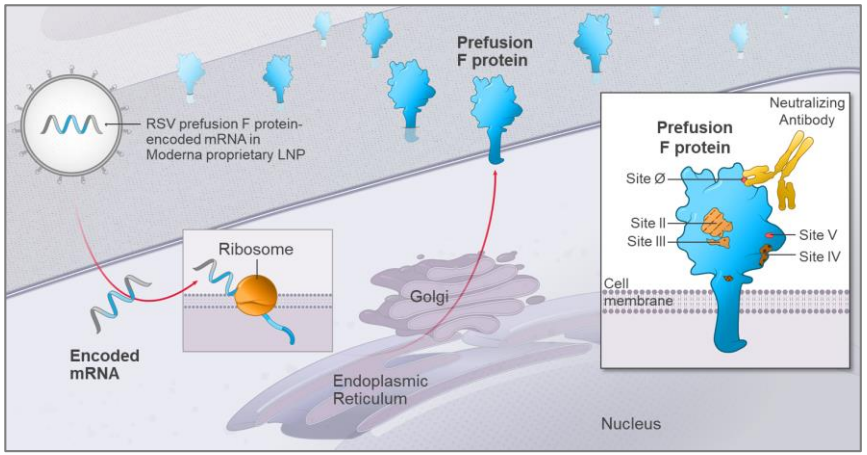
Pediatric RSV vaccine (mRNA-1345)

- mRNA-1345 encodes for a stabilized prefusion F glycoprotein
- mRNA-1345 will use the same LNP as our hMPV/PIV3 (mRNA-1653) and CMV (mRNA-1647) vaccines
- We believe that neutralizing antibodies elicited by mRNA-1345 will lead to the reduction of medically attended RSV disease in young children (< 5 yrs)
- Intend to combine mRNA-1345 with mRNA-1653, our vaccine against hMPV and PIV3, to create a pediatric respiratory combination vaccine
- Current plan is to develop mRNA-1345 and mRNA-1653 independently through initial clinical studies and then combine prior to registration



RSV *Respiratory syncytial virus*	**hMPV** *Human metapneumovirus*	**PIV3** *Parainfluenza virus type 3*
Hospitalization rate in children < 5 years old in the U.S.:**~3:1000**[1]	**Hospitalization rate in children** < 5 years old in the U.S.:**~1.2:1000**[1]	**Hospitalization rate in children** < 5 years old in the U.S.:**~0.5:1000**[1]
In the aggregate, three diseases cause **over 3 million medically attended infections annually** in the US		

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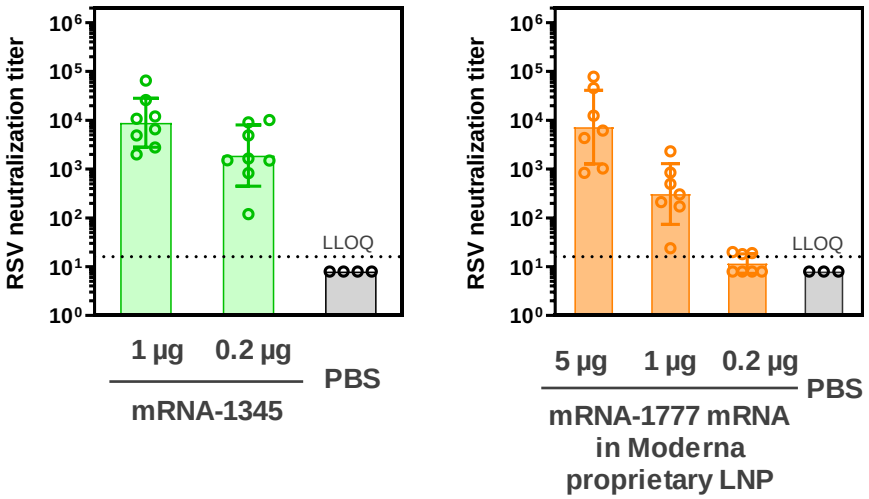
Pediatric RSV vaccine (mRNA-1345)

mRNA-145 is more immunogenic than our first RSV candidate (mRNA-1777)



Results shown here represent that the pediatric RSV vaccine (mRNA-1345) was significantly more immunogenic than mRNA-1777

The left panel below shows the results of a study in which mice were immunized with different dose levels of mRNA-1345 intramuscularly on study days 1 and 21 and RSV neutralizing antibody titers were measured in serum collected on day 33. The right panel shows the results of a similar mouse study conducted with mRNA from mRNA-1777 formulated in the same proprietary LNP as mRNA-1345.

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