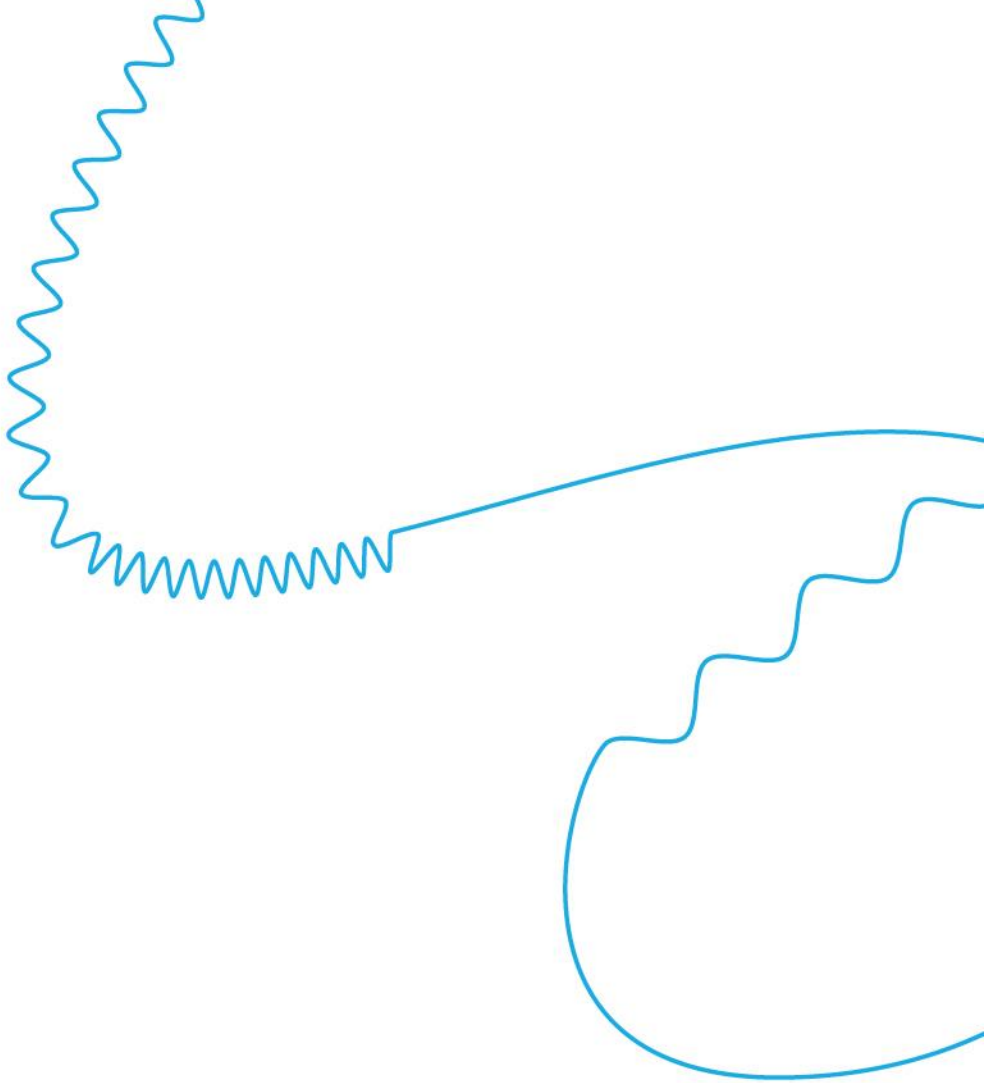
Fourth Vaccines Day

April 11, 2023



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Forward-looking statements and disclaimer

This presentation contains forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995, as amended, including statements regarding: the future impact of vaccination on global health, economies and social welfare; the advantages of Moderna's mRNA platform; the impact of climate change on human pathogenic diseases; the potential for mRNA vaccines to address enteric viruses and bacterial pathogens; Moderna's ability to meet the needs of the evolving COVID-19 vaccine market, including Moderna's ability to serve the fall 2023 market and to rapidly adapt to emerging strains; Moderna's ability to develop next-generation vaccines to meet customer needs; anticipated timing of regulatory action for Moderna's older adults RSV vaccine; Moderna's ability to advance multiple generations of single-virus and combination respiratory vaccines, and the potential benefits of combination vaccines; expected initiation of enrollment in Moderna's study of mRNA-1083 (COVID/flu); the timing of potential vaccine launches, including for mRNA-1010 (flu), mRNA-1345 (older adults RSV), combination respiratory vaccines, mRNA-1283 (SARS-CoV-2), mRNA-1647 (CMV) and next-generation flu vaccines; Moderna's expectations regarding the respiratory vaccines market, including for COVID-19, RSV and flu vaccines, and as COVID-19 enters the endemic phase; the potential for seasonal combination vaccines to expand the respiratory seasonal flu vaccine market; the potential markets addressable by Moderna's latent virus vaccines, including for CMV; Moderna's expectations regarding its levels of future R&D investments; Moderna's expectations for its respiratory franchise to become a significant source of cash generation by 2027; Moderna's expectations regarding the mRNA-1010 Phase 3 P303 study, including expected improved immune responses against influenza B strains to enable licensure of mRNA-1010 through accelerated approval: Moderna's expectations for a continuously improving influenza vaccine portfolio; and Moderna's planned Phase 3 studies of its PCV cancer vaccine. In some cases, forward-looking statements can be identified by terminology such as "will," "may," "should," "could," "expects," "intends," "plans," "aims," "anticipates," "believes," "estimates," "predicts," "potential," "continue," or the negative of these terms or other comparable terminology, although not all forward-looking statements contain these words. The forward-looking statements in this presentation are neither promises nor guarantees, and you should not place undue reliance on these forward-looking statements because they involve known and unknown risks, uncertainties, and other factors, many of which are beyond Moderna's control and which could cause actual results to differ materially from those expressed or implied by these forward-looking statements. These risks, uncertainties, and other factors include, among others, those risks and uncertainties described under the heading "Risk Factors" in Moderna's Annual Report on Form 10-K for the fiscal year ended December 31, 2022, filed with the U.S. Securities and Exchange Commission (SEC), and in subsequent filings made by Moderna with the SEC, which are available on the SEC's website at www.sec.gov. Except as required by law, Moderna disclaims any intention or responsibility for updating or revising any forward-looking statements contained in this presentation in the event of new information, future developments or otherwise. These forward-looking statements are based on Moderna's current expectations and speak only as of the date hereof.

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The impact of safe and effective vaccines on global health, economies and social welfare is undeniable

Health

- Reduce infectious disease morbidity and mortality
- Eradicate infectious diseases
- Prevent certain cancers
- Reduce long-term health burden from viral infections

Impact of vaccination

Social

- Promote health equity
- Empowerment of women
- Strengthen health and social care infrastructure
- Improve life expectancy and opportunity

Economic

- Healthcare cost savings
- Economic productivity gains
- Minimize societal impact of disease
- Cost-effective preparedness for outbreaks

SOURCE: Rodrigues, Charlene et al., *Microbiol* (2020), https://doi.org/10.3389/fmicb.2020.01526

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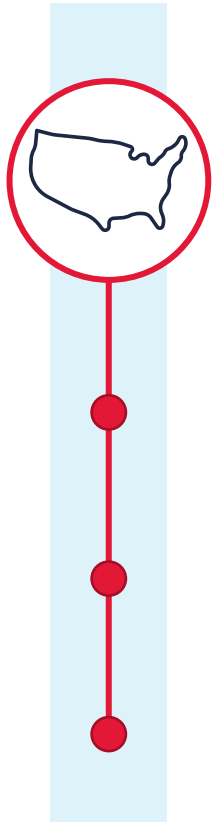
Safe and effective vaccines provide significant return on healthcare dollars invested and strengthen global health



In the US, CDC estimates of **vaccination impact** on children born between 1994-2013 (US) in the Vaccines for Children (VFC) program[1]

~$1.4 trillion saved in total societal cost

322 million illnesses prevented

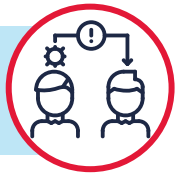
732,000 deaths prevented

Globally, every dollar invested in vaccination between 2011-2020 resulted in an estimated **net return of 44 times the cost**[2]

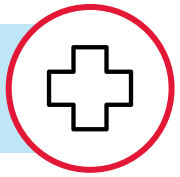
(1) Whitney, Cynthia et al., *CDC* (2014), https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6316a4.htm
(2) In 94 low-and middle-income countries across ten antigens. Ozawa, Sachiko et al., *Health Affairs* (2016), https://doi.org/10.1377/hlthaff.2015.1086

Despite successes with existing vaccines, key global health challenges still need to be addressed

There is a large unmet need in preventing viral infectious disease in humans



Aging population is more susceptible to severe acute infections



Latent virus infections increase the risk for debilitating long-term health conditions

Climate change is aggravating human pathogenic diseases

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Challenge: There is still a large unmet need in preventing viral infectious disease

Four major viral diseases (RSV[1], flu[2], norovirus[3], and HIV[4]) cause an estimated 1.7 million global deaths annually

Of the ~220 viruses known to affect humans, 18 have available vaccines[5]

Progress against communicable diseases took a temporary step backward after 2019, as COVID-19 infected more than 500M people and caused an estimated 15M excess deaths[6]

1. RSV (160k), https://www.niaid.nih.gov/diseases-conditions/respiratory-syncytial-virus-rsv#:~:text=Globally%2C%20RSV%20affects%20an%20estimated,causes%20160%2C000%20deaths%20each%20year.; 2. HIV (650k), https://www.who.int/data/gho/data/indicators/indicator-details/GHO/number-of-deaths-due-to-hiv_aids#:~:text=The%20estimated%20650%20000%20%5B510,is%20no%20room%20for%20complacency.; 3. Flu (650k), https://www.who.int/europe/activities/estimating-disease-burden-of-influenza; 4. Norovirus (200K), https://www.cdc.gov/norovirus/downloads/global-burden-report.pdf, page 4.; 5. Woolhouse, Mark et al., Philos Trans R Soc Lond B Biol Sci (2012), https://doi.org/10.1098/rstb.2011.0354 ; https://www.fda.gov/vaccines-blood-biologics/vaccines/vaccines-licensed-use-united-states
6. https://unstats.un.org/sdgs/report/2022/The-Sustainable-Development-Goals-Report-2022.pdf, page 10. Infections as of mid-2022, deaths as of year-end 2021

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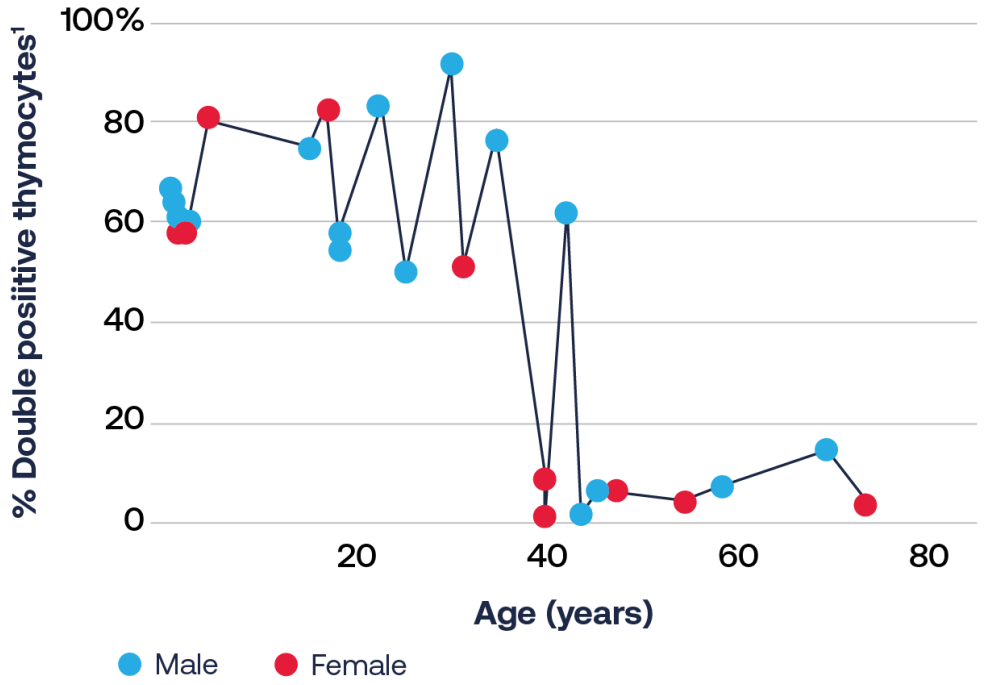
Challenge: older adults are more susceptible to infectious diseases and are a growing share of the global population

Decline in naïve T-cell production with age

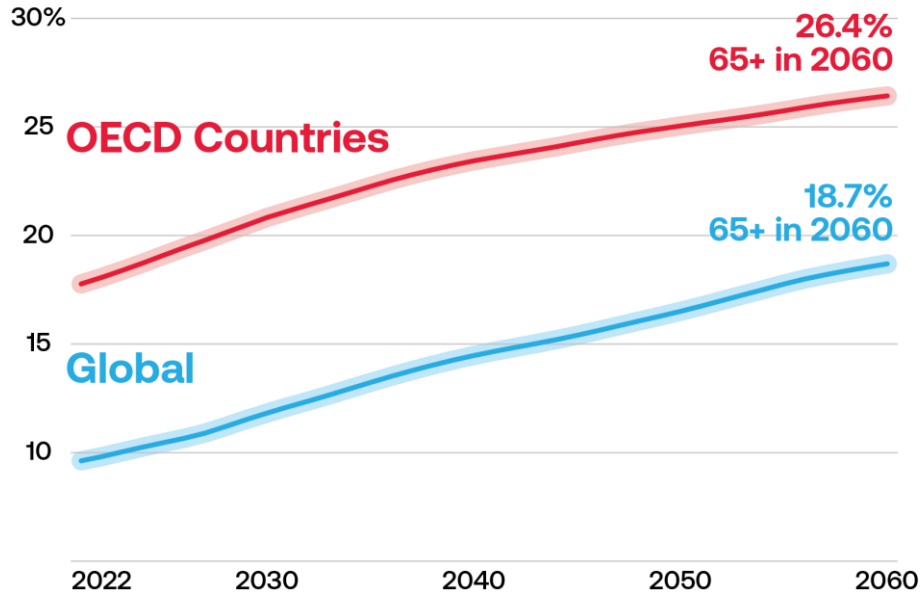


SOURCE: : J Thome et al., Longterm maintenance of human naive T cells through in situ homeostasis in lymphoid tissue sites, *Science Immunology*, Dec 2016 https://pubmed.ncbi.nlm.nih.gov/28361127/

1. Double Positive: expresses CD4 and CD8 T cells

The world's population is aging

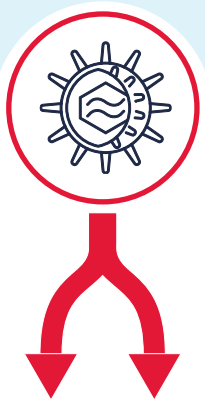
(Percent of population 65+ years old)



SOURCE: OECD population projections https://stats.oecd.org/Index.aspx?DataSetCode=POPPROJ#

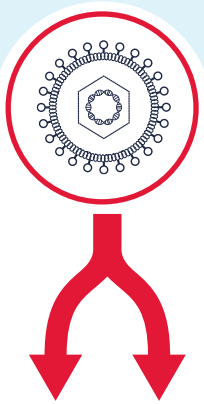
Challenge: latent viruses have long-term health implications

CMV infection[1,2]



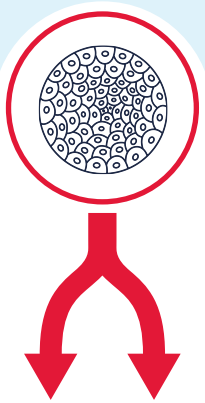
- Birth defects
- Transplant complication

EBV infection



- Multiple sclerosis[3]
- Lymphomas[4]

HPV infection

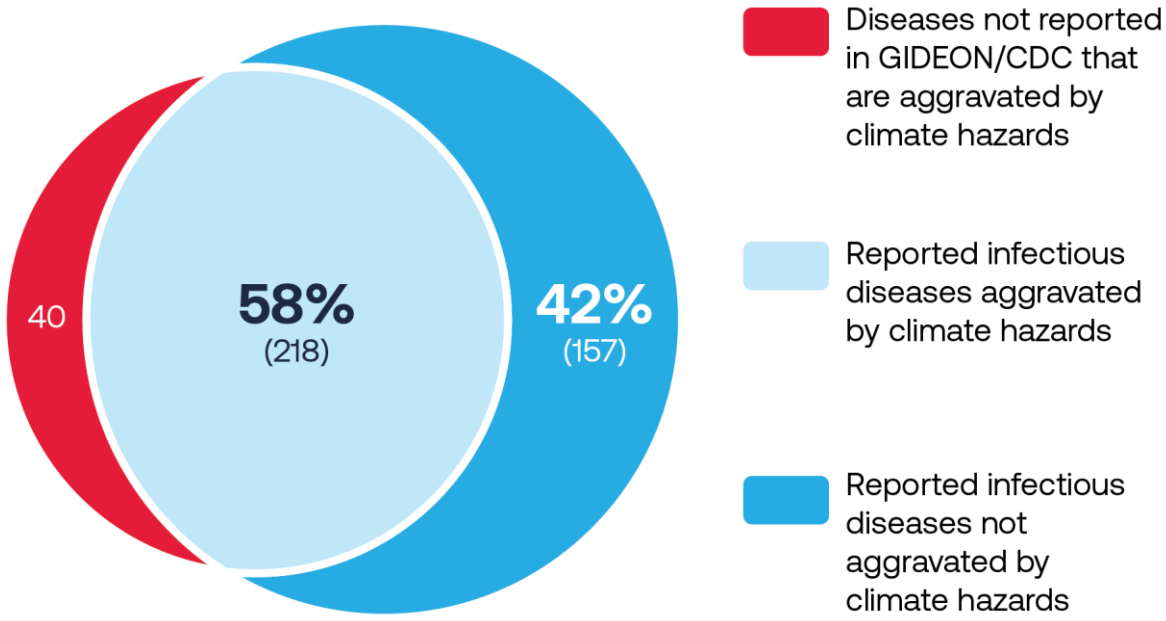


- Cervical cancer
- Head & neck cancer[5]

1 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4967965
2 https://www.cdc.gov/cmv/index.html
3 https://www.science.org/doi/10.1126/science.abj8222; Bjornevik, Khetil et al, Science (2022)
4 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5597738
5 https://www.cdc.gov/cancer/headneck/index.htm

Challenge: climate change is aggravating human pathogenic diseases

Subset of diseases aggravated by climatic hazards compared with all reported infectious diseases



Climate change is leading to a **shift in the geographical range of species**

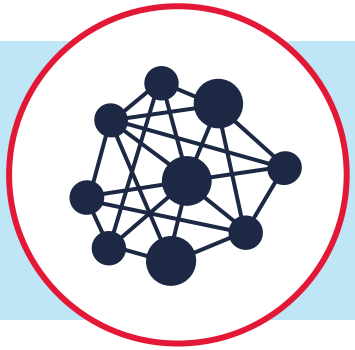
Climatic hazards facilitated the contact between people and pathogens by **moving people closer to pathogens**

Climate change has also **enhanced specific aspects of pathogens**

GIDEON: Global Infectious Disease and Epidemiology Network

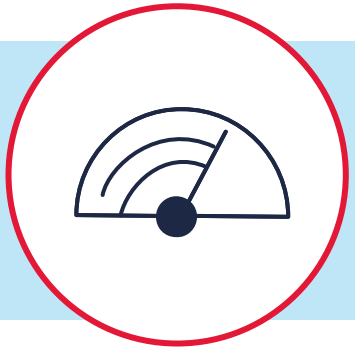
McKenzie, Mora et al., *Nat. Clim. Chang.* (2022), https://doi.org/10.1038/s41558-022-01426-1

Moderna's mRNA vaccine platform is addressing these challenges



High biological fidelity

- Ability for translation of **complex antigens**
- Ability to construct **combination vaccines**
- Potential for **high efficacy**



Speed

mRNA is a platform – ability to go from sequence to the clinic to approved products in record time

Flexible manufacturing

- **Each manufacturing site supports the entire platform** – ability to go from mRNA vaccines to mRNA therapeutics using the same process
- **Greater capital efficiency**

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Moderna is now expanding our mRNA platform to target bacterial pathogens

Existing vaccines against bacterial pathogens include live attenuated, subunit protein, and polysaccharide conjugate vaccines

Capsular polysaccharide vaccines are widely used and effective for many diseases, but are not always possible or the best choice

Protein vaccines **elicit mainly humoral responses** which can be effective in many indications

There are many bacterial pathogens that have no effective vaccines

mRNA vaccines offer a potential key advantage to address certain bacteria

mRNA vaccines elicit both **cellular and humoral responses**, which could be advantageous for bacterial pathogens with intracellular and/or extracellular life stages

Moderna's first bacterial target will be **Lyme disease**

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Moderna's infectious disease vaccine portfolio has made substantial progress over the past two years

Vaccines Day 2021			
7	Preclinical	10	Respiratory
5	Phase 1	4	Latent
3	Phase 2	2	Emerging: global health
0	Phase 3	0	Emerging: enteric
1	Commercial Stage	0	Emerging: bacterial

Vaccines Day 2023			
8	Preclinical	21	Respiratory
11	Phase 1	7	Latent
9	Phase 2	2	Emerging: global health
5	Phase 3	2	Emerging: enteric
1	Commercial Stage	2	Emerging: bacterial

Numbers represent development programs, except for commercial state for 2023. For 2023 commercial stage, COVID-19 vaccine and boosters represent five development programs for mRNA-1273, mRNA-1273.214 and mRNA-1273.222 across adult, adolescent and pediatric populations.

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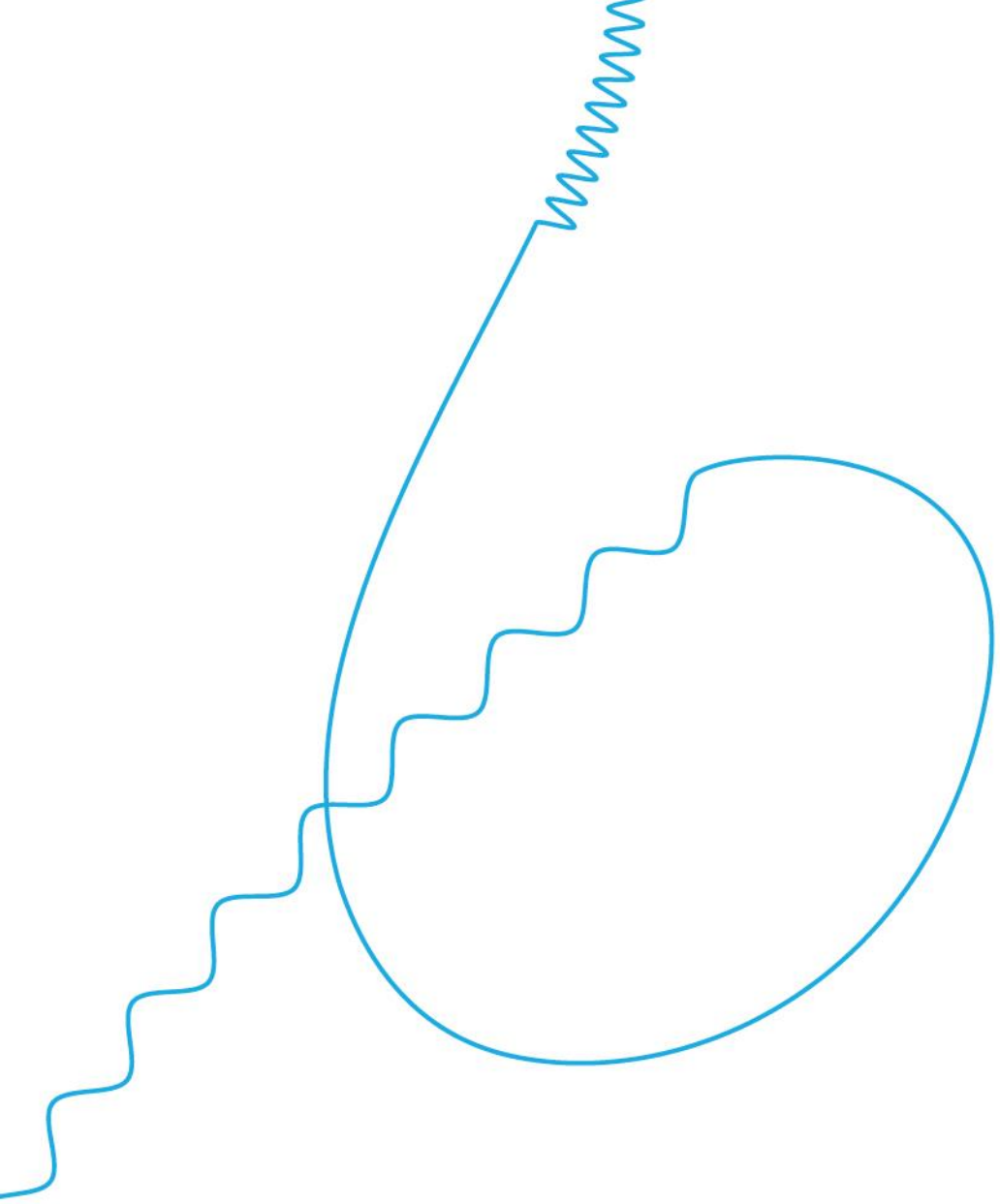
Vaccines Day Agenda

Introduction	**Stéphane Bancel**, *Chief Executive Officer*
Development strategy	**Stephen Hoge, M.D.**, *President*
Vaccines against respiratory viruses • **COVID-19** • **Influenza** • **RSV** • **Respiratory combination strategy**	**Jacqueline Miller, M.D.**, *SVP, Head of Development, Infectious Diseases* **Raffael Nachbagauer, M.D., Ph.D.,** *Executive Director, Influenza Portfolio Lead* **Christine Shaw, Ph.D.,** *VP, Portfolio Head Respiratory Vaccines, Infectious Disease Development*
Coffee Break	
Vaccines against latent viruses • **Overview of latent virus vaccine portfolio** • **HIV phase 1 interim data and next steps**	**Jacqueline Miller, M.D.**, *SVP, Head of Development, Infectious Diseases* **William Schief, Ph.D.,** *Professor, Immunology and Microbiology, Scripps. Executive Director, Vaccine Design, IAVI*
Enteric viruses and bacterial pathogens • **Norovirus (enteric)** • **Lyme disease (bacterial pathogens)**	**Jacqueline Miller, M.D.**, *SVP, Head of Development, Infectious Diseases*
Commercial opportunity in vaccines	**Arpa Garay,** *Chief Commercial Officer*
Financial strategy & outlook	**Jamey Mock,** *Chief Financial Officer*
Conclusion	**Stéphane Bancel**, *Chief Executive Officer*
General Q&A	**Stéphane Bancel, Jamey Mock, Stephen Hoge, Jacqueline Miller**



R&D Strategy Overview

Stephen Hoge, M.D.

President

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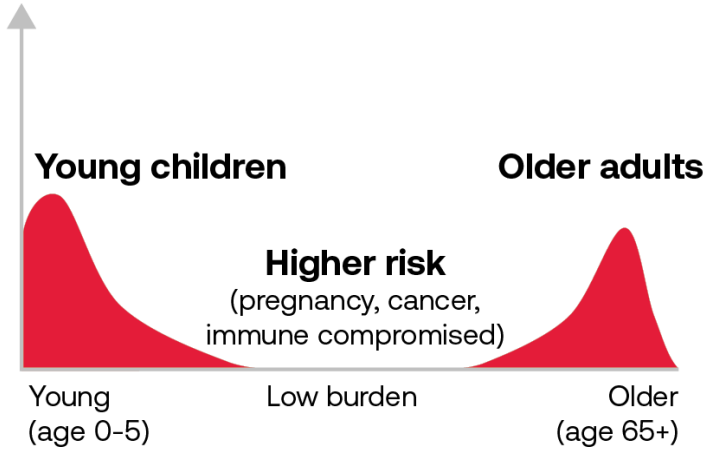
Our vaccine franchise leverages mRNA technology to address major health burdens

Respiratory

- Highest burden in the young, old and immunocompromised
- Respiratory infections are a top cause of death globally

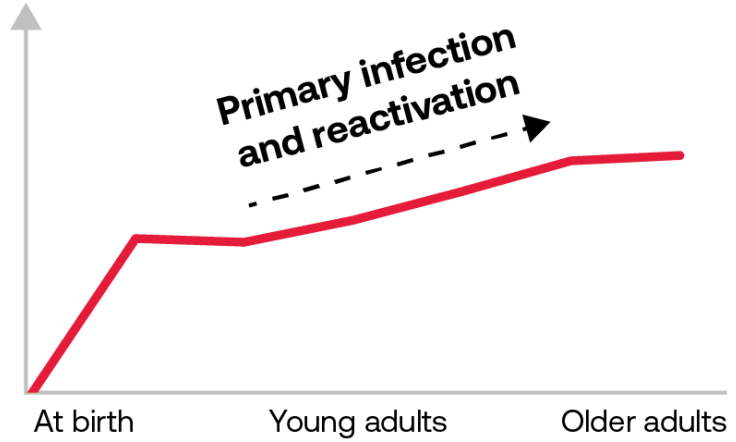
Burden of Respiratory Viruses *(illustrative)*



Latent

- Immediate impact of infection (e.g., birth defects, mono)
- Long-term sequelae from latent infections (cancer, autoimmune)

Percent of Population Infected *(illustrative)*



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Expanding our mRNA platform into areas of high unmet need

Current Vaccine Programs

- Respiratory
- Latent

Emerging Programs

Enteric viruses

Introducing norovirus vaccine candidates

Norovirus is the leading cause of diarrheal deaths globally

Bacterial pathogens

Introducing Lyme vaccine candidates

Lyme disease causes 4,500 hospitalizations per year in the US and creates a significant quality of life burden in the US and Europe

Global health threats

- Persistent global health threats (e.g., Malaria, Zika) among WHO/CEPI priority pathogens
- Pandemic preparedness

Sources: GBD 2016 Diarrhoeal Disease Collaborators. *Lancet Infect Dis* 2018 Nov;18(11):1211-1228. Banyai. Viral gastroenteritis. *Lancet* 2018; 392: 175–86.
Hall AJ et al. *Emerg Infect Dis.* 2013 Aug;19(8):1198-205. Wikswo ME. MMWR 2012;61(SS09):1-12, Hinckley et al. Zoonoses Public Health. 2020; 67: 407–415. https://doi.org/10.1111/zph.12699
https://academic.oup.com/ofid/article/9/11/ofac597/6809059

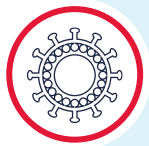
Today we are sharing clinical updates from select vaccine programs and introducing new development programs

Sharing data across multiple development programs

Next-generation COVID-19 vaccine
mRNA-1283 **PHASE 2**

Flu vaccine
mRNA-1010 **PHASE 3**

Next-generation flu vaccine
mRNA-1020/1030 **PHASE 1**



HIV vaccine
mRNA-1644 **PHASE 1**

Announcing new development programs

Norovirus
mRNA-1403 & mRNA-1405

Lyme disease
mRNA-1975 & mRNA-1982

Next-Gen COVID/flu combo
mRNA-1083

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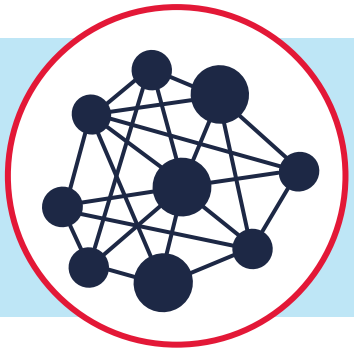
Advantages of our mRNA platform



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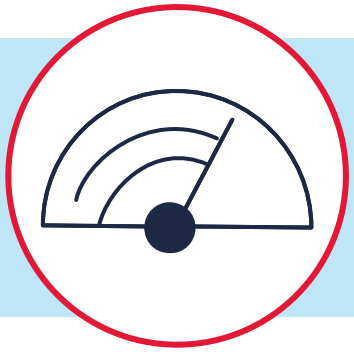

Speed

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Flexible manufacturing

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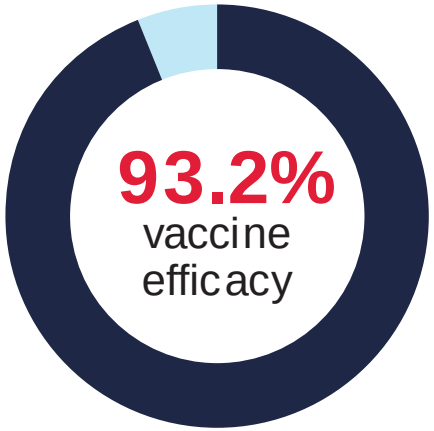
High biological fidelity creates the potential for high vaccine efficacy

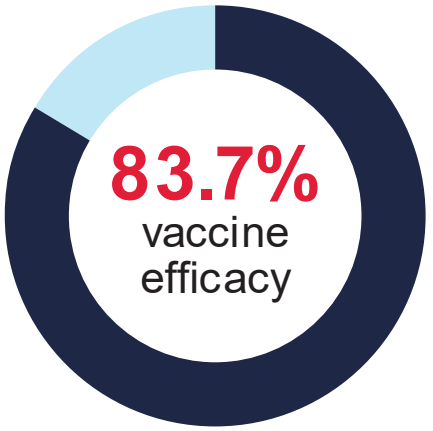
COVID-19
mRNA-1273

- Demonstrated mRNA-1273 is well-tolerated with 93.2% vaccine efficacy against the ancestral strain of SARS-CoV-2[1]



RSV
mRNA-1345

Study met its primary efficacy endpoints, including vaccine efficacy of 83.7% against RSV-LRTD[2] as defined by two or more symptoms[3]



1. https://www.fda.gov/media/155675/download
2. LRTD: Lower respiratory tract disease
3. https://investors.modernatx.com/news/news-details/2023/Moderna-Announces-mRNA-1345-an-Investigational-Respiratory-Syncytial-Virus-RSV-Vaccine-Has-Met-Primary-Efficacy-Endpoints-in-Phase-3-Trial-in-Older-Adults/default.aspx

We moved vaccines for 3 major respiratory pathogens from preclinical to Phase 3 data in record time

Program	ID	Vaccines Day 2021	Vaccines Day 2022	Vaccines Day 2023	Time from Ph.1 – Ph.3
COVID	mRNA-1273	Commercial	Commercial	**Commercial**	**<1 year**
	mRNA -1273.214	n/a	Preclinical	**Commercial**	**<1 year**
	mRNA-1273.222	n/a	n/a	**Commercial**	**<1 year**
Flu	mRNA-1010	Preclinical	Phase 2	**Phase 3 data**	**<2 years**
RSV	mRNA -1345	Phase 1	Phase 2	**Phase 3 data**	**2 years 4 months**

Vaccine development time industry average (Ph.1start-Ph.3 data)[1]

6-8 years

1. Represents statistics for non-oncology programs. See https://www.mckinsey.com/industries/life-sciences/our-insights/fast-forward-will-the-speed-of-covid-19-vaccine-development-reset-industry-norms

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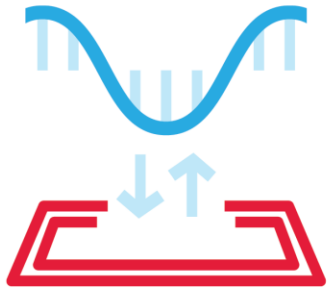
Ability to go from mRNA vaccines to mRNA therapeutics using platform approach

mRNA platform manufacturing



Norwood, MA

COVID booster
mRNA-1273.214 ⟶ Market

COVID booster
mRNA-1273.222 ⟶ Market

Vaccine & therapeutics portfolio ⟶ Clinical studies

Vaccine & therapeutics discovery ⟶ Preclinical

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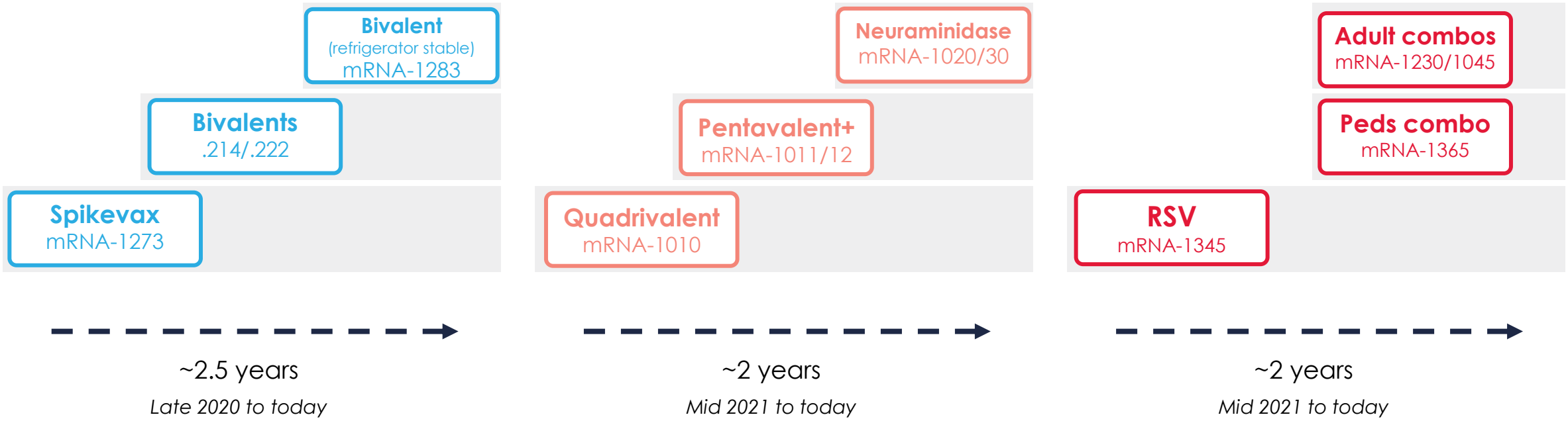
Our platform allows rapid cycles of innovation in our respiratory pipeline

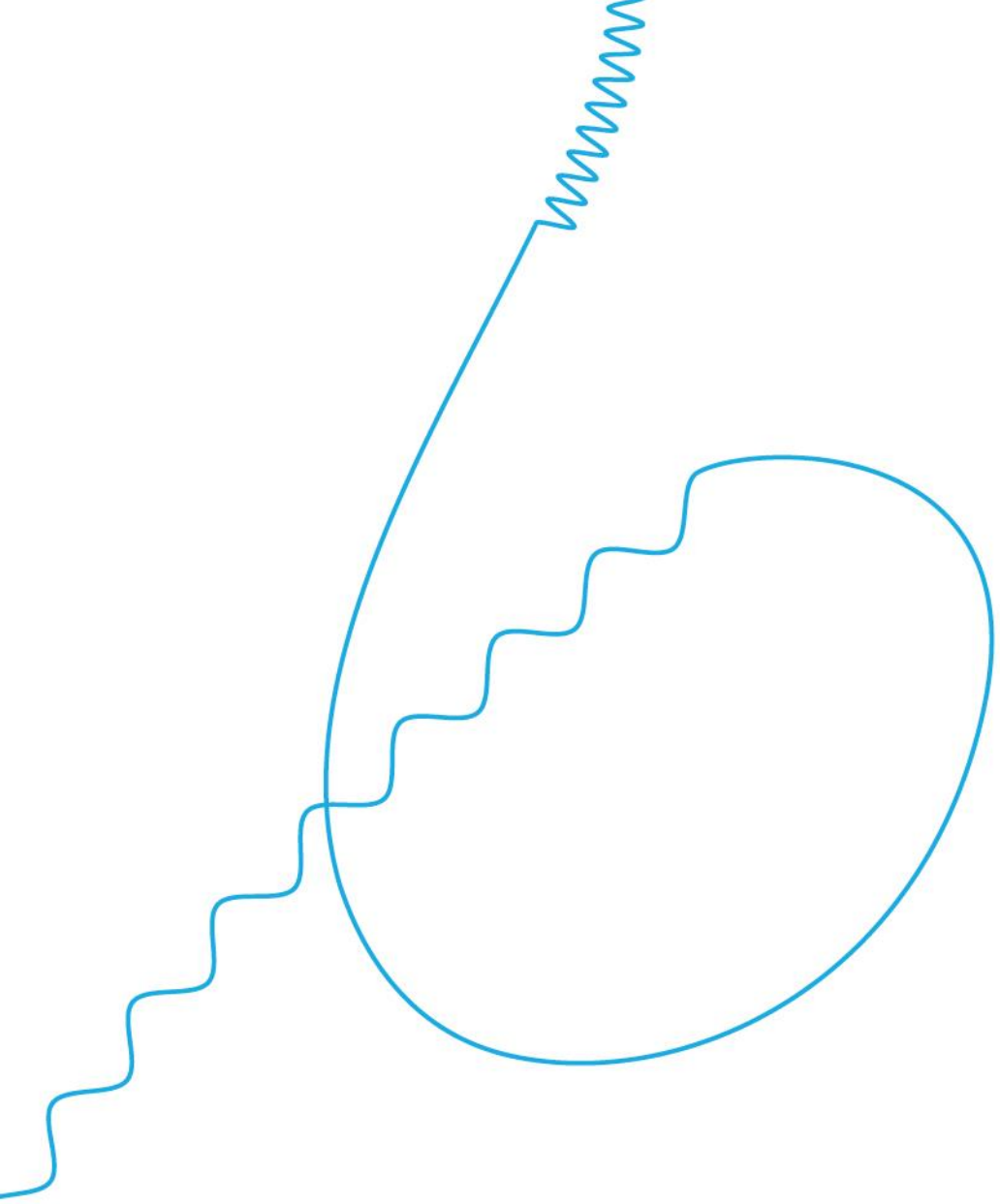
mRNA vaccine platform permits accelerated advances into our clinical pipeline

COVID: Rapid updates to meet an evolving threat and endemic market needs

Influenza: Rapid expansion of antigens to try to improve matching

RSV: Rapid advancement into multiple combinations





Moderna's Respiratory Portfolio

Jacqueline Miller, M.D.

Senior Vice President, Head of Development, Infectious Diseases, Moderna

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Respiratory vaccines pipeline overview

Approved and Phase 3 programs

PC | Ph. 1 | Ph. 2 | Ph. 3 | Comm.

COVID-19 (mRNA-1273.214/.222)

PC | Ph. 1 | Ph. 2 | Ph. 3 | Comm.

Older adults RSV (mRNA-1345)

PC | Ph. 1 | Ph. 2 | Ph. 3 | Comm.

Flu (mRNA-1010)

Next generation respiratory programs

PC | Ph. 1 | Ph. 2 | Ph. 3 | Comm.

COVID-19 variant boosters and next-generation booster (mRNA-1283)

PC | Ph. 1 | Ph. 2 | Ph. 3 | Comm.

Flu (mRNA-1011/1012)

PC | Ph. 1 | Ph. 2 | Ph. 3 | Comm.

Flu (mRNA-1020/1030)

Combination vaccine programs

PC | Ph. 1 | Ph. 2 | Ph. 3 | Comm.

COVID + flu (mRNA-1073)

PC | Ph. 1 | Ph. 2 | Ph. 3 | Comm.

COVID + flu (mRNA-1083)

PC | Ph. 1 | Ph. 2 | Ph. 3 | Comm.

COVID + flu + RSV (mRNA-1230)

PC | Ph. 1 | Ph. 2 | Ph. 3 | Comm.

RSV + Flu (mRNA-1045)

PC | Ph. 1 | Ph. 2 | Ph. 3 | Comm.

Pediatric hMPV + PIV3 (mRNA-1653)

PC | Ph. 1 | Ph. 2 | Ph. 3 | Comm.

Pediatric RSV + hMPV (mRNA-1365)

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Presenting new respiratory vaccine data today

COVID-19

mRNA-1283

Next-gen COVID-19 Phase 2 data

Flu

mRNA-1010

Immunogenicity and safety data from P301 & P302 studies

mRNA-1020/1030

Next-gen flu program Phase 1 data

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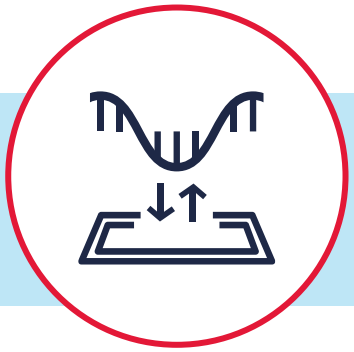
COVID-19 Update

Jacqueline Miller, M.D.

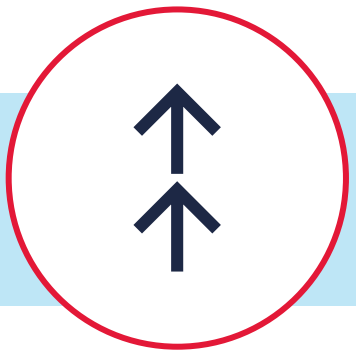
Senior Vice President, Head of Development, Infectious Diseases, Moderna

Moderna will continue to meet the needs of the evolving COVID-19 market

January 2023 VRBPAC (Vaccines and Related Biological Products Advisory Committee) agreed that the vaccine strain composition for primary and booster doses should be harmonized; the bivalent composition should be used for both



Moderna is well-positioned to serve the 2023/2024 fall vaccination campaign because of our ability to use our mRNA platform to **rapidly adapt to emerging strains**



Moderna's strain-matched bivalent vaccines have demonstrated durable higher immune responses against emerging variants and **a trend toward higher efficacy**

Our next-generation COVID-19 vaccine, mRNA-1283, was evaluated in a Phase 2 and has advanced to **Phase 3**

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VRBPAC meeting had positive implications for Moderna's COVID-19 franchise

At the January 2023 VRBPAC meeting, the committee **unanimously agreed to harmonize the primary series and booster dose** to the updated bivalent vaccine composition

VRBPAC considered proposals to have an annual COVID-19 vaccination schedule, much like the U.S. has for the flu, most likely with an updated vaccine designed to match whatever variant is predicted to be spreading

VRBPAC members suggested **more than one annual dose may be required** in vulnerable populations

An additional VRBPAC **meeting on strain selection is likely in May/June 2023**

Our mRNA platform has a demonstrated ability to rapidly pivot when new strains emerge, offering an advantage to produce variant-matched vaccines on a shorter timeline than older technologies

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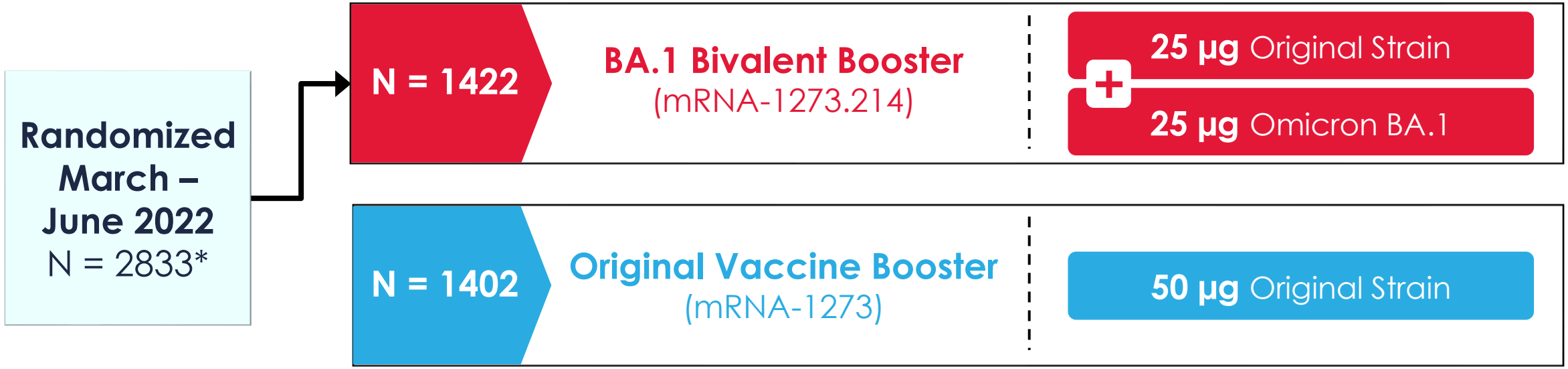
Phase 3 randomized, active-controlled study of Omicron BA.1 bivalent vs original mRNA-1273 boosters in individuals ≥16 years of age in the UK

Study 305, Part 2

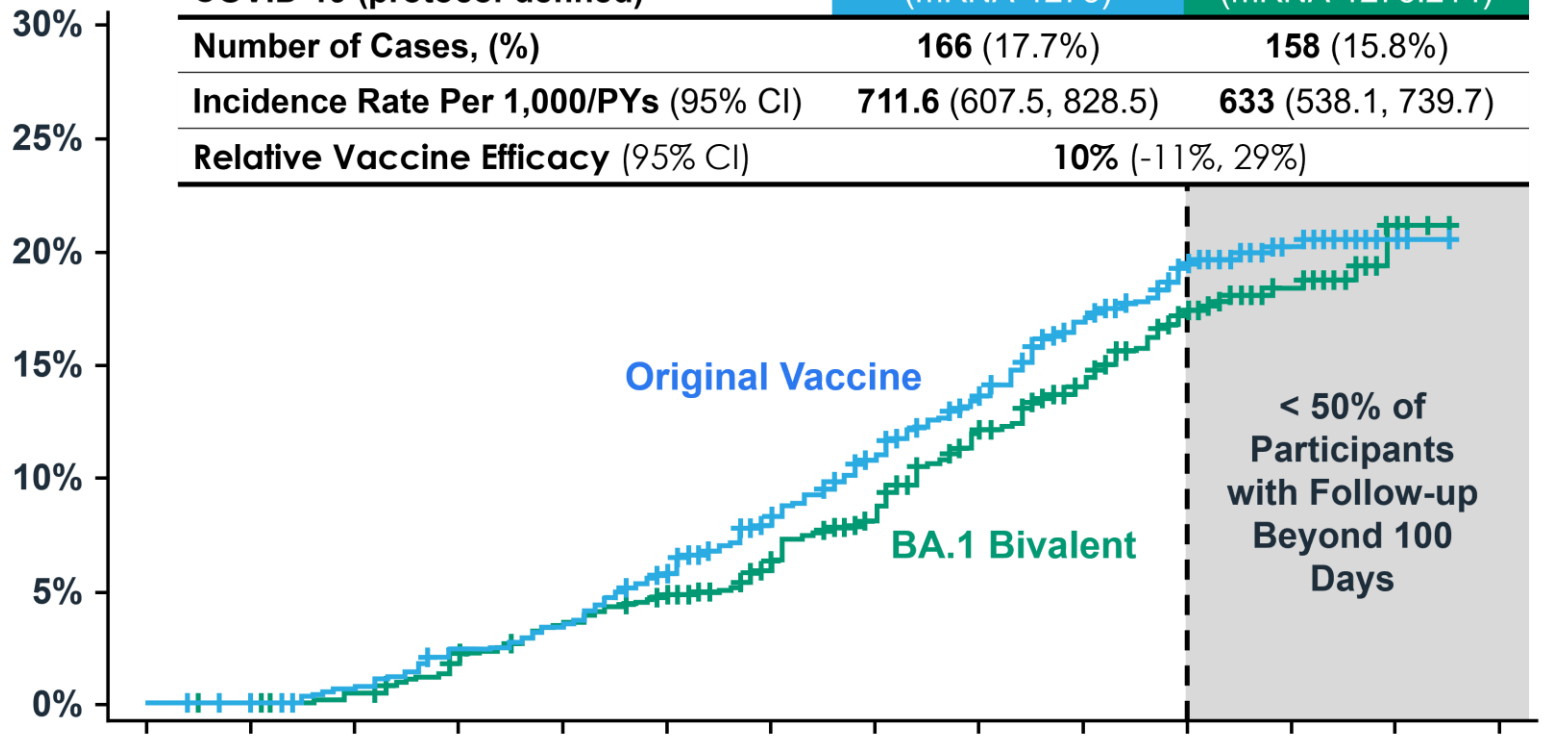


https://clinicaltrials.gov/ct2/show/NCT05249829
*9 individuals were randomized but did not receive a booster

Cumulative incidence curve of COVID-19 ≥14 days following receipt of Omicron BA.1 bivalent or original vaccine booster

Study 305, Part 2: Primary Case Definition – Per Protocol Set for Efficacy

COVID-19 (protocol-defined)	Original Vaccine (mRNA-1273)	BA.1 Bivalent (mRNA-1273.214)
Number of Cases, (%)	**166** (17.7%)	**158** (15.8%)
Incidence Rate Per 1,000/PYs (95% CI)	**711.6** (607.5, 828.5)	**633** (538.1, 739.7)
Relative Vaccine Efficacy (95% CI)	**10%** (-11%, 29%)	

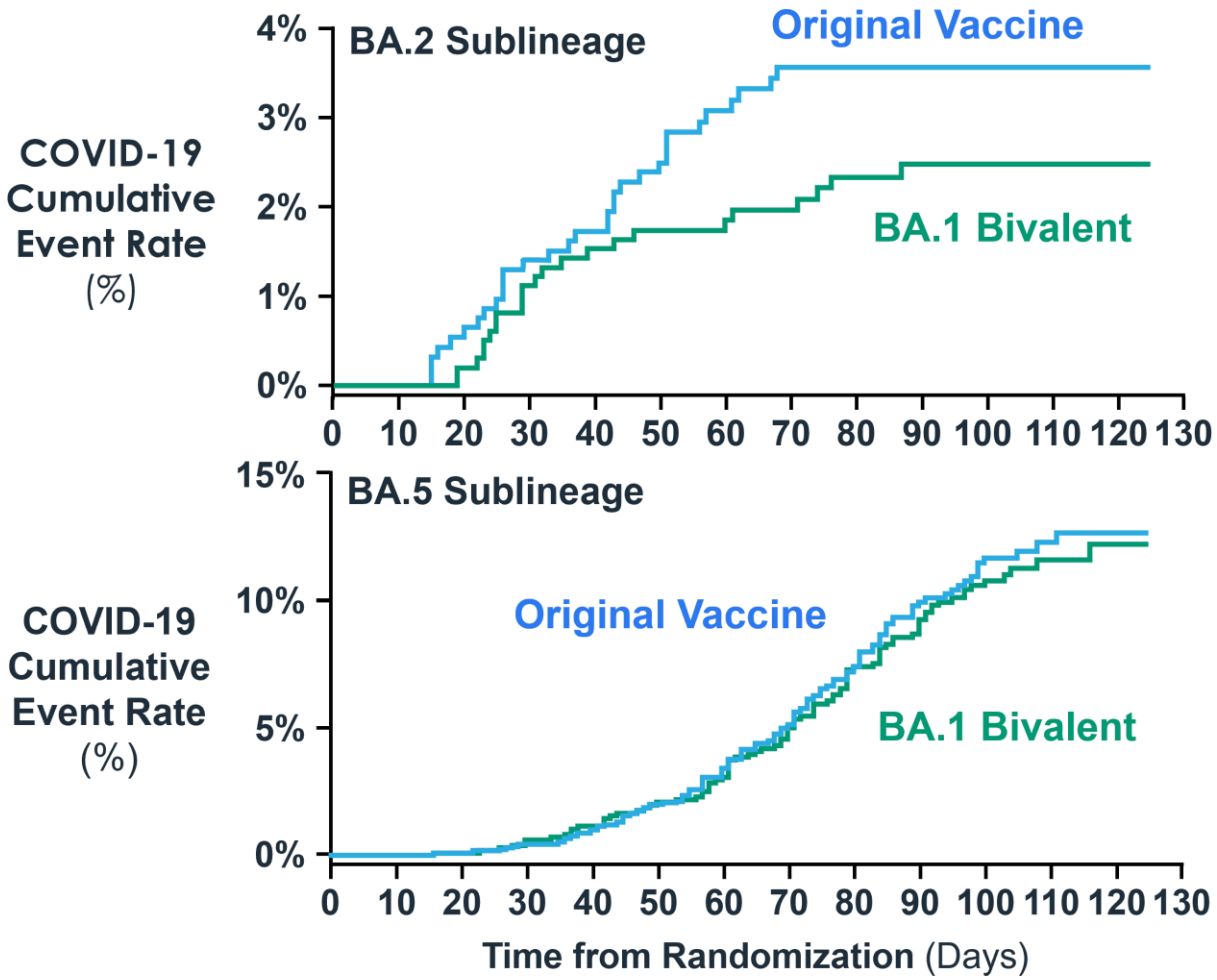


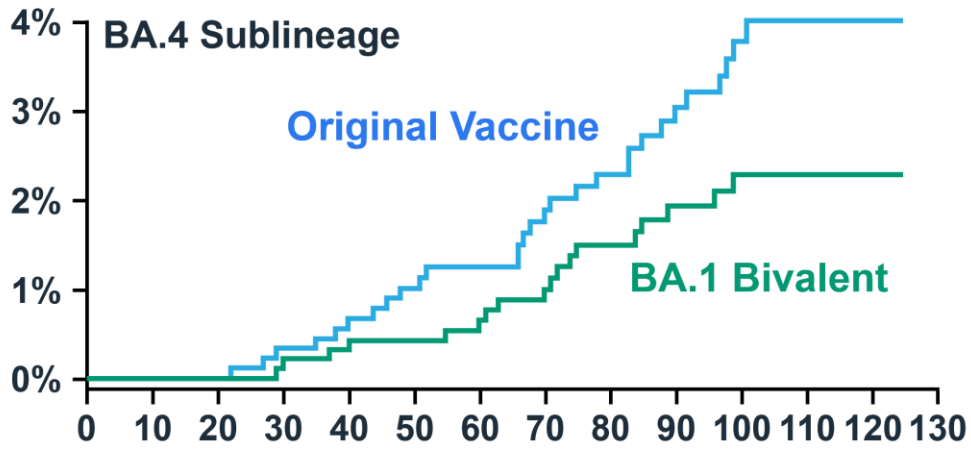
BA.1 Bivalent	997	994	980	964	945	921	870	827	754	654	488	234	30	0
Original Vaccine	937	931	919	902	893	863	806	758	701	601	452	229	27	0

https://www.medrxiv.org/content/10.1101/2023.01.24.23284869v1.full.pdf

Cumulative incidence curve of COVID-19 by Omicron sublineages following receipt of Omicron BA.1 bivalent or original booster

Study 305, Part 2: Primary Case Definition – Per Protocol Set for Efficacy – Exploratory Analysis





	Relative Vaccine Efficacy (95% CI)
Non-BA.5 Sublineage	**37.3%** (6.9, 57.8)
BA.5 Sublineage	**4.4%** (-27.2, 28.2)

https://www.medrxiv.org/content/10.1101/2023.01.24.23284869v1.full.pdf

Effectiveness of Moderna BA.4/BA.5 bivalent mRNA vaccine in immunocompetent individuals, Kaiser Permanente

Aug 31-Dec 31, 2022, Preliminary Analysis (157,435 BA.4/BA.5 boosted individuals / 314,837 controls)

COVID-19 outcomes	Relative VE (compared with individuals who had ≥2 original vaccine doses)	Absolute VE (compared with individuals not vaccinated with any COVID-19 vaccine)
Hospitalization (chart confirmed)*	**73%** (64%-80%)	**83%** (75%-88%)
Emergency department and urgent care	**56%** (50%-62%)	**57%** (47%-65%)

Bivalent BA.4/BA.5 booster provides additional protection against COVID-19 hospitalizations, emergency department, and urgent care visits

Results presented at US FDA VRBAC meeting: January 26th 2023 – URL: https://www.fda.gov/media/164810/download

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CDC surveillance data suggests additional protection against hospitalization provided by the strain-matched (BA.4/BA.5) booster in US adults

In December 2022, compared to adults ages 18 years and older who received an updated COVID-19 bivalent booster dose, monthly rates of COVID-19-associated hospitalizations were **16.0x Higher in Unvaccinated and 2.6 x Higher in Vaccinated Adults without an updated booster.***

Rates of COVID-19 associated hospitalizations

Unvaccinated Adults

21.5x higher
In ages 18-49 years

24.0x higher
in ages 50-64 years

12.8x higher
In ages 65 years and older

Vaccinated Adults but without an updated booster

2.9x higher
In ages 18-49 years

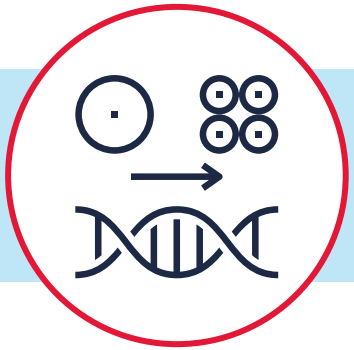
3.3x higher
in ages 50-64 years

2.5x higher
In ages 65 years and older

*Limitation: some of the improved effectiveness seen following bivalent boosting may be due to having received a bivalent booster more recently

https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covid-net/hospitalizations-by-vaccination-status-report.pdf

Summary of mRNA-1273.214/222 clinical data and real-world evidence supports the use of a strain-targeted vaccine



Randomized, controlled clinical evidence of **improved vaccine efficacy for strain-matched boosters** against emerging variants, when compared to ones targeting the original strain

Improved protection for both BA.1 and BA.4/5 targeting vaccines across multitude of public health concerns including hospitalizations and urgent care admissions

Recent real-world **evidence emphasizes the importance of seasonal boosting** and the additional efficacy provided by strain-matched vaccines

https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covid-net/hospitalizations-by-vaccination-status-report.pdf
https://www.medrxiv.org/content/10.1101/2023.01.24.23284869v1.full.pdf

Results presented at US FDA VRBAC meeting: January 26th 2023 – URL: https://www.fda.gov/media/164810/download

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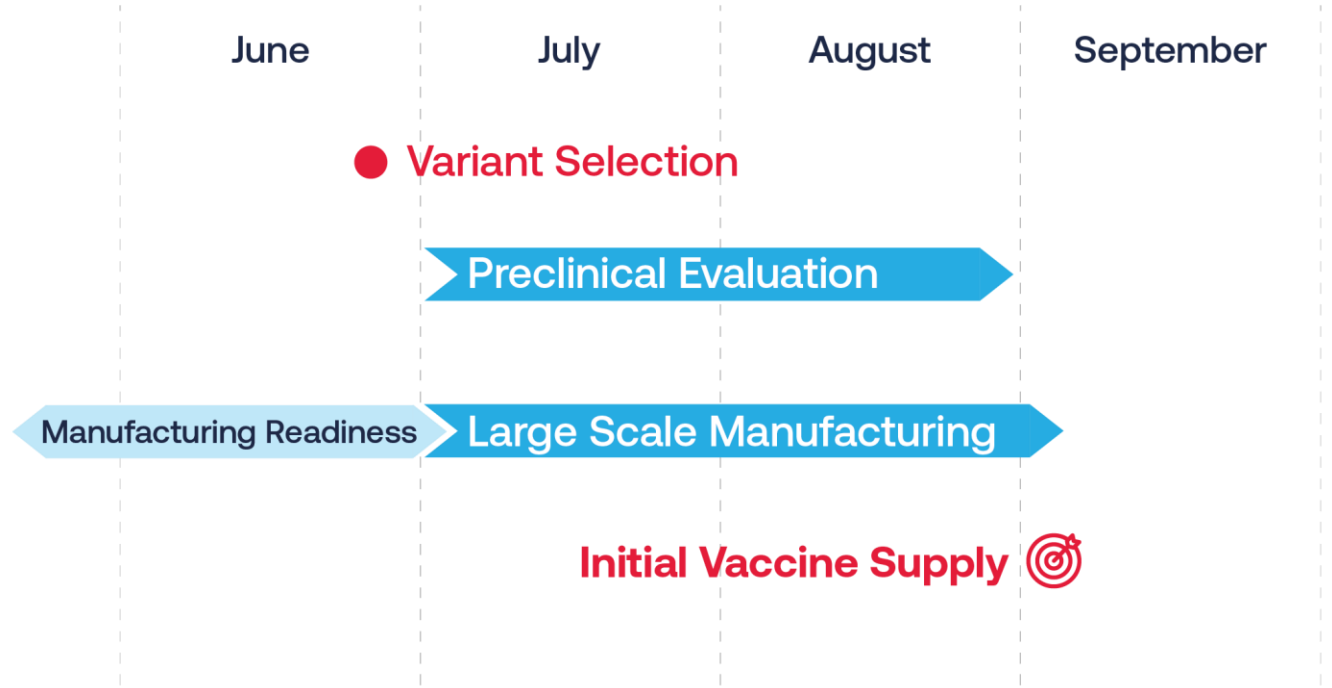
Our mRNA platform enables rapid adaptation to emerging strains

Our Omicron BA.4/5 (mRNA-1273.222) vaccine was manufactured and delivered approximately 2 months from strain selection

mRNA-1273.222 received emergency use authorization in the US as a booster dose for all age groups from 5 months of age

Our platform is well positioned to meet the proposed VRBPAC timeline, from a June strain selection to commercial readiness for the proceeding Fall season (Sept 2023)



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Moderna's variant library enables rapid vaccine updates

Variant library continuously updated based on global surveillance and risk assessment

Library will expand as the virus evolves and variant waves occur globally or in specific geographical regions

Select variants of concern under monitoring*		
BN.1	BQ.1.1	XBB.1
BA.2.2.20	BA.2.72.2	CH.1.1

Preclinical assessment completed on multiple novel strain-matched candidates ahead of fall season regulatory guidance

Further epidemiological monitoring and preclinical vaccine testing enable selection of specific variant vaccines from the library for at-risk small scale manufacturing lot preparation

*Internal monitoring, non exhaustive list of variants

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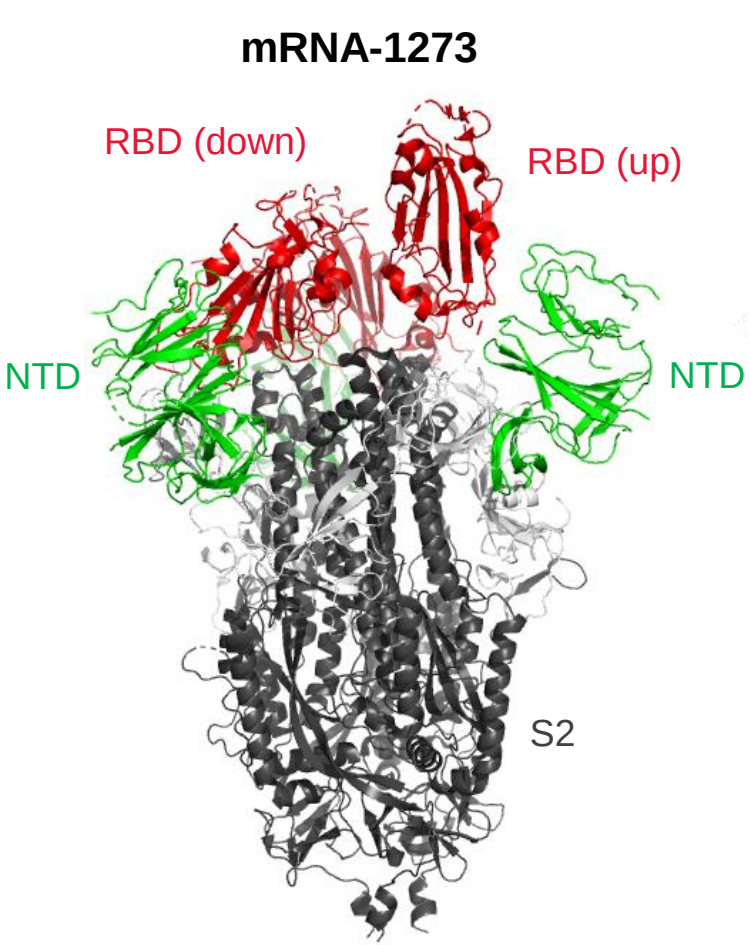
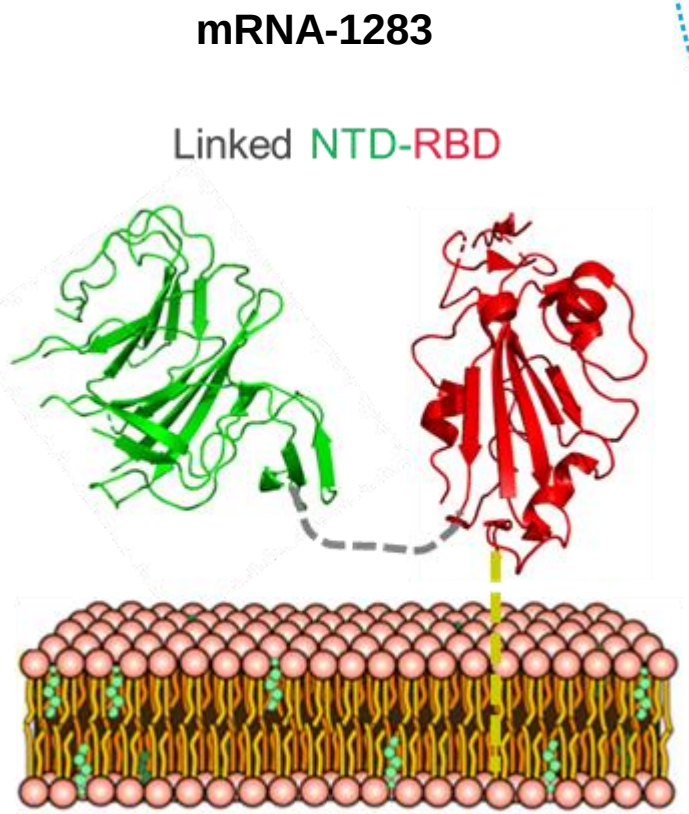
Our next generation COVID-19 vaccine mRNA-1283 is a significant leap forward in our respiratory vaccine strategy

mRNA-1283 encodes specifically for the Receptor Binding Doman (RBD) and N-Terminal Domain (NTD) of the spike protein

Enables combination vaccines and enhance overall respiratory portfolio

Offers a more competitive standalone COVID-19 vaccine, driven by refrigerator-stable pre-filled syringes (PFS)





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mRNA-1283-P201 Phase 2a booster vaccine candidate study

mRNA-1283-P201 is a dose-ranging Phase 2a booster study evaluating the safety and immunogenicity of mRNA-1283, mRNA-1283.211 (part A) and mRNA-1283.529 (part B)

Part A is a randomized, observer-blind study with a mRNA-1273 50 ug comparator; participants received mRNA-1283 or mRNA-1283.211 as a **first booster dose**

Part B is an open-label study; participants received mRNA-1283.529 as a **second booster dose**

Part A enrolled Dec 2021 – Feb 2022, part B enrolled Feb-Mar 2022. The following slides show reactogenicity and immunogenicity results through Day 91 from part A.

Phase 2a study

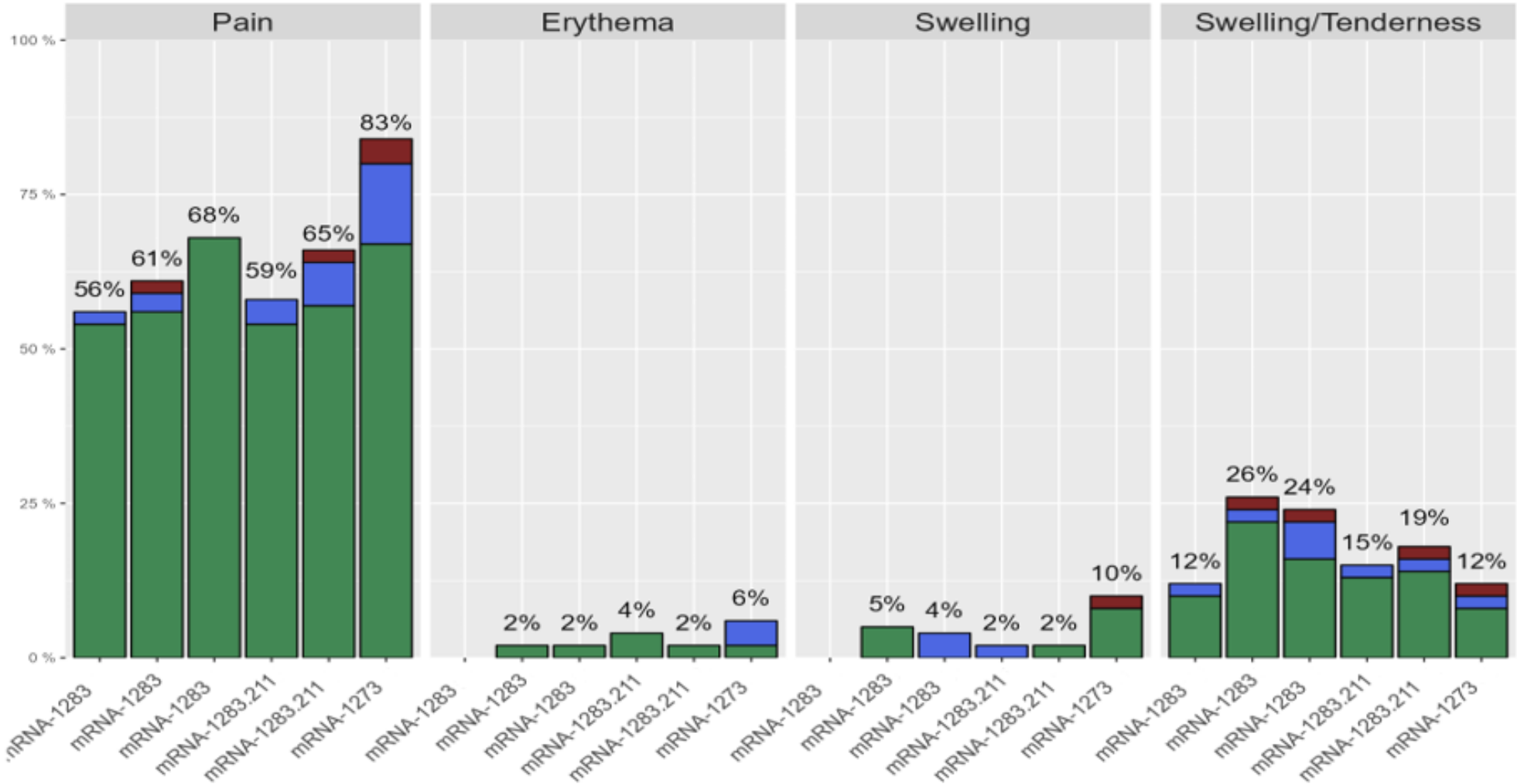
***Part A**: Booster dose after mRNA-1273 primary series (100 µg) >6 months*

- **Cohort 1** (dose level 1) N=58
- **Cohort 2** (dose level 2) N=65
- **Cohort 3** (dose level 3) N=56
- **Cohort 4** (dose level 1) N=53
- **Cohort 5** (dose level 2) N=54
- **Cohort 6** (mRNA-1273 50 µg comparator) N=57

***Part B**: Booster dose after mRNA-1273 primary series (100 µg) and mRNA-1273 booster dose (50 µg) >3 months*

- **Cohort 7** (dose level 1) N =103
- **Cohort 8** (dose level 2) N = 97

Phase 2 part A: The local reactogenicity profile of mRNA-1283 and mRNA-1283.211 was similar to mRNA-1273



In all participants regardless of prior infection

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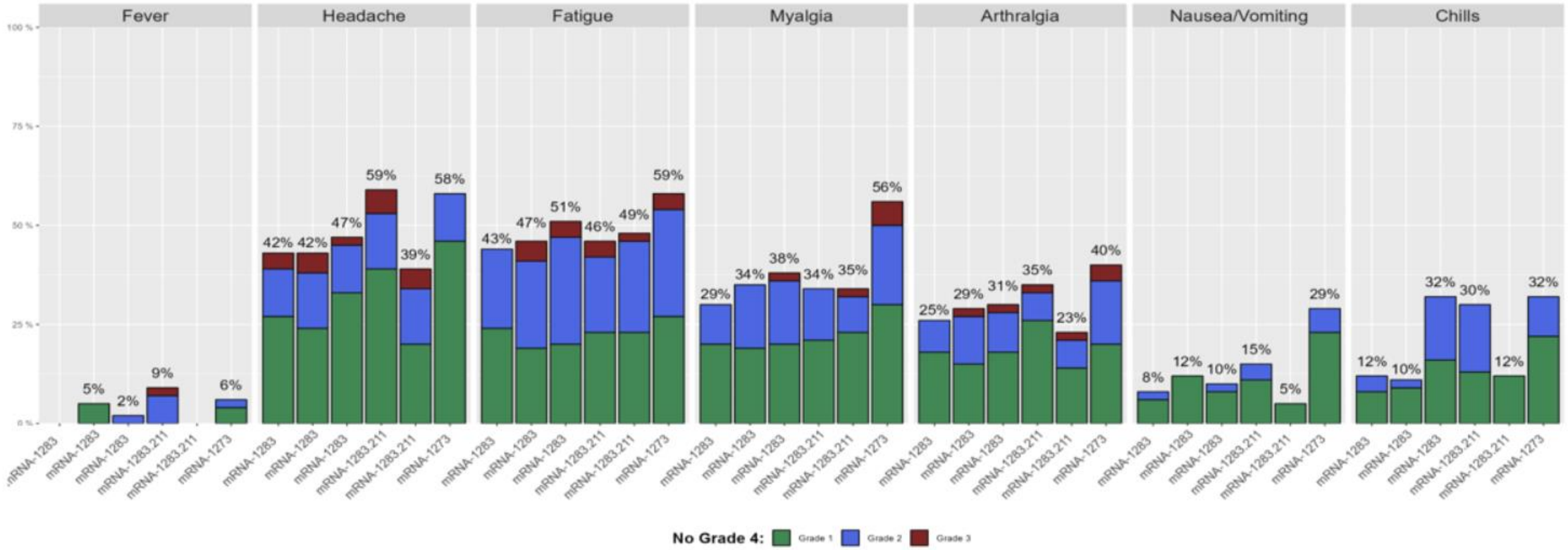
Phase 2 part A: The systemic reactogenicity profile of mRNA-1283 and mRNA-1283.211 was similar to mRNA-1273



In all participants regardless of prior infection

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mRNA-1283 and mRNA-1283.211 elicited numerically similar or higher neutralizing antibody responses against the ancestral SARS-CoV-2 D614G through Day 91

	mRNA-1283 *(dose level 1), N=30*	**mRNA-1283** *(dose level 2), N=38*	**mRNA-1283** *(dose level 3), N=30*	**mRNA-1283.211** *(dose level 1), N=22*	**mRNA-1283.211** *(dose level 2), N=22*	**mRNA-1273** *(50 µg) N=23*
Pre-booster GMT, 95% CI	178.3 (107.2,296.6)	165.4 (114.4, 239.2)	173.0 (102.6, 291.8)	197.1 (119.1, 326.2)	168.6 (74.5, 381.3)	161.7 (93.9, 278.5)
Day 29 GMT, 95% CI	4351.3 (3103.7,6970.8)	5666.5 (4149.3, 7738.4)	7301.3 (5253.5,10147.2)	4994.2 (2909.6, 8572.6)	4729.8 (2572.4, 8696.3)	3549.8 (2592.3, 4860.8)
Day 91 GMT, 95% CI	3935.7 (2391.8,6476.0)	4589.2 (3285.9,6409.4)	6216.8 (4210.6,9178.8)	4691.1 (2911.9,7557.5)	4319.8 (2758.9,6763.7)	2911.8 (1734.7,4887.8)

Participants without serological evidence of previous SARS-CoV-2 infection

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mRNA-1283 and mRNA-1283.211 elicited numerically similar or higher neutralizing antibody responses against Beta through Day 91

	mRNA-1283 *(dose level 1), N=30*	**mRNA-1283** *(dose level 2), N=38*	**mRNA-1283** *(dose level 3), N=30*	**mRNA-1283.211** *(dose level 1), N=22*	**mRNA-1283.211** *(dose level 2), N=22*	**mRNA-1273** *(50 µg) N=23*
Pre-booster GMT, 95% CI	33.5 (20.1,55.7)	36.1 (25.9, 50.3)	40.1 (24.1, 66.8)	41.6 (21.2, 81.7)	29.3 (14.2, 60.4)	30.3 (17.7, 51.8)
Day 29 GMT, 95% CI	911.8 (583.6,1424.4)	1216.2 (838.9,1763.3)	1799.4 (1214.3, 2666.3)	1603.3 (939.9, 2734.8)	1224.8 (660.6, 2271.0)	895.3 (630.3,1271.9)
Day 91 GMT, 95% CI	764.1 (438.1,1332.9)	965.6 (631.0,1477.7)	1360.9 (926.2,1999.8)	1108.3 (592.5,2073.2)	990.5 (591.0,1660.0)	596.4 (350.2,1015.6)

Participants without serological evidence of previous SARS-CoV-2 infection

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mRNA-1283 Phase 2 interim results summary

mRNA-1283 elicited **a potent anti-SARS-CoV-2 neutralizing antibody response comparable to 50 µg mRNA-1273** using lower dose levels.

- Antibody persistence through day 91 observed

Reactogenicity profile is consistent with the approved mRNA-1273 vaccine

- The frequency of local and systemic solicited adverse reactions with mRNA-1283 was overall comparable to mRNA-1273 50 µg

Based on these results we initiated a Phase 3 randomized, observer-blind, active-controlled safety, immunogenicity and relative vaccine efficacy study

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Initiating a Phase 3 study with mRNA-1283.222: Safety, immunogenicity and relative vaccine efficacy in adolescents and adults

Randomized, observer-blind, active-controlled

Booster Vaccine	N	Planned Follow-up
mRNA-1283.222	~3,250 to 4,250	12-months
mRNA-1273.222 50 µg	~3,250 to 4,250	12-months

- **1:1 randomization, 1283.222 and 1273.222 50 µg in 12 yo+**
- Booster dose after mRNA immunization (Moderna or Pfizer) >3 mo interval

Primary objectives

Evaluation of safety and reactogenicity of mRNA-1283 bivalent

Demonstration of non-inferior immunogenicity of mRNA-1283 bivalent vs. mRNA-1273 bivalent 50 µg

Key secondary objective

Demonstration of non-inferior vaccine efficacy of mRNA-1283 bivalent vs. mRNA-1273 bivalent 50 µg

First participants dosed in Phase 3 study in April 2023

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COVID-19 vaccines summary and next steps

Proven effectiveness

Clinical data and real-world evidence from our bivalent COVID-19 vaccines have demonstrated effectiveness with a strain-matched vaccine

Leveraging the platform to create updated vaccines to address new variants

Strategy and systems are in place to rapidly respond to strain selection by FDA and global health authorities for Fall 2023 market

- Epidemiological surveillance
- Proactive CMC activities
- Preclinical evaluation of vaccine candidates

All of these enable manufacturing readiness when strain is selected

Developing next-gen vaccines to meet customer needs

Phase 3 for next-generation vaccine, mRNA-1283, has initiated enrollment

- Has demonstrated encouraging safety and immunogenicity in earlier clinical studies
- Offers a more competitive COVID-19 vaccine product, driven by refrigerator-stable presentations, including pre-filled syringes
- Can enable combination vaccines to enhance overall respiratory portfolio

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Influenza Update

Raffael Nachbagauer, M.D., Ph.D.

Influenza Portfolio Lead, Infectious Diseases, Moderna

mRNA-1010 Phase 2 data indicated superior influenza A and non-inferior influenza B responses to a licensed flu vaccine

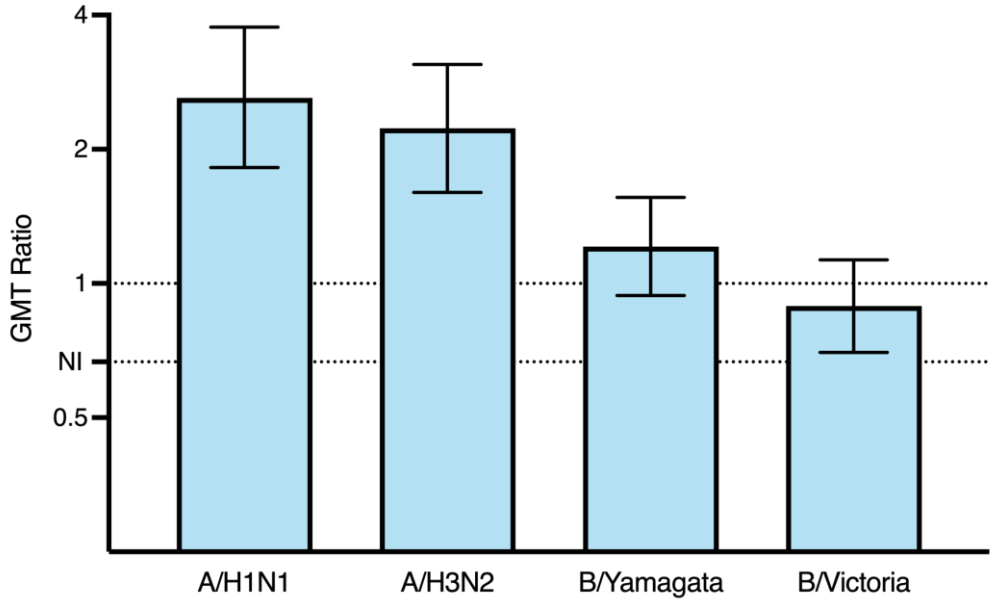
Study conducted in the US during the 2021/22 NH influenza season

Immunogenicity data at D29 was consistent with a potential for superiority to standard dose vaccine for **influenza A strains** (which drive majority of disease in adults)

The data was consistent with potential for non-inferiority to standard dose vaccine in **influenza B strains**

GMTrs were consistent across ages, including the older adult population

Ph2 geometric mean titer ratio over standard dose comparator (50 µg; 18 years and older)



Data supported evaluation of 50 µg dose of mRNA-1010 in Phase 3

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mRNA-1010 Phase 3 studies were initiated following encouraging Phase 2 safety and immunogenicity data

Interim Phase 3 immunogenicity & safety trial (P301) data previously announced

- 6,102 adults (18+) in the Southern Hemisphere
- mRNA-1010 demonstrated an acceptable safety and tolerability profile; independent Data and Safety Monitoring Board (DSMB) raised no safety concerns
- Trial met all its endpoints for influenza A strains, including superiority for H3N2
- Trial did not meet non-inferiority on influenza B strains

Interim Phase 3 vaccine efficacy trial (P302)

- 22,508 older adults (50+) in the Northern Hemisphere
- Primary endpoints are evaluation of safety of mRNA-1010 and relative vaccine efficacy (rVE) of mRNA-1010 compared to an active comparator
- Secondary endpoints include immunogenicity of mRNA-1010 compared to an active comparator
- Not enough cases were accrued at time of interim analysis to declare early study success
- DSMB did not identify safety concerns at interim analysis

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Safety observations from mRNA-1010 program

Safety

Phase 2 study mRNA-1010

No serious adverse events related to the study vaccine or pause rules were observed through Day 29

- The most common solicited systemic ARs were myalgia, headache and fatigue
- The most common solicited local ARs were pain and axillary swelling/tenderness

Phase 3 P301 study

mRNA-1010 demonstrated an acceptable safety and tolerability profile; independent DSMB raised no safety concerns

Phase 3 P302 study

DSMB reviewed interim safety; **No safety concerns were identified**

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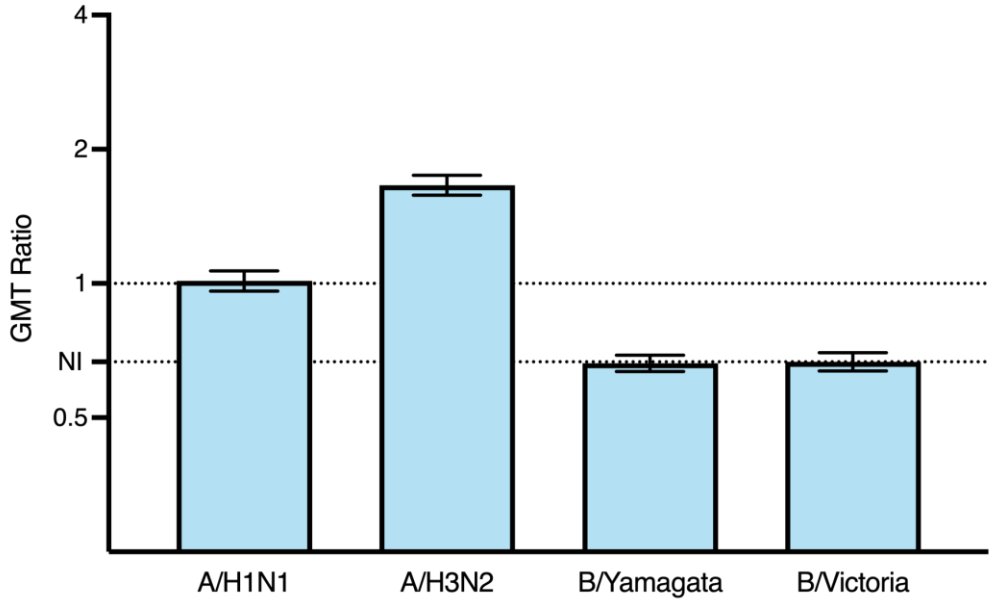
P301 results were not in line with expectations following Phase 2

Conducted in Southern Hemisphere (SH) countries (Australia, Argentina, Colombia, Panama and Philippines) during the 2022 SH influenza season

Demonstrated superiority on geometric mean titer ratios for A/H3N2, and non-inferiority on geometric mean titer ratios for A/H1N1

Non-inferiority was not met for the influenza B/Victoria- and B/Yamagata-lineage strains

P301 geometric mean titer ratio over standard dose comparator (50 µg; 18 years and older)



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Comparing Phase 2 and Phase 3 studies

	Phase 2	P301
mRNA-1010 dose	50 µg	50 µg
GMTr A	Potential for superiority	Superior for H3N2
GMTr B	Potential for NI	Did not meet NI
Study location	Northern Hemisphere	Southern Hemisphere

Key differences between studies

- Phase 2 was exclusively conducted in the US, while P301 enrolled in SH countries with strongest enrollment from Argentina, Philippines and Colombia
- Compared to the US where influenza vaccines are broadly recommended, **97.6% of participants in P301 had not received an influenza vaccine in the year prior to study conduct**
- Differences in prior immunization history may have led to inconsistent immunogenicity results between Phase 2 and P301

Differences in immunization history of study populations may have contributed to differences in responses observed

Repeated annual influenza vaccination and vaccine effectiveness: review of evidence

Edward A. Belongia[a], Danuta M. Skowronski[b], Huong Q. McLean[a], Catharine Chambers[b], Maria E. Sundaram[c] and Gaston De Serres[d,e]

[a]Center for Clinical Epidemiology & Population Health, Marshfield Clinic Research Institute, Marshfield, WI, USA; [b]Communicable Disease Prevention and Control Services, British Columbia Centre for Disease Control, Vancouver, BC, Canada; [c]University of Minnesota School of Public Health, Minneapolis, MN, USA; [d]Institut National de Sante Publique du Quebec [National Institute of Health of Quebec], Quebec, Canada; [e]Department of Social and Preventive Medicine, Laval University, Quebec, Canada

Several studies since the 2009 pandemic have assessed the impact of repeated vaccination on adaptive immune response. Although earlier studies have shown that **prior vaccinees are less likely to seroconvert after vaccine receipt than first-time vaccinees**, the more **recent studies demonstrate that repeated vaccination can blunt the antibody response to hemagglutinin even after adjusting for prevaccination titer**

Repeat vaccination reduces antibody affinity maturation across different influenza vaccine platforms in humans

Surender Khurana[1], Megan Hahn[1], Elizabeth M. Coyle[1], Lisa R. King[1], Tsai-Lien Lin[2], John Treanor[3], Andrea Sant[3] & Hana Golding[1]

This study identifies an important impact of repeat vaccination on antibody-affinity maturation following vaccination, which may contribute to lower vaccine effectiveness of seasonal influenza vaccines in humans

Perspective

Immunizing the Immune: Can We Overcome Influenza's Most Formidable Challenge?

Ali H. Ellebedy

Division of Immunobiology, Department of Pathology and Immunology, Washington University School of Medicine, 660 S. Euclid Avenue, St. Louis, MO 63110, USA; ellebedy@wustl.edu

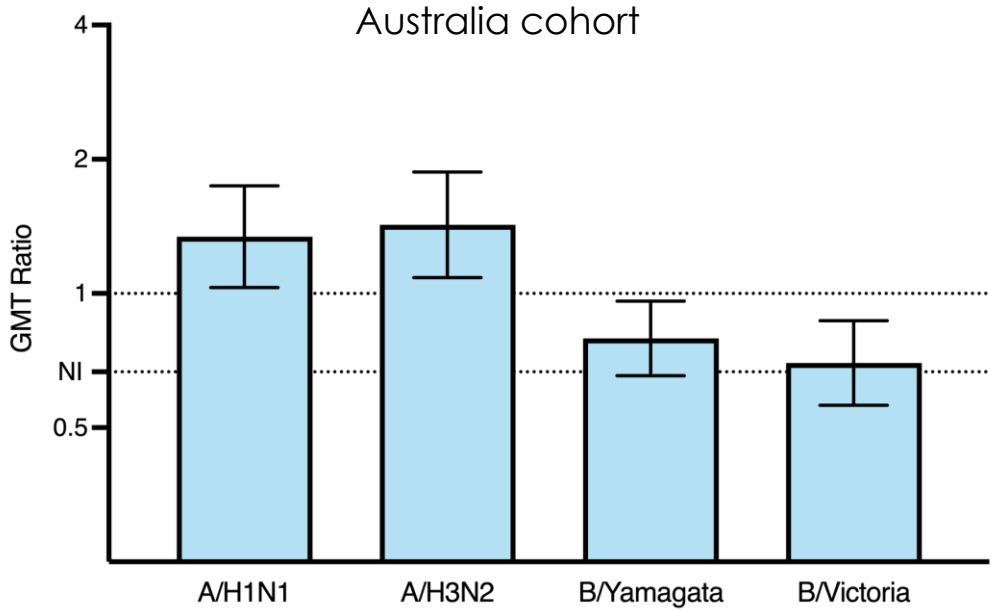
As the influenza virus changes its major antigenic determinants, it creates new ones in the process. Our immune system adapts by targeting the new determinants. However, **pre-existing antibodies and memory B cells interfere with the generation of de novo responses against these newly formed epitopes, rendering vaccines less effective**. Overcoming such interference is essential for the development of more effective influenza vaccines.

P301 immunogenicity data from Australian cohort more closely resembled Phase 2 results than the overall study population

Approximately 200 Australian participants were enrolled in P301

Australian influenza vaccination recommendations are similarly broad as recommendations in the United States, **increasing the likelihood of participants having received influenza vaccines in past**

P301 geometric mean titer ratio over standard dose comparator (50 µg; 18 years and older)



Preliminary immunogenicity data from Phase 3 efficacy trial (P302) confirms Phase 2 data

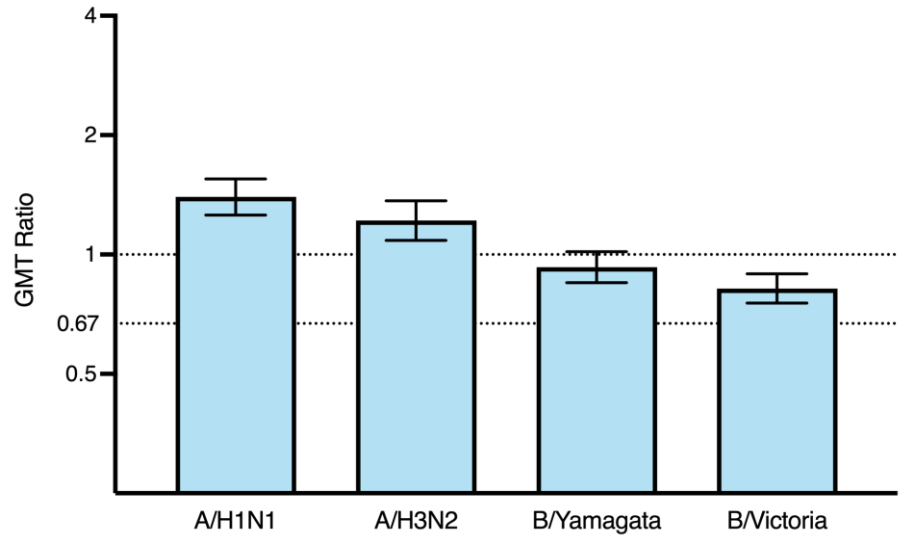
P302 interim analysis did not accrue sufficient cases to declare early success and the independent DSMB recommended continuation of the efficacy follow-up

Samples of approximately 900 study participants from the US were collected for immunogenicity analysis

The lower bound of the 95% CIs exceeded 0.667 for all 4 strains, further exceeding a value of 1 for both influenza A/H1N1 and A/H3N2

Given that primary intent of P302 is demonstration of efficacy, **success criteria for immunogenicity endpoints were not pre-specified**

P302 geometric mean titer ratio over standard dose comparator (50 µg; 50 years and older)



Study will follow participants until the end of season according to the protocol

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mRNA-1010 Phase 3 P303 study overview

P303 will test the immunogenicity of an updated formulation of mRNA-1010 that is expected to lead to improved immune responses against influenza B strains and is intended to enable licensure of mRNA-1010 through accelerated approval

Design
Randomized, observer-blind, active-controlled study

Number of participants
2,400 medically stable adults ≥ 18 years old

Vaccination schedule
Randomization 1:1 to mRNA-1010 or active comparator

Duration: 6 months
Enrollment period: April –June 2023

Study participants will be followed up for 6 months after study injection

Site location
Northern Hemisphere (United States)

Total N = 2,400, Randomization Ratio = 1:1

mRNA-1010 (50 µg)
N=1200

Active comparator
N=1200

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Observations from mRNA-1010 program

1. **mRNA-1010 has demonstrated an acceptable safety and tolerability profile** shown in Phase 1 through Phase 3 studies

2. **Phase 1/2 studies** indicated potential for superiority for influenza A strains, and non-inferiority for influenza B strains and supported evaluation of 50µg dose of mRNA-1010 in Phase 3 studies

3. **Phase 3 (P301 Southern Hemisphere)** immunogenicity study met all of its endpoints for influenza A strains, including superiority for H3N2, and did not meet non-inferiority for influenza B strains

4. **Phase 3 (P302 Northern Hemisphere) efficacy did not accrue sufficient cases to declare early success** and the independent data and safety monitoring board recommended continuation of the efficacy follow-up

5. **Phase 3 (P302 Northern Hemisphere) study success criteria for immunogenicity endpoints were not pre-specified,** however, the lower bound of the 95% CIs exceeded 0.667 for all 4 strains, showing a trend in line with Phase 2 immunogenicity results

6. **Phase 3 (P303) will test the immunogenicity of an updated formulation of mRNA-1010** that is expected to lead to improved immune responses against influenza B strains and is **intended to enable licensure of mRNA-1010 through accelerated approval**

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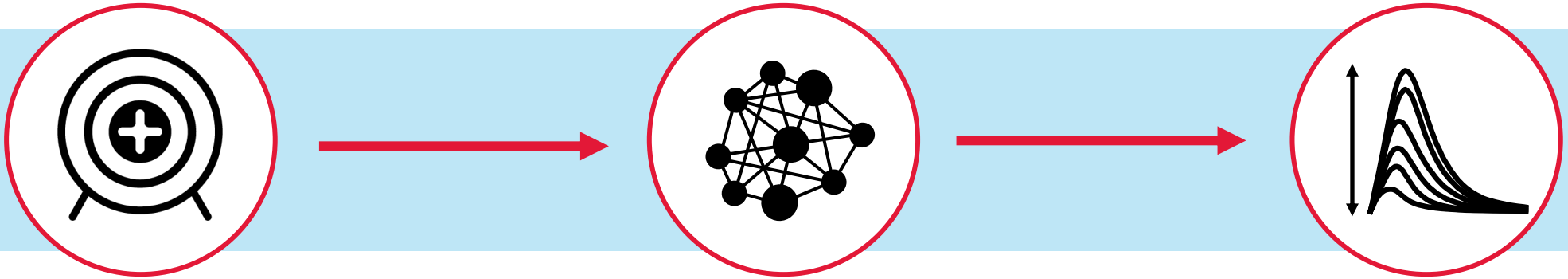
mRNA-1010 will be the foundation of a continuously improving influenza vaccine portfolio



Seasonal quadrivalent flu vaccine
(mRNA-1010)

- Using WHO recommended strains
- First generation vaccine using established licensure pathway

Broader antigen flu vaccines
(mRNA-1020/1030)

- Adding Neuraminidase (NA) antigens
- Improve immunity by targeting more conserved antigens

Beyond quadrivalent flu vaccines
(mRNA-1011/1012)

- Adding Hemagglutinin (HA) antigens (e.g. H3N2, H1N1) to expand strain matching
- Provide an enhanced antigen selection opportunity to public health authorities; potential for regional variation

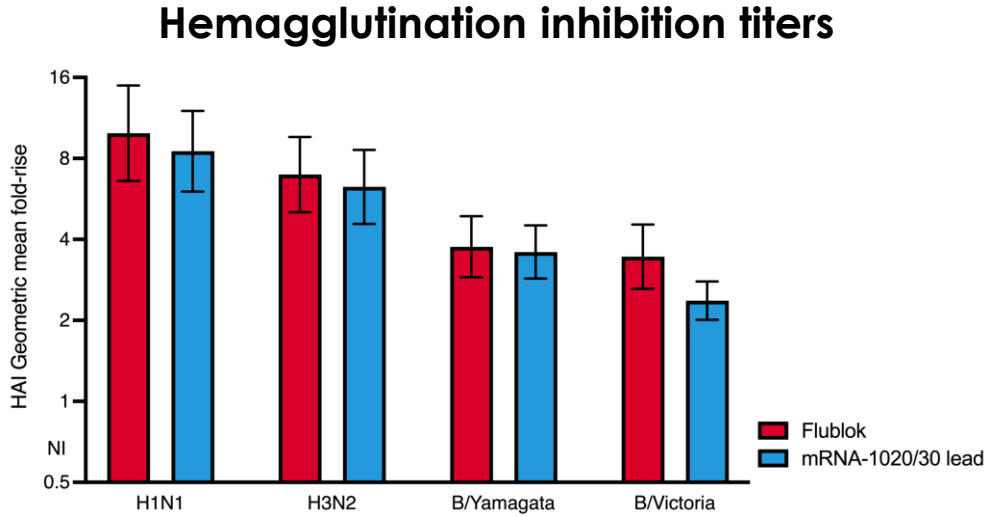
mRNA-1020/1030 P101 study results demonstrate that mRNA vaccines can elicit responses against neuraminidase

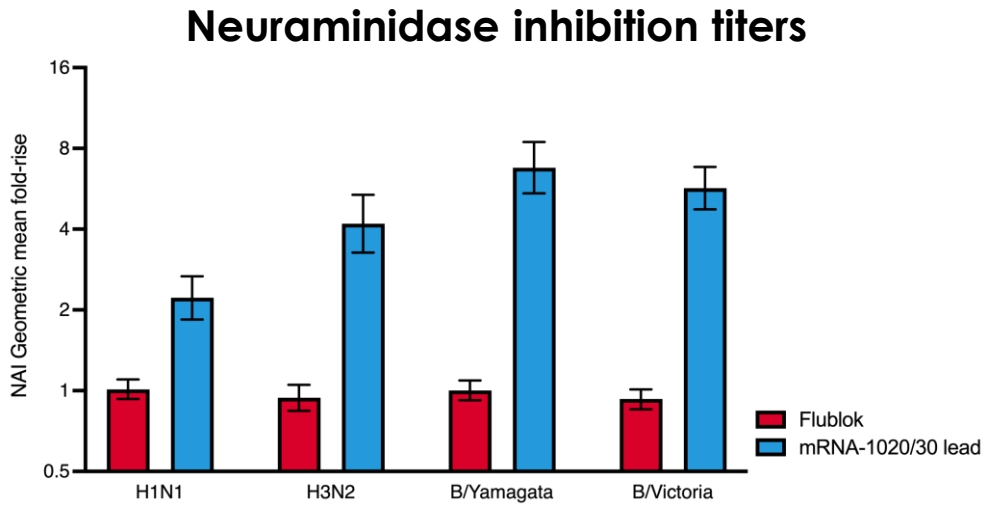
Flublok® is an enhanced vaccine that demonstrated **30% rVE** against a standard dose vaccine in its pivotal efficacy trial, **despite not including any neuraminidase** antigens

Inclusion and standardization of neuraminidase content into vaccines has posed a challenge for traditional manufacturing platforms, but is **not a limitation for mRNA vaccines**

A **2-fold increase in neuraminidase inhibition** titers (NAI) has been associated with an approximately **30% reduced** risk of infection[1,2]

The **mRNA-1020/1030 lead candidate elicits functional NAI titers** in addition to inducing hemagglutination inhibition (HAI) titers in a similar range to Flublok®





[1] https://doi.org/10.1093/cid/ciz1198
[2] https://doi.org/10.1093/infdis/jiv195

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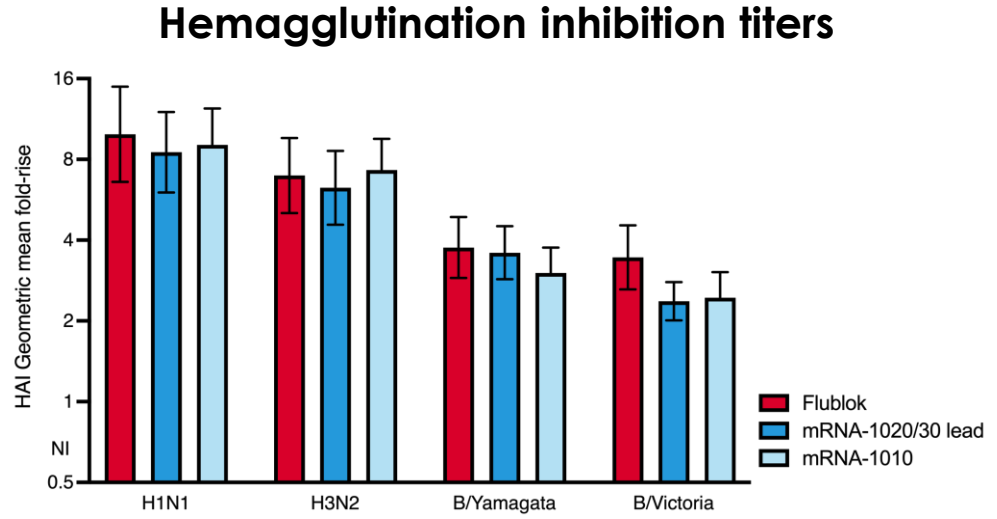

[1] https://doi.org/10.1093/cid/ciz1198
[2] https://doi.org/10.1093/infdis/jiv195

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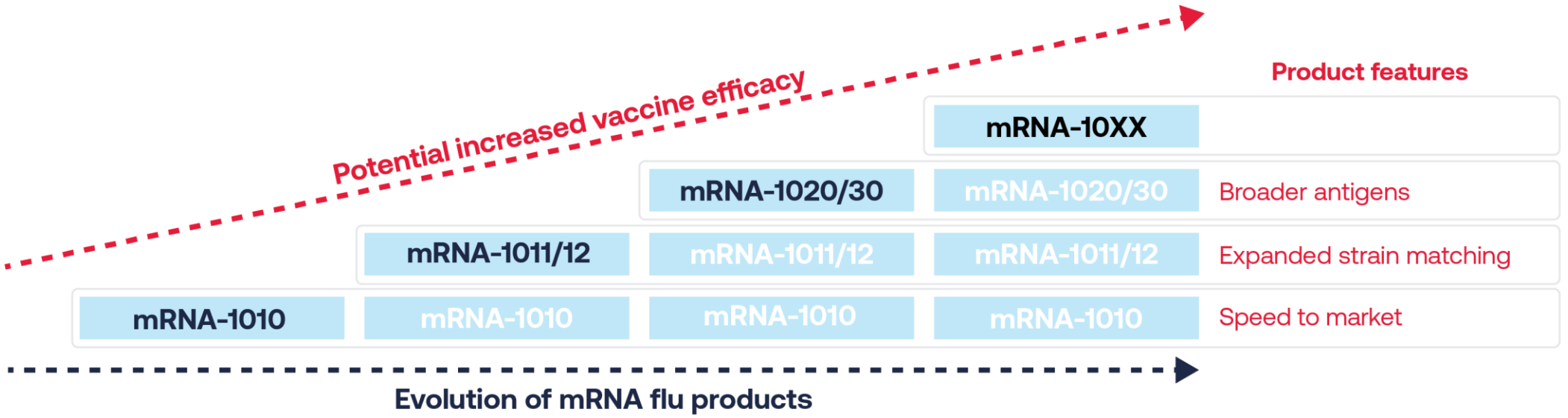
mRNA-1010 will be the foundation of a continuously improving influenza vaccine portfolio

mRNA-1020/1030 Phase 1/2 study initiated in April 2022 and generated proof-of-concept that mRNA vaccines can elicit immune responses against both hemagglutinin and neuraminidase

mRNA-1011/1012 Phase 1/2 study initiated in April 2023 and will generate data on the feasibility to include additional influenza A hemagglutinins to provide broader coverage against drifted strains and in mismatch seasons

mRNA-10XX could be a future vaccine candidate combining the features of the lead candidates identified in prior studies



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Moderna's RSV Strategy

Christine Shaw, Ph.D.

VP, Portfolio Head, Respiratory Vaccines, Infectious Disease Development

RSV is a leading cause of respiratory illness in young children and older adults

Disease burden in pediatrics

- Hospitalization rate in children <5 years old in the U.S.: ~3:1000[1]
- Annually ~2 million medically attended RSV infections in children <5 years old in the U.S., 58,000-80,000 are hospitalized[2]
- Pediatric RSV results in an estimated ~$2 billion in annual medical costs in the U.S.
- Almost all children will have had an RSV infection by their second birthday[3]

Disease burden in older adults

- There are up to 160,000 hospitalizations in adults 65+ due to RSV in the U.S. each year, and up to 10,000 deaths[4]
- Across high-income countries in 2019, RSV caused an estimated ~5.2 million cases, 470,000 hospitalizations and 33,000 in-hospital deaths in adults 60+ years old[5]

(1) Rha, Brian, et al., *Pediatrics* (2020), https://doi.org/10.1542/peds.2019-3611 ; (2) Eiland, Lea., *J Pediatr Pharmacol Ther.* (2009), https://doi.org/10.5863/1551-6776-14.2.75 ; (3) Respiratory Syncytial Virus Infection (RSV), CDC, https://www.cdc.gov/rsv/about/symptoms.html ; (4) RSV in Older Adults and Adults with Chronic Medical Conditions, CDC, https://www.cdc.gov/rsv/high-risk/older-adults.html; (5) Savic, M et al., Influenza Other Respi Viruses (2022): https://doi.org/10.1111/irv.13031

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Moderna's RSV pipeline is addressing key populations at increased risk of RSV infection

Older Adults

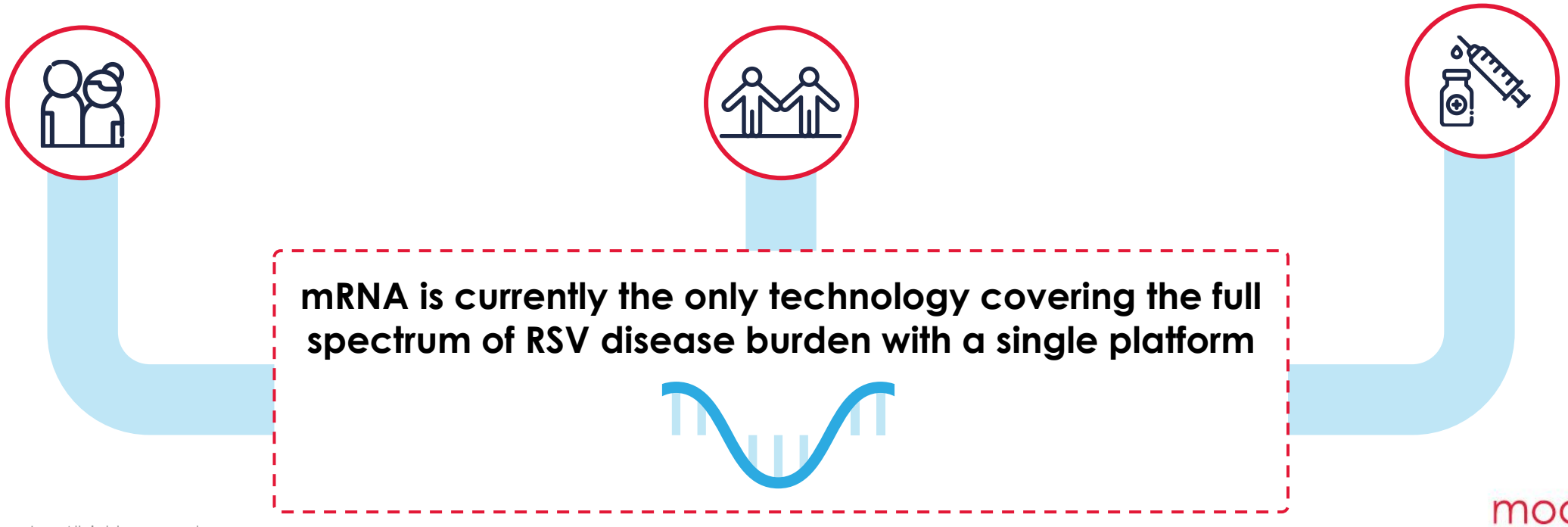
- Largest RSV disease burden
- Phase 3 data of mRNA -1345 demonstrated a competitive clinical profile
- Potential regulatory action expected as early as 4Q2023-1Q2024

Pediatrics

- Pediatric RSV mRNA-1345 and RSV+hMPV combination mRNA-1365 is enrolling children in a Phase 1 study of children 5 to < 24 months old
- mRNA-1345 is being evaluated in women of child-bearing potential

Combinations

- mRNA-1345 profile supports combination development
- mRNA-1045 (Flu+RSV) and mRNA -1230 (COVID+Flu+RSV) are in Phase 1 studies



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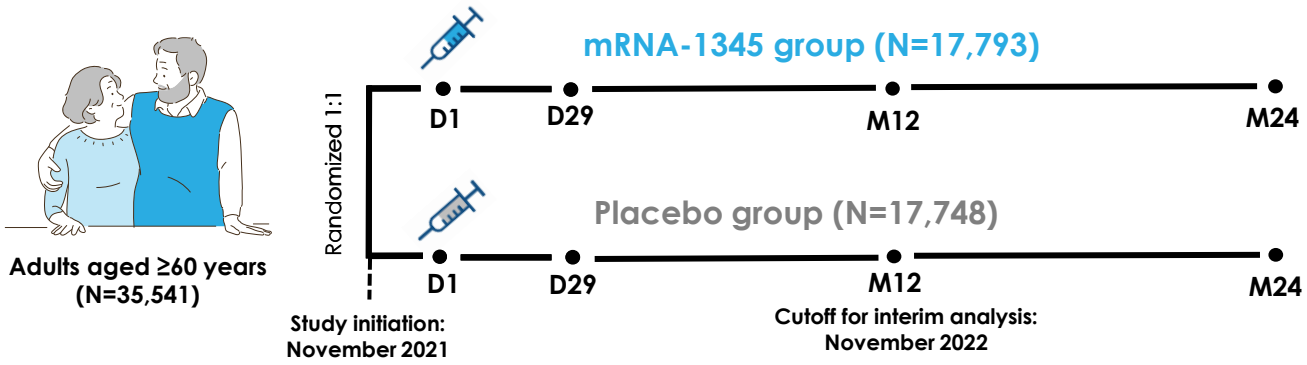
Older Adults RSV Vaccine Program

mRNA-1345 Phase 2/3 Clinical Trial

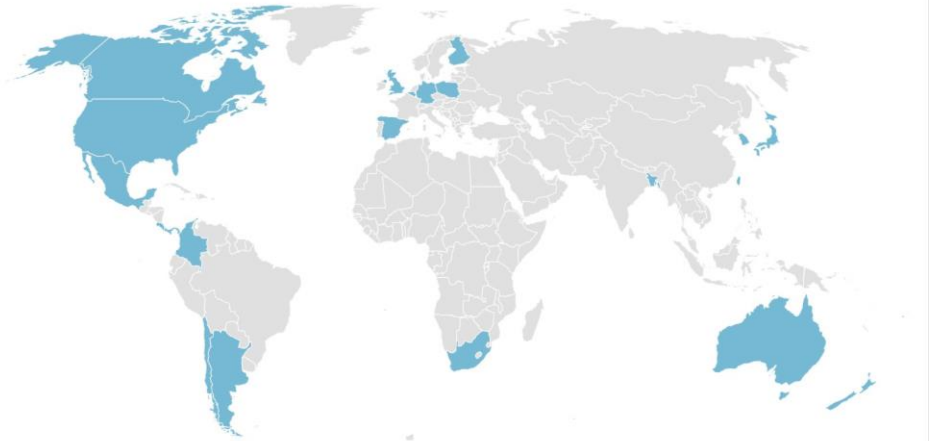
ConquerRSV

In this ongoing Phase 2/3, randomized, observer-blind, placebo-controlled, case-driven study in adults aged ≥60 years (NCT05127434), 35,541 participants from 22 countries were randomized 1:1 to receive 1 dose of mRNA-1345 50 µg or placebo. Healthy participants were included, as well as medically stable participants with ≥1 chronic medical diagnoses

Study Schedule



Trial Sites



Primary Efficacy Endpoints

- Vaccine efficacy of mRNA-1345 to **prevent a first episode of RSV lower respiratory tract disease (LRTD) with ≥2 or ≥3 symptoms** between 14 days to 12 months following injection
- Primary efficacy analysis was triggered based on accrual of RSV cases

Received Breakthrough Therapy Designation from the FDA

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mRNA-1345 Phase 2/3 clinical trial: efficacy endpoint definition

ConquerRSV

Two Primary Endpoint Definitions for RSV LRTD

RSV LRTD with 2 or more lower respiratory symptoms

RT-PCR–confirmed RSV

PLUS

Radiologic evidence of pneumonia

OR

New or worsening of 2 or more LRTD symptoms for ≥24 hours

RSV LRTD with 3 or more lower respiratory symptoms

RT-PCR–confirmed RSV

PLUS

Radiologic evidence of pneumonia

OR

New or worsening of 3 or more LRTD symptoms for ≥24 hours

LRTD Symptoms

- Shortness of breath
- Cough and/or fever
- Wheezing/rales/rhonchi
- Sputum production
- Tachypnea
- Hypoxemia
- Pleuritic chest pain

LRTD, lower respiratory tract disease; mRNA, messenger ribonucleic acid; RSV, respiratory syncytial virus; RT-PCR, reverse transcription polymerase chain reaction.

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Phase 3: demographics and baseline characteristics

ConquerRSV

	mRNA-1345 (N = 17,793)	Placebo (N = 17,748)
Age at Enrollment (Years), Mean (SD)	68.1 (6.19)	68.1 (6.20)
Age Group, n (%)[a]		
60 to 69 Years	11,315 (63.6)	11,270 (63.5)
70 to 79 Years	5493 (30.9)	5478 (30.9)
≥80 Years	985 (5.5)	1000 (5.6)
Sex, n (%)		
Male	9100 (51.1)	9004 (50.7)
Female	8693 (48.9)	8744 (49.3)
Comorbidities of Interest, n (%)[b]		
0	12,535 (70.4)	12,593 (71.0)
≥1	5258 (29.6)	5155 (29.0)

	mRNA-1345 (N = 17,793)	Placebo (N = 17,748)
Race Groups, n (%)		
White	11,285 (63.4)	11,254 (63.4)
Black	2210 (12.4)	2173 (12.2)
Asian	1541 (8.7)	1535 (8.6)
Other[c]	2688 (15.1)	2680 (15.1)
Unknown/Not Reported	69 (0.4)	106 (0.6)
Ethnicity, n (%)		
Hispanic or Latino	6112 (34.4)	6162 (34.7)
Not Hispanic or Latino	11,495 (64.6)	11,377 (64.1)
Unknown	27 (0.2)	22 (0.1)
Not Reported	159 (0.9)	187 (1.1)

- Demographics and baseline characteristics were well matched across groups

Note: Data are from the Randomization Set analysis population.
CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; LRTD, lower respiratory tract disease; mRNA, messenger ribonucleic acid; SD, standard deviation.
[a]Derived from age and risk collected on electronic case report forms.
[b]Comorbidities of interest include COPD, asthma, chronic respiratory disease, diabetes, CHF, advanced liver disease, or advanced renal disease.
[c]"Other" race includes American Indian or Alaska Native, Native Hawaiian or other Pacific Islander, Other, or Multiple.

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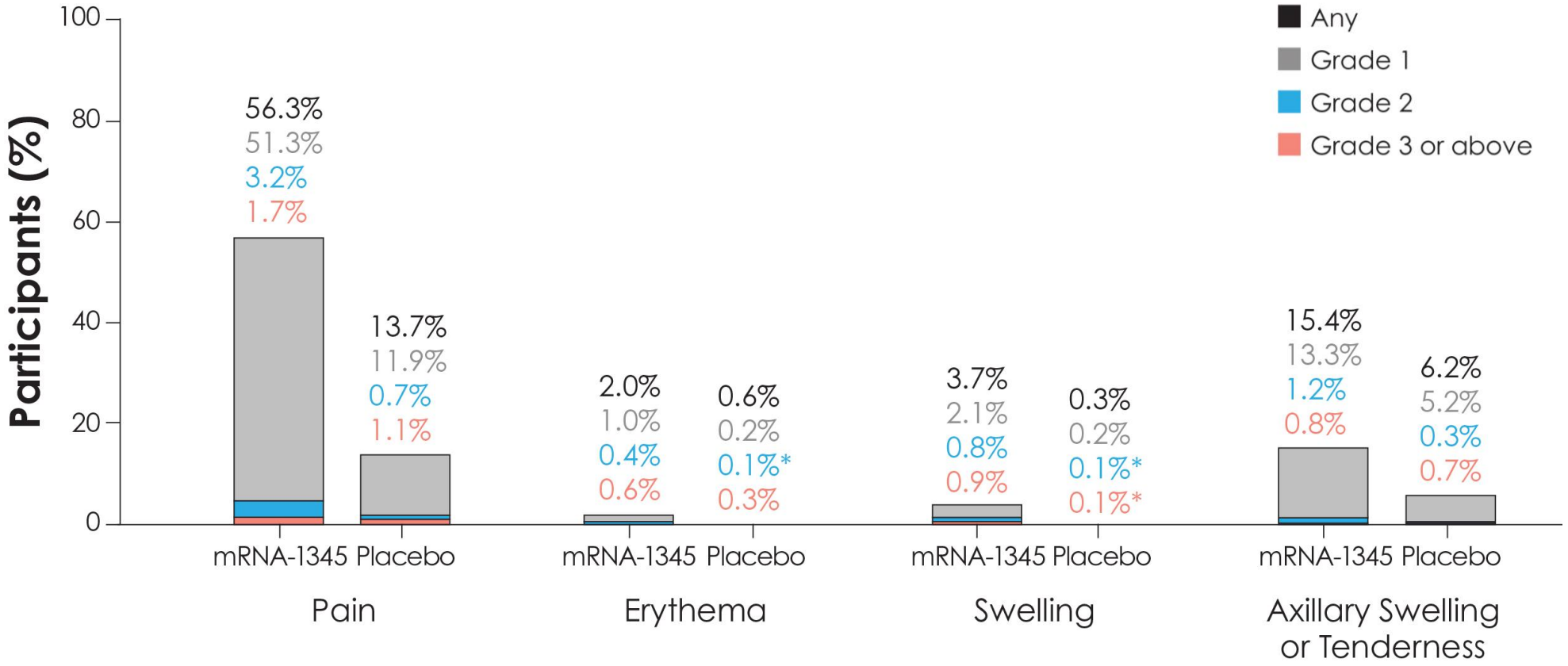
Percentage of participants with solicited local adverse reactions within 7 Days

ConquerRSV



Pain at the injection site (mostly grade 1) was the most frequently reported local adverse reaction

Note: Data are from the Solicited Safety Set analysis population.
Summary of participants with solicited adverse reactions within 7 days after injection by grade; placebo (n = 17,598); mRNA-1345 50 µg (n = 17,665).
Note: *For placebo, grade 2 for erythema and grade 2 and grade 3 or above for swelling are <0.1%.
mRNA, messenger ribonucleic acid.

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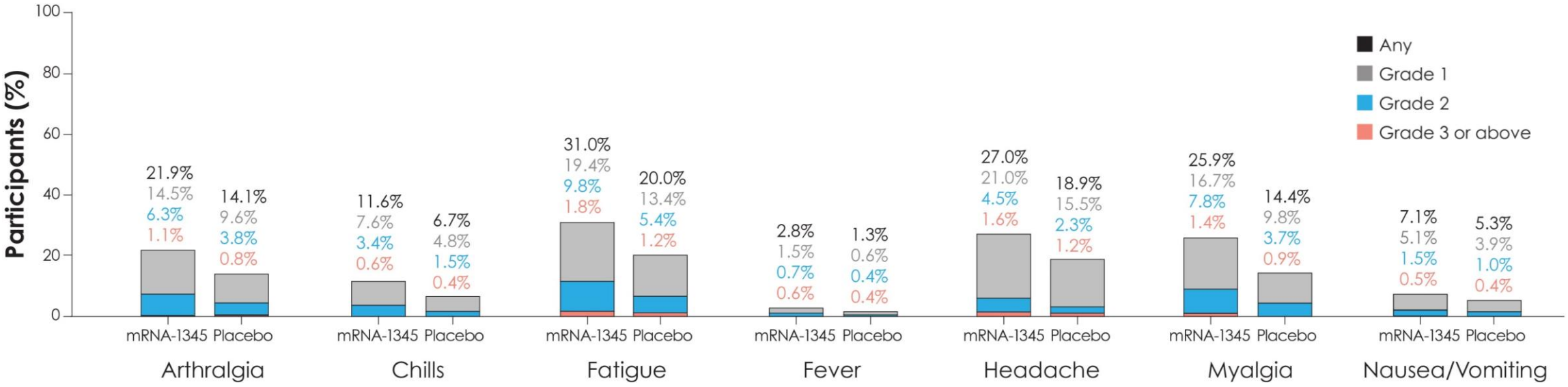
Percentage of participants with solicited systemic adverse reactions within 7 days

ConquerRSV



Arthralgia, fatigue, headache, and myalgia were the most frequently reported systemic adverse reactions

Note: Data are from the Solicited Safety Set analysis population.
Summary of participants with solicited adverse reactions within 7 days after injection by grade; placebo (n = 17,598); mRNA-1345 50 µg (n = 17,665).
mRNA, messenger ribonucleic acid.

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Efficacy of mRNA-1345 against RSV LRTD

ConquerRSV

	mRNA-1345 (N=17,572)	Placebo (N=17,516)
RSV LRTD with ≥2 symptoms		
Cases, n/N (%)[a,b]	9/17,572 (0.05%)	55/17,516 (0.31%)
VE (%) based on hazard ratios (alpha adjusted 95.88% CI)[c]	**83.7%** (66.0%, 92.2%)	
RSV LRTD with ≥3 symptoms		
Cases, n/N (%)[a,b]	3/17,572 (0.02%)	17/17,516 (0.10%)
VE (%) based on hazard ratios (alpha adjusted 96.36% CI)[c]	**82.4%** (34.8%, 95.3%)	

Note: Data are from the Per-Protocol Efficacy Set analysis population, 14 days to 12 months post-injection.
CI, confidence interval; LRTD, lower respiratory tract disease; mRNA, messenger ribonucleic acid; RT-PCR, reverse transcription polymerase chain reaction; VE, vaccine efficacy.
[a]Protocol-defined RSV-LRTD with ≥2 and ≥3 symptoms is based on eligible symptoms onset within a timeframe of +/- 14 days from positive RSV RT-PCR collection date.
[b]The time to first occurrence of protocol-defined RSV-LRTD with ≥2 and ≥3 symptoms will be calculated as date of case — date of randomization + 1.
[c]VE is defined as 100% x (1 — hazard ratio [mRNA-1345 vs. placebo]). The CI for VE is based on a stratified Cox proportional hazard model with Efron's method of tie handling and with the treatment group as a fixed effect, adjusting for stratification factors at randomization.

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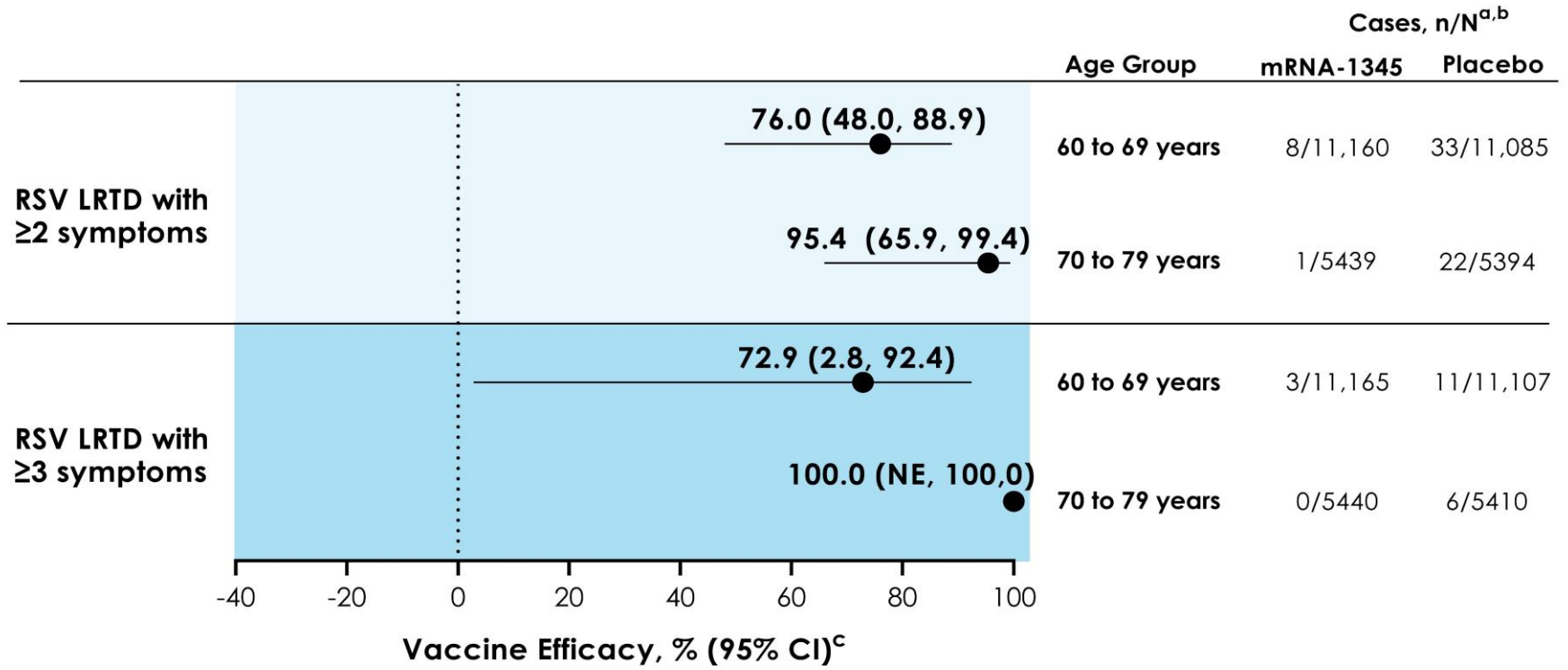
Efficacy of mRNA-1345 against RSV LRTD across age groups

ConquerRSV



In adults ≥80 years, no cases of RSV LRTD with ≥2 or ≥3 symptoms were observed (mRNA-1345, n/N=0/964; PBO, n/N=0/982)

Note: Data are from the Per-Protocol Efficacy Set analysis population, 14 days to 12 months post-injection.
CI, confidence interval; LRTD, lower respiratory tract disease; mRNA, messenger ribonucleic acid; NE, not evaluated; PBO, placebo; RSV, respiratory syncytial virus; RT-PCR, reverse transcription polymerase chain reaction; VE, vaccine efficacy
[a]Protocol-defined RSV-LRTD with ≥2 and ≥3 symptoms is based on eligible symptoms onset within a timeframe of +/- 14 days from positive RSV RT-PCR collection date.
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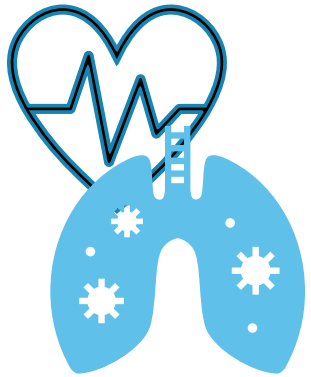
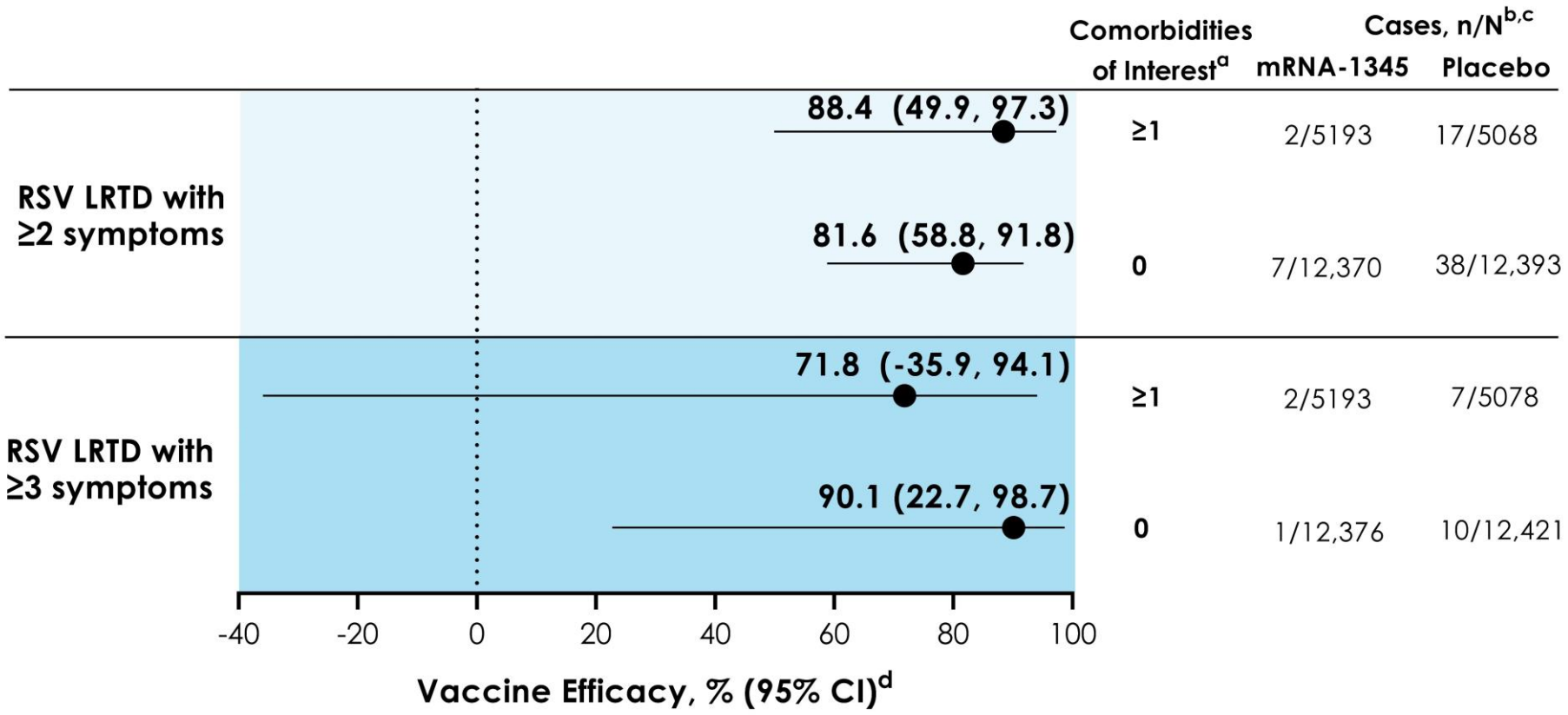
Efficacy of mRNA-1345 against RSV LRTD in participants with pre-existing comorbidities

ConquerRSV





Note: Data are from the Per-Protocol Efficacy Set analysis population, 14 days to 12 months post-injection.
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[1]Comorbidities of interest include COPD, asthma, chronic respiratory disease, diabetes, CHF, advanced liver disease, or advanced renal disease. [2]Protocol-defined RSV-LRTD with ≥2 and ≥3 symptoms is based on eligible symptoms onset within a timeframe of +/- 14 days from positive RSV RT-PCR collection date. [3]The time to first occurrence of protocol-defined RSV-LRTD with ≥2 or ≥3 symptoms will be calculated as date of case — date of randomization + 1. [4]VE is defined as 100% x (1 — hazard ratio [mRNA-1345 vs. placebo]). The CI for VE is based on a stratified Cox proportional hazard model with Efron's method of tie handling and with the treatment group as a fixed effect, adjusting for stratification factors at randomization.

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mRNA-1345 data highlights

Safety

- mRNA-1345 was well tolerated; solicited adverse reactions were **mostly grade 1 or grade 2 in severity**
- **No cases of Guillain-Barre Syndrome (GBS)** have been reported

Efficacy

- Efficacy of **83.7%** supported by 64 RSV-LRTD cases (9 in mRNA-1345 group and 55 in placebo group)
- Vaccine efficacy was **maintained in +70** years of age participants and ones with **comorbidities**

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mRNA-1345 Phase 3 in older adults – summary and next steps

Efficacy	• 83.7% and 82.4% against RSV LRTD with ≥2 and ≥ 3, respectively, lower respiratory signs/symptoms • Efficacy was maintained with increasing age • Efficacy was maintained among participants with underlying risk factors
Safety	• Well tolerated; solicited adverse reactions were mostly grade 1 or 2 • No cases of GBS have been reported • No safety concerns identified
Next steps	• Expect to submit BLA in 1H23 with an option to use a priority review voucher

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Combination Respiratory Vaccines

Our strategy is to advance multiple generations of single-virus and combination respiratory vaccines to address unmet need

Evolution of Target Portfolio Profile

1st Generation Single-Virus Vaccines

Advance vaccines that provide **the highest protection** against seasonal respiratory viruses **for those most at risk**

2nd Generation Single-Virus Vaccines

Enhance single-virus vaccines with **improved product attributes**, such as higher efficacy, improved tolerability, product image, storage

Combination Vaccines

Deliver **diverse portfolio of 1st and 2nd generation-based combination vaccines,** ideally with non-inferior profiles to single-virus vaccines and improved convenience (patient) and value (payor/system)

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Our development strategy for combination vaccines can provide substantial public health benefits

COVID/Flu **mRNA-1073** *mRNA-1273/mRNA-1010*	Target is to deliver similar profile to single-virus vaccine products	Phase 1/2 enrollment complete
Flu/RSV **mRNA-1045** *mRNA-1010/mRNA-1345*	Seasonal overlap with RSV and Flu; avoids uncertainty of SARS-CoV-2 variants and timing	Phase 1 enrollment complete
COVID/ Flu/RSV **mRNA-1230** *mRNA-1273/mRNA-1010/mRNA-1345*	Address the largest burden of disease with the most convenient dosing regimen	Phase 1 enrollment complete
COVID/Flu **mRNA-1083** *mRNA-1283/mRNA-1010*	2nd generation combo vaccine that may translate to improved tolerability and/or immunogenicity	IND submitted

Benefits of combination vaccines

- Higher compliance
- Better uptake
- Larger benefit to healthcare systems
- Consumer convenience

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Combinations summary and next steps

Leveraging data and clinical experience

- Our respiratory combination strategy leverages on data and clinical experience generated from our late-stage single-virus respiratory portfolio

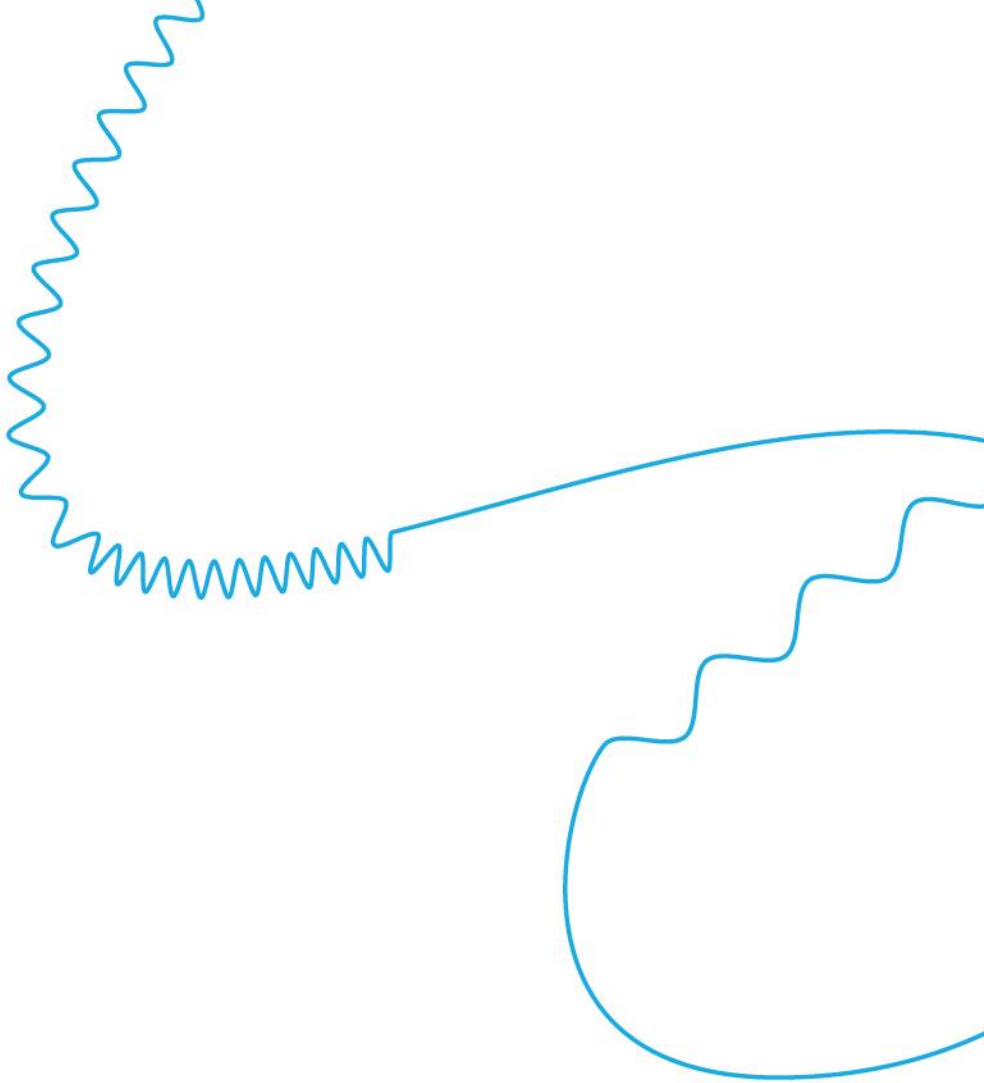
Addressing disease burden

- Moderna's combination vaccine candidates cover respiratory viruses associated with the largest disease burden in the category

Next steps

- Our next generation flu/COVID combination mRNA-1083 is expected to initiate enrollment in 2Q23

Break



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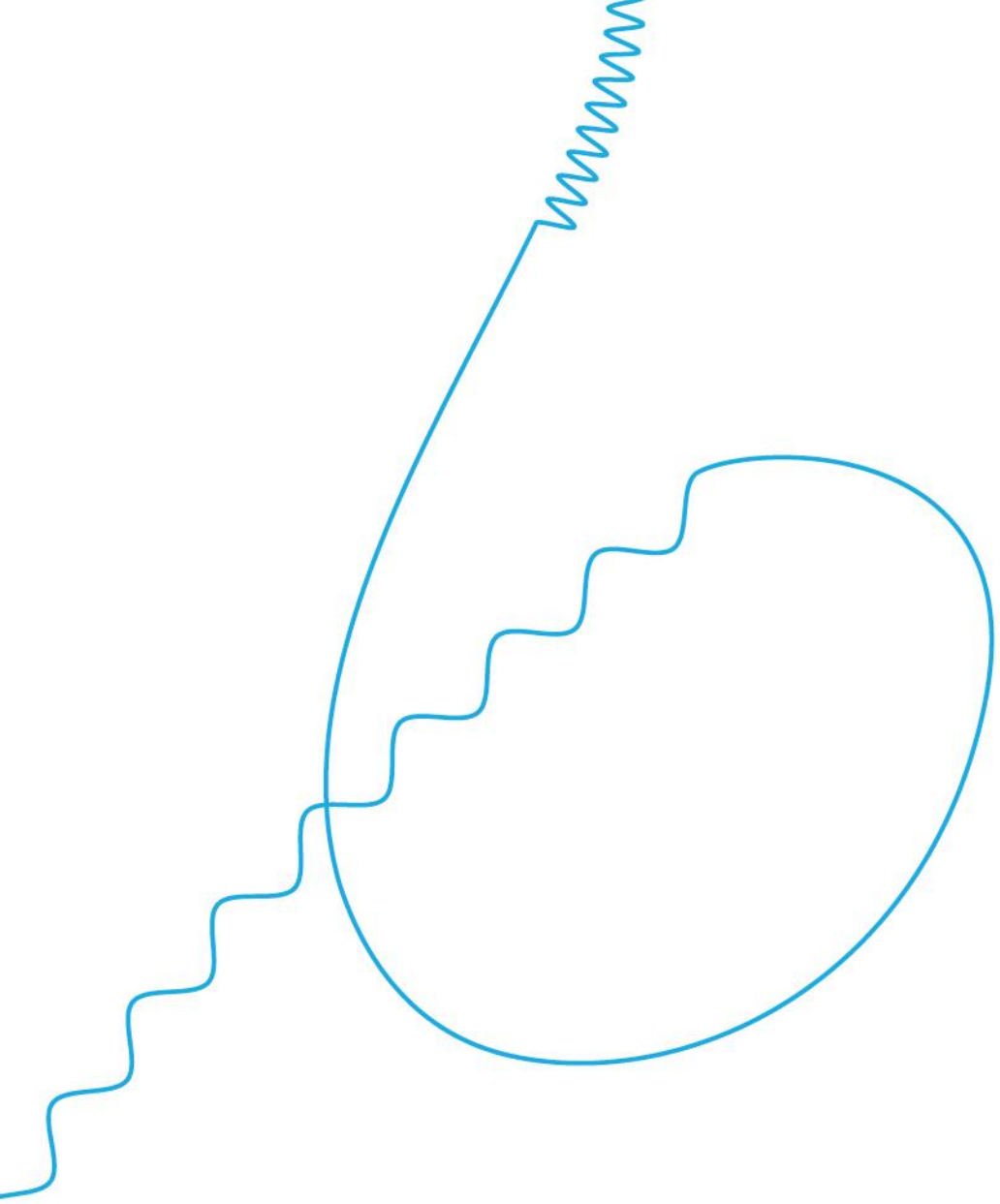

Moderna's Latent Portfolio

Jacqueline Miller, M.D.

Senior Vice President, Head of Development, Infectious Diseases, Moderna

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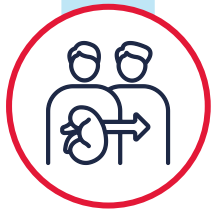
Latent vaccines can address multiple indications; pediatrics, acute and long-term effects from infection

Current population
Women 16-40 years old

Pediatrics
Adolescent



Transplant patients
CMV is most frequent viral infection in post-transplant patients

Learnings from our CMV program inform the design of **CMV studies for adolescents and transplant patients**

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Moderna is currently developing vaccines against five latent viruses with unmet or underserved needs

Latent Viruses	Any Approved Vaccine	
Cytomegalovirus (CMV) • Leading infectious cause of **birth defects** (12-20K congenital CMV cases annually in the U.S. alone)[1] • Major cause for graft loss in solid organ transplant patients	✗	**mRNA-1647** Phase 3
Epstein-Barr virus (EBV) • >160K deaths attributed to EBV-related **malignancies** (2017)[2] • Major driver of **Multiple Sclerosis risk** (>30x increase)[7]	✗	**mRNA-1189** **mRNA-1195**
Herpes simplex virus (HSV) • HSV-2 establishes **life-long latent infections** within sensory neurons from which it can reactivate, leading to genital herpes • Globally, ~**5% of the population in the 18-49 age range** is HSV-2 seropositive[4]	✗	**mRNA-1608**
Varicella zoster virus (VZV) • Declining immunity in older adults leads to **reactivation of the virus from latently infected neurons, causing painful and itchy lesions** • Herpes Zoster occurs in **1 out of 3 adults in the U.S. in their lifetime**[5]	✓	**mRNA-1468**
Human immunodeficiency virus (HIV) • Cause of AIDS, **resulting in approximately 650,000 deaths** worldwide annually (2020)[3] • Evaluating candidates with **IAVI, NIAID, and Gates Foundation**	✗	**mRNA-1644** **mRNA-1574**

1. Lanzieri, Tatiana, CDC, https://www.hhs.gov/sites/default/files/2018-9-13-nvac-exploringthepipeline-cmvvaccines.pdf ; 2. Khan, Gulfaraz et al., *BMJ Open* (2020), https://doi.org/10.1136/bmjopen-2020-037505 ; 3. Global HIV/AIDS epidemic, https://www.hiv.gov/hiv-basics/overview/data-and-trends/global-statistics; 4.Looker et al, BMJ Global Health (2020), https://doi.org/10.1136/bmjgh-2019-001875 ; 5. CDC, Shingles, https://www.cdc.gov/shingles/about/index.html ; 6. https://www.cdc.gov/std/hpv/stdfact-hpv.htm; 7. https://www.science.org/doi/10.1126/science.abj8222

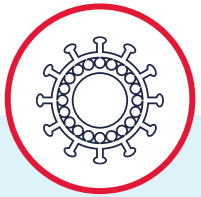
Moderna's mRNA technology is well positioned to address latent viruses

Important features to address latent viruses	mRNA vaccine attributes
Both antibody and T cell responses are important	mRNA vaccines elicit both antibody and T cell immune responses
Multiple cell entry pathways	Can code for multiple antigens and antigen complexes in the same vaccine
Includes complex antigens	Demonstrated ability for mRNA to code for complex antigens

Latent virus pipeline progress and presenting new HIV Phase 1 interim data

CMV (mRNA-1647)

- **Phase 3** enrollment update
- **Phase 1/2** primary prevention in adolescents is enrolling
- **Phase 2** in transplant population enrolling



HIV (mRNA-1644)

- **Phase 1** interim analysis

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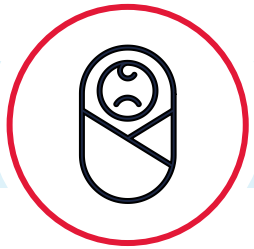
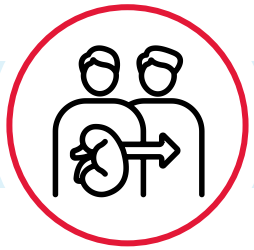
Cytomegalovirus (CMV)

Our vaccine development strategy targets the major health burden from CMV infection

Women of child-bearing age



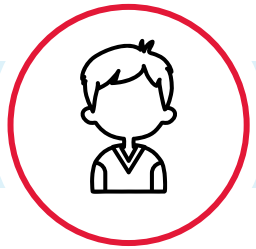
Congenital CMV infection



Transplant and immunocompromised populations

At-risk populations

Teenagers



Age de-escalation into pediatric studies

Broader prevention/eradication

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Cytomegalovirus (CMV): a significant public health burden

Most common infectious cause of congenital sensorineural hearing loss worldwide

>$1B in annual healthcare costs[1]

Sequelae include:

- At birth: microcephaly, chorioretinitis, seizures, sensorineural hearing loss
- Long term: cognitive impairment, cerebral palsy, seizure disorder, sensorineural hearing loss

1 in 200

babies in the U.S. are born with a congenital CMV infection (CMV infection is present at birth)

1 in 5

will have severe, life-altering health problems

(1) Grosse, Scott et al. "Economic assessments of the burden of congenital cytomegalovirus infection and the cost-effectiveness of prevention strategies," *Seminars in perinatology,* 2021, https://doi.org/10.1016/j.semperi.2021.151393

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CMV vaccine (mRNA-1647) Phase 3 trial *for women of childbearing age* is >50% enrolled

Randomized, observer-blind, placebo-controlled study to evaluate the **efficacy, safety and immunogenicity of mRNA-1647 to evaluate prevention of primary infection**

Enrollment is ongoing in the U.S. and internationally across 150 sites globally

Participants are at a higher risk of contracting CMV

Goal to **enroll a diverse group of U.S. participants** into the study

Enrollment **could be completed in 2023**

Primary efficacy analysis will be triggered based on accrual of seroconversion cases

CMVictory

Ph 3 trial design

mRNA-1647 (100 µg) N=~3,650	**Placebo** N=~3,650

3 dose course: D1, D57, D169

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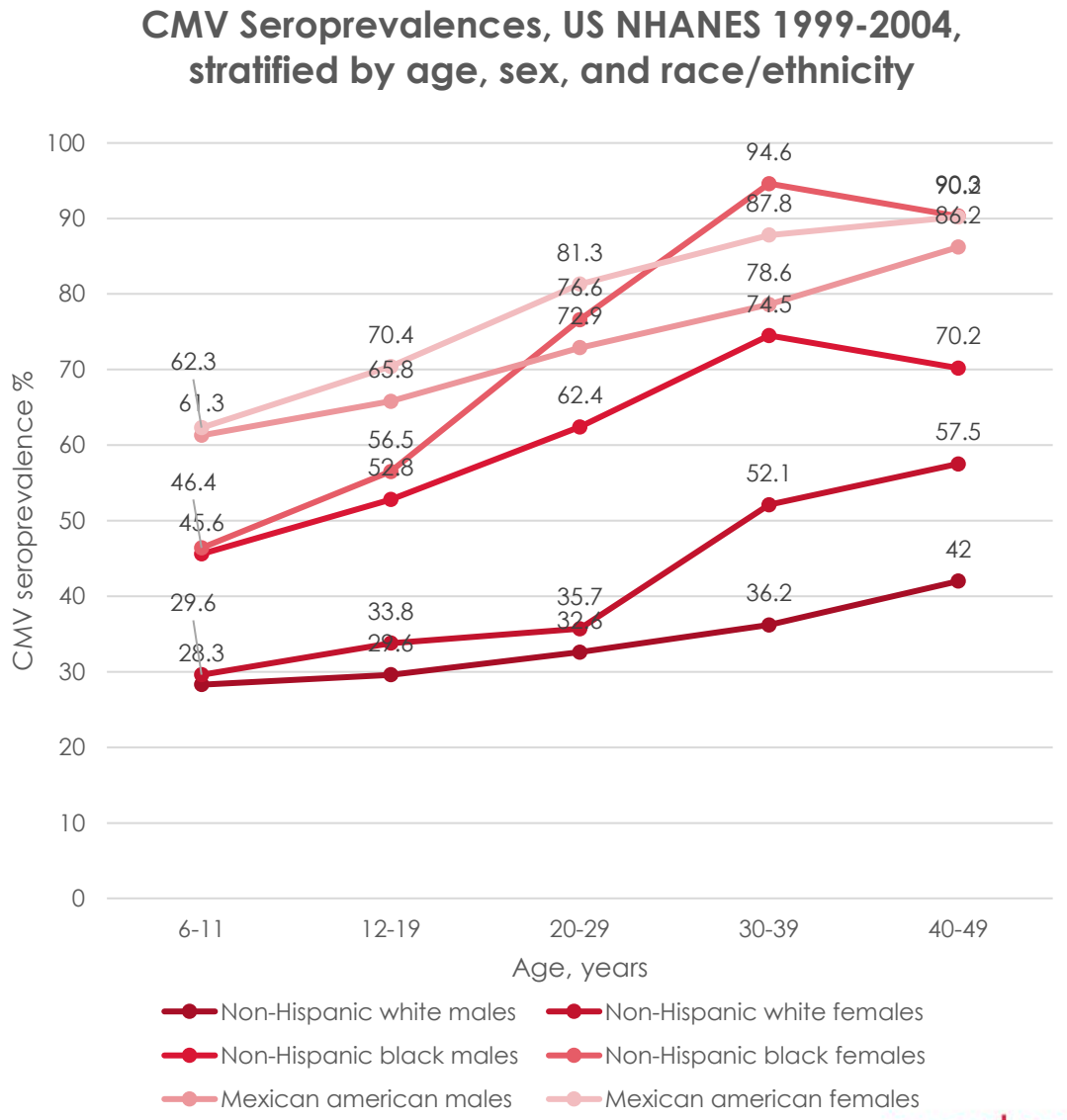
CMV vaccination in adolescents is aimed at primary prevention

Majority of cases of disabling congenital CMV infection could be prevented by a universal vaccination policy in adolescence

Ease of implementation into existing (ACIP) vaccine schedule for this age group



[1]Fowler, Pediatrics 2006; [2]Sohn, JID1991; [3]Fowler, JID 1993; [4]Pass, Semin Ped Inf Dis 2002

mRNA-1647 Phase 1/2 Study in Adolescents has begun enrollment

- Phase 1/2 open-label and placebo-controlled study to evaluate safety and immunogenicity in male and female participants at 9 to 15 years of age
- The study will include ~770 participants across ~70 sites globally
- Immunogenicity will be assessed against both epithelial cell and fibroblast cell infection

Ph 1 trial design

- **Placebo**
- **mRNA-1647** Low dose
- **mRNA-1647** Medium dose
- **mRNA-1647** High dose

3 dose course: D1, D57, D169

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CMV is a major health burden in the transplant population

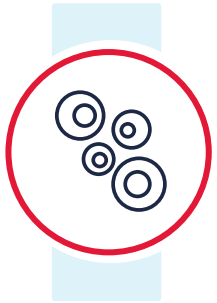
Risks associated with CMV infection post SOT/HSCT

- Graft rejection
- End-organ CMV disease (EOD)

Unmet need:

- No approved vaccines against CMV for post transplant
- High cost and toxicity of antiviral prophylaxis

40k
Solid Organ Transplantation (SOT)



22k
Hematopoietic Stem Cell Transplantation(HSCT)

~62k transplants in the US annually

*Based on OPTN data as of February 27, 2023. Data subject to change based on future data submission or correction.
^ Health Resources and Services Administration: Donation and Transplantation Statistics https://bloodstemcell.hrsa.gov/data/donation-and-transplantation-statistics

Anderson-Smits C, Baker ER, Hirji I. Coinfection rates and clinical outcome data for cytomegalovirus and Epstein-Barr virus in post-transplant patients: A systematic review of the literature. Transpl Infect Dis. 2020 Dec;22(6):e13396.
Yadav SK, Saigal S, Choudhary NS, Saha S, Sah JK, Saraf N, Kumar N, Goja S, Rastogi A, Bhangui P, Soin AS. Cytomegalovirus infection in living donor liver transplant recipients significantly impacts the early post-transplant outcome: A single center experience. Transpl Infect Dis. 2018 Aug;20(4):e12905.
McDevitt LM. Etiology and impact of cytomegalovirus disease on solid organ transplant recipients. Am J Health Syst Pharm. 2006 Oct 1;63(19 Suppl 5):S3-9.

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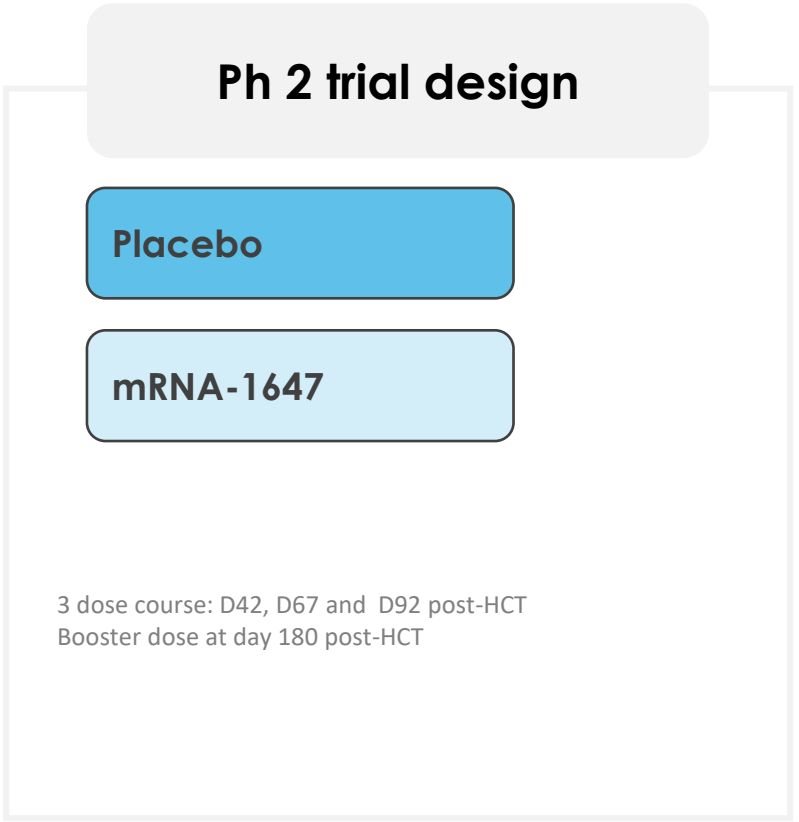
Enrollment has begun in mRNA-1647-P205: Phase 2 POC Study in Allogeneic Hematopoietic Cell Transplant (HCT) Patients

- Phase 2, placebo controlled, single-center proof-of-concept (POC) study evaluating efficacy, safety and immunogenicity of mRNA -1647 in patients undergoing HCT
- The study will recruit CMV-seropositive patients who have gone high-risk allogeneic HCT
- Primary outcome measure is time to first occurrence of an CS-CMVi event measures by initiation of antiviral therapy
- The study will recruit approximately 224 patients with a 1:1 randomization
- Patients will receive multiple doses across a 6-months schedule with an additional 6 months follow up



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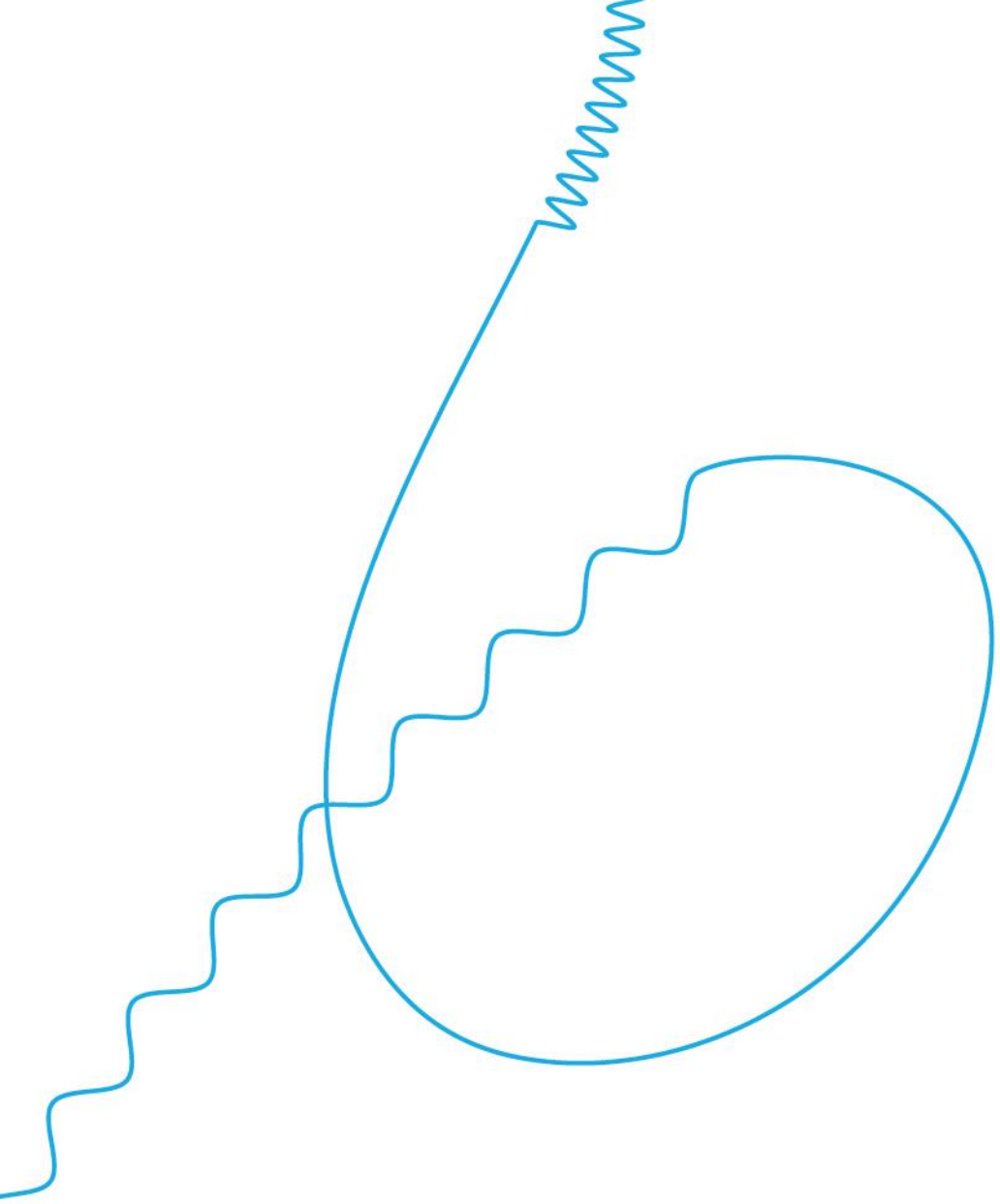
HIV Phase 1 Interim Analysis

William Schief

Professor, Immunology and Microbiology, Scripps

Executive Director, Vaccine Design, IAVI



Emerging Programs

Jacqueline Miller, M.D.

Senior Vice President, Head of Development, Infectious Diseases, Moderna

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We are expanding applications of our mRNA vaccine technology beyond our current portfolio

Current portfolio

Respiratory viruses

Latent viruses

Enteric viruses

mRNA technology is well-suited to address these viruses; using a multi-valent virus-like particle and the same proven LNP technology as our respiratory vaccines

Bacterial pathogens

mRNA can target bacterial proteins that elicit strong antibody and T cell responses

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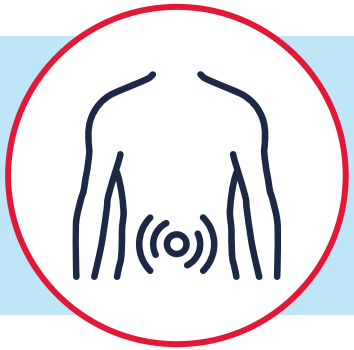
Enteric Vaccines

Enteric viruses that cause acute gastroenteritis are a leading cause of diarrheal disease worldwide among young children and older adults



Enteric viruses multiply in the gastrointestinal tract and generally follow fecal-oral route of spread

Enteric viruses, including norovirus, are a leading cause of global acute gastroenteritis (AGE), resulting in significant morbidity and mortality worldwide, particularly among young children and older adults[1]

AGEs associated with viral infection have proven to be preventable with vaccines, as seen with rotavirus, emphasizing the need to broaden vaccination coverage

1. Ahmed et al. Lancet Infect Dis 2014; 14: 725–30

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Among enteric viruses, norovirus is a leading cause of diarrheal disease globally resulting in substantial health care burden

Norovirus is associated with 18% of all acute gastroenteritis worldwide[1]

The **highest incidence is in children**; morbidity and mortality greatest in children in low-income countries

In high-income countries, **older adults and immunocompromised patients are at highest risk of severe outcomes**, including death

The **burden of norovirus among older adults is expected to rise** along with societal aging and an increased need for institutionalized care

	United States (per year)[2]	Global (per year)[3,4]
Infections	**~20M** infections	**~685M** infections
Deaths and hospitalizations	**~900** deaths (mostly older adults) **~100K** hospitalizations	**~200K** deaths (~50K among children)
Societal costs	**~$2B** in healthcare costs and lost productivity	**~$60B** in healthcare costs and lost productivity

1. Ahmed, S.M., et al., Global prevalence of norovirus in cases of gastroenteritis: a systematic review and meta-analysis. Lancet Infect Dis, 2014.
2. https://www.cdc.gov/norovirus/trends-outbreaks/burden-us.html
3. https://www.cdc.gov/norovirus/trends-outbreaks/worldwide.html
4. https://www.who.int/teams/immunization-vaccines-and-biologicals/diseases/norovirus

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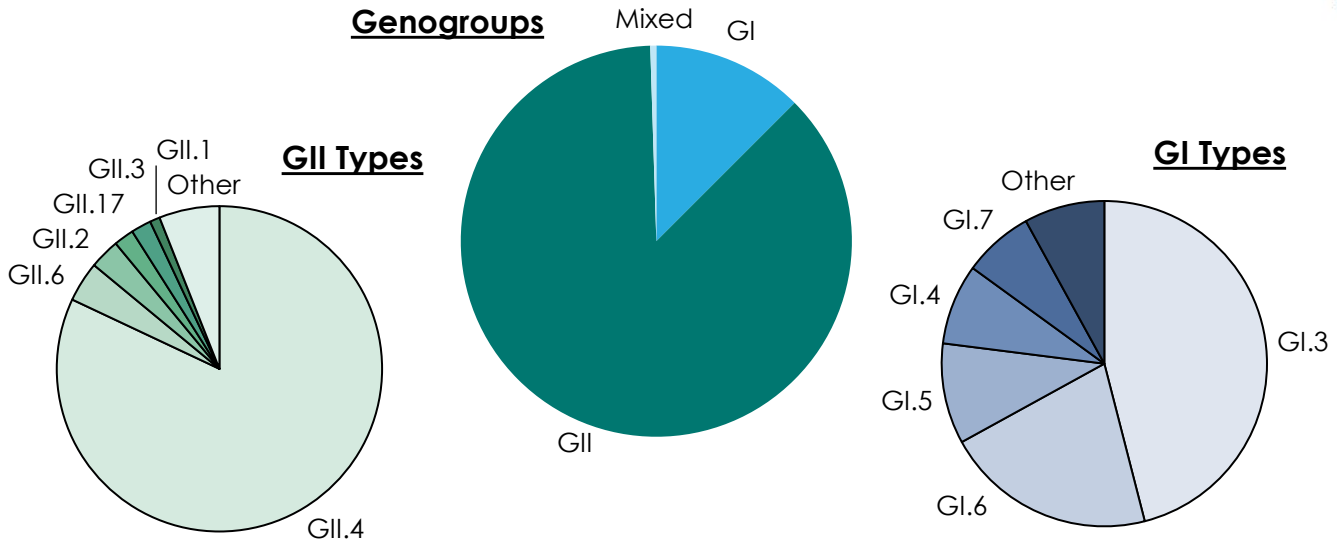
Norovirus vaccine development is challenging due to genotypic diversity and variability over time

Norovirus has broad variant variability; The virus is classified into 10 genogroups and 49 genotypes

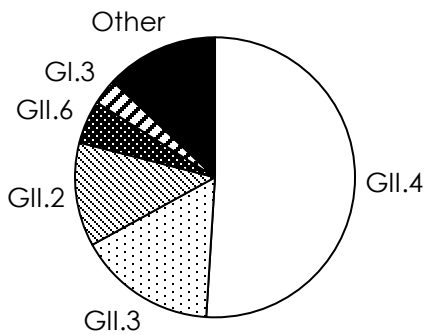
Vaccine development has been challenging to date due to the broad and shifting diversity of genotypes which requires frequent vaccine updates

To protect against >70-80% of noro-AGE in young children and older adults, a multivalent vaccine design is required

Norovirus genogroups and genotypes in long term care facility outbreaks in the US
2009-2018
Adapted from Calderwood et al, 2022



Global distribution of norovirus genotypes among hospitalized children <5, NoroSurv
2015-20122

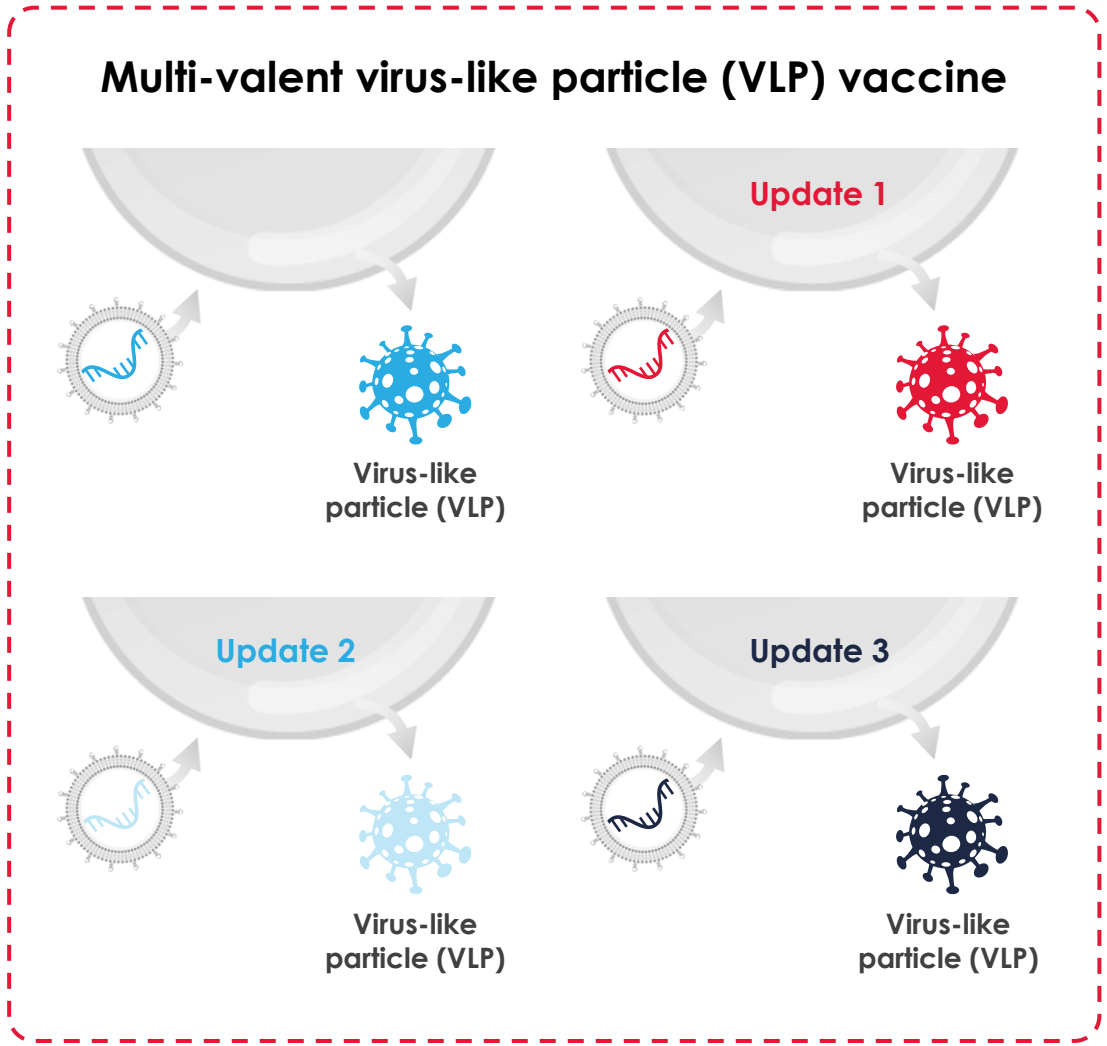


mRNA vaccine technology provides the ability to make multivalent VLPs that can be quickly updated

mRNA vaccines allow for intracellular production of multi-valent virus-like particles (VLPs)

These VLPs are structurally similar to native virions and mimic major antigenic features including the display of critical epitopes

mRNA platform provides the ability to make multivalent compositions that can quickly be updated based on real world data from ongoing epidemiologic surveillance



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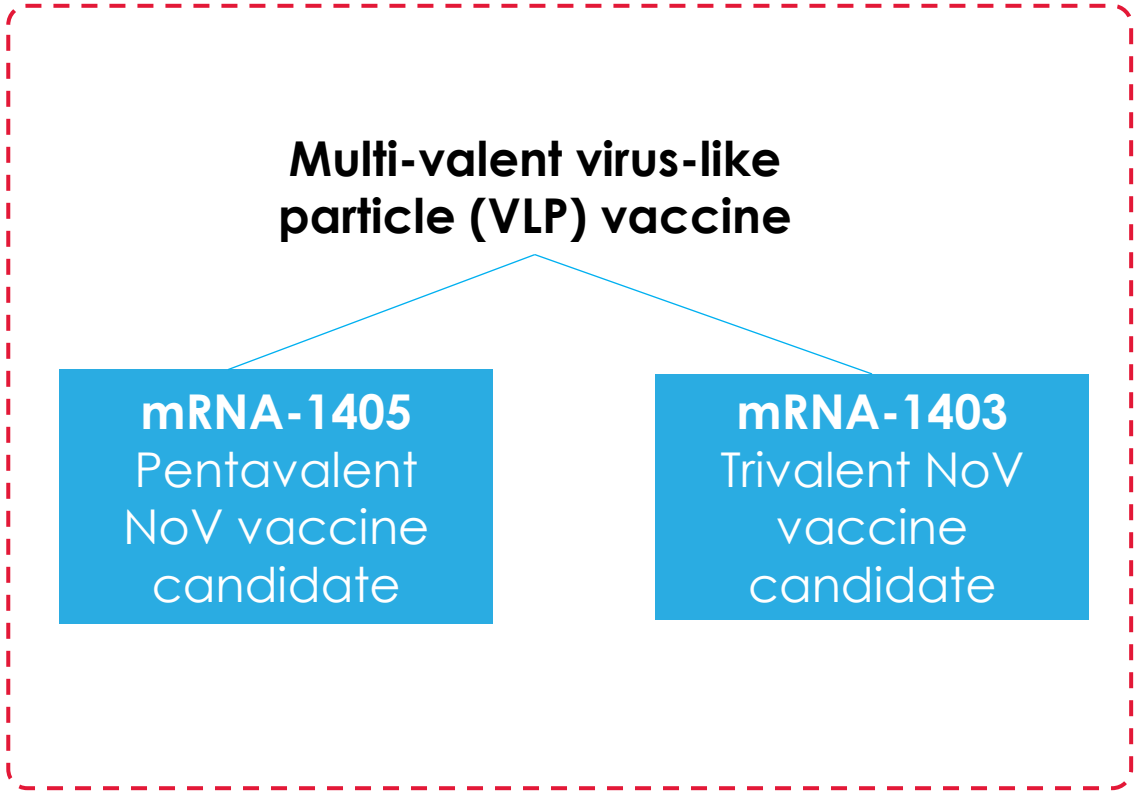
Moderna has two vaccine candidates that tackle key challenges of norovirus genotypic diversity and variability

Introducing mRNA-1403 and mRNA-1405 for Norovirus, multi-valent virus-like particle (VLP) vaccines for the prevention of acute gastroenteritis (AGE) from the most prevalent norovirus genotypes in young children and older adults

This intramuscular vaccine **uses the same LNP technology** as our respiratory vaccines



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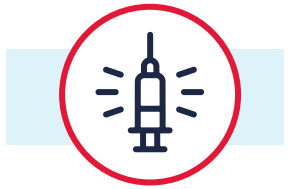
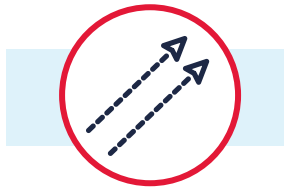
Bacterial Pathogens

Moderna's first bacterial target will be Lyme disease

120,000 Lyme disease cases are reported each year in the US and Europe[1,2]



No approved human vaccine currently on the market



Moderna's strategy will involve development of two vaccine candidates in parallel

Our proposed seven-valent vaccine candidate is differentiated from competitive vaccines under development and will address Lyme's biological complexity, designed to potentially offer broader strain coverage

1. https://www.cdc.gov/lyme/datasurveillance/surveillance-data.html
2. Stone BL, Tourand Y, Brissette CA. Brave New Worlds: The Expanding Universe of Lyme Disease. Vector Borne Zoonotic Dis. 2017 Sep;17(9):619-629

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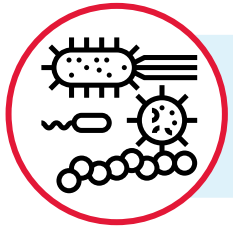
Moderna's mRNA technology may be an effective way to target bacterial antigens



Bacteria are very complex organisms relative to viruses

- Each bacterium can contain thousands of possible antigens, making antigen targeting a challenge
- The immunologic potential of each antigen is difficult to decipher
- Bacteria can switch on and off the expression of certain antigens

Moderna's seven-valent approach to address Lyme may be **an effective way to elicit specific antibodies for almost all Lyme strains prevalent in the US and Europe**

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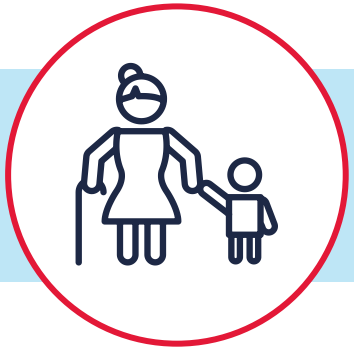
Lyme is a major disease burden in the US and Europe with no currently approved human vaccine



Lyme follows a bimodal age distribution, affecting mainly children under 15 and older adults

US (35,000 cases/year) and Europe (85,000 cases/year) are the major Lyme geographies[1,2]

Patients can develop rash, fever, headaches, fatigue, joint pain swelling, stiffness and headaches. Some of these symptoms can continue for six months or more.

1. https://www.cdc.gov/lyme/datasurveillance/surveillance-data.html
2. Stone BL, Tourand Y, Brissette CA. Brave New Worlds: The Expanding Universe of Lyme Disease. Vector Borne Zoonotic Dis. 2017 Sep;17(9):619-629

Moderna's Lyme strategy targets key antigens

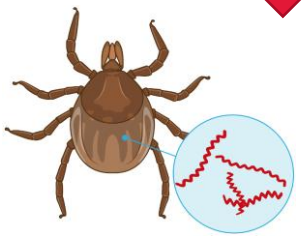
Antigen = 7x serotypes (SR) of Outer surface protein A (OspA)

mRNA-1982 = OspA SR1 elicits antibodies specific for Borrelia burgdorferi, which causes almost all the Lyme disease in the US

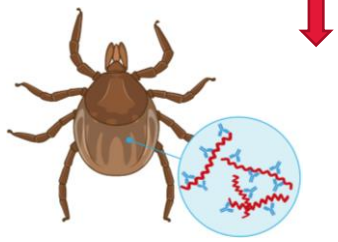
mRNA-1975 = OspA SR1-7 elicits antibodies specific for the four major Borrelia species causing disease in US and Europe

Product concept: The OspA lipoprotein is a transmission blocking vaccine antigen

Vaccine, when injected, elicits high levels of anti-OspA antibodies



Borrelia infected tick attaches to vaccinated human and begins blood meal



Antibodies kill *Borrelia* in midgut, preventing transmission to human host

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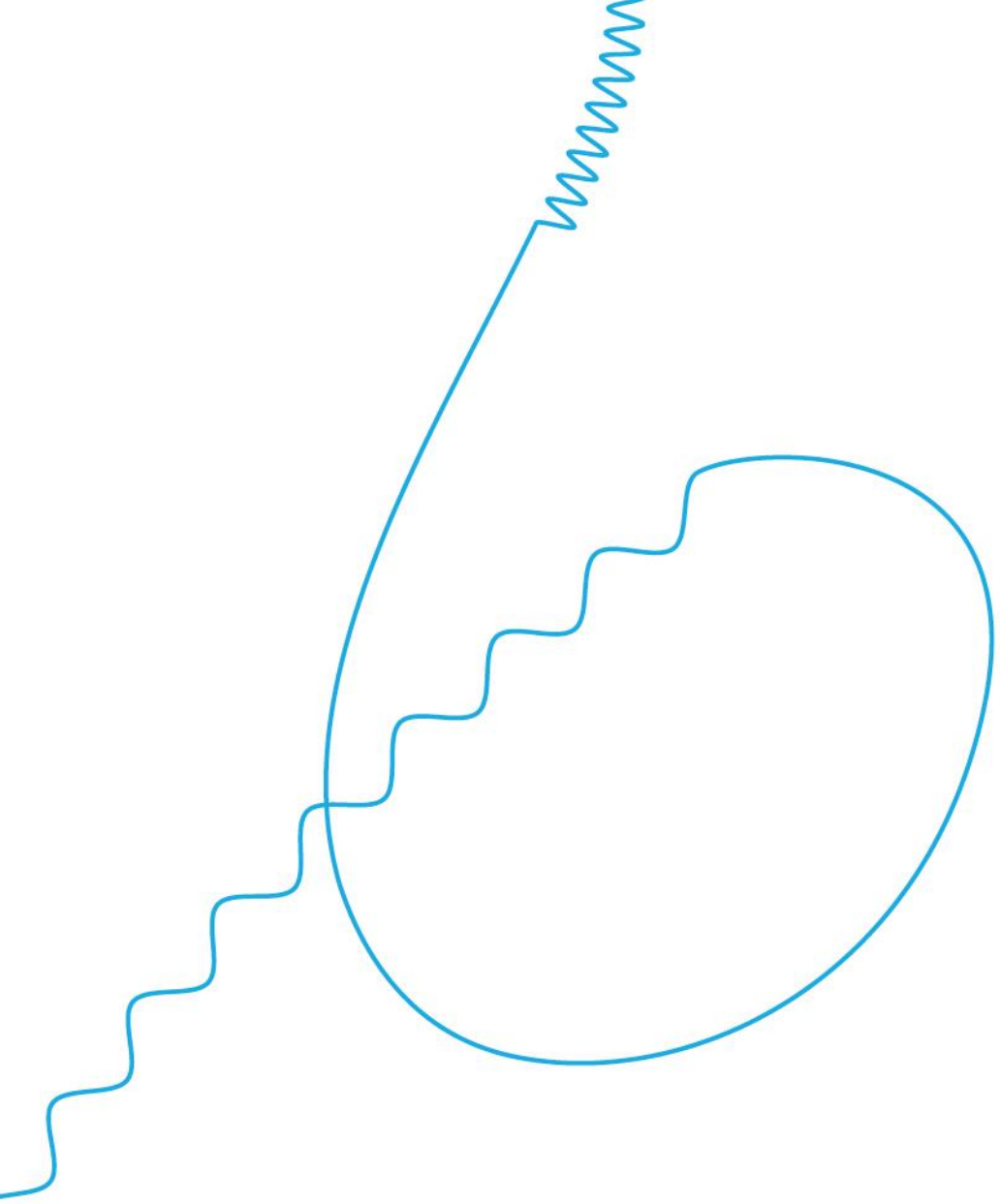

Commercial Opportunity in Vaccines

Arpa Garay

Chief Commercial Officer

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Moderna's current pipeline is targeting large addressable markets

Respiratory vaccines (COVID-19, RSV, flu, combinations)	**~$30b+**
Latent vaccines (CMV, EBV, HSV, VZV, HIV)	**~$10-25b+**
New vaccine candidates	**Significant unmet need**

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Multiple potential vaccine launches in the near future[1]

Launched

- **Spikevax**
  SARS-CoV-2

2024

- **mRNA-1345**
  RSV (older adults)
- **mRNA-1010**
  Seasonal Flu (HA)

2025

- **Combination respiratory vaccines**
- **mRNA-1283**
  SARS-CoV-2

2026+

- **Next generation influenza vaccines**
- **mRNA-1647**
  CMV

[1]Subject to clinical and regulatory success

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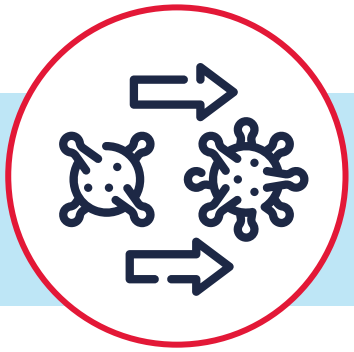
Respiratory vaccines market to reset in 2023 as COVID-19 enters the endemic phase, and expected to grow thereafter

Key variables that will impact COVID-19 volume in endemic market

Medical need



Viral evolution

Public health authority recommendations

Consumer motivation to vaccinate

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Global endemic COVID-19 booster market estimated to be ~$15B

Key assumptions

- COVID-19 vaccination coverage rate equal to flu vaccination rate in 50-65 and 65+ year old populations, and lower than flu for younger age groups
- Price ~2x compared to premium flu vaccines due to higher value

Estimated Global COVID total addressable market[1] (TAM)

1. Internal estimates

RSV: opportunity to develop respiratory vaccine market

RSV has the potential to be >$10 billion market[1,2]

Market dynamics

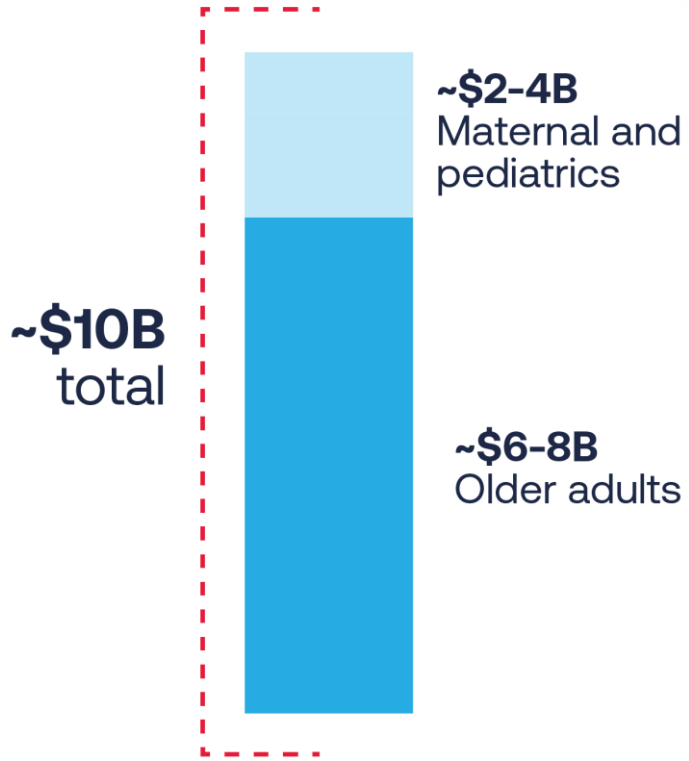
Addressable population

Older adults (>60 years old)

Pediatric trials ongoing

- Market size assumes vaccination coverage 75% of flu for 65+ & 50% of flu for 50-65
- Assumes premium pricing compared to flu

Market size



1. Analyst reports: Leerink investor report: RSV could be next $10B vaccine market
2. FiercePharma

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Flu: opportunity to expand the market with next-generation premium vaccines

Current influenza market ~$6 billion

Market could grow to ~$9 billion in 2028[1], with rise in more effective vaccines

Market dynamics

Addressable population

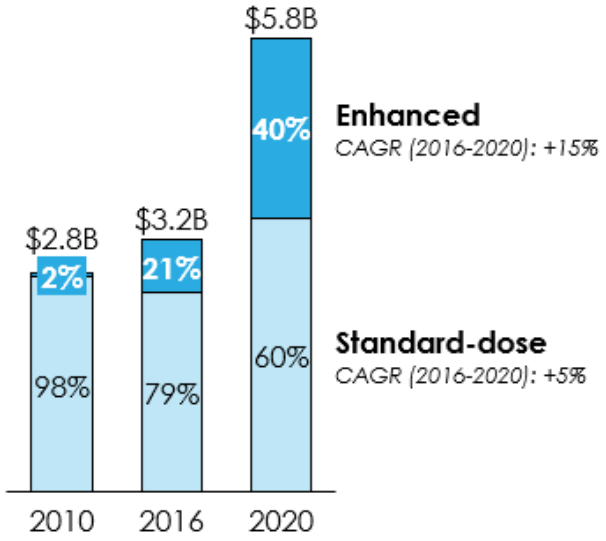
- Aim for recommendation in older adults (>65 years old)
- Adults 18+ eligible
- Explore pediatric indications

Enhanced vaccines

Premium vaccines with improved vaccine efficacy get a higher price (>$50/dose) and are growing at a faster rate[2]

Reported Global Influenza Vaccine Sales[3]

USD, billions



Source: EvaluatePharma, IQVIA MIDAS, Sanofi Vaccine Day (2021); High-dose products include Fluzone HD, Flublok, Fluad, total sales estimated

1. EvaluatePharma. Influenza vaccine : Worldwide | Overview
2. https://www.cms.gov/Medicare/Medicare-Fee-for-Service-Part-B-Drugs/McrPartBDrugAvgSalesPrice/VaccinesPricing
3. EvaluatePharma, IQVIA MIDAS, Sanofi Vaccine Day (2021); High-dose products include Fluzone HD, Flublok, Fluad, total sales estimated

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We believe combination vaccines will expand the current seasonal respiratory vaccine market[1]

Current annual global flu market

500-600m
doses
volume

- Increased vaccine value to health ecosystem
- Greater vaccination rates & compliance
- Market shift towards more effective vaccines

1. Seasonal respiratory vaccine market currently defined as influenza market

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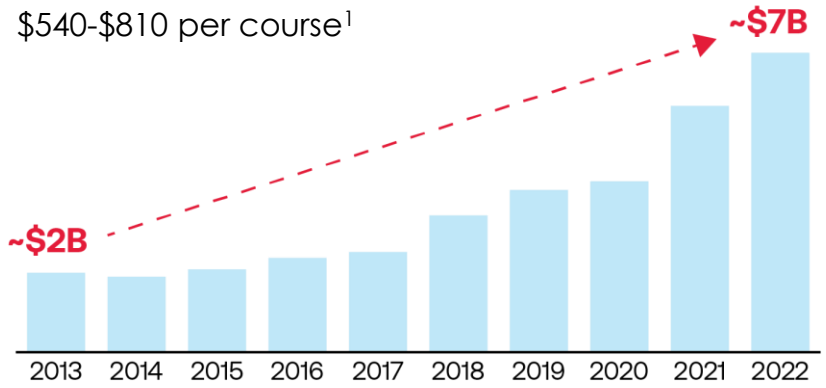
Moderna's latent virus vaccine development candidates have potential to address multi billion-dollar markets

Latent Viruses	Moderna Program
Cytomegalovirus (CMV)	mRNA-1647
Epstein-Barr virus (EBV)	mRNA-1189 mRNA-1195
Herpes simplex virus (HSV)	mRNA-1608
Varicella zoster virus (VZV)	mRNA-1468
Human immunodeficiency virus (HIV)	mRNA-1644 mRNA-1574

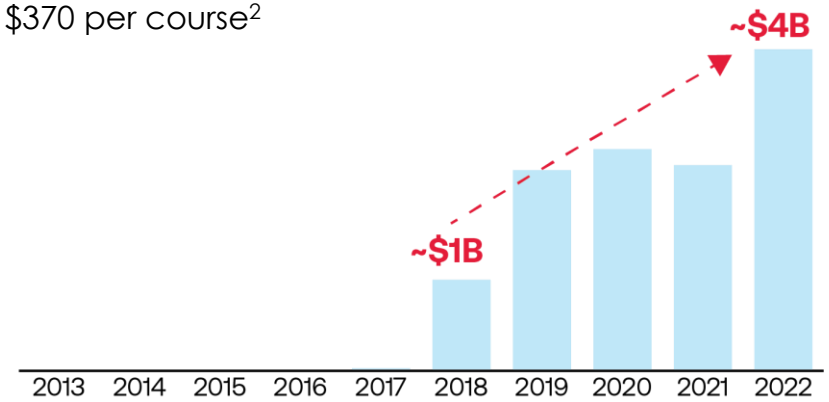
Worldwide Gardasil (HPV) Sales

$540-$810 per course[1]



Worldwide Shingrix (VZV) Sales

$370 per course[2]



1. Gardasil is a registered trademark of Merck Sharpe & Dohme Corp. Revenue: Evaluate Pharma estimates; Price. Annual report
2. Shingrix is a registered trademark of GlaxoSmithKline Biologicals, S.A. Revenue: Evaluate Pharma estimates; Price. Annual report

CMV: opportunity to be first in market

Latent viruses (such as herpes viruses and HIV) **do not follow seasonal patterns**

Demand is more constant over time, and market increases by expanding eligible populations (such as going down in age)

CMV expected to be a $2-5 billion annual market[1]

Build and expand the CMV market

- Women of child-bearing age (~4 million births a year in the U.S.)[2]
- Adolescents / primary prevention

New indications

CMV transplant population

1. Internal estimate
2. https://www.cdc.gov/nchs/products/databriefs/db136.htm#:~:text=The%20estimated%20number%20of%20pregnancies,2007%20has%20been%20well%20documented

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We are preparing to launch vaccines in large addressable markets

Large addressable markets

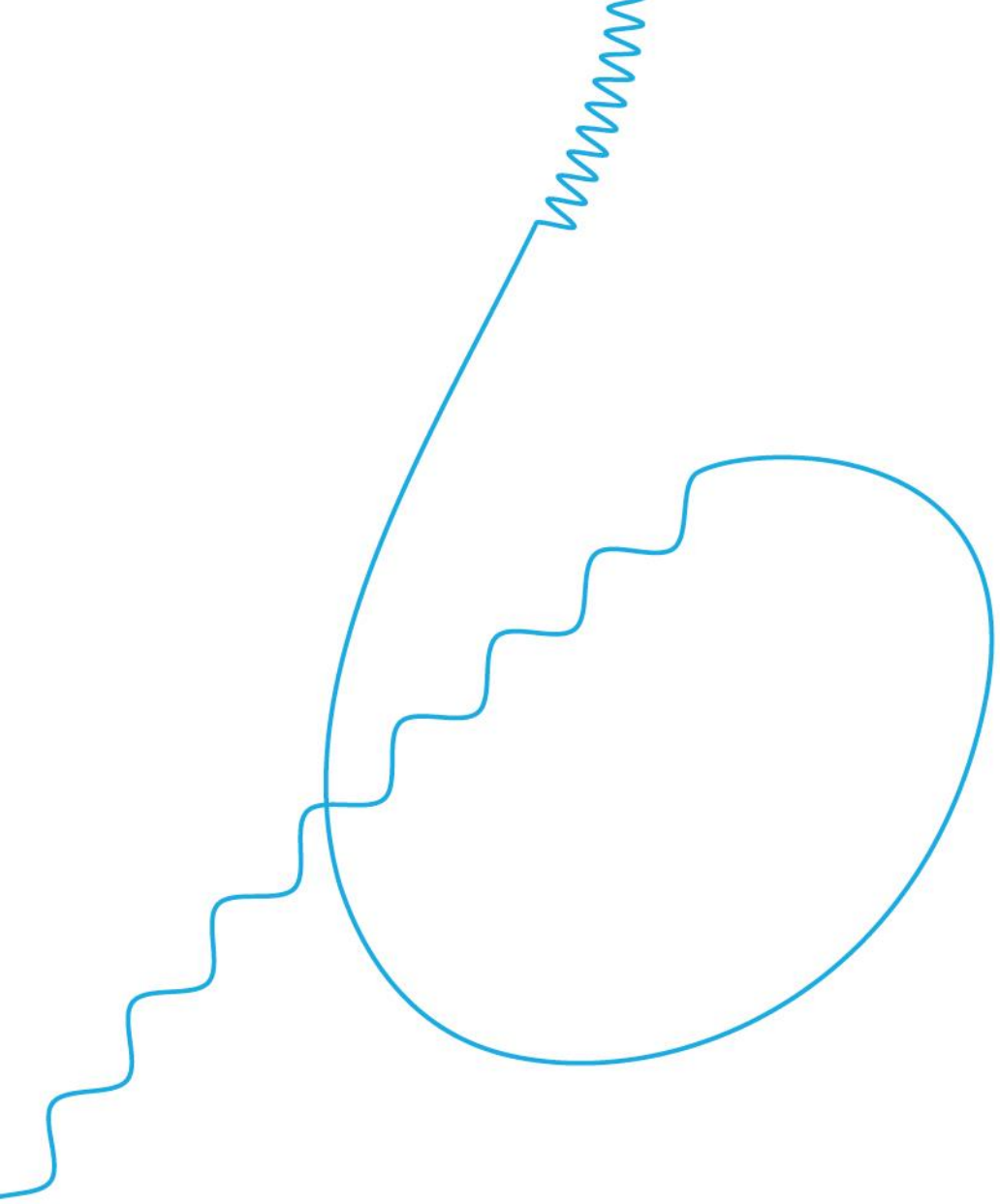
- Respiratory vaccines market is a large, multi-billion-dollar opportunity and combination vaccines provide competitive advantages
- Latent virus vaccines have different market dynamics compared to respiratory and offer considerable market opportunities

Preparing for launches

- Preparing for multiple vaccine launches between 2023-2026

Commercial readiness

- Have the global scale to compete in commercial vaccine markets
- Build on existing commercial and medical infrastructure with additional investment to support launch



Financial Strategy & Outlook

Jamey Mock

Chief Financial Officer

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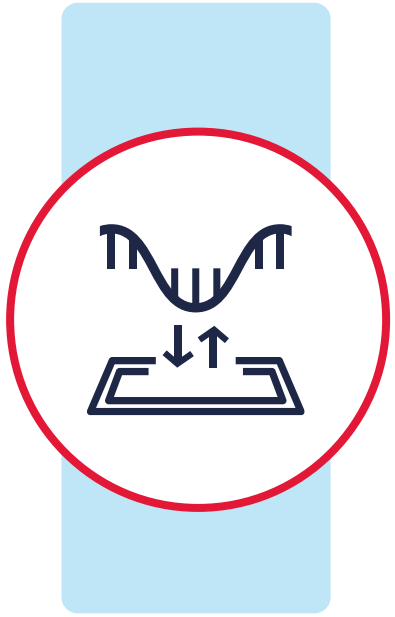
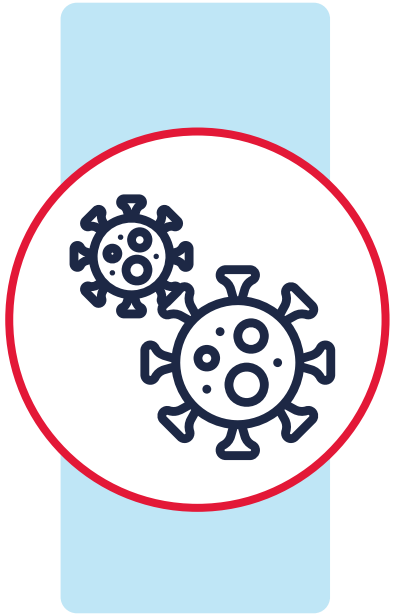
The significant investment in our platform enabled our COVID-19 success and established our vaccines franchise



Platform Investments 2011 to 2020

~$2.2B

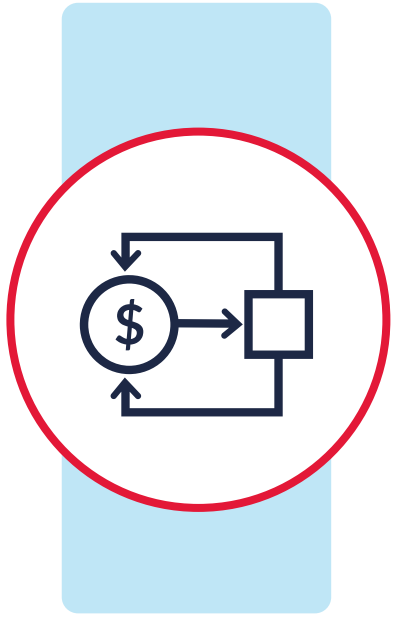


Incremental COVID-19 investments 2020 - 2022

~$4.0B

COVID-19 Product Sales through 2022

~$36.3B



2022 Ending Cash balance for future investment

~$18.2B

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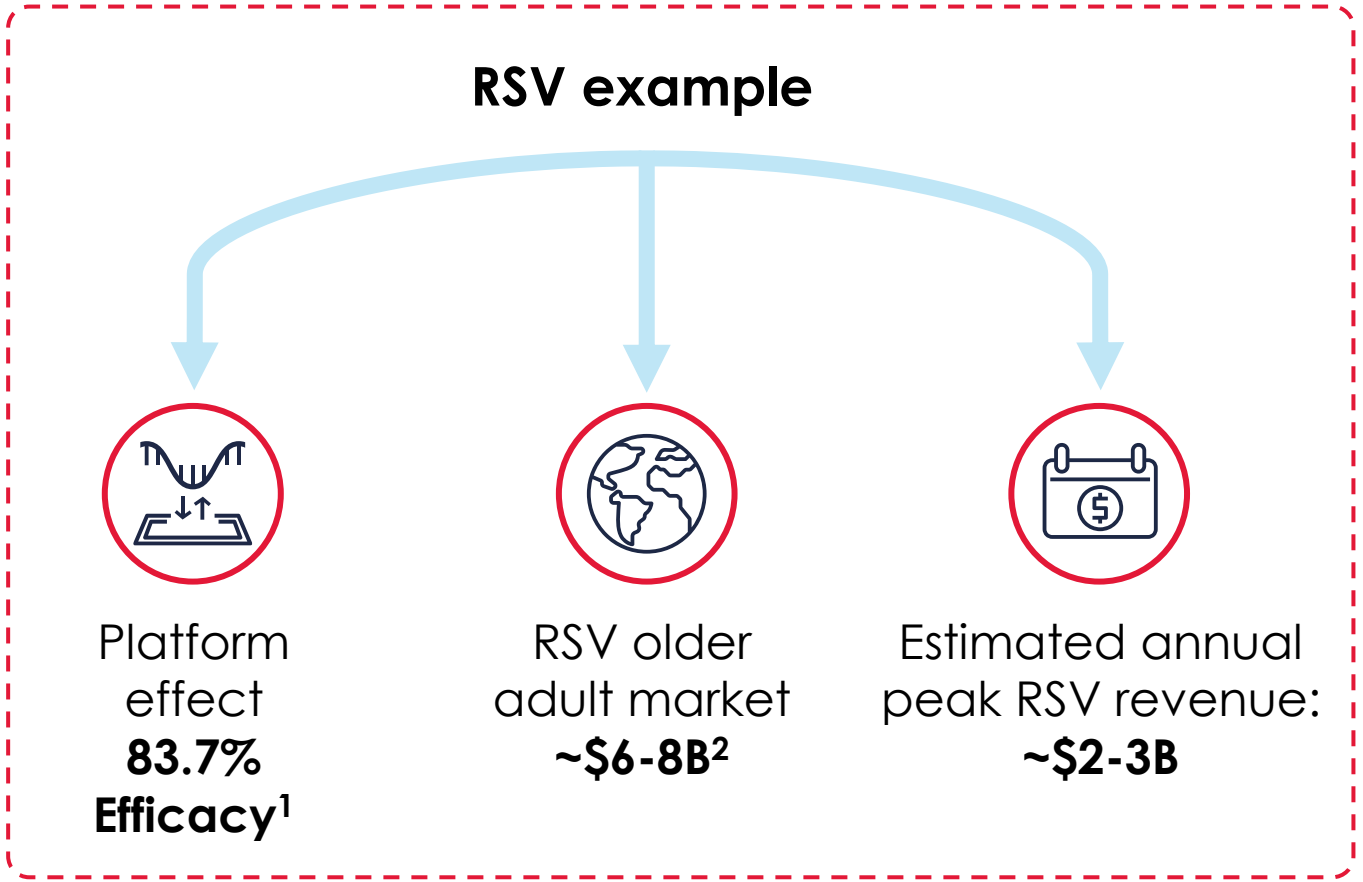
Elements of a strong vaccine opportunity

1. Ability to demonstrate high vaccine efficacy
2. Large addressable market
3. Durable recurring revenue



1. mRNA-1345 demonstrated vaccine efficacy of 83.7% (95.88% CI: 66.1%, 92.2% P<0.0001) against RSV lower respiratory tract diseases, defined 2 or more symptoms in older adults
2. Analyst reports: Leerink investor report: RSV could be next $10B vaccine market

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Benefits of a Platform approach

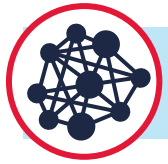
Speed
Phase 1 start to Phase 3 read-out

COVID	RSV	Flu
<1 year	~2.3 years	<2 years

Flexible manufacturing
Internal and external investment

Internal
~$0.9B invested across four sites

External
~$0.6B invested across five CMO partners



High biological fidelity

Ability to do combination vaccines

Category Investment
Reduced platform investment over time

Platform (to '20)
$2.2B

Infectious disease platform ('20-23)
~$0.4B combined

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Combination vaccines have potential to expand respiratory vaccines market with reduced incremental R&D investments

Potential for Market Expansion

Current Annual Flu Market

Market expansion drivers:

- Increased vaccine value to health ecosystem
- Ease of administration impacting vaccination rates
- Market shift towards more effective vaccines

Reduced R&D Investments[1]

Leverage vaccine efficacy and safety data from large Phase 3 studies of respective standalone vaccines

Immune bridging studies for regulatory approval for combinations

[1]Subject to regulatory discussions

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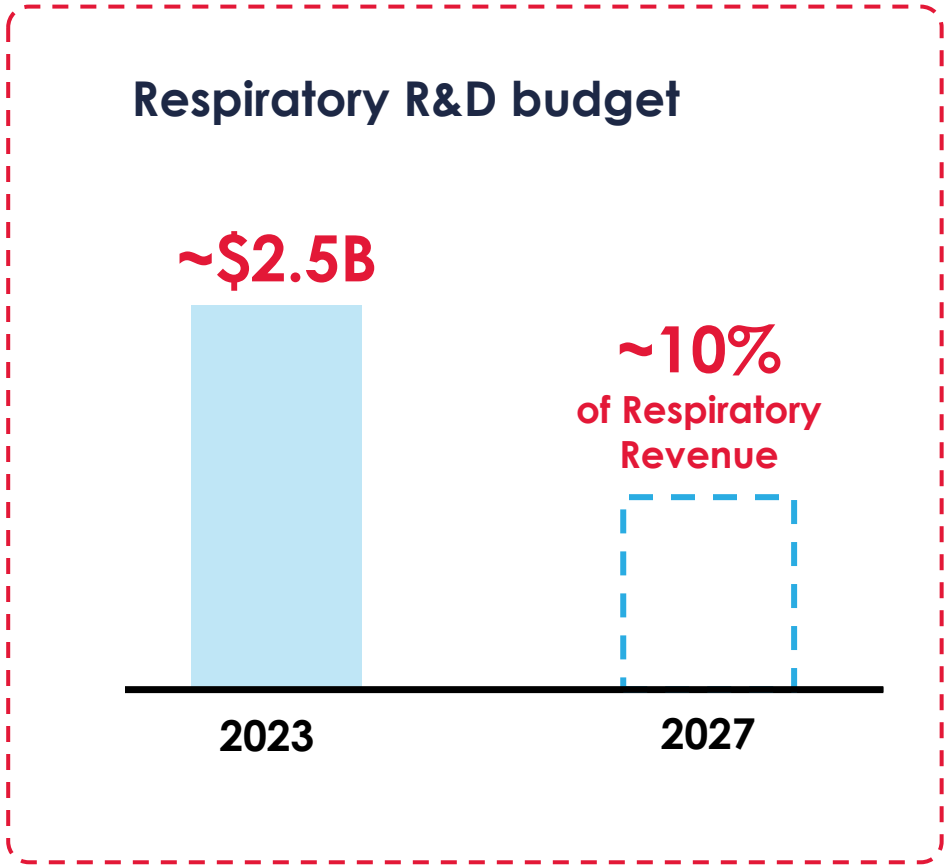
Our respiratory R&D investments are expected to remain at current levels through 2025, and to decline to maintenance levels by 2027

Spend Drivers

	2022	2023	2024	2025	2026
#1	COVID	RSV	Flu	Combos	Next Gen
#2	RSV	COVID	RSV	Flu	Combos
#3	Flu	Flu	COVID	RSV	Flu

Future investment options (~$6-8B)

- Phase 3 follow-ons
- Pediatrics
- Strain-specific requests
- Combination vaccines
- Maternal
- Other viruses (e.g. hMPV)



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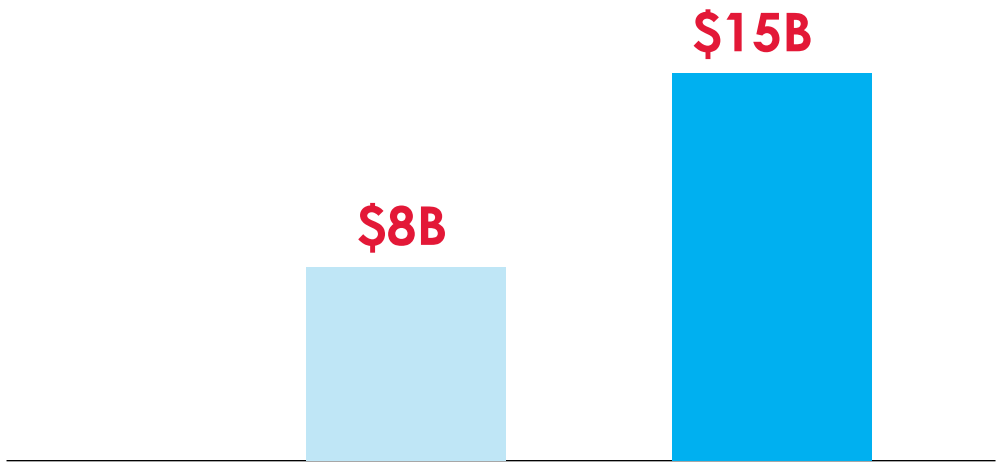
Our respiratory franchise is expected to become a significant source of cash generation by 2027

Estimated 2027 Respiratory Product Sales Range



	Low	High
Gross Profit %	~75%	80%+
Operating Profit %	50%+	60%+
Operating Profit $	**$4B+**	**$9B+**

Factors affecting revenue range:

- Vaccination rates
- Strong vaccine efficacy
- Stand alone versus combination share

Continued room for growth beyond 2027

Leverageable, efficient and flexible cost base

Low Capex intensity

- Reinvestment ratio below 0.5x

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Financial takeaways of our respiratory franchise

1. **COVID-19 was only the beginning.** We are creating an unrivaled respiratory franchise
2. **The opportunity set is large**, and we will remain financially disciplined in our approach to capture
3. **Our mRNA platform is well positioned** to solve the unmet need of combination vaccines with speed, flexible manufacturing and lower investment
4. **Our respiratory R&D investments are expected to remain at current levels through 2025,** and to decline to maintenance levels by 2027
5. **This franchise is expected to be a significant source of cash generation**, enabling future franchises

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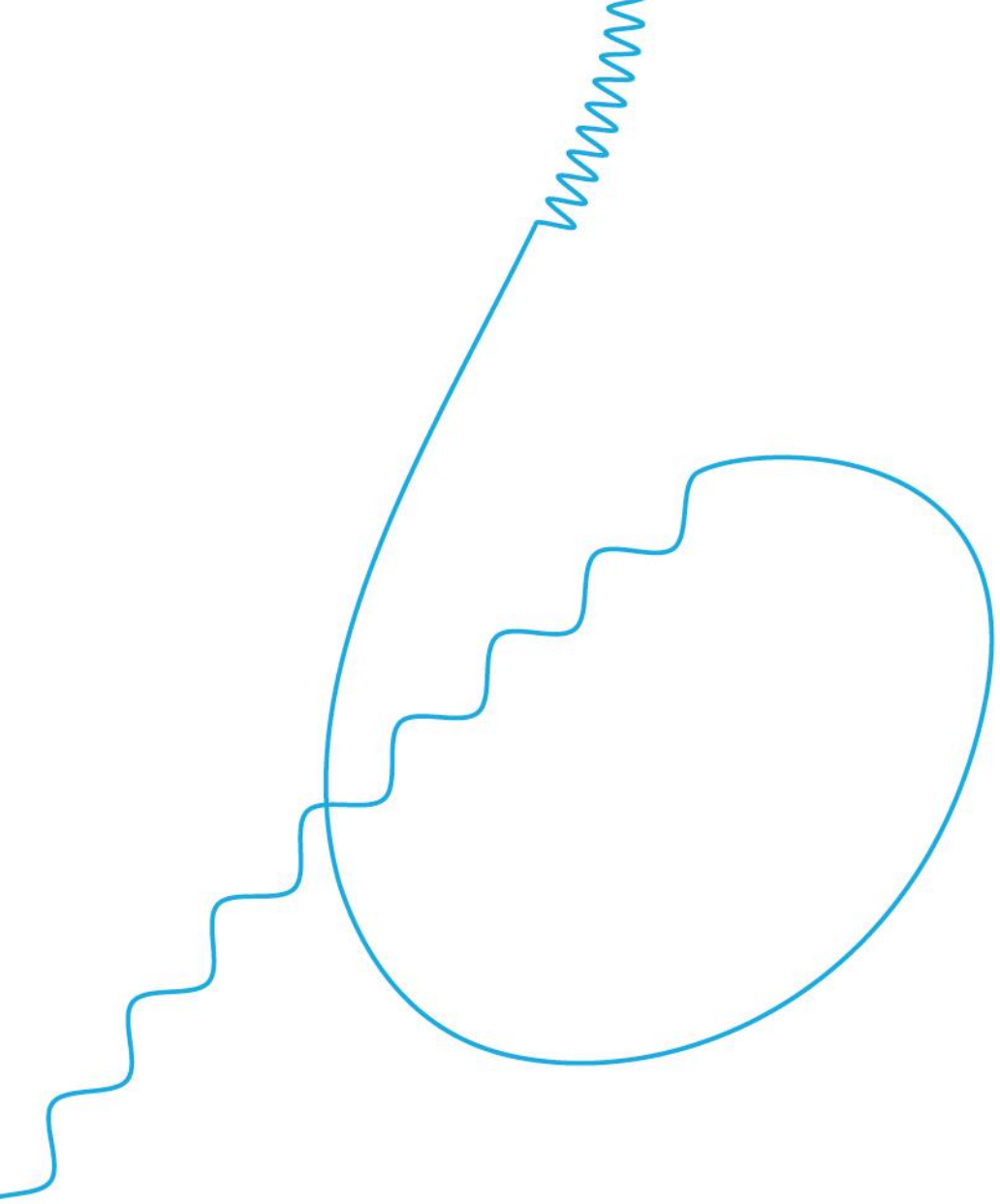

Conclusion

Stéphane Bancel

Chief Executive Officer

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The opportunity ahead in infectious disease vaccines

1

6 major vaccine product launches in the next 3+ years

2

COVID-19 base business transitioning to large endemic market

3

Our lead in mRNA technology will enable Moderna to continue to release innovative products: Norovirus / Lyme

4

Financial characteristics of our vaccine franchise are attractive, based on a leverageable platform

Moderna is positioned to be a leading vaccine provider by 2030, and will continue to develop innovative products

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Today was about vaccines, but Moderna is much more than a vaccines company

Personalized cancer therapeutic – additional Phase 2 adjuvant melanoma data at AACR on April 16. Starting Phase 3 study in adjuvant melanoma this year and planning to expand into additional tumor types including NSCLC with partner Merck

Rare diseases – early encouraging data from Phase 1/2 propionic acidemia clinical study; moving to expansion phase of study

Inhaled pulmonary therapeutics - our very first inhaled mRNA therapeutic is in a Phase 1 trial in cystic fibrosis with partner Vertex

Cardiovascular - Phase 1b study in heart failure patients is ongoing for relaxin

AACR: American Association for Cancer Research, NSCLC: Non-Small Cell Lung Cancer

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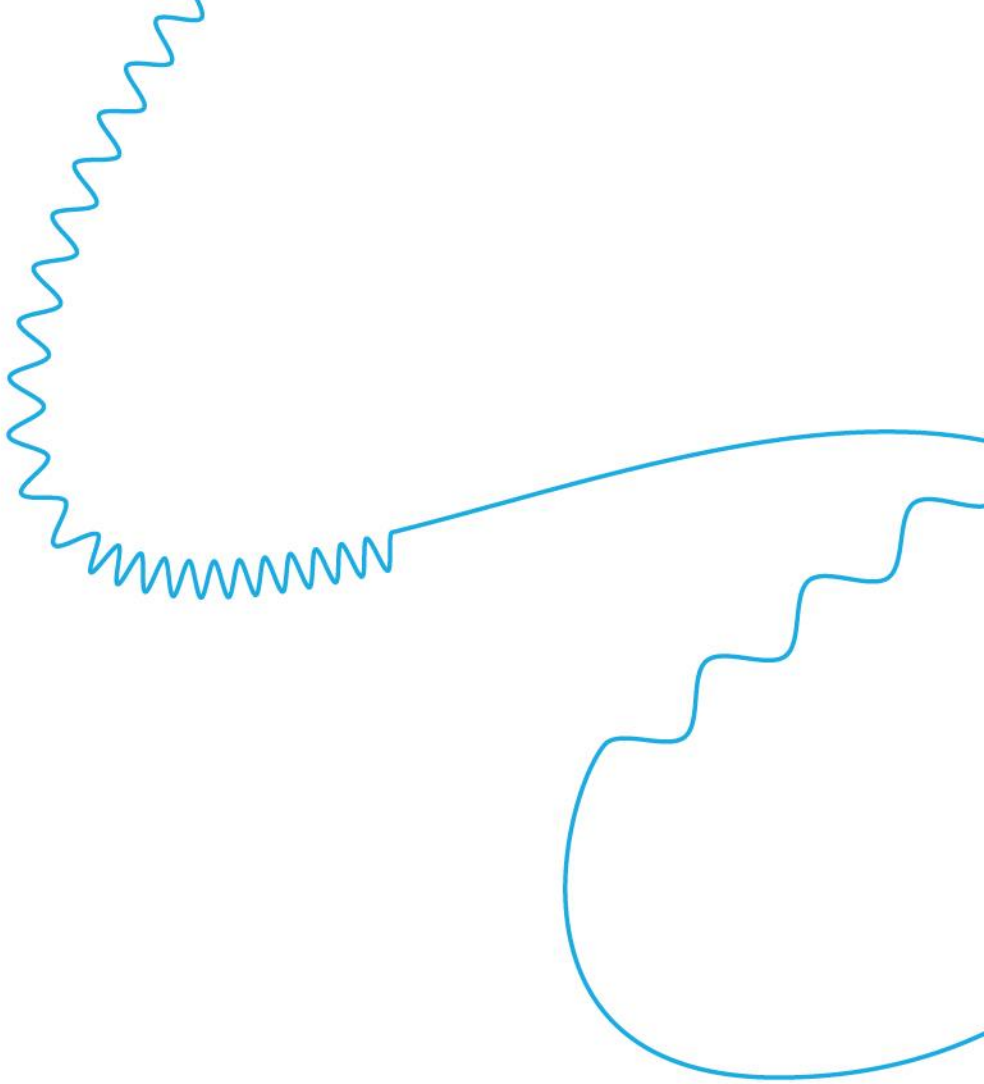
Q&A

Thank you



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