Perspectives on navigating a pandemic disruption and advancing competing vaccine development efforts beyond COVID-19

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DISCLAIMER : these perspectives are my own and do not necessarily represent the views of Leidos Biomedical Research or Frederick National Laboratory or USG-NIH /NIAID/ VRC

VCMP vaccine pilot plant activities during COVID-19

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- **Ensuring continuity of operations**
  - Establishing/implementing site-centric business continuity of operations strategy and framework

- **Staying the course with competing priorities in a contract environment**
  - Pivoting during a transient pause to support the community and local institutes
  - Returning to the workplace

- **Supporting COVID-19 vaccine development**
  - Assessing the competitive landscape; unique NIAID-VRC industry rapid response effort (mRNA)
  - Planning horizon and VCMP capabilities to support protein-based vaccine advancement

Pandemic "disruption" –how are we doing as an essential business?

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Key success elements

- Business continuity framework and gates
- Communications plan (site-specific)
- Cross-functional leadership endorsement
- Enterprise-wide EOC/ emergency Ops committee

Actions/Decisions

- ID of essential /minimal staff and rostering
  - Staff tracker tool implemented on Teams
  - Telework policies extended for all staff w/ HR
- Facility status changes
  - March: A to B (3/17), then to C (3/31)
  - May: return to B status ; managing to no more than 50 % onsite staff on any given day

4-tier Framework

STATUS	Facility Operation	Production	Onsite Staffing Plan	Telework	Site-wide Notification	Risk level
A	Normal	Normal	All staff except for routine telework and those on approved leave	Routine	N/A	Low
B	Normal	Normal	Only staff who cannot carry out job duties via telework Minimal # of staff to maintain normal operations	Non-routine	YES	Moderate
C	Reduced	Paused	Minimal # of staff to maintain reduced operations	Non-routine	YES	High
D	Closed	Stop	Minimal # of staff required to maintain safety and security of facility	Non-routine	YES	Critical

Pandemic "disruption" : hand Sanitizer AND resume clinical prod.

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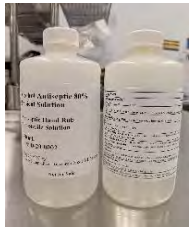
Hand Sanitizer : NIAID/VRC-funded

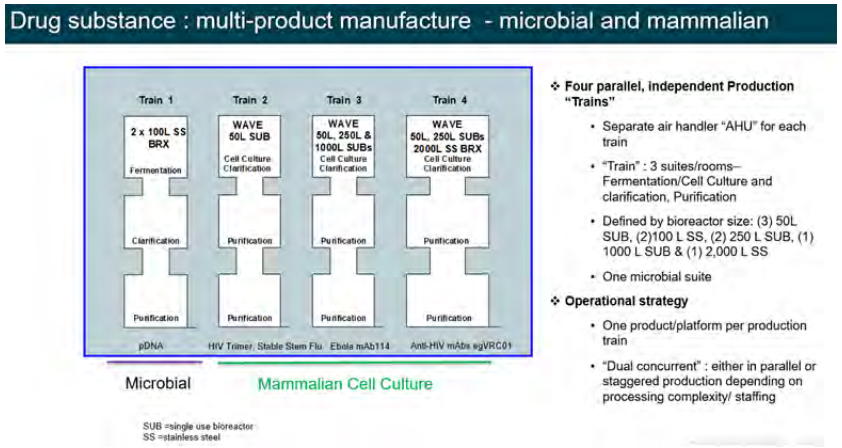
- 80% alcohol-based
- FDA: facility registration; temporary guidance
- 13 x 75-Liter batches ; single use systems
- Total supply : 2041 bottles
- Supplied local hospitals & NIH (60%), and FNL (40%)

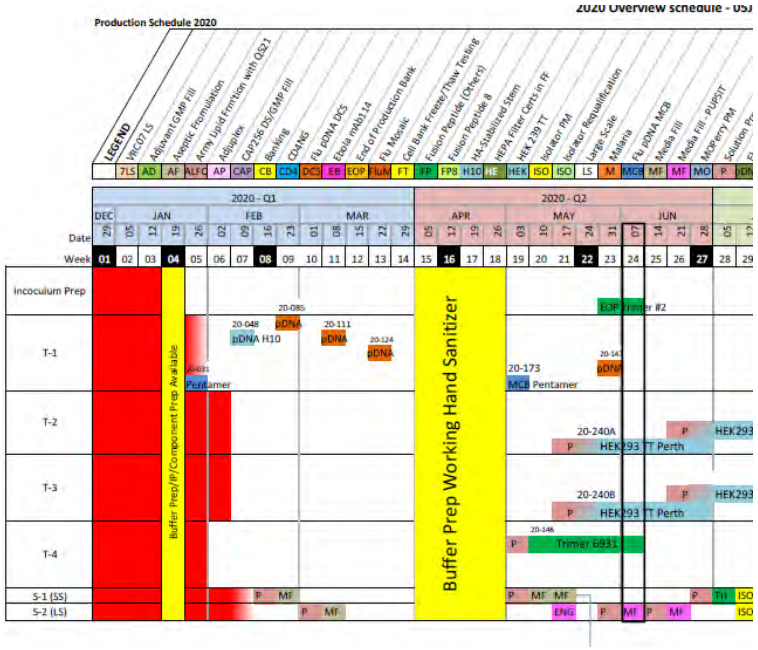


Resumed Production in May!!

- **HIV Vaccines (2)**
  - Rec glycoprotein trimer
  - Peptide conjugate (3 components)
  - + Proprietary adjuvant
- **Influenza universal vaccine**
  - Nanoparticle (5 components)

VCMP: multi-product, GMP facility





Enterprise-wide “return to the workplace” website resource

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ENVIRONMENT, HEALTH AND SAFETY

COVID-19 Return to the Workplace

Search EHS for... Go

COVID-19 | Waste | Health | Security | Safety | Emergencies | Resources | Contacts

Return to the Workplace Status

Current Status: Mission Essential Only
Current Group:
A B C D

Return to the Workplace Groups

Group A

- Indicators: Data supports moving forward.
- Principles: Work that cannot be completed remotely.
- Staffing: Staff whose work must be done onsite (i.e. campus support, intramural research).
- Health & Safety: Targets for staffing; Physical distancing (6ft); All meetings remote and mission critical travel.
- Timeline: Earliest - June.

COVID Safety: Prepare for a "New Normal"

Training

Return to the Workplace Training for Staff

Return to the Workplace Training for Supervisors

Help Preparing

View Q&As

How You Can Stop the Spread

Our Mission Is the Same, But We'll Be Doing Things Differently

NCI at Frederick and Frederick National Laboratory staff will be asked to return to offices and laboratories when it is deemed necessary and safe.

Return to the Workplace

- Q&A
- COVID Safety
- Workplace Signage
- EAP Resources

Return to the Workplace Resources

- NIH COVID Guidance for Employees
- Communication Center: COVID Messages
- Hand Sanitizer Request Form
- Order from the Supply Warehouse
- Self-Checker
- Prevention
- DIY Face Coverings
- Steps to Disinfect
- EPA Disinfectants

Basic science informs assay and vaccine development

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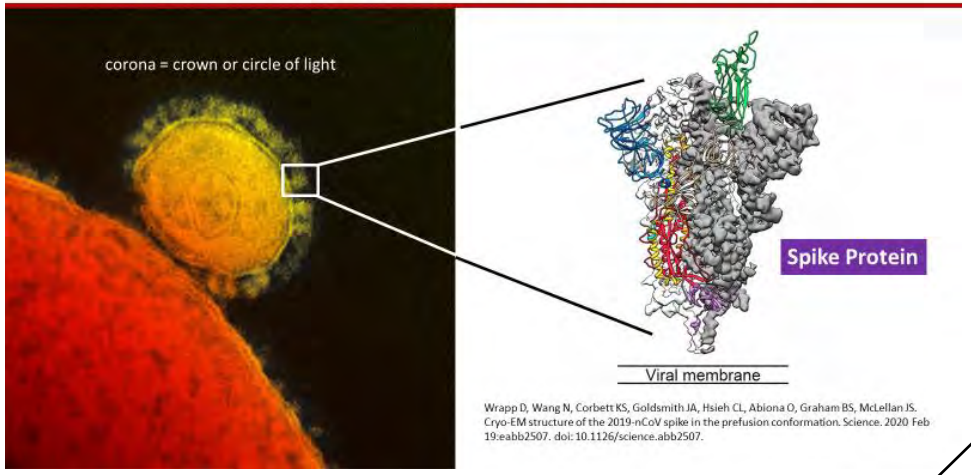
Coronavirus Biology and Nomenclature

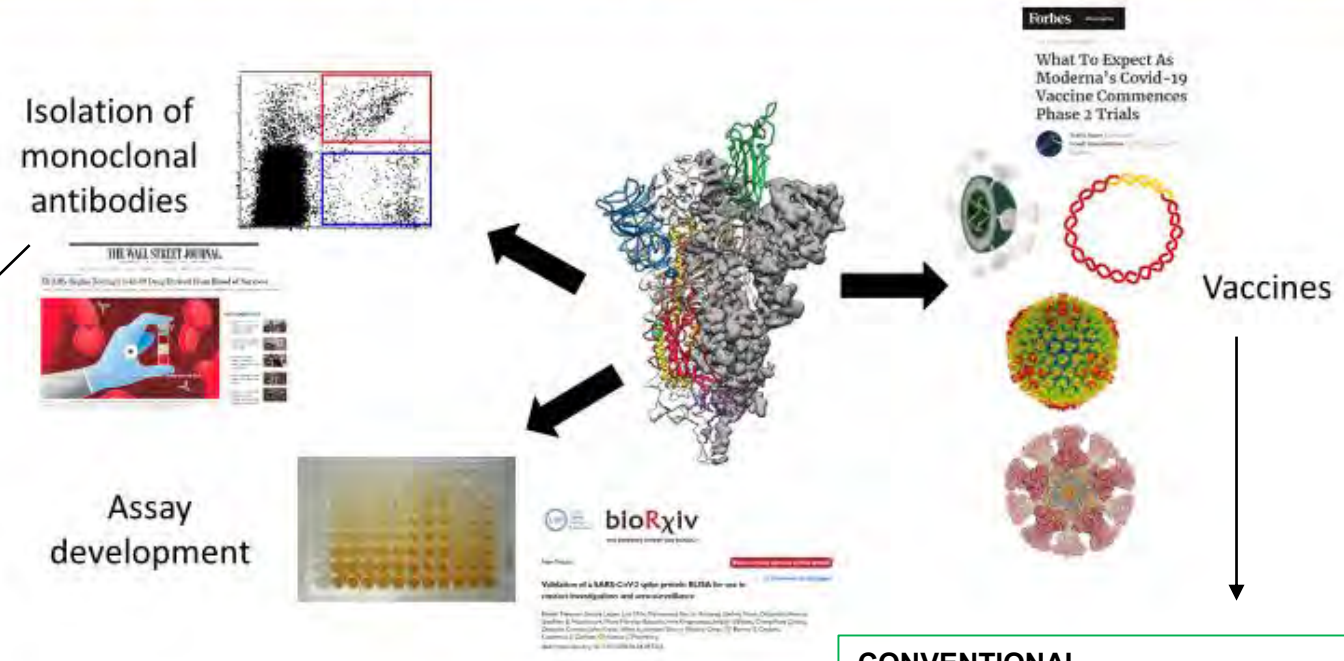


Cryo-EM structure determined: informs structure-based vaccine design

THERAPEUTICS DEVELOPMENT

- **Broadly neutralizing and potent mAb(s) expressed in mammalian cell culture**
- **Evaluate in clinical studies**

High Quality Protein is the Basis for Next Steps



CONVENTIONAL

- **Viral vector e.g. adenovirus vaccine**
- **Nucleic acid e.g. pDNA or RNA**
- **Mammalian cell culture subunit**
- **Mammalian cell culture nanoparticle**

Courtesy of Barney Graham, NIAID- VRC

SARS-CoV-2 vaccine landscape : complex “race” to clinic

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NOVAVAX
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PRESS RELEASE

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Novavax Initiates Phase 1/2 Clinical Trial of COVID-19 Vaccine

- *First participants enrolled in Phase 1 portion of clinical trial of NVX-CoV2373*
- *Preliminary immunogenicity and safety results expected in July 2020*
- *Phase 2 portion to begin promptly following successful Phase 1 results*

GAITHERSBURG, Md., May 25, 2020 (GLOBE NEWSWIRE) -- Novavax, Inc. (NASDAQ: NVAX), a late-stage biotechnology company developing next-generation vaccines for serious infectious diseases, today announced enrollment of the first participants in a Phase 1/2 clinical trial of its coronavirus vaccine candidate, NVX-CoV2373, a stable, prefusion protein made using its proprietary nanoparticle technology. NVX-CoV2373 includes Novavax' proprietary Matrix-M™ adjuvant to enhance immune responses and stimulate high levels of neutralizing antibodies. Preliminary immunogenicity and safety results from the Phase 1 portion of the trial are expected in July 2020.

Nanoparticle + adjuvant

moderna

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Moderna Advances Late-Stage Development of its Vaccine (mRNA-1273) Against COVID-19

June 11, 2020 at 7:57 AM EDT PDF Version

Phase 3 study of 30,000 subjects expected to begin in July 2020 at 100 µg dose level

Manufacturing scale up with Lonza on track to supply 500 million to 1 billion 100 µg doses per year

Completed enrollment of younger adults in the Phase 2 study of mRNA-1273 (n=300); also completed enrollment of the sentinel group of older adults (n=50)

mRNA

AstraZeneca ties up with Emergent BioSolutions to make COVID-19 vaccine in U.S.

2 MIN READ

FILE PHOTO: The company logo for pharmaceutical company AstraZeneca is displayed on a screen on the floor at the New York Stock Exchange (NYSE) in New York, U.S., April 8, 2019. REUTERS/Brendan McDermid/File Photo

Adenoviral vector

(Reuters) - Emergent BioSolutions Inc (EBS.N) said on Thursday it signed an $87 million deal to make AstraZeneca Plc's (AZN.L) experimental COVID-19 vaccine in the United States, boosting the British drugmaker's efforts to bring a vaccine to the market.

The deal comes weeks after the United States pledged up to $1.2 billion to secure 300 million doses of AstraZeneca's vaccine, which is among the first to move into mid-stage trials.

Unique industry –govt. partnership : messenger RNA technology

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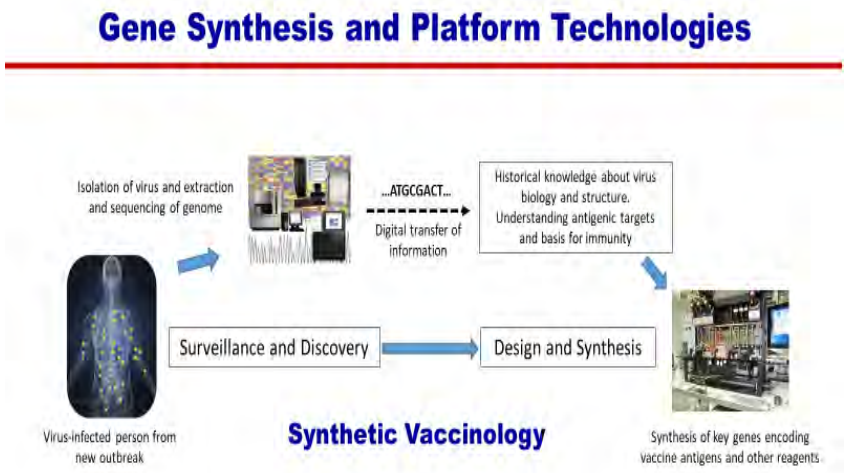
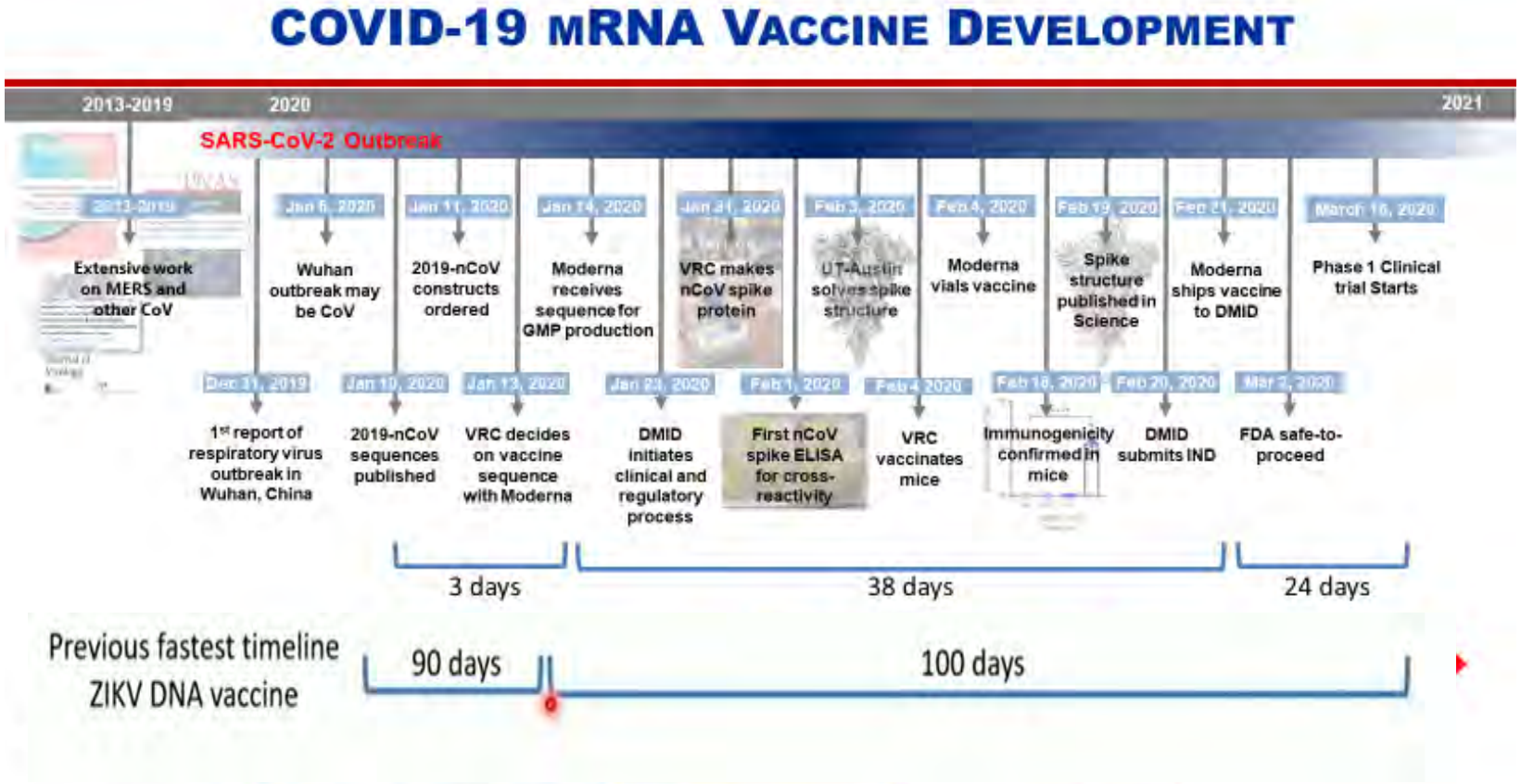
- **NIAID/VRC – Moderna (mRNA-1273) : thru Phase I, in Phase II, planning Ph III…**
- **<u>Driver</u> : rapid speed to clinic**





mRNA vaccinology ► "disruptive technology"

Courtesy of Barney Graham, NIAID- VRC

VCMP : proved capability and capacity to advance protein-based vaccines and therapeutics

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Multi-Prong Strategies for COVID-19 protein vaccine

Conventional: CHO mammalian cell culture **9-18 months out (!)**

- Cell line development in-house or subcontract (e.g. Cellca –Germany): 3-6 month endeavor
  - Goal: **high expression, soluble COVID Spike protein** with and without furin enzymatic cleavage + variants
- Additional 6-12 months for Process/analytical, then Tech Transfer and clinical production, testing and release for clinic

Disruptive and/or novel technologies (timing: yet TBD!)

- ***C1 Expression system (M. thermofilia fungus)*** protein vaccine
  - Drivers : rapid development /low cost; short mfg. processing times and purported scalability; targeted glycosylation /product quality
  - Goal : **COVID-19 Spike Protein-expressing C1 cell lines** with and without furin enzymatic cleavage + other variants
- ***Spy Tag / Spy Catcher technology*** protein antigen nanoparticle vaccine
  - Fuse either spy tag or spy catcher to self-assembling nanoparticles and antigens (e.g. Spike protein)

Conclusions / takeaways

- **Continuity plan /actionable framework is paramount to business resilience**
  - Includes return to work plan
- **Core values are foundational to delivering on commitments**
  - Versatility and Compassion
- **Science informs vaccine and therapy development**
  - Structure-based design

How can you get involved ?