



Chronic Pandemic? Vaccine Geopolitics

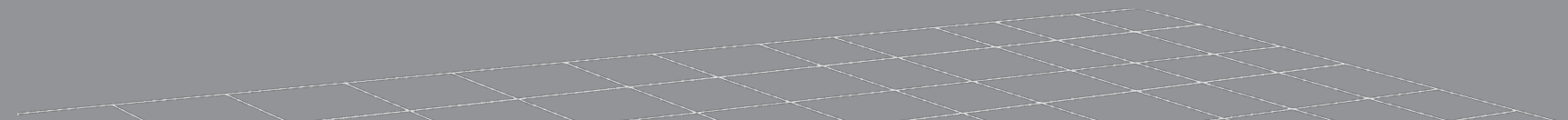
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25. February 2021



- Vaccine diplomacy after face mask diplomacy
- 2 Definitions of **Geopolitics**
 1. Politics, especially international relations, as influenced by geographical factors
 2. Zero-sum thinking
- Vaccine is definitely not zero sum (high fixed costs)
... but the power arising from it is zero sum
- with constantly evolving mutants – not 2021, but long game
- Which technology is
 - adaptable to mutants? mRNA?
[BioNTech/Pfizer, Moderna, Curvec] (US, Germany)
 - Easy to distribute? [AstraZenica Oxford, J&J] (UK, US)

Multilateral global approach

- Smallpox killed 2 million people a year in 1960s
 - Soviet Union developed vaccine
 - Global strategy to eradicate smallpox at the height of cold war.
- Global challenge
 - As long a border as not fully closed, virus spreads (Redding webinar)
 - Dangers of partial vaccination: the virus adapts and mutates
- Multilateral approach – WHO
 - Has the WB and IMF found its role?
 - Are private global organization (Gates foundation) more important than official institutions?

South-south cooperation: India and Africa

- Suppose we are in the long-game with annual vaccinations for 10 years
- Who is building vaccine structure for Africa?
- mRNA technology [from US/Germany]
- Production technology from India/Brazil
- Production sites in Africa
- Idea: A role for the World Bank

Data, Science, and Trust

- Using own population as Guinea pigs to gain geopolitical advantage (UK?)
- Combining data with other health data (Israel)
- Promote innovation in private sector
Private-public partnership arrangement
- International property right protection
(Kremer, Summers webinar)

Poll Questions

1. How will COVID-19 pandemic end?
 - a. When global population is sufficiently vaccinated;
 - b. In advanced countries
 - c. Never, it will become chronic, like HIV;
2. Russia, China, and India will
 - a. Become global suppliers of vaccines;
 - b. Supply vaccines mostly to emerging markets;
 - c. not have any dominance in vaccine geopolitics/diplomacy;
3. Emerging Markets will have
 - a. widespread fiscal/financial crises;
 - b. Fiscal and financial problems will be mostly local;
 - c. Will be fine due to low global interest rates



Chronic Pandemics? The Geopolitics of Vaccines and Policy Implications

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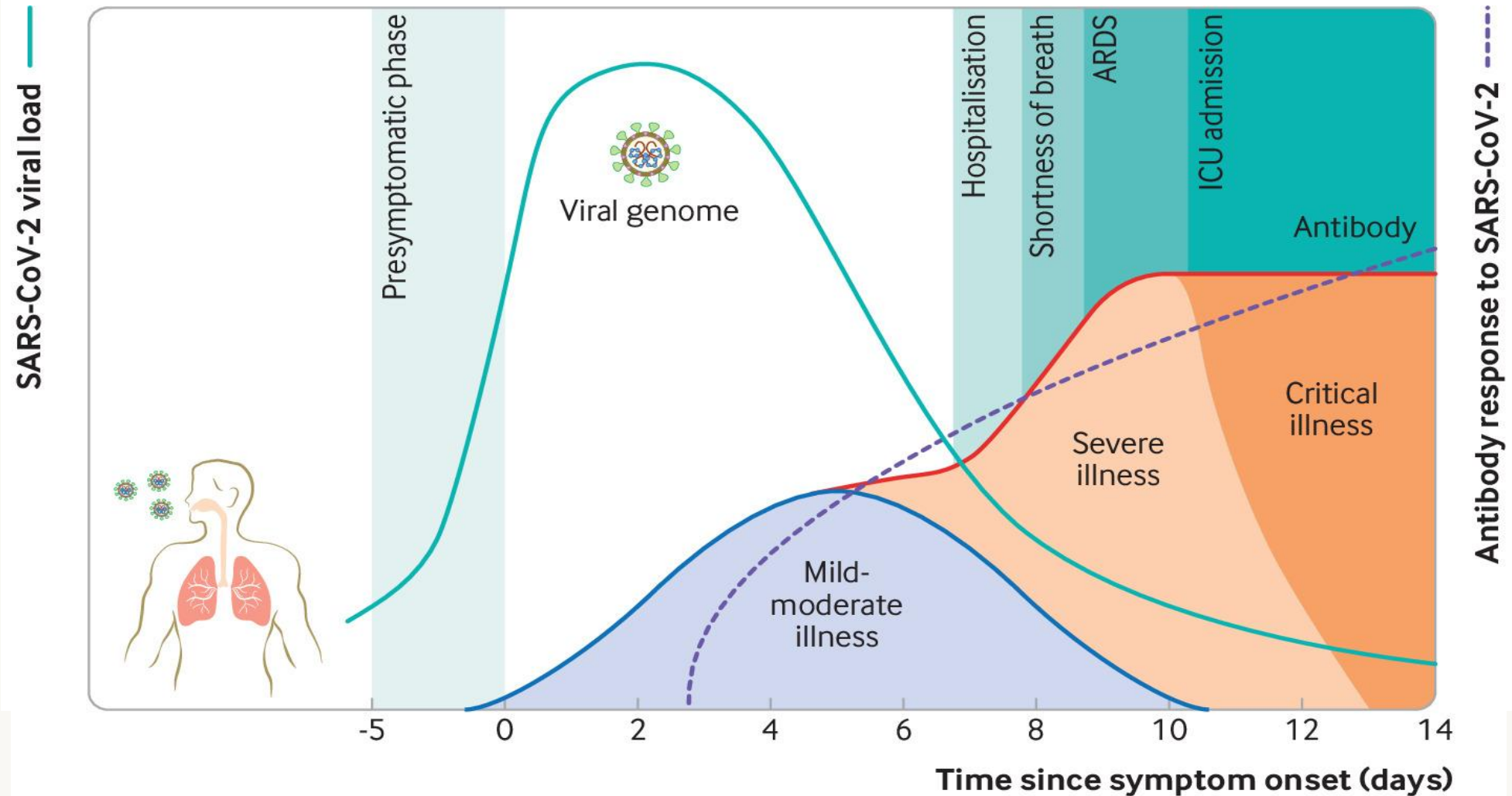
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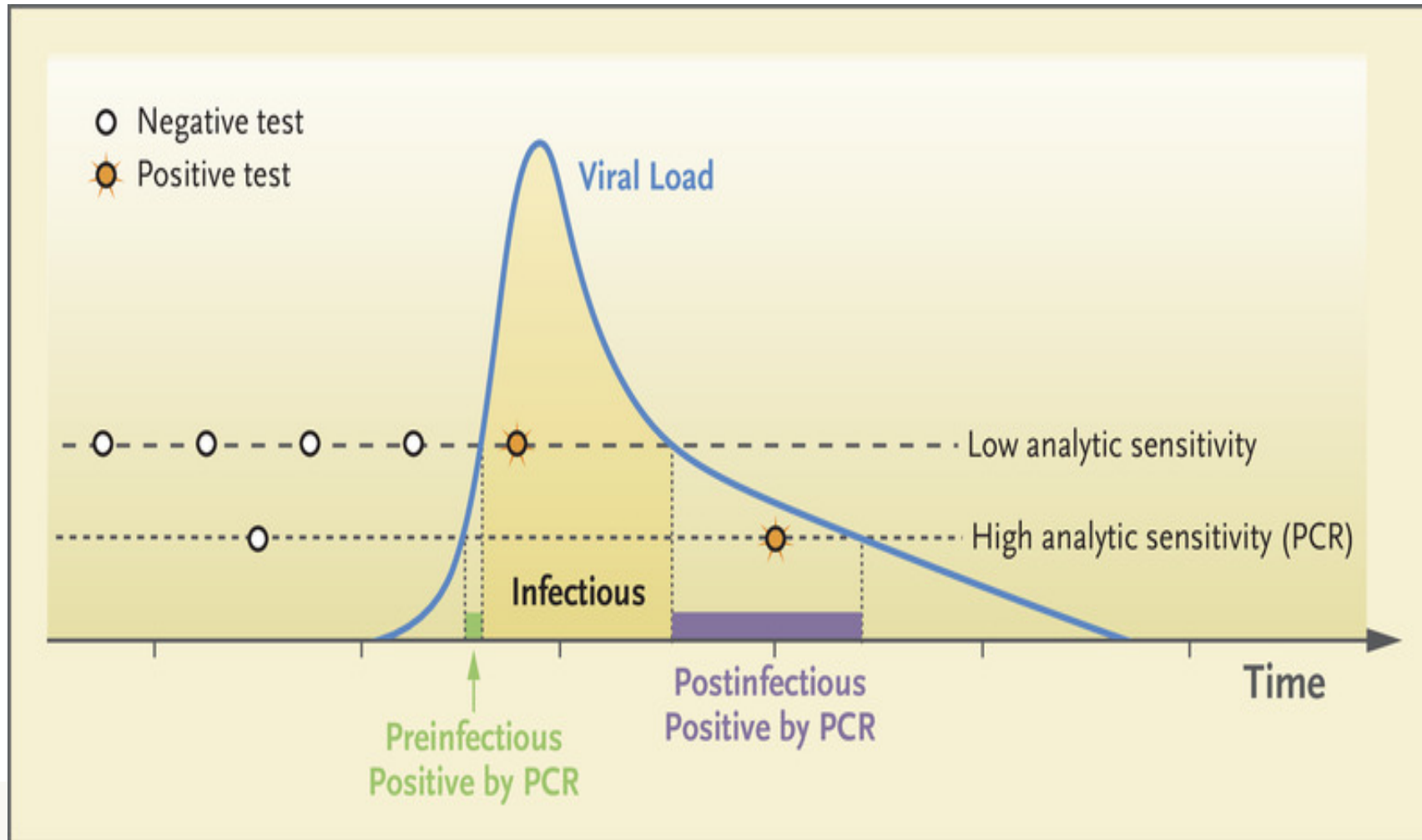
Why Chronic Pandemics?

- ♦ SARS-CoV-2 and COVID-19
- ♦ Zoonotic viruses and environmental concerns
- ♦ Lack of global preparedness/cooperation
 - ♦ Communication and Transparency
 - ♦ NPIs and social/political adhesion
 - ♦ Genomic Surveillance

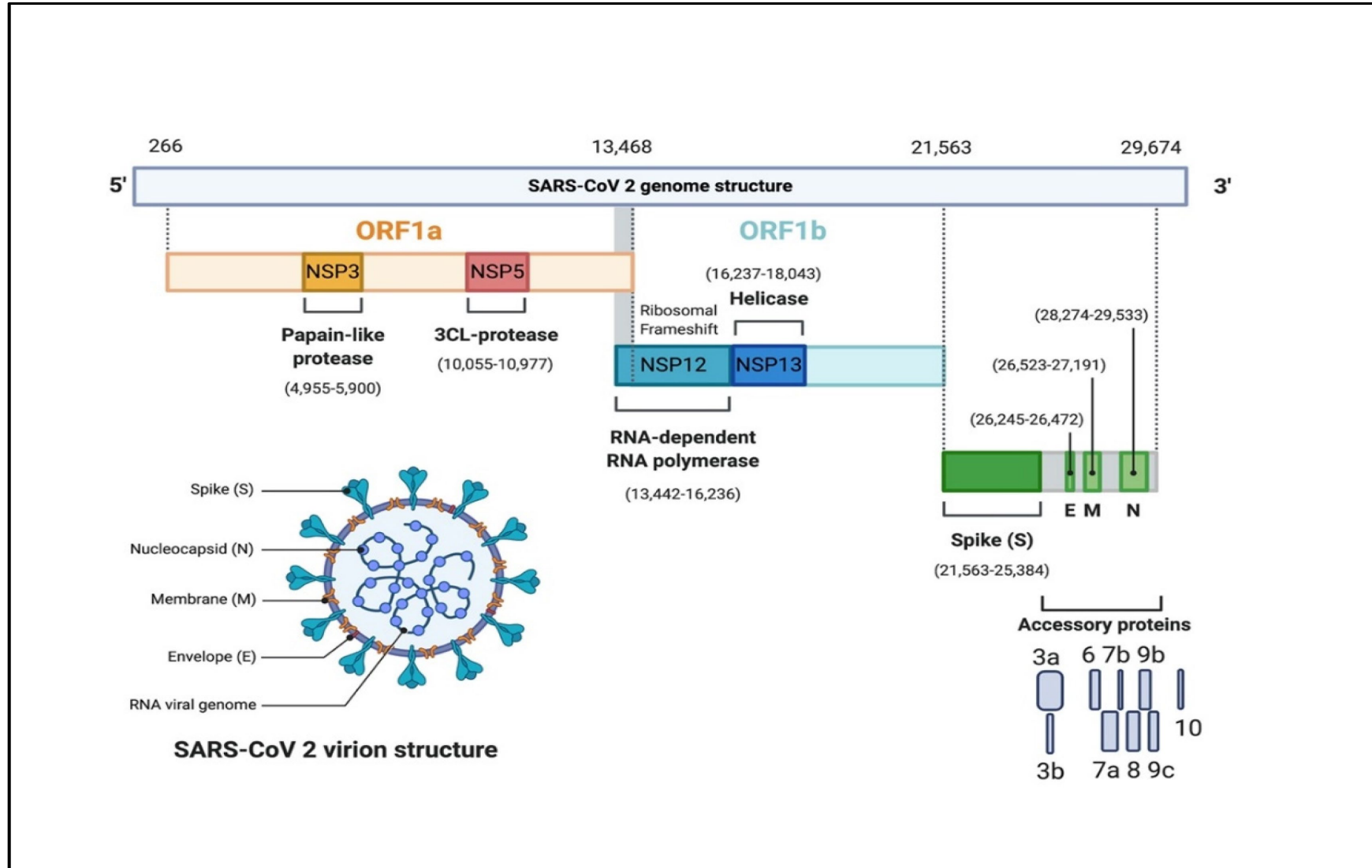
COVID-19: Viral Titers (Source: BMJ)



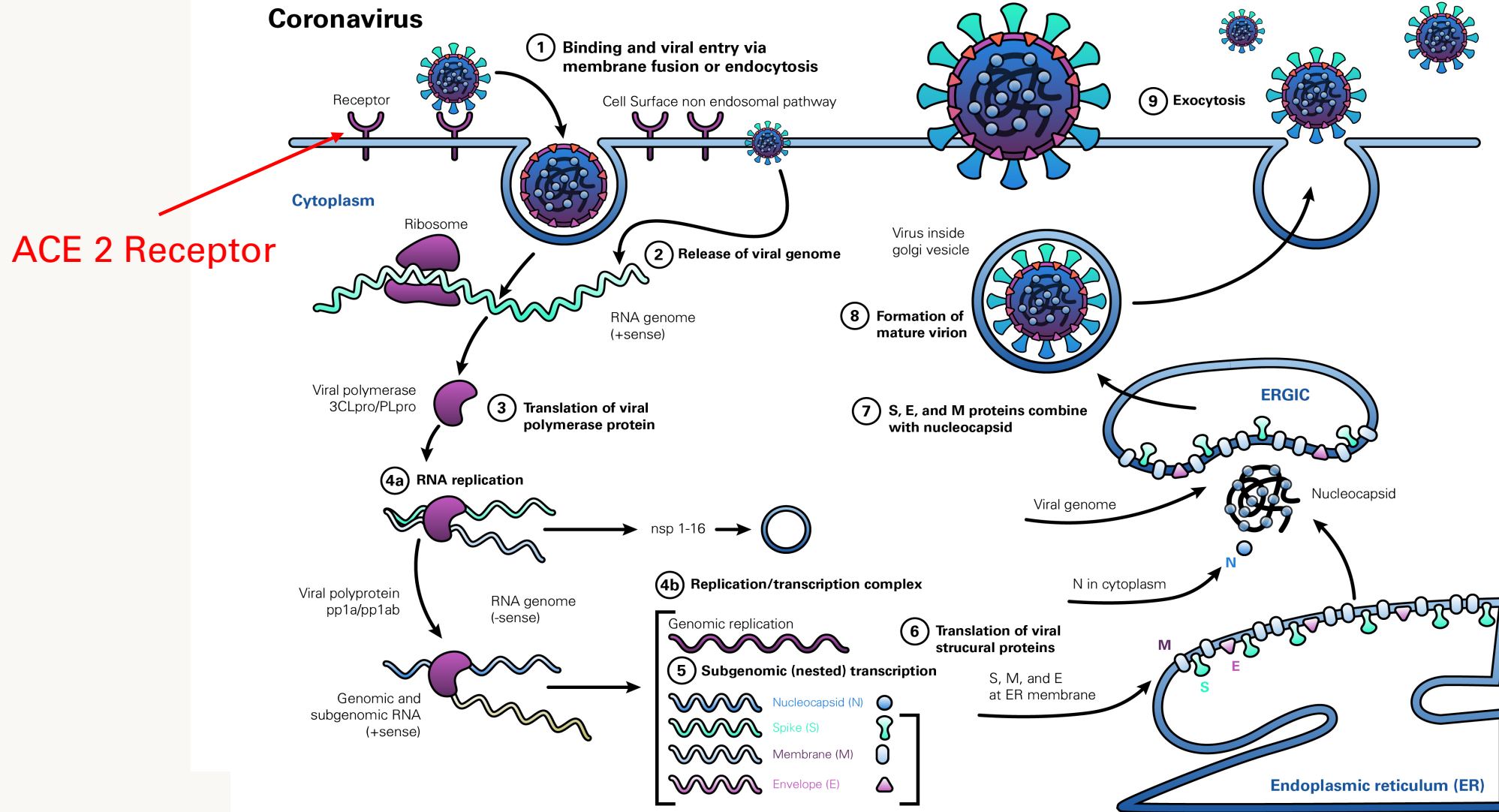
Testing



The SARS-CoV-2 Genome: 30k bps



The Viral Cycle

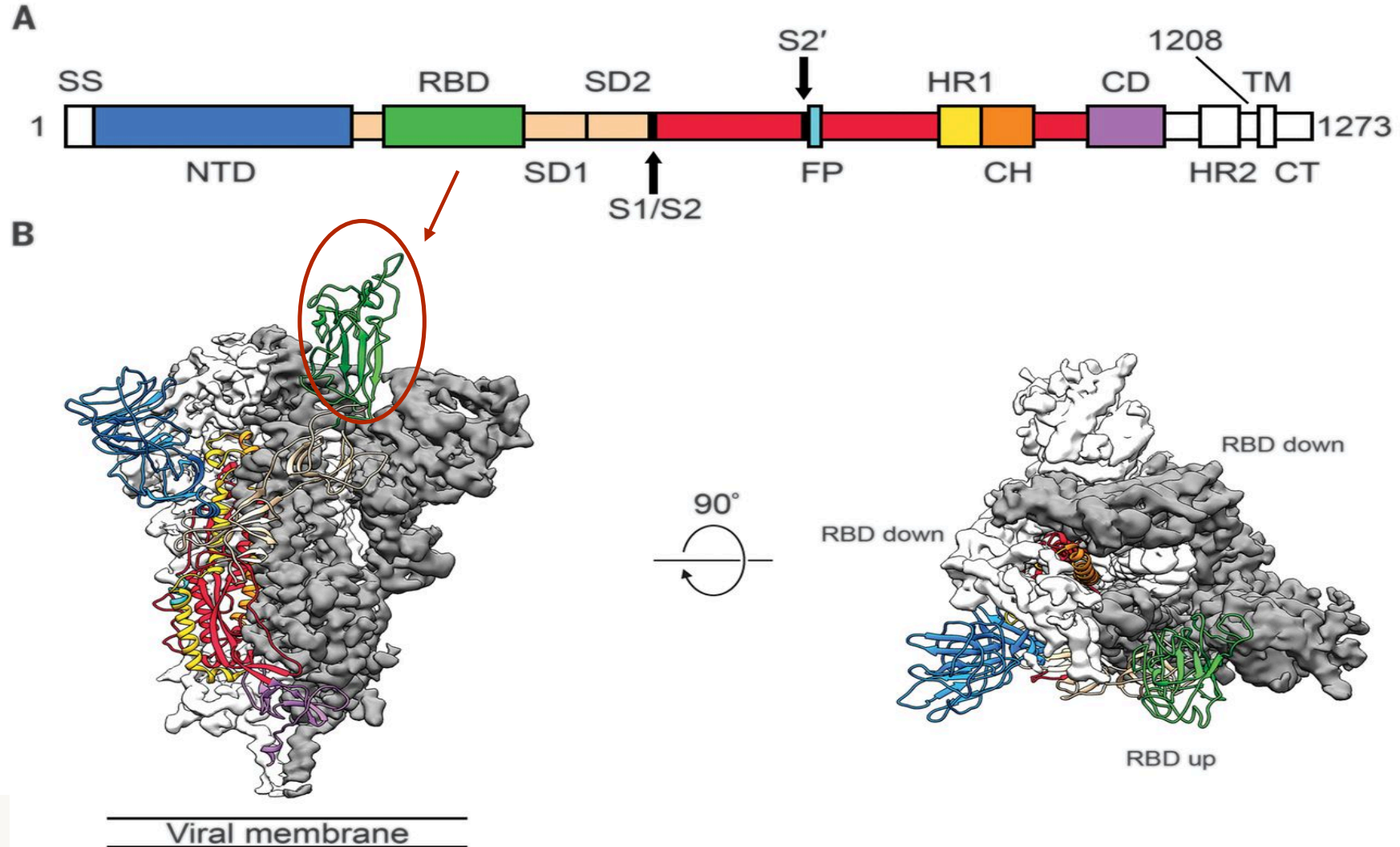


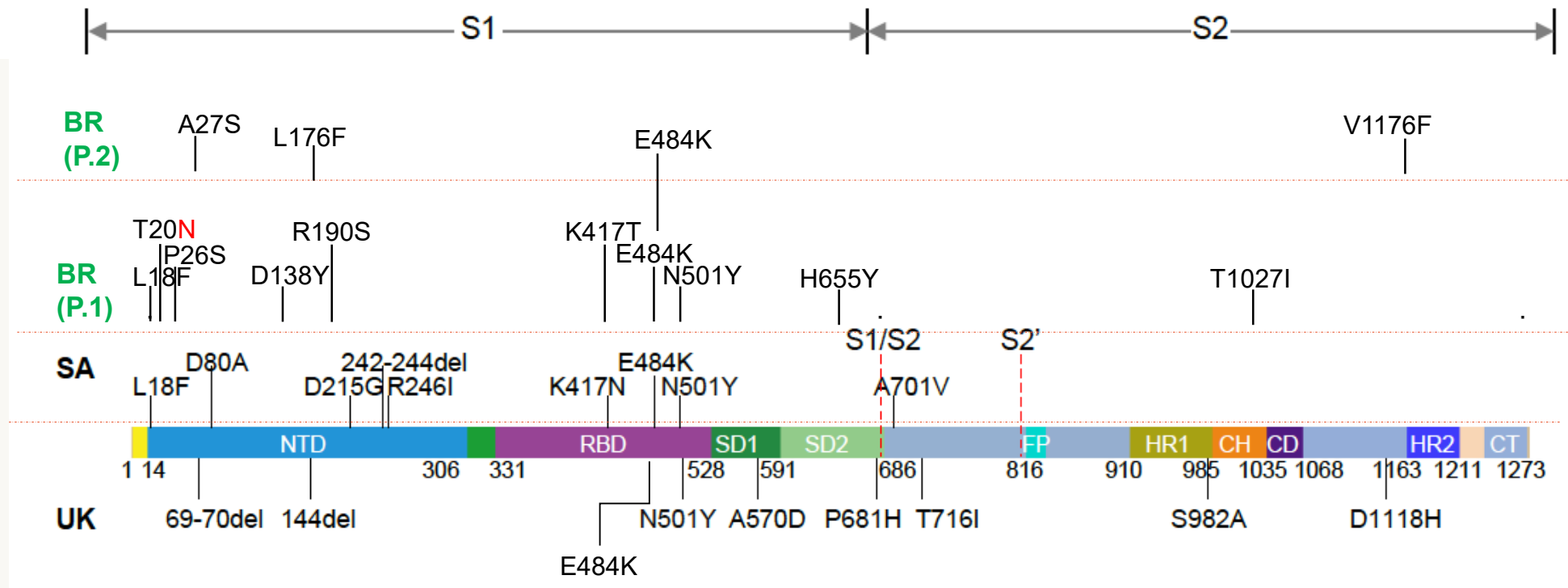
- ♦ As a virus replicates, either in a host or in a population, it will mutate. Within the same host, no mature virion is exactly like any other.
- ♦ Mutations are completely random:
 - ♦ Many will be neutral from the virus' perspective
 - ♦ Some may be deleterious to the virus
 - ♦ Some may be advantageous to the virus
- ♦ When a virus finds a new host – a new species – it will undergo adaptation/evolution. Over time, this will lead to greater viral “fitness”. “Fitness” is not synonymous with pathogenicity.

- ♦ Mutations: Changes in the genome. They may be SNPs: Synonymous, missense, nonsense, or frameshift mutations. They may also be indels: insertions or deletions.
- ♦ Variants: Genomes that differ in sequences by one or many mutations.
- ♦ Strains: Variants that have very different phenotypes from the “wild-type” virus (they may be more transmissible, more pathogenic, become more capable of immune evasion).
- ♦ Variants of Concern (VOCs): Variants that have accumulated mutations that may be more advantageous to the virus.

- ♦ Convergent evolution: The independent appearance of similar mutations that may increase viral fitness/adaptation.
 - ♦ Example: When VOCs appear in different parts of the world with similar mutations in the same regions of the genome. If viral adaptation is occurring, these variants will tend to become dominant.
- ♦ Selective Pressure: External agents/circumstances that affect viral fitness/adaptation. They may be positive, or negative.
 - ♦ Example of positive selective pressure on viruses: Chronic infections in immunosuppressed individuals; environments in which there has been high seroprevalence (Manaus, Brazil for SAR-CoV-20).

The Spike Protein





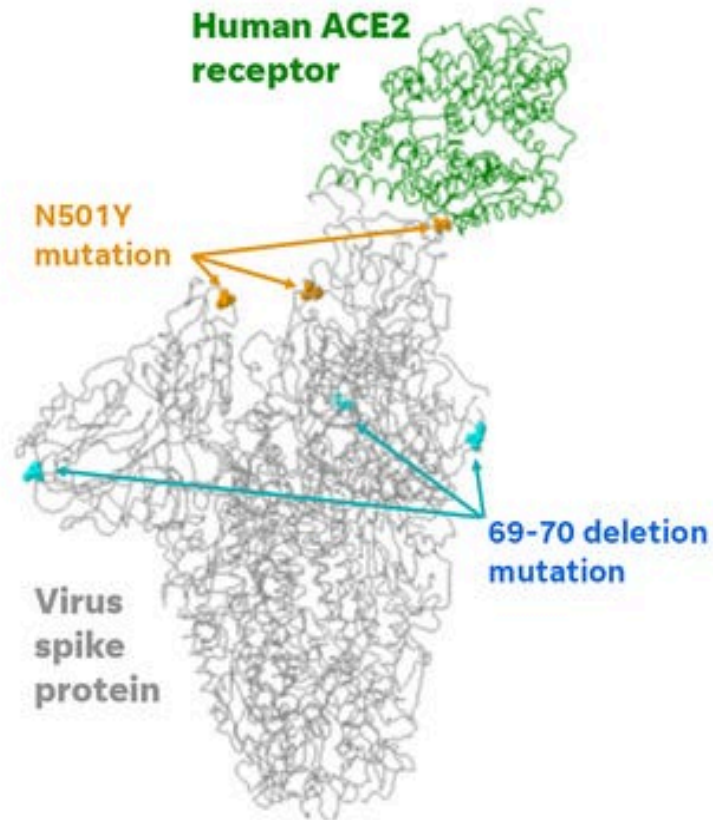
BR: Variant P1 (501Y.V3), Manaus

BR: Variant P2, Rio de Janeiro

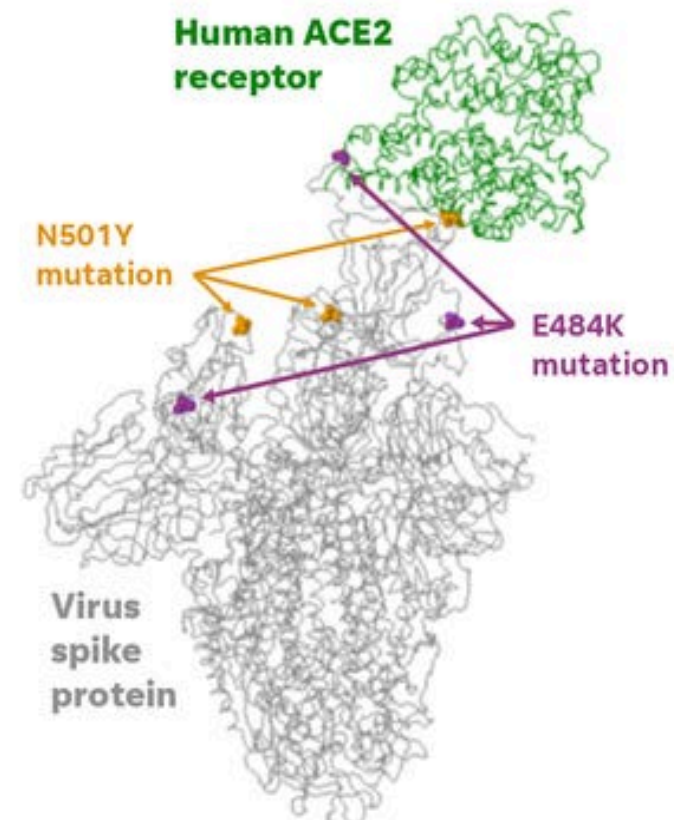
SA: Variant B.1.351 (501Y.V2), South Africa

UK: Variant B.1.1.7 (501Y.V1), UK

To Visualize

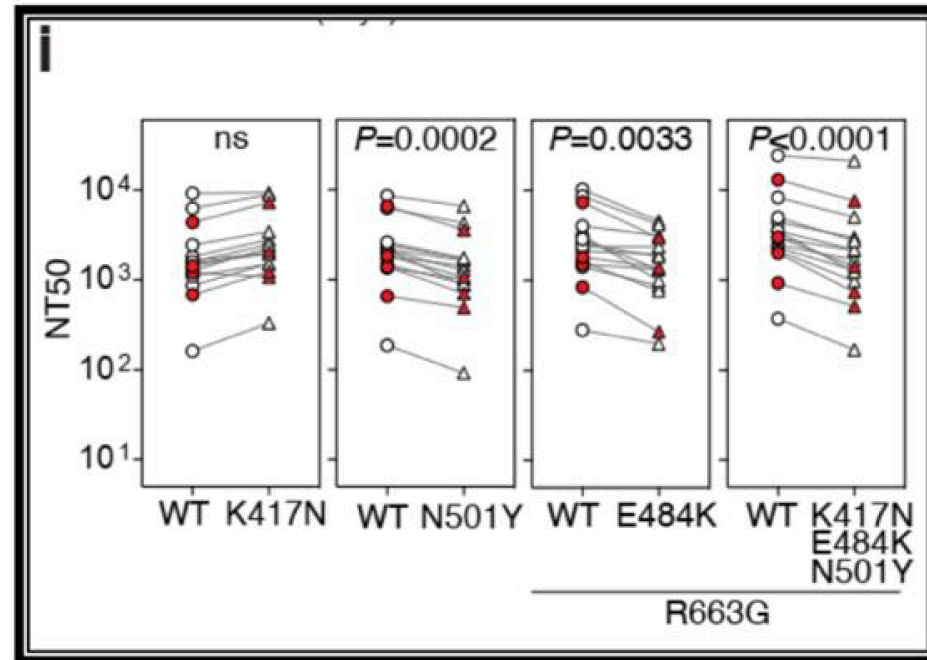
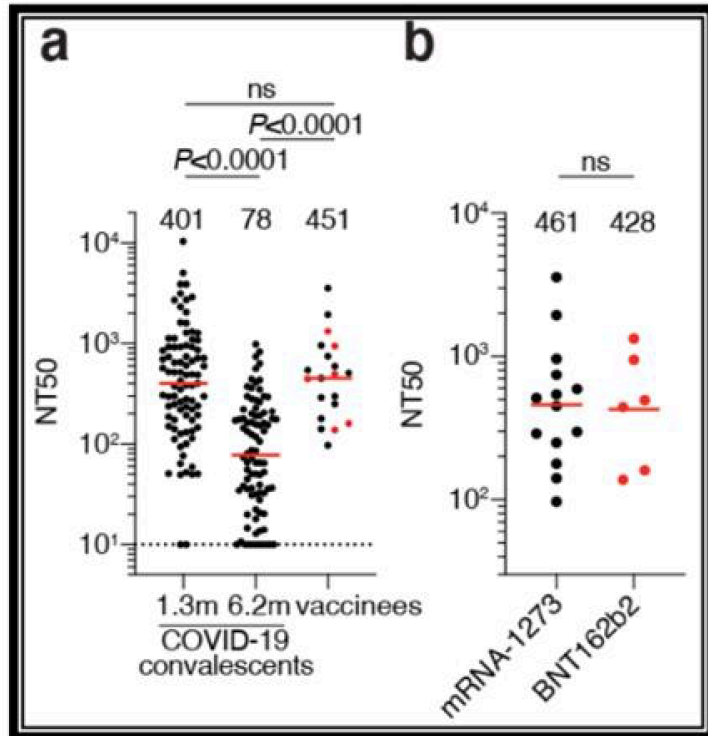


The U.K. variant



The South Africa variant

Immune Evasion, Convalescent Plasma and Vaccinated Plasma



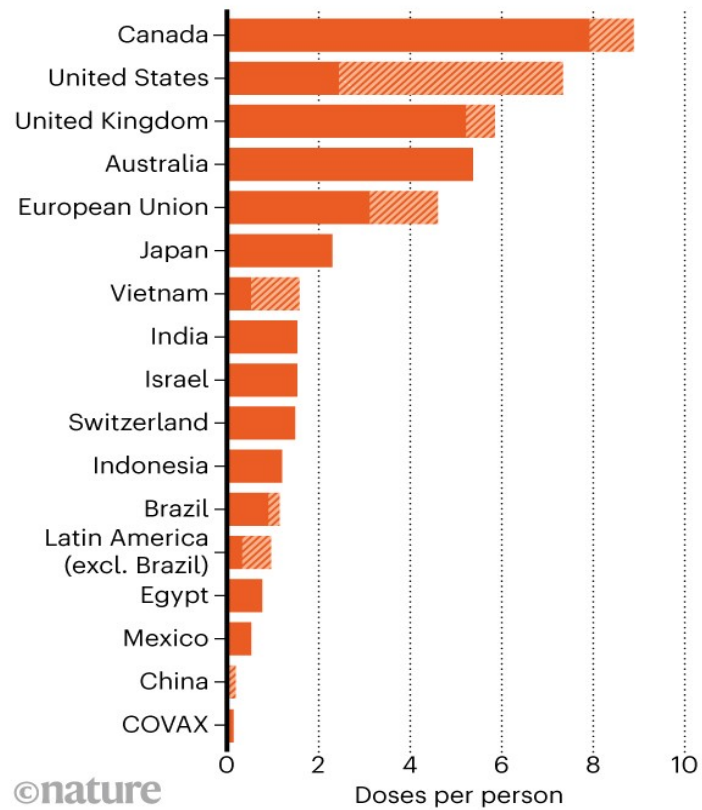
- ♦ These VOCs confer advantages to SARS-CoV-2 – evidence of convergent evolution.
- ♦ These VOCs may quickly become dominant. How would we know? Genomic Surveillance.
- ♦ Immune evasion means potentially a larger pool of susceptible people (due to reinfections). Vaccines? Next slide.

Vaccines and Global Cooperation

BEST AND WORST SUPPLIED

Canada has pre-ordered almost 9 doses of COVID-19 vaccines per person.

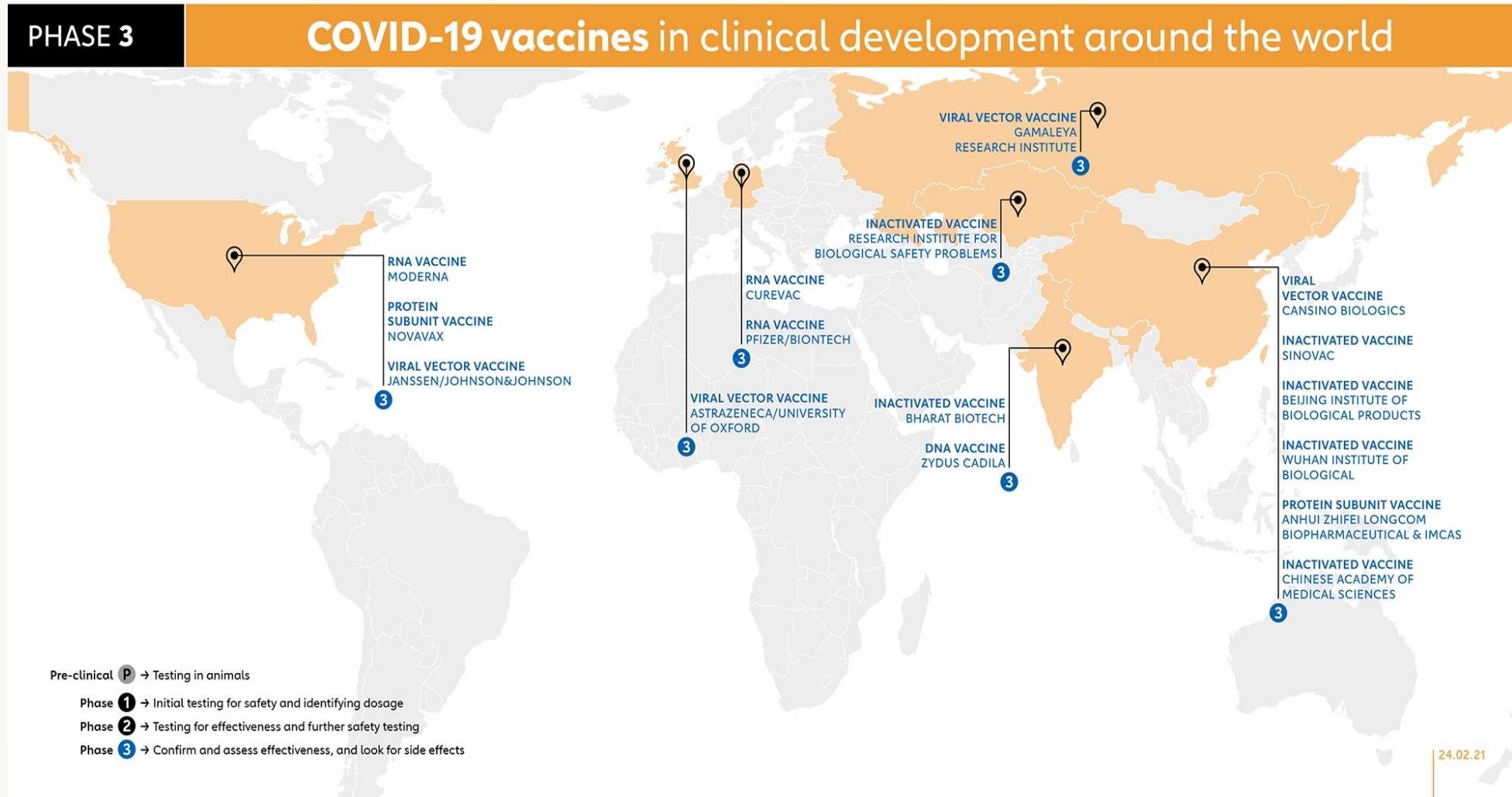
■ Pre-ordered ■ Potential for expansion in deal



A General Conversation about Vaccines

- ♦ Types of Platforms:
 - ♦ Genetic vaccines
 - ♦ Viral Vectors
 - ♦ Whole Inactivated Virus
- ♦ The Geopolitics of Vaccines: China, India, Russia
- ♦ Vaccines and Economic Recovery
- ♦ Vaccines and Inequality

Vaccine Geopolitics



Chronic Pandemics: Policy Implications

- ♦ Vaccines will need to be regularly updated. What does this mean?
- ♦ Chronic disease burden and fiscal consequences
- ♦ What policies? Debt and deficit burdens
- ♦ Rising inequality: How to respond? Political Consequences?
- ♦ High economic volatility due to NPIs?
- ♦ Rebuilding economies around public health?