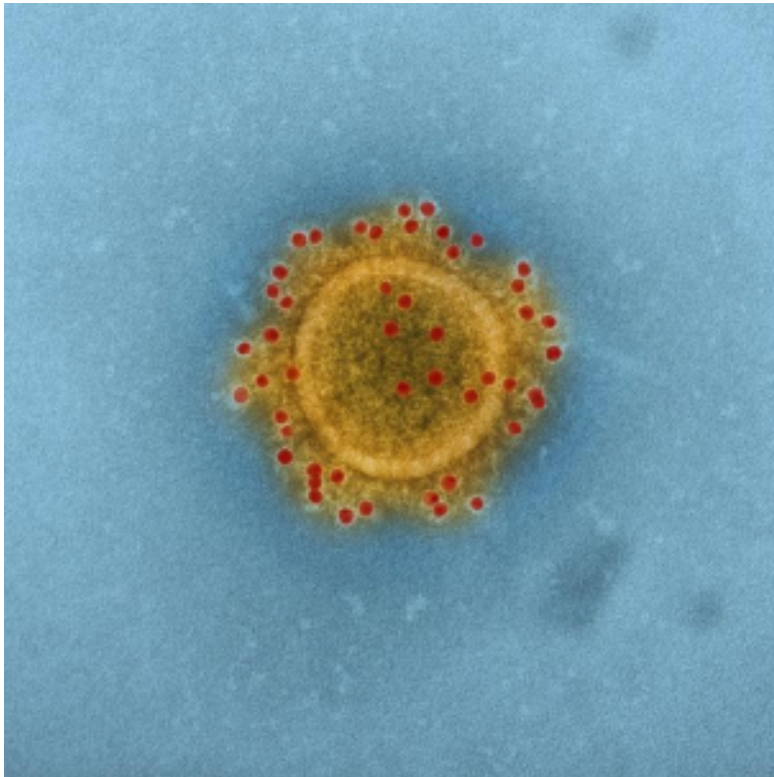


SARS-CoV-2 & COVID-19

SUZANNE D VERNON, PHD

MARCH 2020

Coronaviruses



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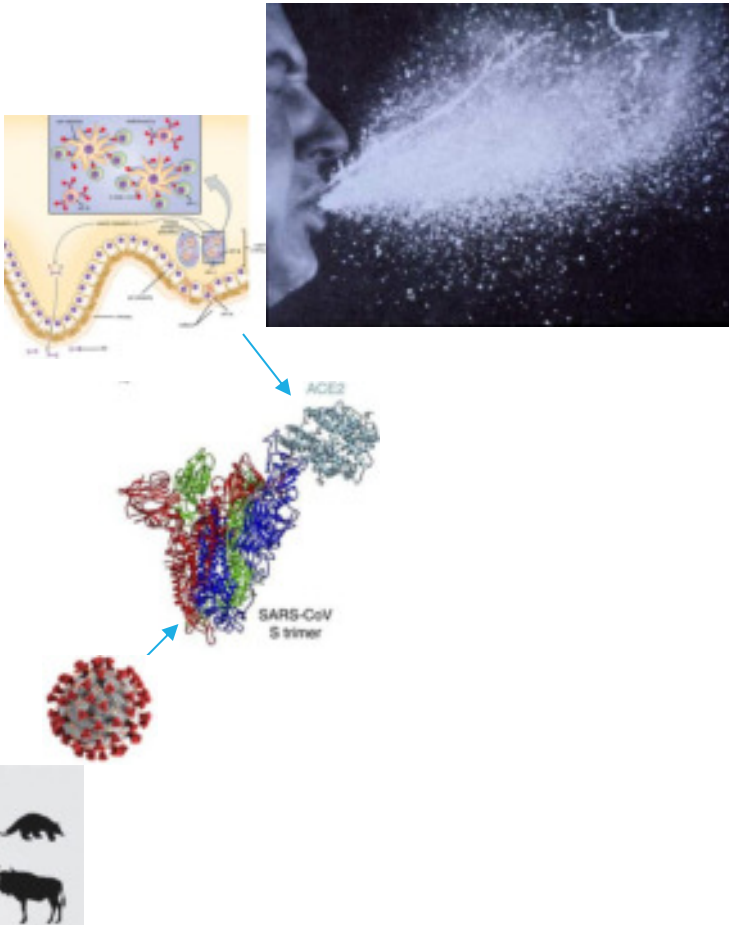
First isolated in 1965 – nose

Large, enveloped, plus-strand RNA viruses

Causes highly prevalent disease in humans (common cold, SARS [2003], MERS, COVID-19) and domestic animals (pig, dog, cat, rabbit, mouse, rat, turkey, chicken, camel)

Prefer cool & dry conditions – may explain why they occur chiefly during winter months.

Infection & Transmission



SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) and is the cause of COVID-19

- In 2003, a coronavirus caused SARS and in 2012, a coronavirus caused MERS
- Examples of viruses that “jumped” from animals to humans

Incubation period of 5-14 days (possibly dose and variant dependent)

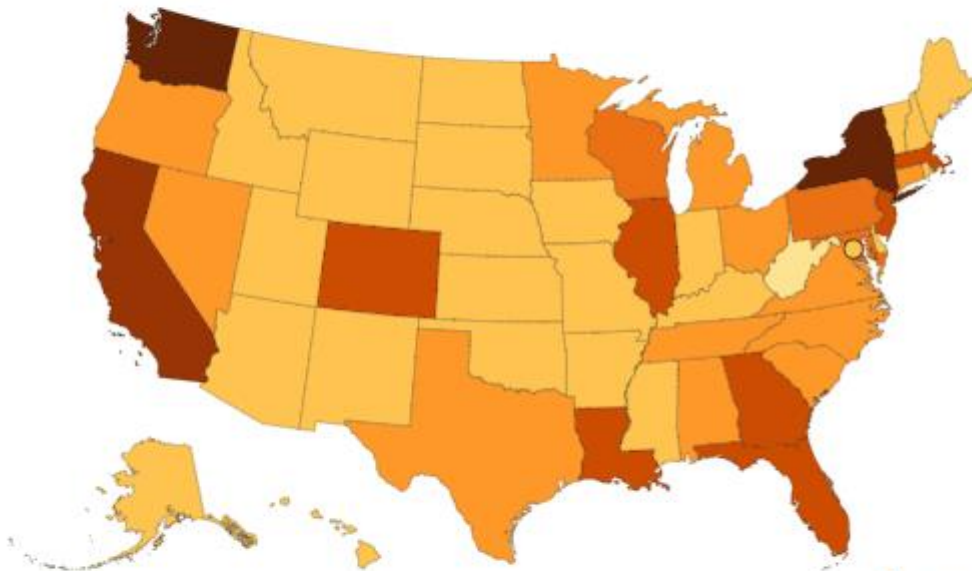
Subclinical infection

- In nonhuman primates - virus shed from nose and throat in absence of clinical signs
- Shed in fecal matter in humans
- **Virus is efficiently inactivated with alcohol-based hand rub solutions (30% or greater alcohol)**
 - Virus remains “live” in aerosols for up to three hours, up to four hours on copper, up to 24 hours on cardboard, and up to two to three days on plastic and stainless steel.
 - Disinfectants (e.g., Lysol, Pine Sol) for the house

cdc.gov

COVID-19 Cases in the U.S.

[Cases in U.S.](#)  [Situation Summary](#) 



Reported Cases
(last updated March 19, 2020)

- None
- 1 to 5
- 6 to 50
- 51 to 100
- 101 to 200
- 201 to 500
- 501 to 1000
- 1001 to 5000

Territories AS GU MH FM MP PW PR VI

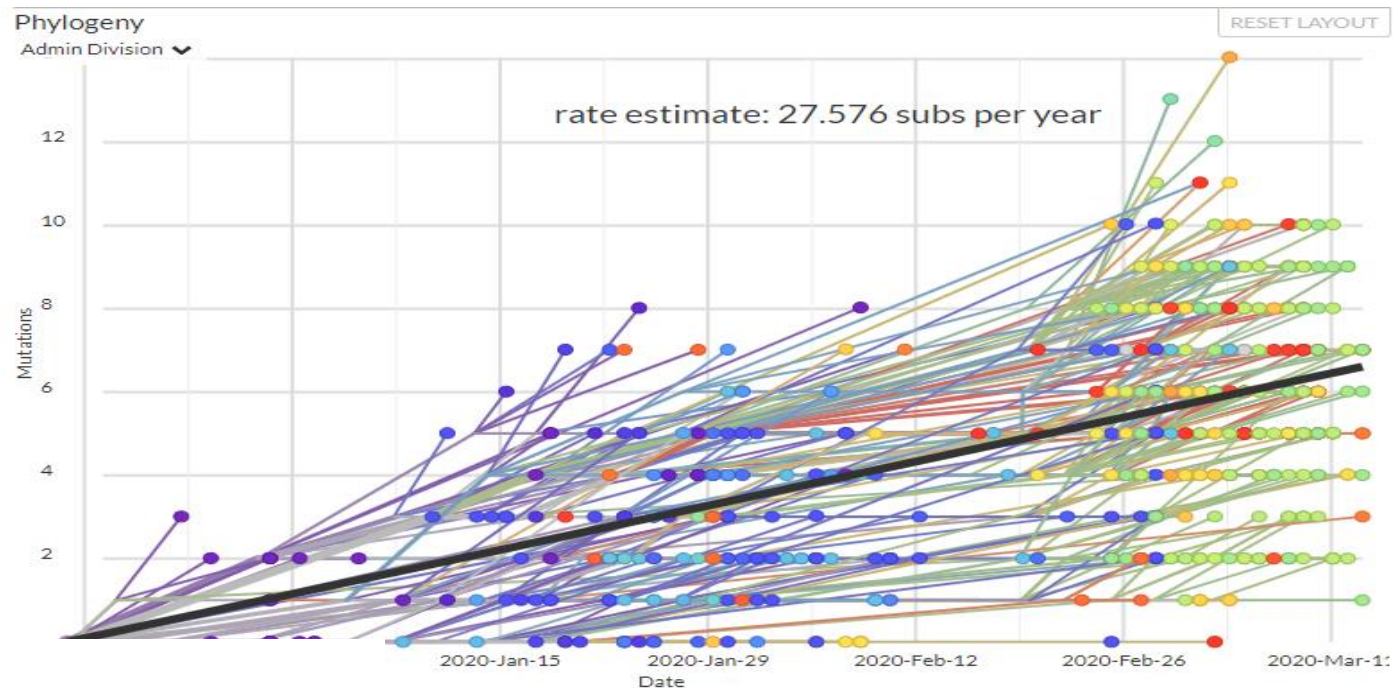


States +

SARS-CoV-2 Evolution

Sequencing many isolates shows the virus has evolved naturally and was not constructed in the lab.

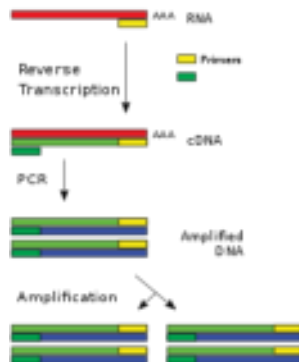
- Important for vaccine and antiviral R&D
- <https://nextstrain.org/ncov>



Testing

RT PCR – makes many copies of the viral nucleic acid so it can be sequenced to determine presence of virus (currently in use)

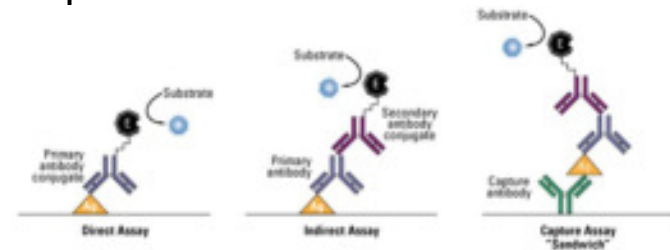
- Amplify and sequence specific genes



- Biological samples first need to have RNA extracted before RT-PCR
 - Sampling issues
 - Supply chain issues

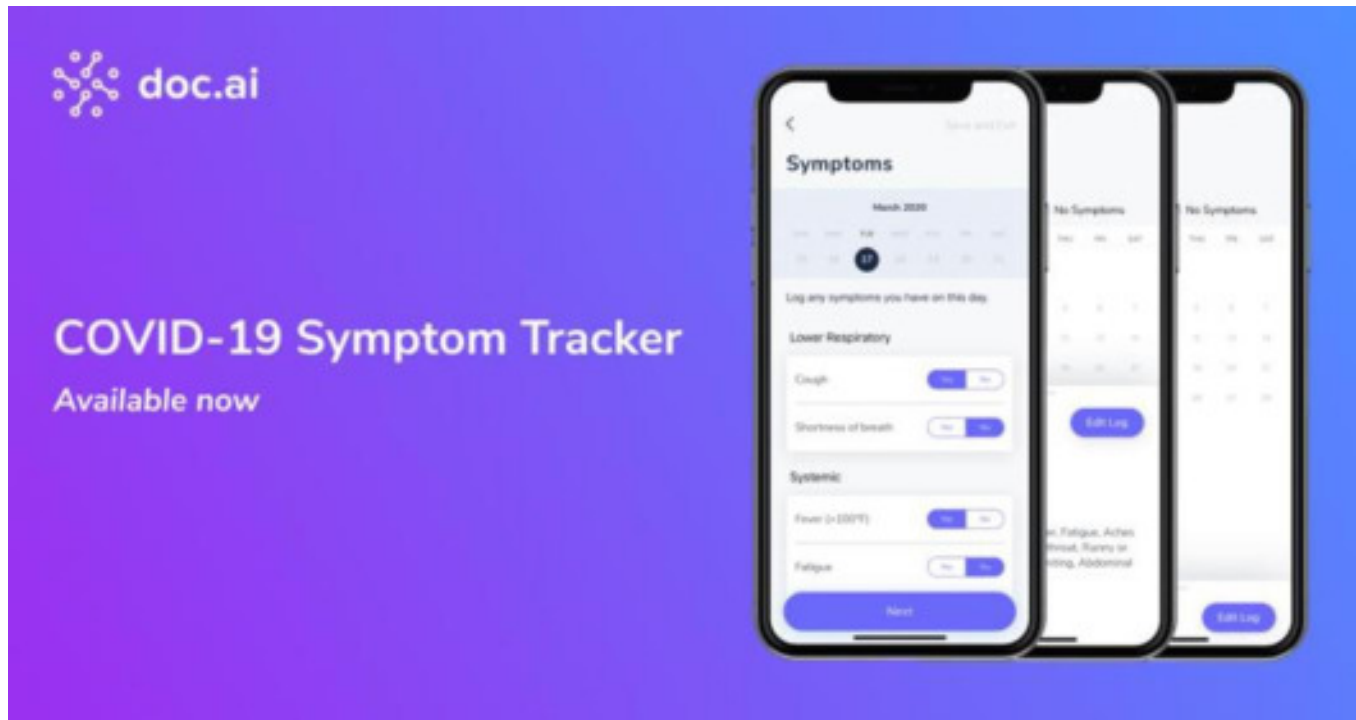
Serology – detects antibodies that the body makes to the virus (under development)

- Indicates current/past infection or exposure



Getting tested – “If you are a close contact of someone with COVID-19 or you are a resident in a community where there is ongoing spread of COVID-19 and develop symptoms of COVID-19, call your healthcare provider and tell them about your symptoms and your exposure. They will decide whether you need to be tested, but keep in mind that there is no treatment for COVID-19 and people who are mildly ill may be able to isolate and care for themselves at home.”

COVID-19 Symptom Tracker



Download the app at doc.ai and visit the research tab

Vaccines, Antivirals & Treatments

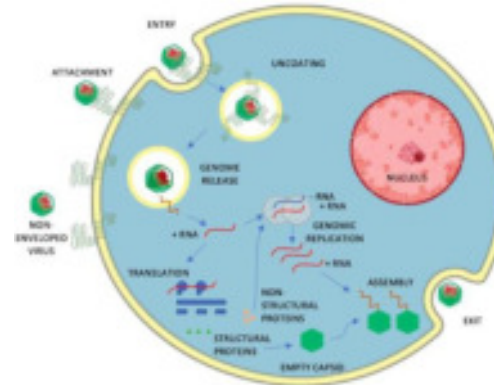
COVID-19 trial began in Seattle using an mRNA vaccine developed by NIAID and Moderna

- Vaccines boost the body's immune system
- Other vaccine approaches likely to follow

Passive immunization

- Providing people with antibodies derived from convalescent serum
- A pre-print is showing that monkeys develop antibodies and are resistant to reinfection – indicating these antibodies neutralize SARS-CoV-2

Viral endocytosis depends on a drop in pH. Chloroquine raises pH of endosomes preventing fusion and blocking infection. Hydroxychloroquine, the less toxic form, is being tested in humans now.



Research is underway to develop other antiviral drugs that interrupt the virus cycle are underway

The Bright Side

- Global sharing of data
 - Nextstrain.org
- Rapid pre-print information sharing
 - Biorxiv.org – preprint server for biology
 - MedRxiv.org – preprint server for the health sciences
- Clinical trial networks
 - Hospitals around the world sharing treatment information
- Registries to track recovery
 - Important to understand chronic sequelae and post-viral syndrome resulting from COVID-19
- Boon for Virology
 - New awareness viruses, vaccines, antivirals, repurposed drugs
 - (hopefully an influx of research dollars!)