

# Adult CF Clinic Introduction

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**COVID19 Updates**

**May 4, 2020**

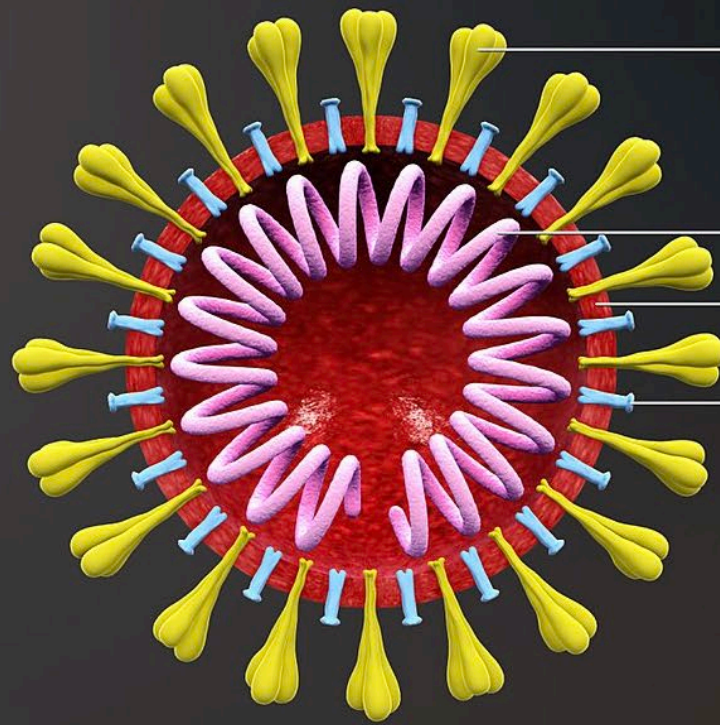
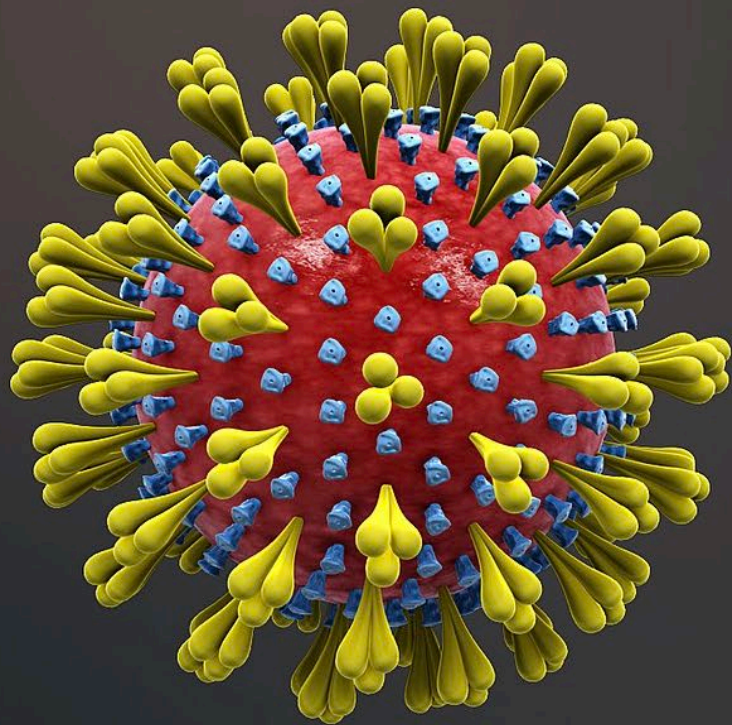
**UAB MEDICINE®**

**Adult Cystic Fibrosis Clinic**



Gregory Fleming James  
Cystic Fibrosis Center





Spike Glycoprotein (S)

RNA and N protein

Envelope

Hemagglutinin-esterase dimer (HE)

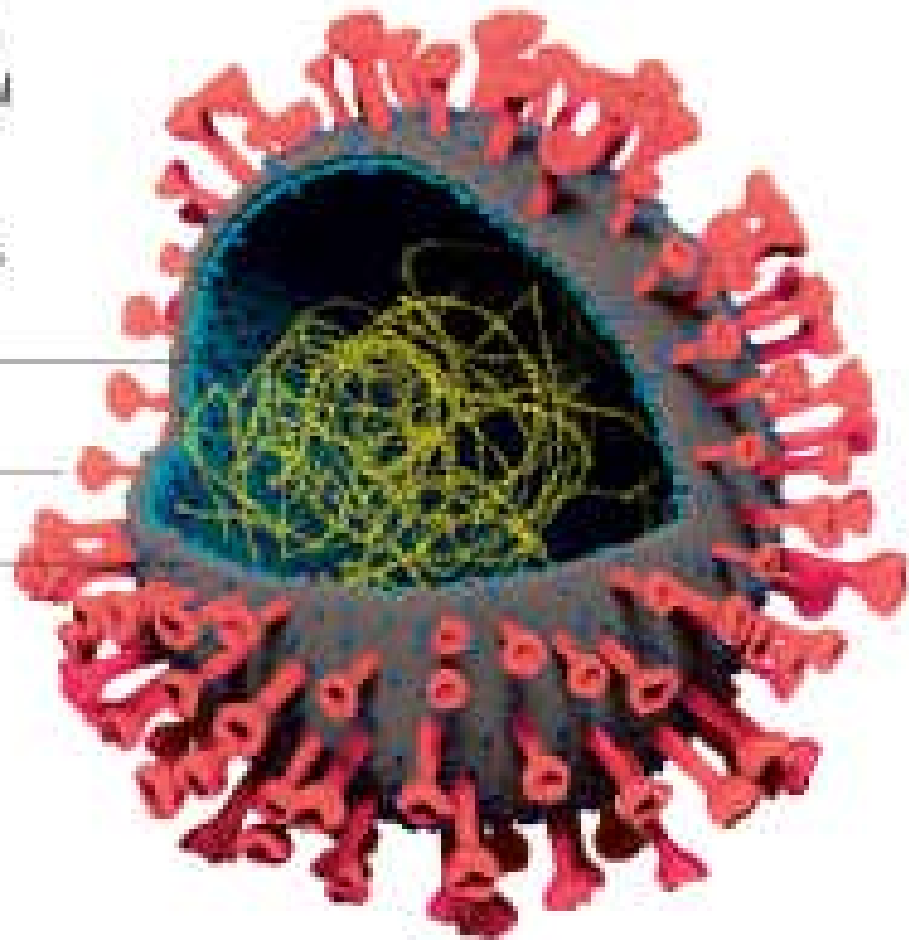
## Anatomy of a virus

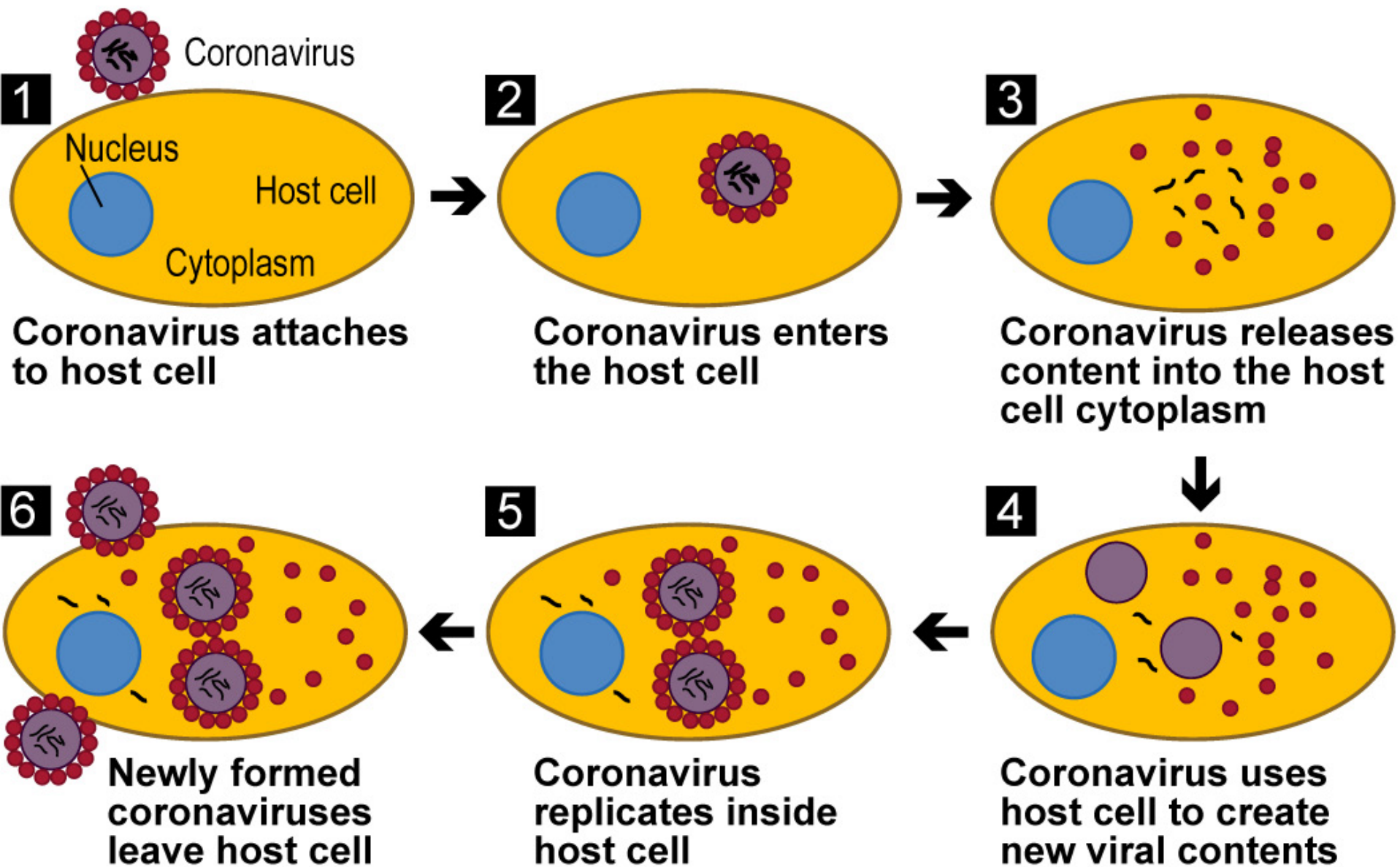
The covid-19 virus has several features we may be able to target with drugs to break it down and stop it entering cells

RNA enclosed  
in protein

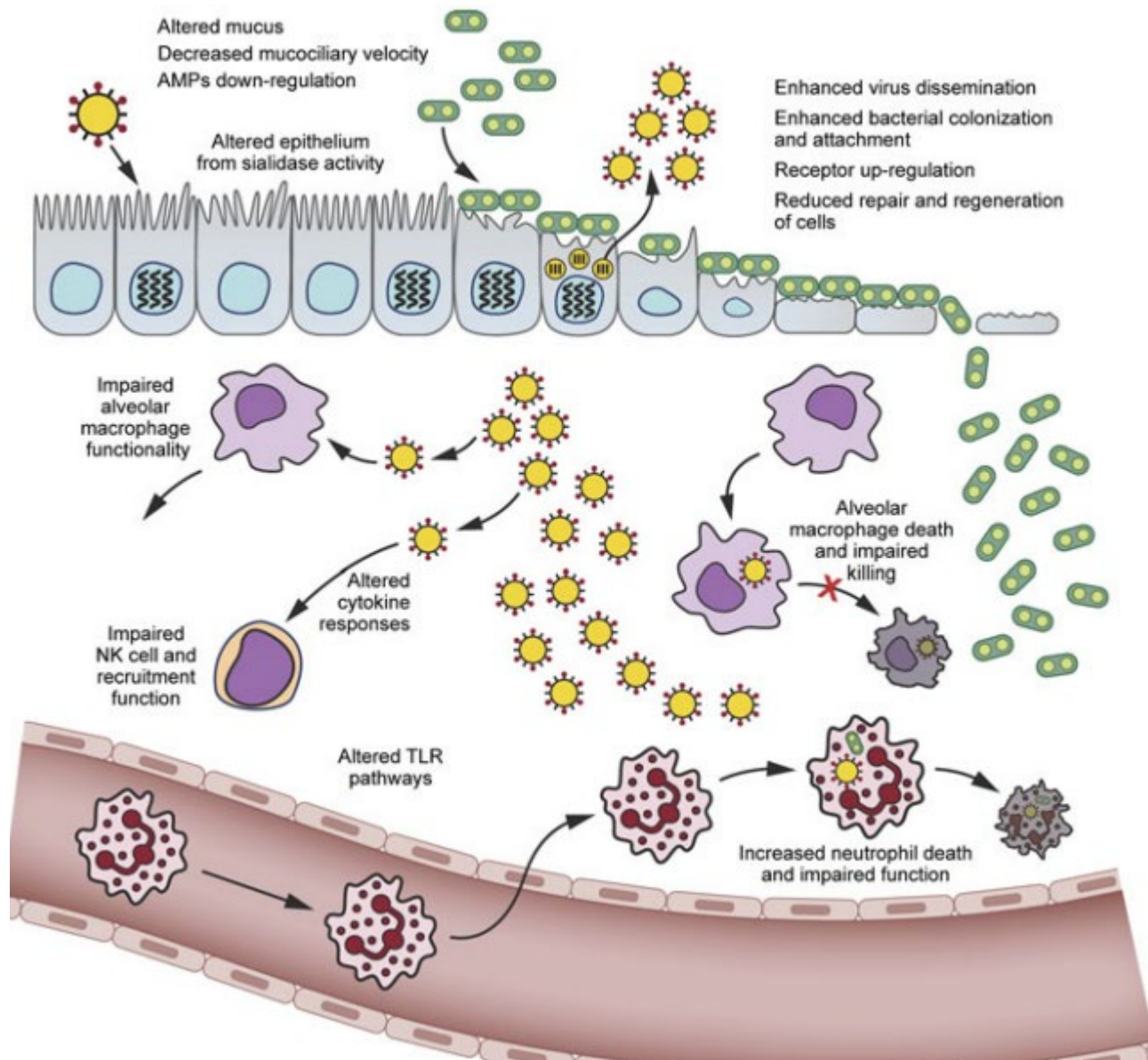
Spike protein

Lipid membranes





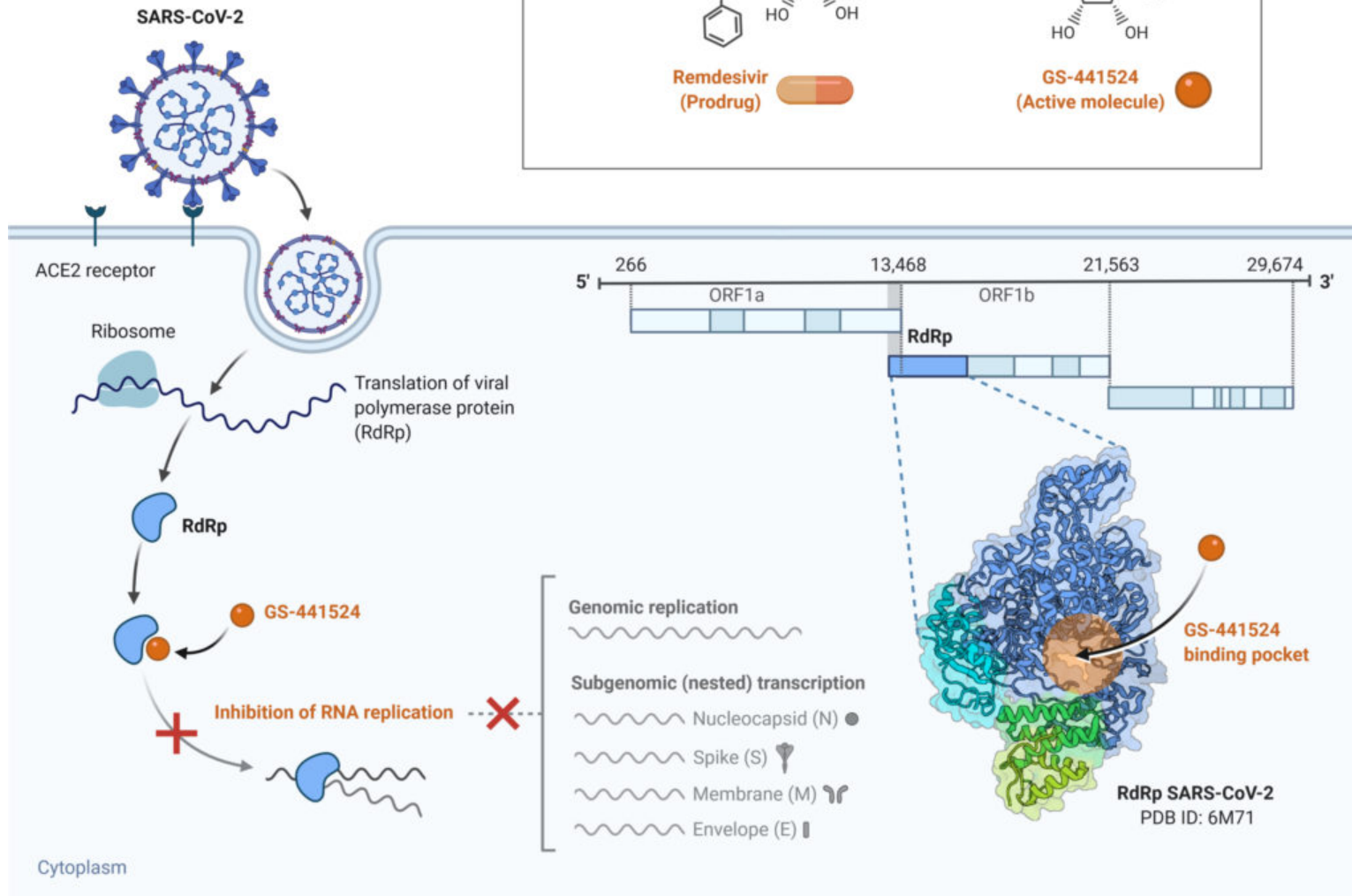
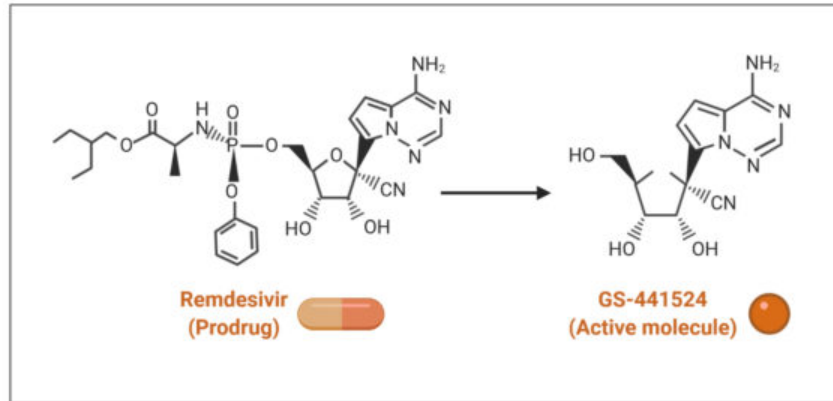
Source: GAO adaptation of Fenner's Veterinary Virology edited by N. James MacLachlan and Edward J. Dubovi. | GAO-20-472SP



Smith & McCullers 2014; Current Topics in Microbiology and Immunology

# Remdesivir

Potential repurposed drug candidate for COVID-19



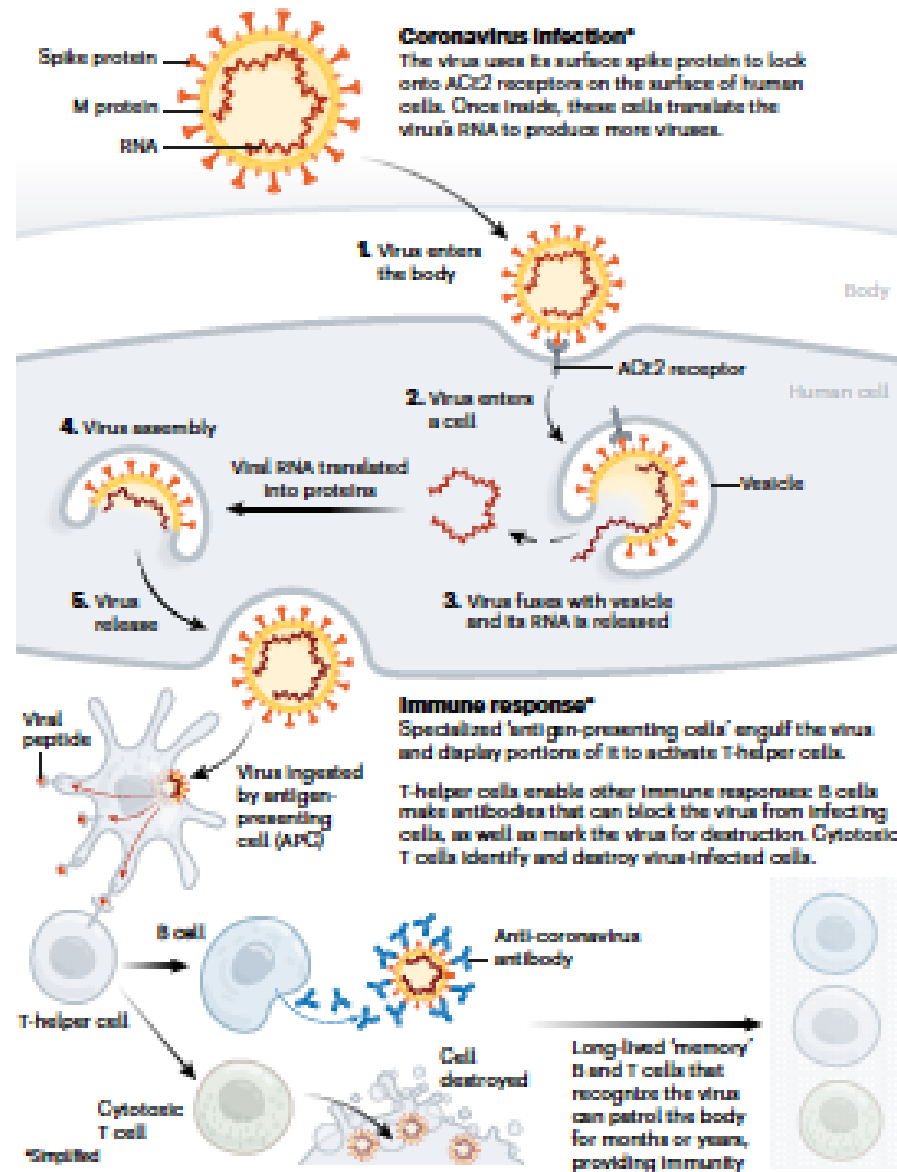
# Remdesivir

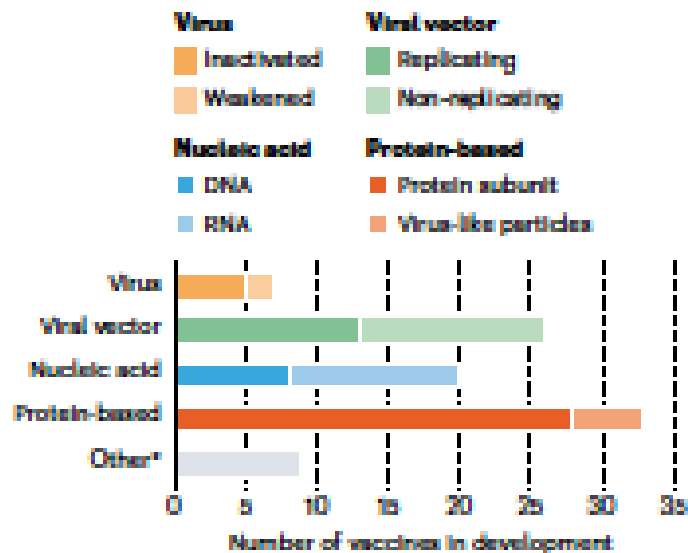
- Safe and individually effective in
- Early RCT data shows improvement in time of recovery and data is close on mortality but not finalized
- FDA cleared it for use in sick, hospitalized patients
- Where it's unclear:
  - Milder disease
  - Prophylaxis

Vaccines

## VACCINE BASICS: HOW WE DEVELOP IMMUNITY

The body's adaptive immune system can learn to recognize new, invading pathogens, such as the coronavirus SARS-CoV-2.





## VIRUS VACCINES

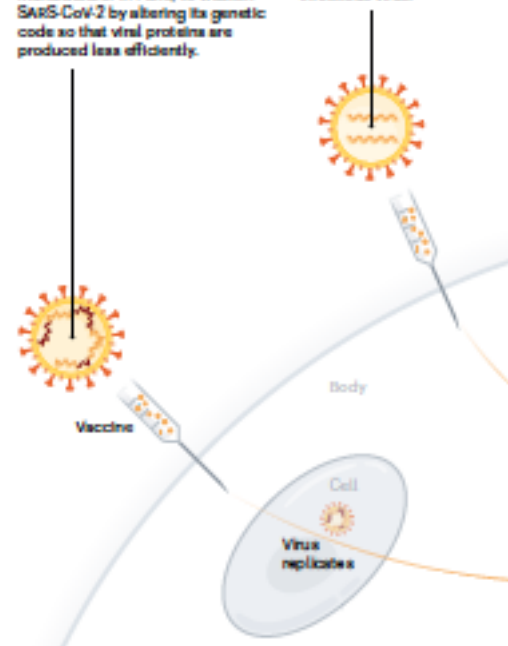
At least seven teams are developing vaccines using the virus itself, in a weakened or inactivated form. Many existing vaccines are made in this way, such as those against measles and polio, but they require extensive safety testing. Sinovac Biotech in Beijing has started to test an inactivated version of SARS-CoV-2 in humans.

### Weakened virus

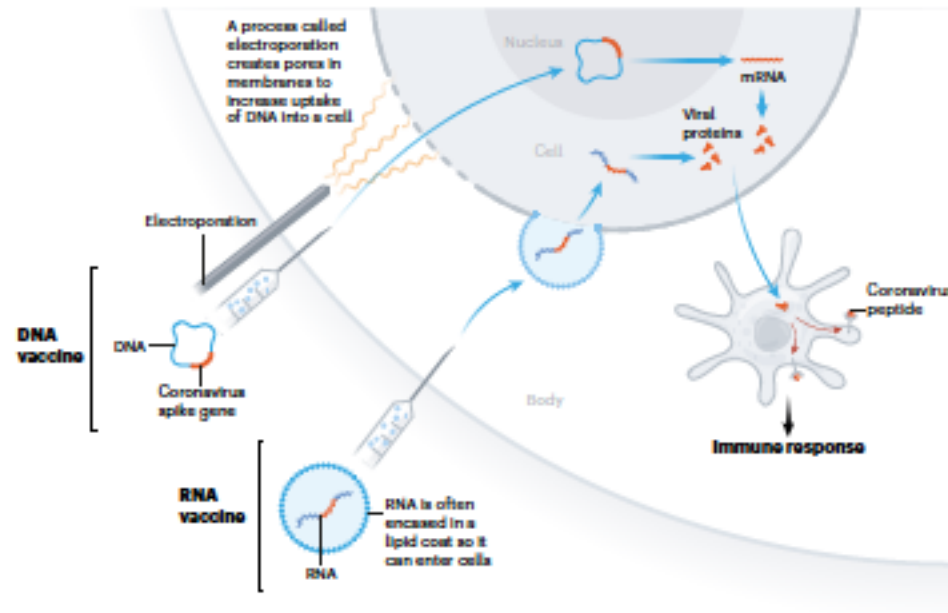
A virus is conventionally weakened for a vaccine by being passed through animal or human cells until it picks up mutations that make it less able to cause disease. Codagenix in Farmingdale, New York, is working with the Serum Institute of India, a vaccine manufacturer in Pune, to weaken SARS-CoV-2 by altering its genetic code so that viral proteins are produced less efficiently.

### Inactivated virus

In these vaccines, the virus is rendered uninfected using chemicals, such as formaldehyde, or heat. Making them, however, requires starting with large quantities of infectious virus.



# Some Vaccines Use the DNA/RNA of the Virus to Stimulate the Immune Response



# Some Vaccines Use Other Viruses or Proteins to Inject DNA directly

## VIRAL-VECTOR VACCINES

Around 25 groups say they are working on viral-vector vaccines. A virus such as measles or adenovirus is genetically engineered so that it can produce coronavirus proteins in the body. These viruses are weakened so they cannot cause disease. There are two types: those that can still replicate within cells and those that cannot because key genes have been disabled.

### Replicating viral vector (such as weakened measles)

The newly approved Ebola vaccine is an example of a viral-vector vaccine that replicates within cells. Such vaccines tend to be safe and provoke a strong immune response. Existing immunity to the vector could blunt the vaccine's effectiveness, however.

### Non-replicating viral vector (such as adenovirus)

No licensed vaccines use this method, but they have a long history in gene therapy. Booster shots can be needed to induce long-lasting immunity. US-based drug giant Johnson & Johnson is working on this approach.

## PROTEIN-BASED VACCINES

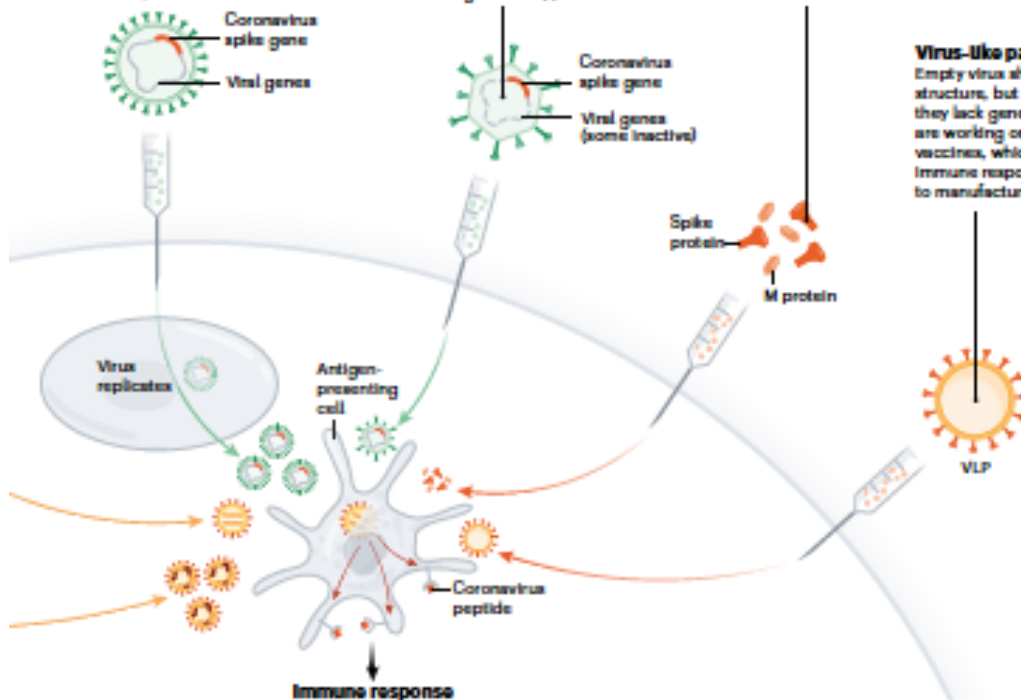
Many researchers want to inject coronavirus proteins directly into the body. Fragments of proteins or protein shells that mimic the coronavirus's outer coat can also be used.

### Protein subunits

Twenty-eight teams are working on vaccines with viral protein subunits — most of them are focusing on the virus's spike protein or a key part of it called the receptor binding domain. Similar vaccines against the SARS virus protected monkeys against infection but haven't been tested in people. To work, these vaccines might require adjuvants — immune-stimulating molecules delivered alongside the vaccine — as well as multiple doses.

### Virus-like particles

Empty virus shells mimic the coronavirus structure, but aren't infectious because they lack genetic material. Five teams are working on 'virus-like particle' (VLP) vaccines, which can trigger a strong immune response, but can be difficult to manufacture.



*Nature* 30  
April 2020

# Am I at Risk?

- It's unclear if PCD poses a significant risk but we do know that worsening lung disease is very detrimental to people with chronic lung diseases already!
- A small CF study suggested low rates of infection and mild illness but cannot conclude that bronchiectasis illnesses are protective!

# What You should Do?

- Stay Close to Home and socially distant
- Extend these measures well beyond what state/local officials
- Await contact tracing and other advanced mitigation efforts before you return to usual day to day activities



**STAY** HOME.  
**STOP** THE SPREAD.  
**SAVE** LIVES.

**m** MINNESOTA

#StayHomeMN