



Covid-19

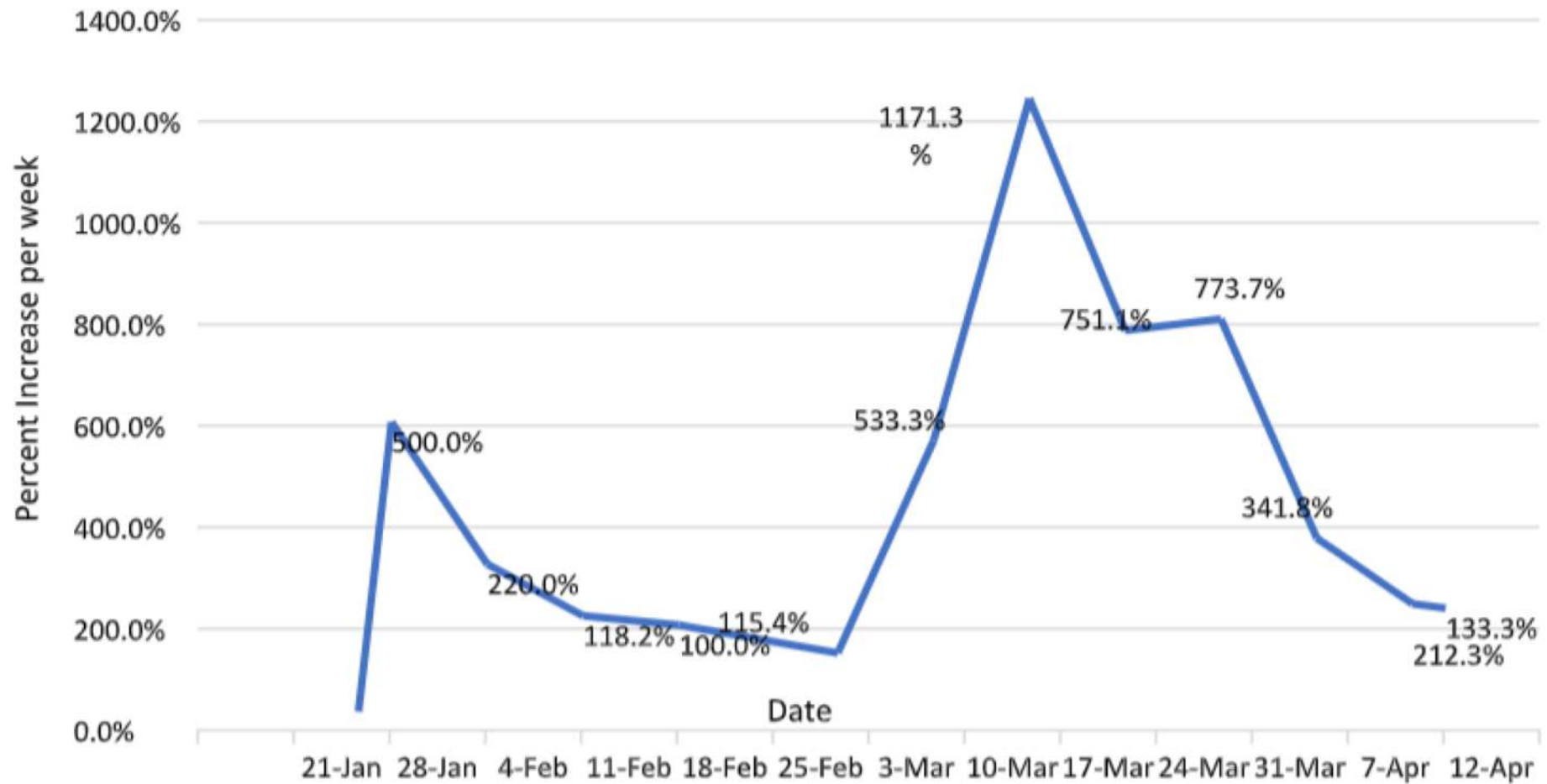
Andrew Pugliese, MS, MD

Blog: <https://www.theiddoc.com/>

Epidemiology

- 80-85% will have mild to moderate symptoms
- 15% will require hospitalization
- 5% will require intensive care therapy
- Reproductive Number for Covid-19 2.28-2.5
Influenza 1-1.3

Percent Increase in COVID-19 Cases (per week) in U.S.



Patient #4

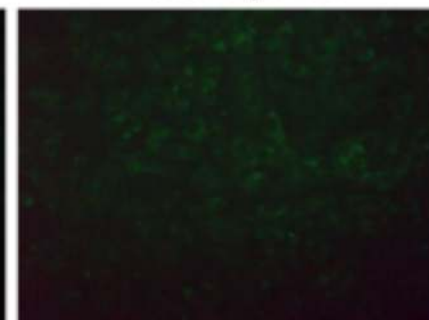
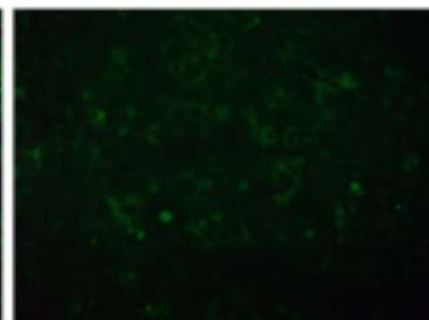
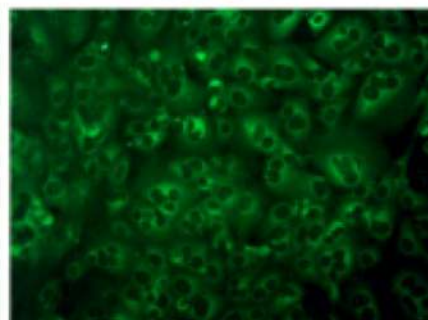
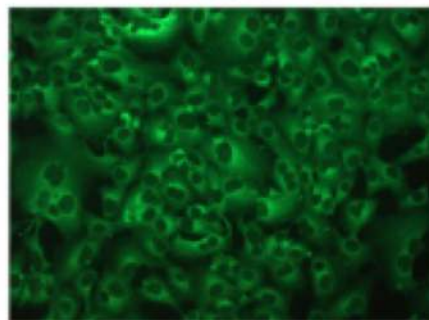
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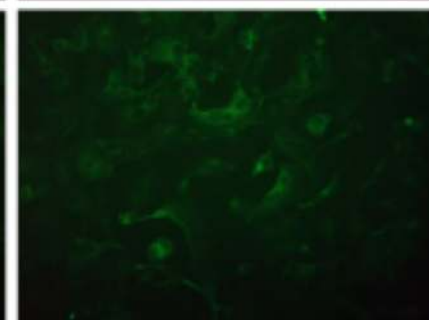
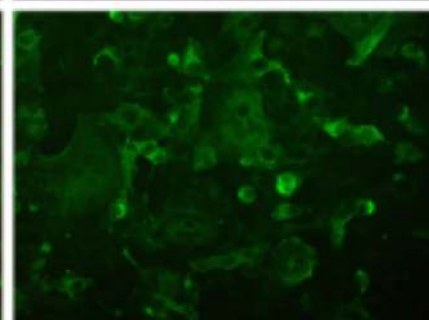
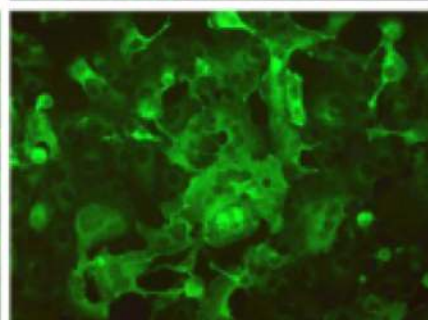
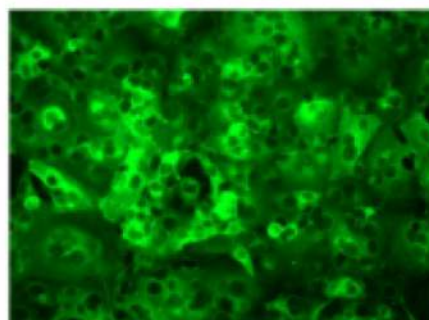
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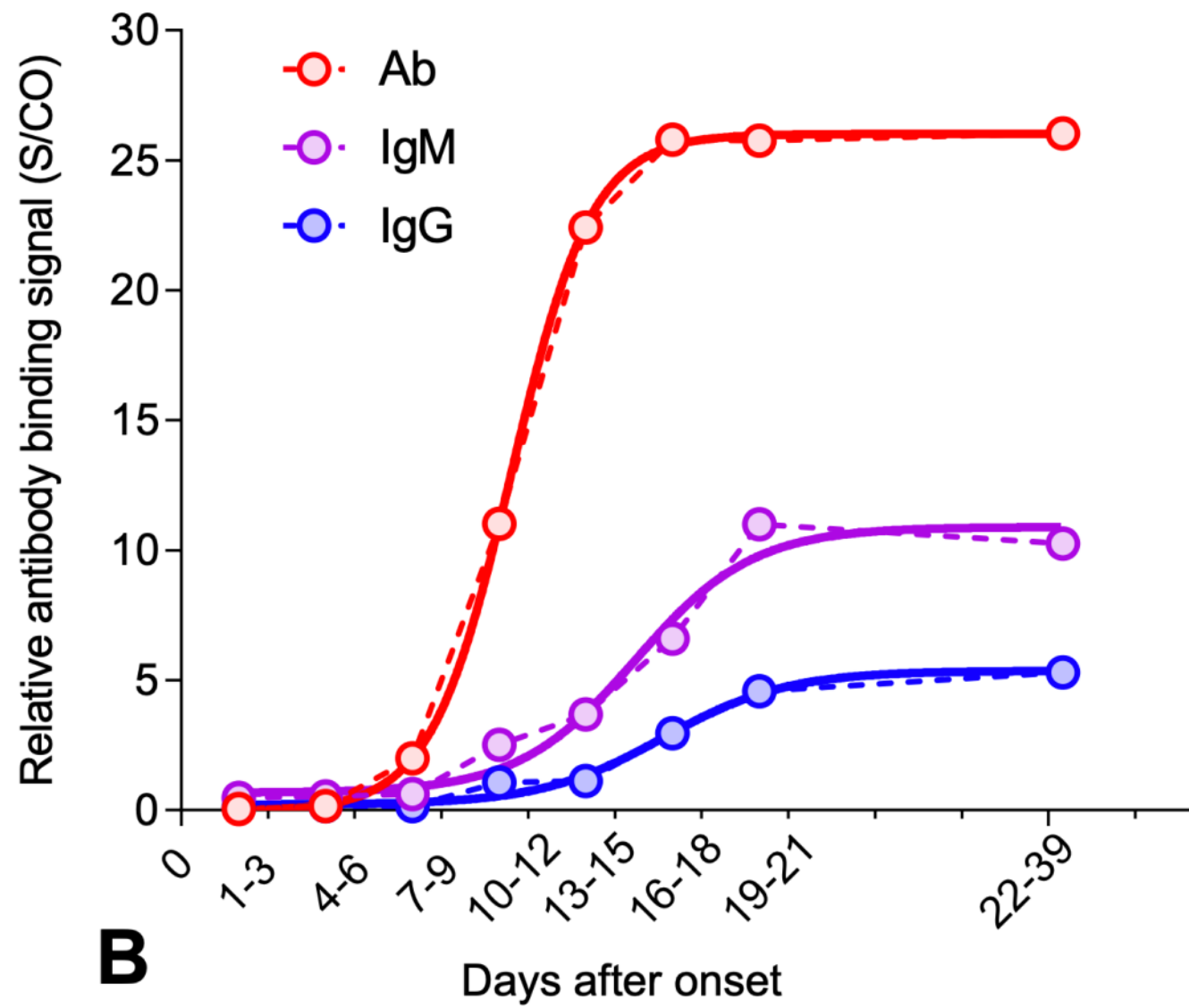
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5 days post onset



17 days post onset

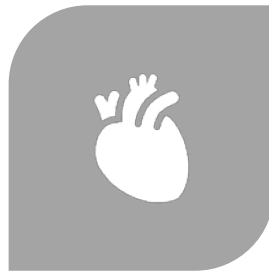




ACE 2 receptors



PREDOMINATELY
FOUND IN THE LUNG



ALSO FOUND IN THE
HEART AND GI TRACT



POSSIBLY FOUND IN
THE OLFACTORY
SYSTEM



CAN EXPLAIN TO WIDE
VARIATIONS IN
PRESENTATIONS

COVID-19: Attacks the 1-Beta Chain of Hemoglobin and Captures the Porphyrin to Inhibit Human Heme Metabolism

- Glycoproteins and ORF 8 (protein associated with Covid-19 that originated in horseshoe bats) bind to porphyrin
- orf1ab, ORF10, and ORF3a proteins (other proteins associated with Covid-19) coordinate to attack the heme on the 1-beta chain of hemoglobin to dissociate the iron necessary to form the porphyrin.
- Less heme, less ability to carry oxygen and carbon dioxide.

Malaria Covid-19 connection

Chloroquine: could prevent orf1ab, ORF3a, and ORF10 from attacking the heme molecule to form the porphyrin, and inhibit the binding of ORF8 and surface glycoproteins to porphyrins to a certain extent, effectively relieve the symptoms of respiratory distress.
Reduce cytokine storm.

Protease inhibitors: Favipiravir could inhibit the envelope protein and ORF7a protein bind to porphyrin, prevent the virus from entering host cells, and catching free porphyrins.

Cytokine Storm

- A severe immune reaction in which the body releases too many cytokines into the blood too quickly. Cytokines play an important role in normal immune responses, but having a large amount of them released in the body all at once can be harmful. A cytokine storm can occur as a result of an infection, autoimmune condition, or other disease.

Symptoms of Covid-19

Typical Symptoms

cough

fever

tiredness

difficulty breathing (severe cases)

Covid-19 Differential Diagnosis

- Viruses
 - [Influenza](#)
 - [Respiratory syncytial virus](#)
 - [Parainfluenza virus](#)
 - [Human metapneumovirus](#)
 - [Adenovirus](#)

Differential Diagnosis continued

- Bacterial Infections
 - *Streptococcus pneumoniae* pneumonia
 - *Haemophilus influenzae* pneumonia
 - *Moraxella catarrhalis* pneumonia

Differential Diagnosis continued

- Atypical bacteria
- *Mycoplasma pneumoniae*
- *Legionella*



Georgia and pollen season

- Presentation can be similar
- Unusually high pollen counts this year

Atypical Symptoms of Covid-19

- Digestive Issues
- Loss of taste and smell
- Malaise and confusion
- Myalgias and Arthraglias
- Headaches and Dizziness

Populations at risk for Severe Disease

- lung conditions, such as COPD and asthma
- certain heart conditions
- immune system conditions, such as HIV
- cancer that requires treatment
- severe obesity
- other health conditions, if not well-controlled, such as diabetes, kidney disease, or liver disease
- pregnancy

Complications of Covid-19

- Acute respiratory distress syndrome (ARDS)
 - Irregular heart rate (arrhythmias, myocarditis)
 - Cardiovascular collapse
 - Neurologic (Guillain Barre Syndrome, encephalitis)
 - Abnormal blood clots
-
- Question: The relationship between genetic predisposition and cytokine storm?

“Proning” Benefits Patients with Severe ARDS

[Patricia Kritek, MD](#) reviewing Guérin C et al. *N Engl J Med* 2013 Jun 6

- Small studies of “proning” demonstrated improved oxygenation without affecting more important outcomes; meta-analyses suggested proning could lower ARDS-associated mortality ([Intensive Care Med 2010; 36:585](#)).



Genetic Predisposition



ACE 2 RECEPTORS



HLA MUTATIONS



CYTOKINE STORM

ACE 2 receptor mutations

- "Mutations to the ACE2 gene might influence the ability of the virus to recognize and infect a human cell," said molecular biologist [Dr. Daisy Robinton](#)

Screening and Identification of Severe Acute Respiratory Syndrome-Associated Coronavirus-Specific CTL Epitopes

- In conclusion, our study demonstrates that in vitro refolding is an effective approach to identify HLA class I-restricted T cell epitopes. Starting from this method, we successfully identified a novel HLA-A*0201-restricted, immunogenic CD8 T cell epitope derived from SARS-CoV S protein





Cytokine Storm

- COVID-19: consider cytokine storm syndromes and immunosuppression
- Accumulating evidence suggests that a subgroup of patients with severe COVID-19 might have a cytokine storm syndrome.

• Lancet Correspondence. [VOLUME 395, ISSUE 10229](#), P1033-1034, MARCH 28, 2020

Testing



PCR testing concern with false negatives (nasal swabs vs. saliva)



Serial testing



Serologies being developed will be important in determining number of asymptomatic or atypical presentations