COVID-19
The Basics

USET ECHO

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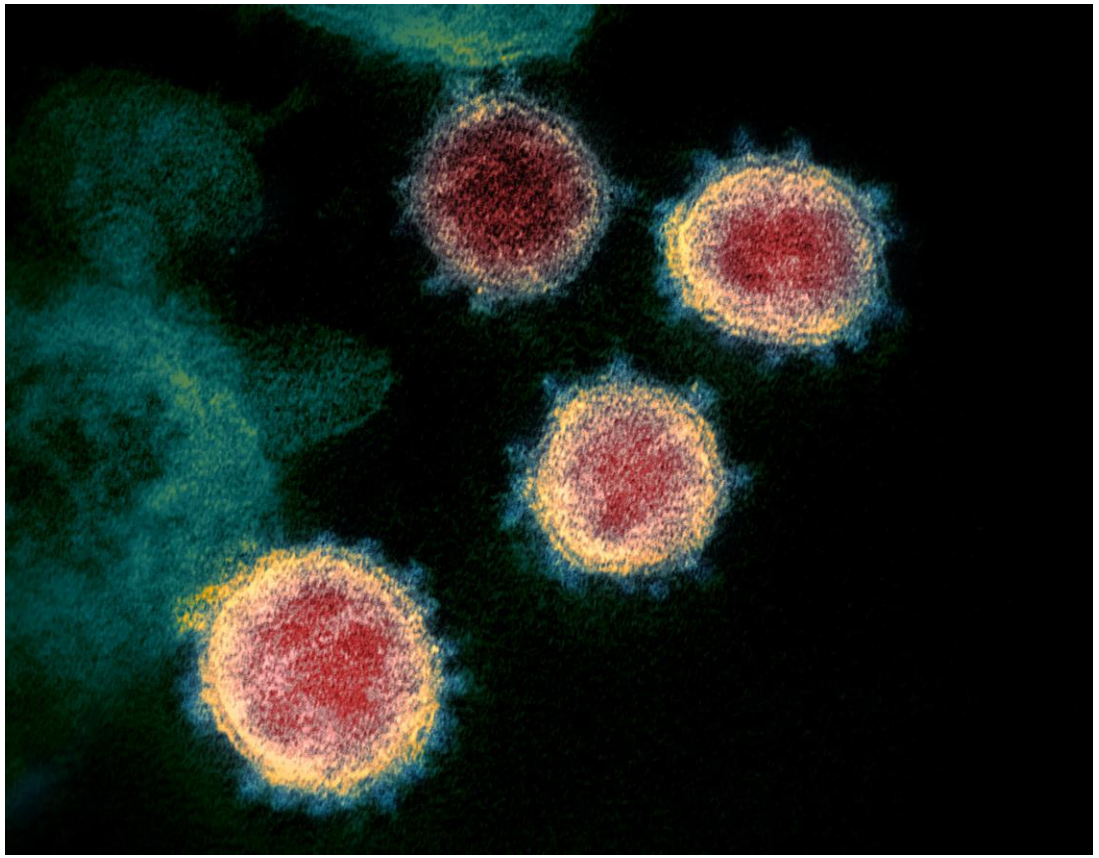
COVID-19 Virology



- SARS-CoV-2
- Betacoronavirus similar to SARS and other coronaviruses in bats
- Enveloped (+)ssRNA virus
- Uses ACE2 receptor for cell entry

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COVID-19 Epidemiology

- First reported in Wuhan, China in late December
- Declared a pandemic by WHO on March 11, 2020
- US and Europe have been hit very hard, but almost nowhere spared
- Over 5.7 million cases worldwide as of 5/28
- Some countries have managed to contain spread through robust to extreme public health measures
- Case fatality rates vary from country to country
- US CFR 5.9% as of 5/28/20

Where did it come from?

Bats

Pangolins

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COVID-19 Epidemiology

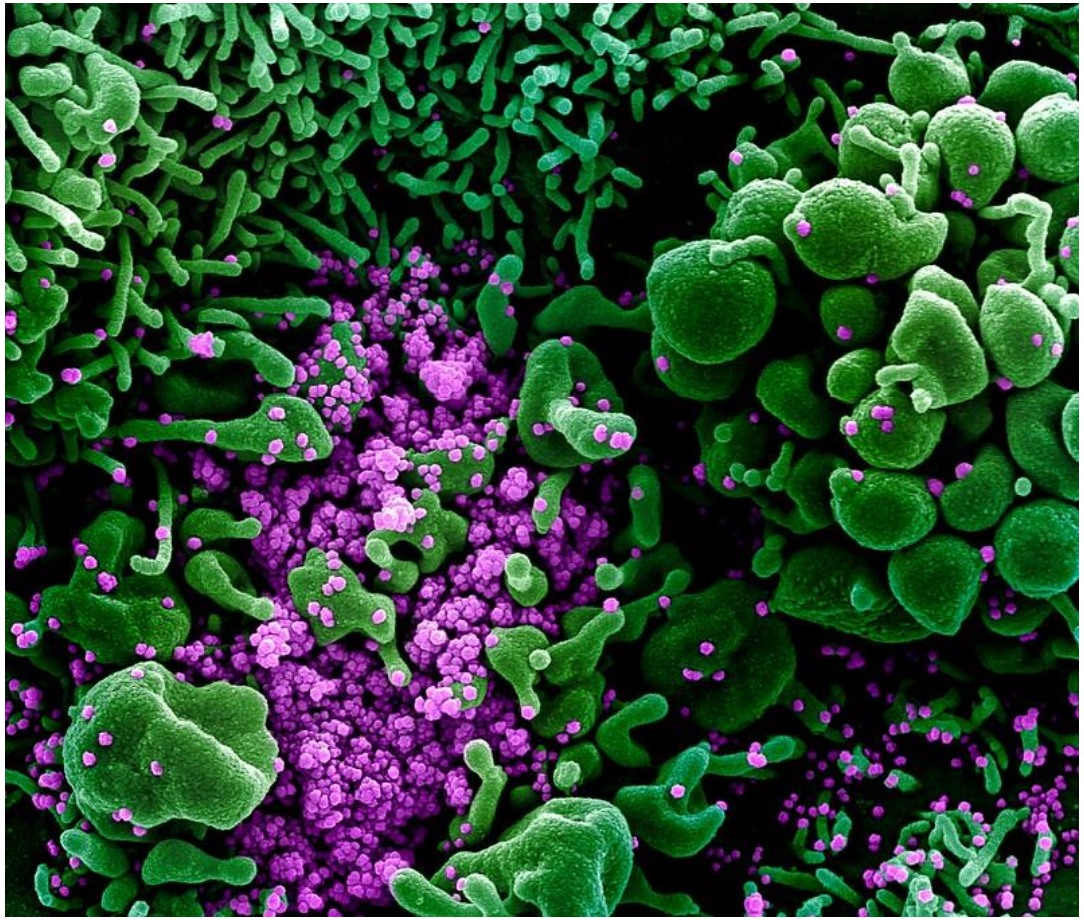
- Transmission: person-to-person
  - Respiratory droplets
  - Cough, sneeze, talk, sing
  - Mucous membrane entry: eyes, nose, mouth
  - Environmental contamination (virus viability?)
  - Aerosolizing procedures – Airborne transmission
  - Full PPE necessary for protection, reduction of spread
  - Fecal-oral route theoretically possible
  - Asymptomatic cases?

COVID-19 Epidemiology

- Period of Infectivity
  - Person is infectious prior to symptoms (48 hours?)
  - Thought to be most infectious early in course of illness

- Risk of Transmission
  - Health care workers, household contacts
  - Studies show average attack rate of about 10% among close contacts
  - “R-naught” variable
  - “Superspread” clusters
  - What about pets?

COVID-19 Pathophysiology



- Virus replicates first in upper airway, then moves to lungs
- Attaches to type 2 pneumocytes (surfactant producing) in the lungs
- Can cause “cytokine storm” leading to Systemic Inflammatory Response Syndrome (SIRS), Acute Respiratory Distress Syndrome (ARDS)

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COVID-19 Clinical Features

- Incubation Period
  - 2 to 14 days
  - Average 4 to 6 days
- Illness Severity
  - Mild – 80%
  - Severe – 15%
  - Critical – 5%

  - Case Fatality Rate varies
    - Belgium – 16.3%
    - Germany – 4.6%

COVID-19 Clinical Features

- Risk Factors for Severe Illness
  - Age >65
  - Cardiovascular Disease
  - Diabetes mellitus
  - Hypertension
  - COPD
  - Cancer
  - CKD
  - Obesity
  - Liver disease?
  - In Italy, only 3 of 355 deaths had no underlying condition

COVID-19 Clinical Features

- Symptoms
  - Fever and Chills (85%)
  - Dry Cough (86%)
  - Dyspnea (80%)
  - Diarrhea (27%)
  - Nausea (24%)
  - Fatigue
  - Anorexia
  - Myalgias
  - Sputum production
  - GI symptoms – diarrhea, nausea, abdominal pain, vomiting
  - Smell and taste disorders
  - Headache, sore throat, rhinorrhea

COVID-19: Complications

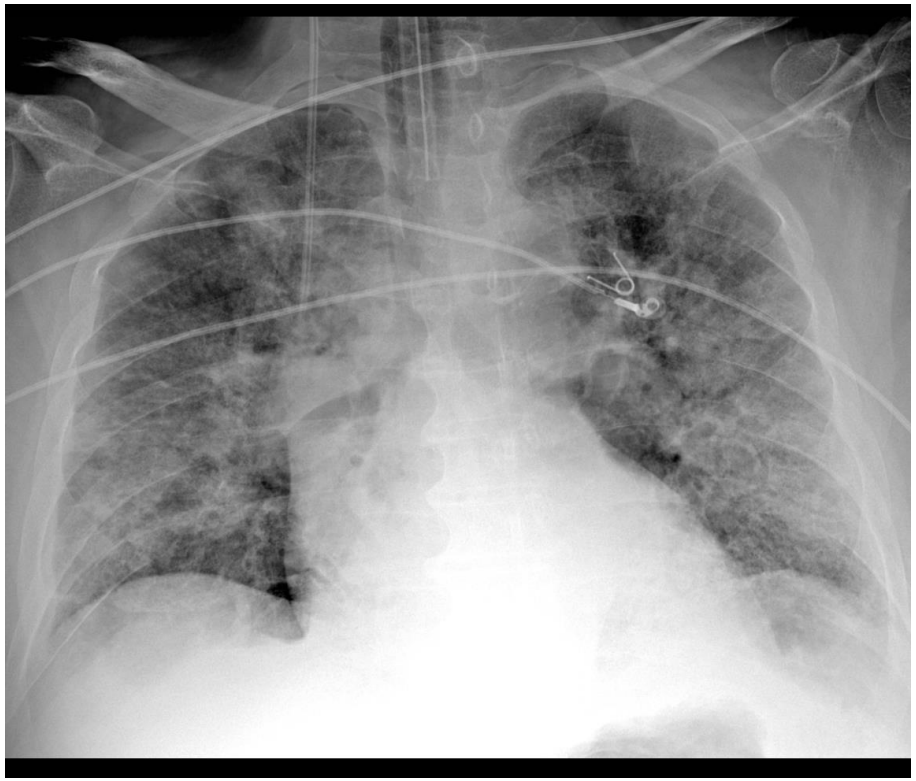
- Pneumonia
  - Hypoxia
  - Respiratory Failure
  - ARDS
  - SIRS
- Cardiac Complications
- Acute Kidney Injury

COVID-19: Laboratory Features

- Lymphopenia
- Elevated transaminases
- Elevated LDH
- Elevated CRP, ferritin
- Elevated D-dimer

COVID-19: Imaging

Chest X-ray



Chest CT

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COVID-19: Diagnosis

- Clinical Evaluation, including lab and imaging
- RT PCR
  - Nasopharyngeal swab (other samples OK per CDC)
  - Lower respiratory specimen
- Antigen Test
  - Only 1 currently with FDA EUA
- Antibody Test
  - IgA, IgM, IgG
  - Currently 12 with FDA EUA

COVID-19 Management

- Treatment is supportive, so prevention is key
- Most cases managed at home
- Hospitalization for oxygen
- Ventilator management for ARDS and respiratory failure
- No proven medication
  - Remdesivir
  - Antimalarials
  - IL-1, IL-6 inhibitors
  - Convalescent plasma

COVID-19: Vaccine Development

- Currently 125 vaccine candidates in some stage of development
- 10 vaccine candidates in clinical trials
  - 2 non-replicating viral vector
  - 2 mRNA
  - 4 inactivated virus
  - 1 protein subunit
  - 1 DNA plasmid

- Timeline???

Thank You Very Much!

Questions?

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