SARS-CoV-2: Transmission and Human Health

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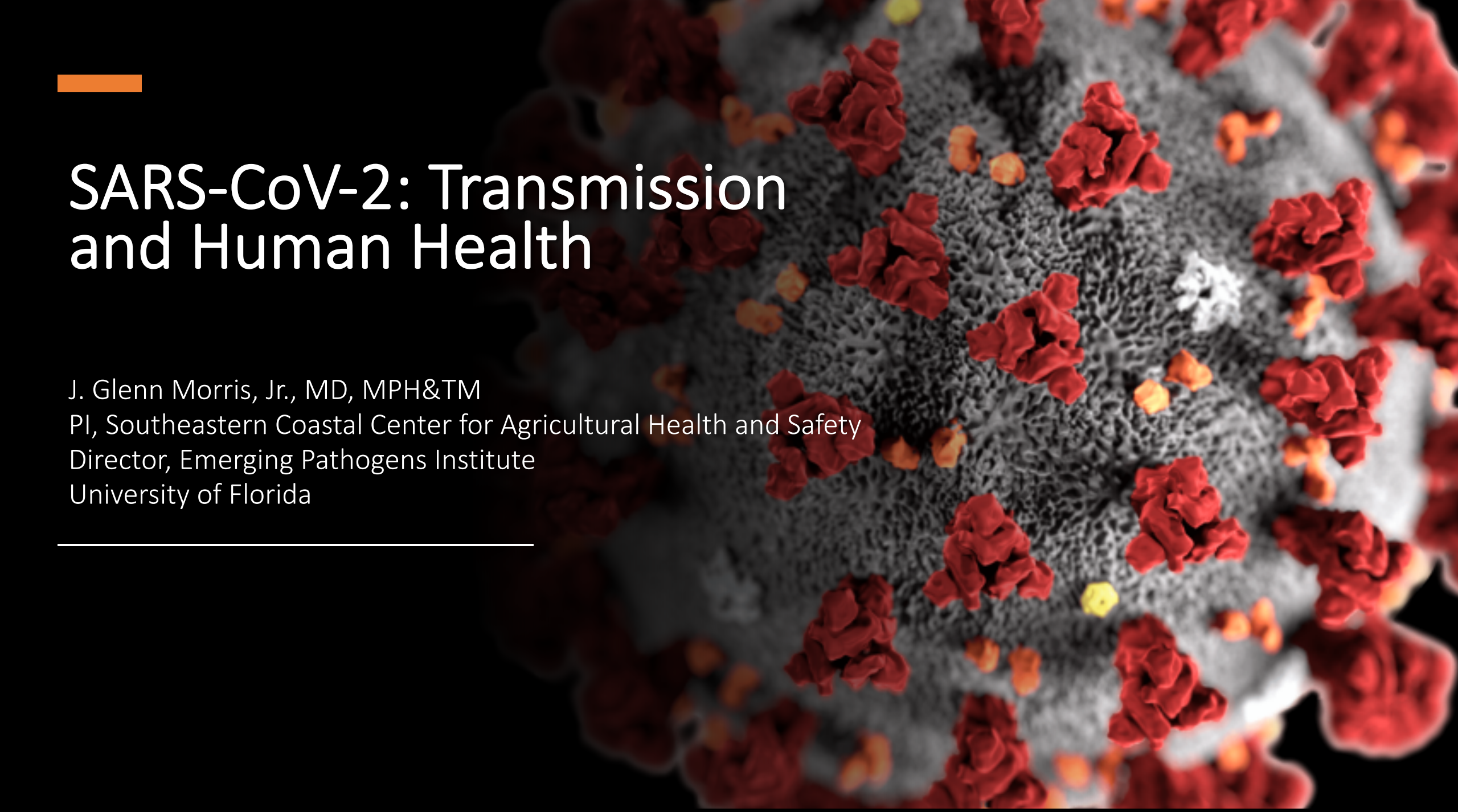
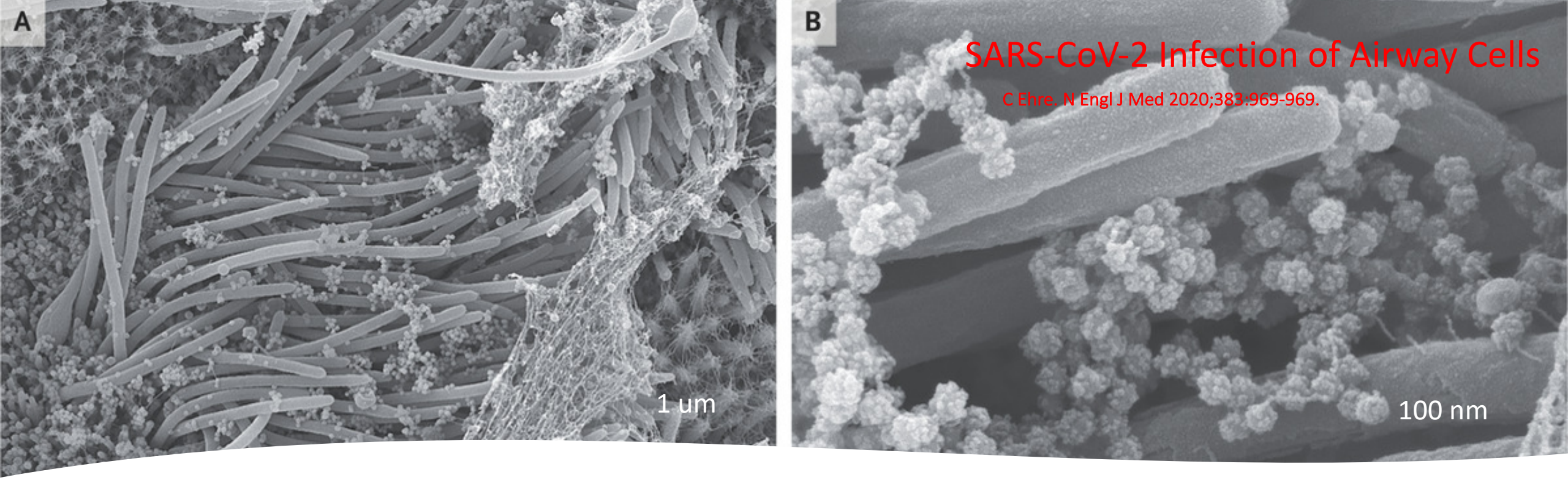




Coronaviruses

- Coronaviruses are species of virus belonging to the subfamily *Coronavirinae* in the family *Coronaviridae*, in the order *Nidovirales*.

- Coronaviruses are enveloped viruses with a positive-sense single-stranded RNA genome and with a nucleocapsid of helical symmetry. The genomic size of coronaviruses ranges from approximately 26 to 32 kilobases, the largest for an RNA virus.

Coronavirus

- Origin – probably bats
- In domestic and wild animals – common cause of illness, which may range from mild to severe
  - Economically significant coronaviruses of farm animals include porcine coronavirus (transmissible gastroenteritis coronavirus, TGE) and bovine coronavirus, which both result in diarrhea in young animals.
- In humans – one of the most common causes of upper respiratory infections
  - Alphacoronaviruses of humans: *Human coronavirus 229E, Human Coronavirus NL63*.
  - Betacoronaviruses of humans: *Human coronavirus HKU1, Human coronavirus OC43*, and SARS, MERS, and COVID-19.

Weekly Detection Rates(%)

8% Site Co-Detection Rate

High Activity	My Site	South*	My Site: Top, South: Bottom
Influenza A H1-2009	14.5	8.5	
Human Rhinovirus/Enterovirus	11.9	15.2	
Medium Activity	**My Site**	**South***	**My Site: Top, South: Bottom**
Respiratory Syncytial Virus	2.6	5.5	
Coronavirus NL63	2.6	1.2	
Human Metapneumovirus	2.0	2.5	
Influenza B	1.7	3.6	
Adenovirus	1.7	3.4	
Coronavirus HKU1	1.7	3.1	
Low Activity	**My Site**	**South***	**My Site: Top, South: Bottom**
Influenza A (no subtype)	0.9	0.4	
Parainfluenza Virus 4	0.3	0.7	
Mycoplasma pneumoniae	0.3	0.6	
Influenza A H3	0.3	0.3	
Coronavirus OC43	0.0	1.2	
Parainfluenza Virus 3	0.0	0.7	
Parainfluenza Virus 1	0.0	0.7	
Coronavirus 229E	0.0	0.2	
Bordetella pertussis	0.0	0.1	
Chlamydia pneumoniae	0.0	0.1	
Parainfluenza Virus 2	0.0	0.0	
Bordetella parapertussis	0.0	0.0	
Influenza A H1	0.0	0.0	

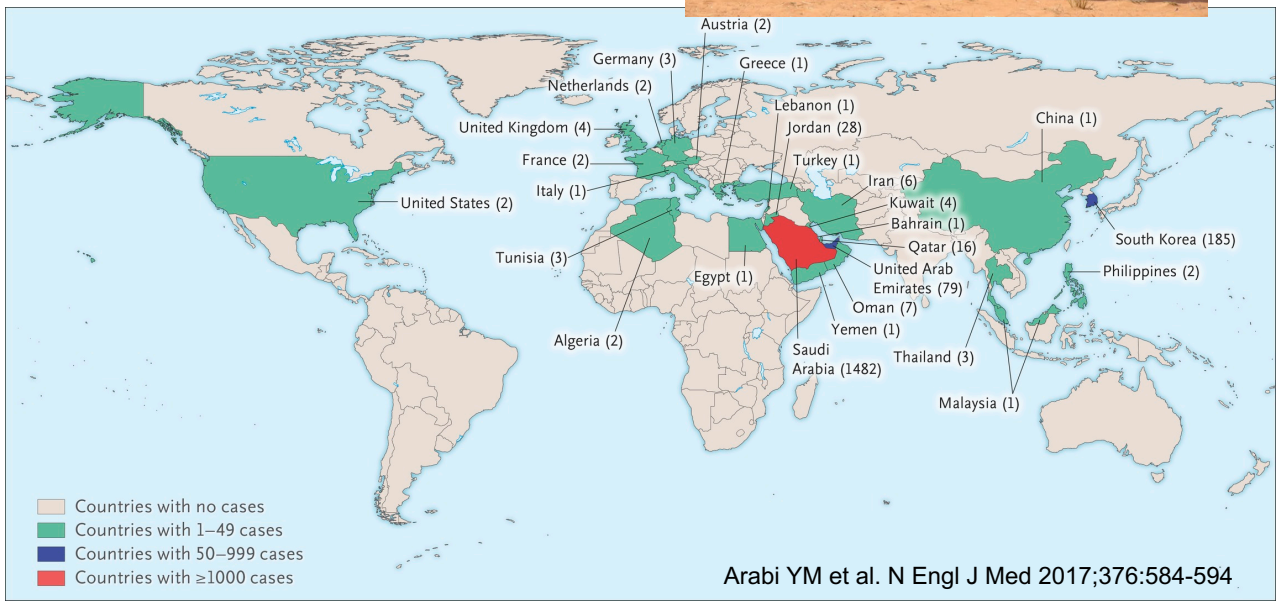
UFHealth, Gainesville

Viral Respiratory Pathogens, detection rates as percentage of total samples (n=314), first week of February, 2020

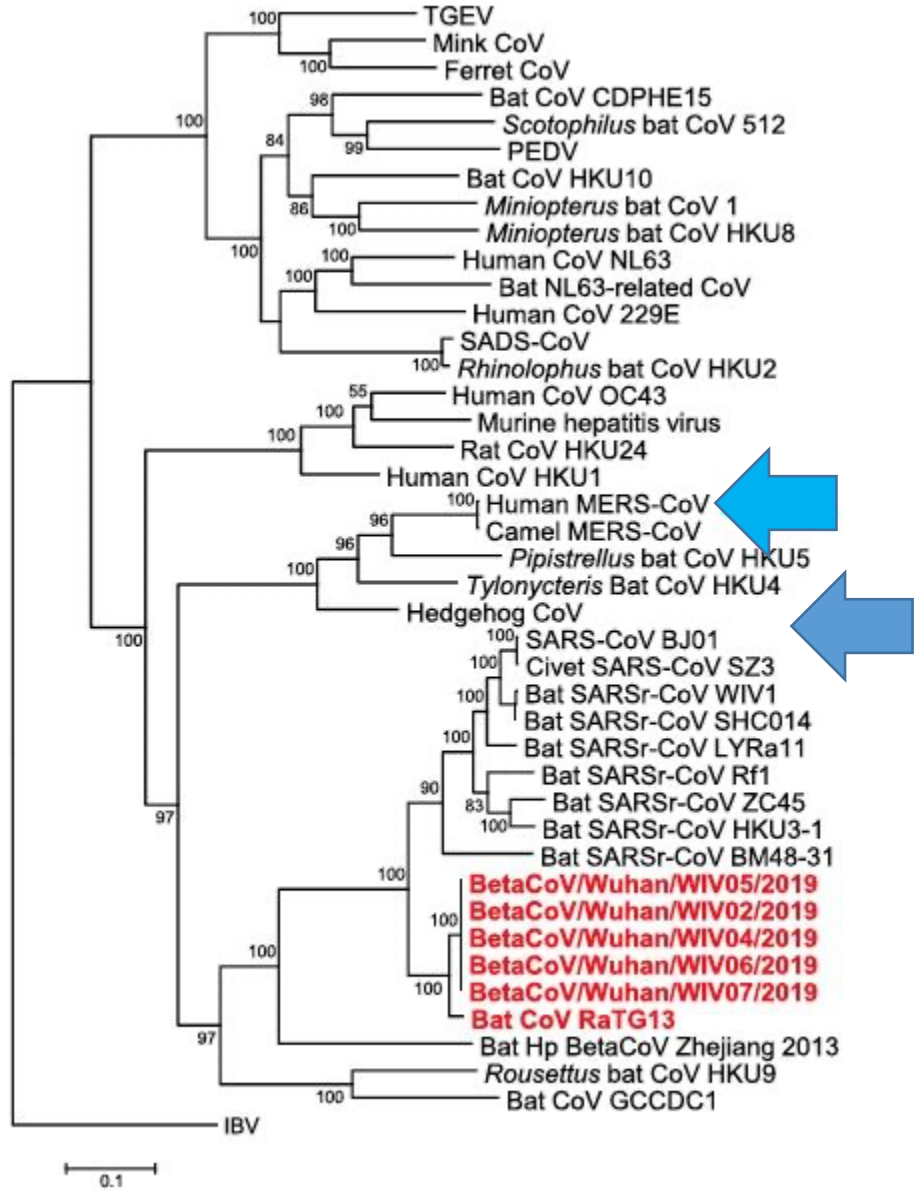
Corona Viruses:

Severe Acute Respiratory Syndrome (SARS)
Middle East Respiratory Syndrome (MERS-CoV)

- SARS
  - Cases in 2003/2004 (none since)
  - Reported from 29 countries, with over 8,000 probable cases and 774 deaths
  - Major outbreaks in Hongkong/China, and Canada (Toronto)
  - Zoonotic link:
    - Palm Civits
    - ? bats
- MERS-CoV
  - First identified in September, 2012
  - Reported from 27 countries, with 1879 laboratory confirmed cases and 659 deaths
  - Major outbreaks in Middle East, Korea
  - Zoonotic link:
    - Dromedaries: secretions, raw milk
    - ? bats



https://ncbiinsights.ncbi.nlm.nih.gov/2020/01/13/novel-coronavirus/



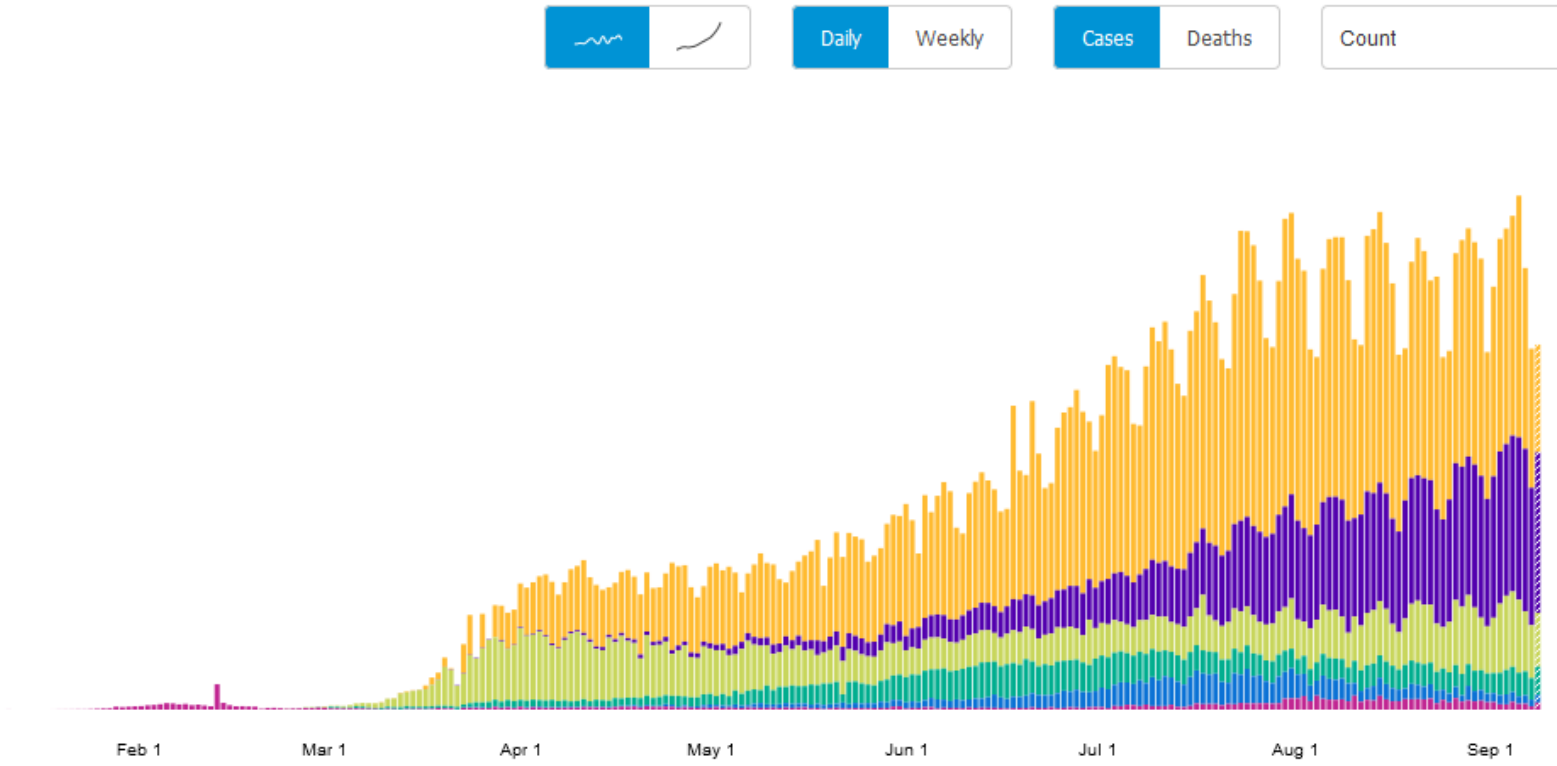
COVID-19: Global Spread

Situation by WHO Region

Americas	14,257,006 confirmed
South-East Asia	4,964,948 confirmed
Europe	4,600,967 confirmed
Eastern Mediterranean	2,040,265 confirmed
Africa	1,096,731 confirmed
Western Pacific	526,302 confirmed

Source: World Health Organization

Data may be incomplete for the current day or week.



Florida Coronavirus Map and Case Count

By The New York Times Updated September 9, 2020, 12:11 P.M. E.T.

TOTAL CASES

652,140

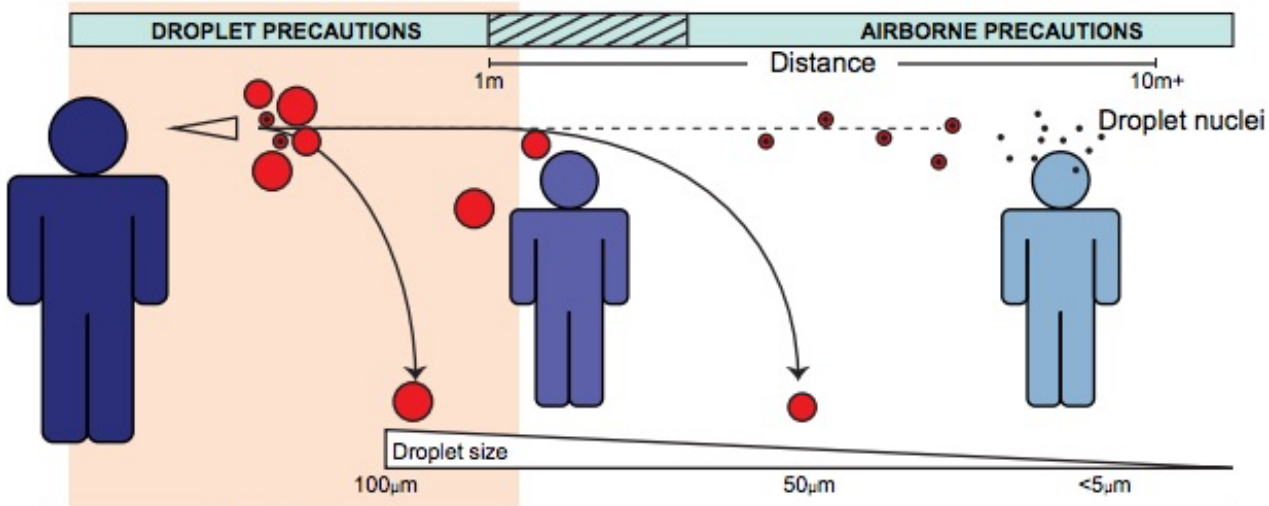
DEATHS

12,114

Includes confirmed and probable cases where available

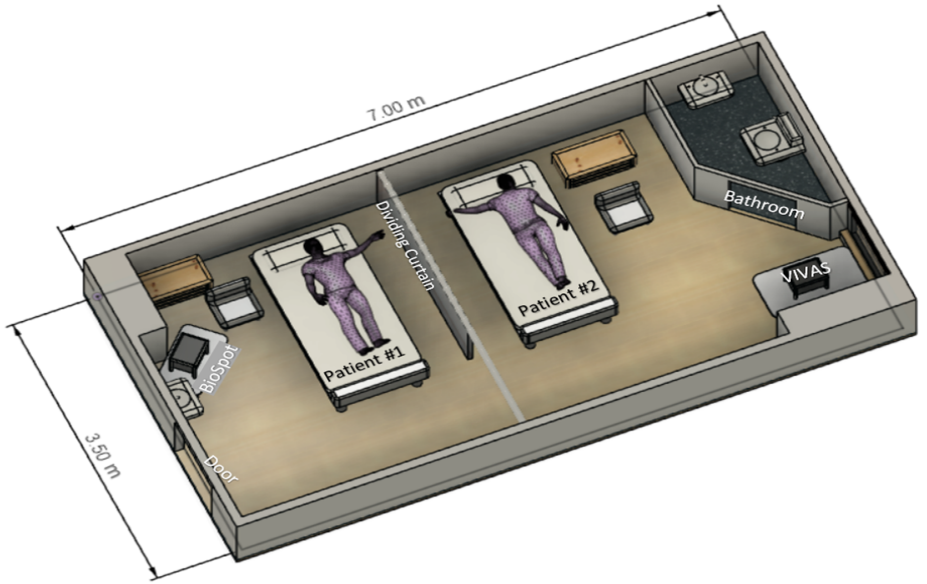
SARS-CoV-2

- Highly contagious
  - Transmission by
    - Large droplets from the respiratory tract –
      "danger zone" of up to 12 feet
    - Airborne/Aerosols – can drift in air for several hours, creating "toxic cloud"
  - Can be transmitted by persons who have no symptoms: this can occur before or after onset of clinical symptoms, or in persons who never have clinical symptoms



Isolation of Respiratory Viruses from Reception Area of Student Infirmary

- Viruses isolated:
- Adenovirus
- Coronavirus 229E
- Coronavirus NL63
- Influenza A H1N1 virus
- Influenza A H3N2 virus
- Influenza B virus
- Human parainfluenza virus -1, -2, -4a
- Human metapneumovirus
- Respiratory syncytial virus A

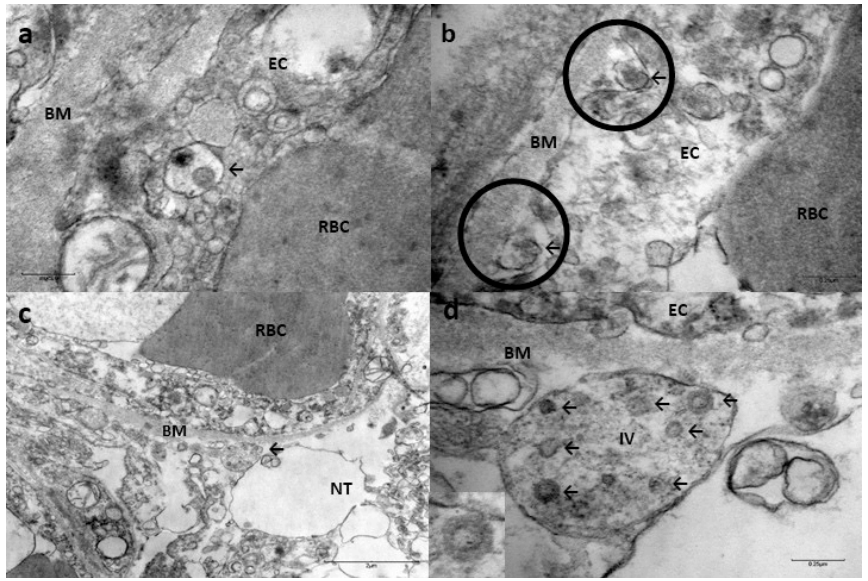


Isolation of SARS-CoV-2 from a patient room

COVID-19: Clinical Presentations

- "Typical" cases
  - Fever – 88%
  - Cough – 68%
  - URI symptoms, diarrhea
  - Loss of sense of taste and smell
  - Onset of symptoms usually around 5 days after exposure
- Severe cases
  - Worsening of symptoms over subsequent days, with hospitalization usually occurring around 11 days after exposure; key symptom: increasing shortness of breath
  - Respiratory failure, with fibrosis of lungs
  - Also - involvement of brain, heart, kidney, liver, and GI tract.
  - Involvement of lining of arteries
  - Hypercoagulable state: strokes, heart attacks

However - up to 50% of infected persons in large, population-based studies are asymptomatic, with another 30-40% having only mild symptoms



Paniz-Mondolfi *et al*, J Med Virol

Risk Factors for More Severe Illness (CDC)

- Age
  - Florida: 86% of deaths, 46% of hospitalizations, but only 12% of cases among persons aged 65 years and older
- Strong Evidence:
  - Cancer
  - Chronic Kidney Disease
  - COPD
  - Immunocompromised state from solid organ transplant
  - Obesity (Body mass index [BMI] of 30 or higher)
  - Serious heart conditions, such as heart failure, coronary artery disease, or cardiomyopathies
  - Sickle Cell disease
- Mixed Evidence:
  - Asthma
  - Cerebrovascular disease
  - Hypertension
  - Pregnancy*
  - Smoking
  - Use of corticosteroids or other immunosuppressive medications

COVID-19 Risk Factors in Pregnancy

- CDC Surveillance: data from 8,207 COVID-19 positive pregnant women
  - 31.5 of pregnant women hospitalized vs. 5.8% of non-pregnant women of reproductive age (but potential problems with way these data were collected)
  - After adjusting for age, underlying conditions, and race/ethnicity:
    - Pregnant women significantly more likely to be admitted to ICU (aRR = 1.5, 95% CI 1.2-1,8)
    - Significantly more likely to require mechanical ventilation (aRR = 1.7, 95% CI 1.2-2.4)
  - Risk of death equal among pregnant and non-pregnant women

Detection

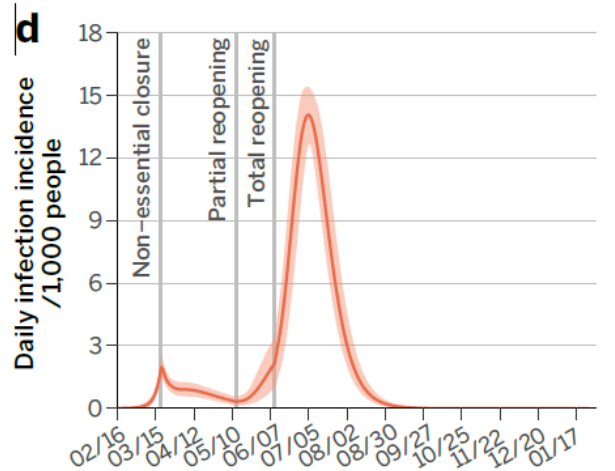
- Genetic approach – detection of virus itself: to find out who is infected, and has the potential for spreading the virus
  - Currently requires RT-PCR, which remains standard assay for the virus
    - Technically difficult, requires special instrumentation, appropriate operator safety precautions
  - Rapid antigen tests approved, but availability of equipment (and supplies) remains limited
- Antibody approach – looking for presence of antibodies to see if people have been infected: does NOT indicate infectivity
  - Blood sample/ “prick test”
  - Assays still under development, and reliability of assays is not always great (you can buy anything on the Internet)
  - Not at all clear that antibodies detected are protective, and there is a possibility that you could be infected again: at this point, not an “immunity passport”
  - By the time antibodies show up, person is likely to not be infectious
  - Reported positives from commercial testing laboratories for state of Florida: 6.67%

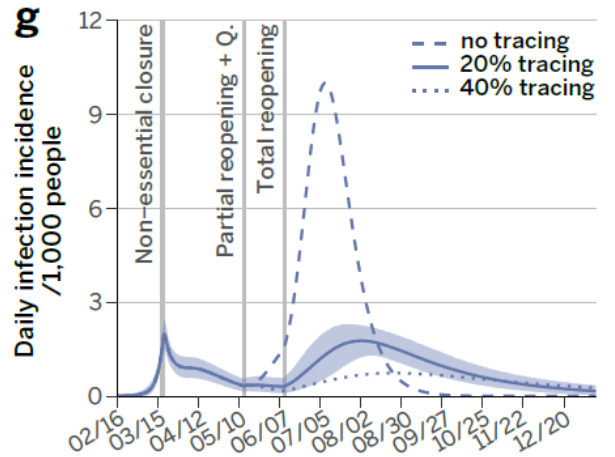
COVID-19 Interventions

- Things that appear to work:
  - Social distancing
    - Every meter further apart – reduce risk by half
  - Masks
    - N95 masks: highly effective in blocking passage of the virus/preventing infection
    - Medical grade masks (not N95): May be as much as 85% reduction in infection
    - Cloth Masks: less effective, but still some effect
      - CDC guidelines – multiple layers of cloth, reasonable fit, cover nose and mouth
  - Face shields
    - May be as much as 65% reduction in infection (but data are soft)
  - Hand washing
  - Stay outdoors as much as possible

COVID-19 Interventions

- Test and Trace
  - Identification of infected persons
    - Need easily accessible testing sites (“pop-up” testing)
    - Need acceptable test
      - NP swab not that popular; starting to move toward saliva testing
    - Need rapid turn-around time/quick answers
  - Isolate those infected, quarantine those exposed





Coronavirus Disease 2019: Interim Guidance from CDC and the U.S. Department of Labor for Agriculture Workers and Employers

Key Points

- Management in the agriculture industry should conduct work site assessments to identify coronavirus disease 2019 (COVID-19) risks and infection prevention strategies to protect workers.
- Work site guidance for COVID-19 prevention and control should be taken into consideration in employer-furnished shared worker housing, transportation vehicles and work settings.
- Prevention practices should follow the hierarchy of controls, which includes using source control and a combination of engineering controls, administrative controls (especially proper sanitation, cleaning, and disinfection), and personal protective equipment.
- Grouping workers together into cohorts may reduce the spread of COVID-19 transmission in the workplace by minimizing the number of different individuals who come into close contact with each other over the course of a week, and may also reduce the number of workers quarantined because of exposure to the virus.
- Owners/operators should maximize opportunities to place farmworkers residing together in the same vehicles for transportation and in the same cohorts to limit exposure.
- Basic information and training about infection prevention should be provided to all farmworkers in languages they can understand.
- Agriculture work sites developing plans for continuing operations where COVID-19 is spreading among workers or in the surrounding community should work directly with appropriate state and local public health officials and occupational safety and health professionals.

COVID-19 and Agriculture: Workers

- Prevalence
  - Data are poor, due in part to reluctance to have testing done, on the part of both workers and employers
  - Studies done by UF/EPI, with county health department
    - Farm workers (ornamentals): 60 tested, 0 positive
    - Fisheries/Cedar Key: 501 tested, 2 positive
    - H-2A workers (case cluster): 100 tested, 91 positive
- Problem areas/areas for intervention to reduce transmission to other workers
  - Housing
  - Transportation
  - Continuing to work while ill (or infectious, without symptoms)

Outbreak in H-2A Workers in Florida

- Group of ~50 H-2A workers from South Florida came to North Central Florida area to join another group of workers under single labor contractor. The crew chief was subsequently notified that two people in the group from South Florida had positive tests for COVID-19
- Local county Health Department subsequently notified by crew chief that multiple persons in work crew had symptoms consistent with COVID-19. Work crew driven to health department in two crowded school buses, where 100 persons were tested.
- Six days later results came back, with 91/100 persons positive for COVID-19. Health department visited work crew on-site: found that many had returned to work while test results were pending. Crew members were living in motel rooms, with 6-10 persons/room; apparently some crew members had visited local emergency rooms for care.
- Follow-up was not possible, as crew moved on shortly thereafter to jobs in other states.

Michigan: Mandatory Testing, Preventative Measures and Safe Housing for Agricultural Workers (effective August 24, 2020)

- Agricultural employers/migrant camp operators
  - One-time testing of all residents
  - Testing of all new residents within 48 hours of arrival, with separate housing for newly arrived residents for 14 days afterward and a second test at the end of that period
  - Testing of any resident with symptoms or exposure
  - Assistance with isolation housing for COVID-positive residents

COVID-19 and Agriculture: Products

- FDA/CDC: “Currently there is no evidence of food, food containers, or food packaging being associated with transmission of COVID-19”
- Agricultural workers/facilities need to continue to adhere to standard USDA/AMS Good Agricultural Practices (GAP) and Good Handling Practices (GHP)
- For workers, particularly those working with RTE products:
  - Maintain good personal hygiene
  - Wash hands
  - Minimize touching mouth or nose; +/- on masks while working, depending on setting
  - Do not work while ill (with particular attention given to symptoms consistent with COVID-19: fever, cough, URI symptoms, diarrhea)

Bottom line

- *Highly contagious*
- Need for accessible, rapid, and reliable testing, to identify cases/monitor transmission
- Potentially effective interventions
  - Masks
  - Social distancing
  - Hand washing
  - Stay outdoors!
- Problem areas with agricultural workers
  - Housing
  - Transportation
  - Working while ill

http://www.sccahs.org/index.php/covid-19/