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 and Illness

• 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.*
COVID-19

• Data from first 1,099 cases - China
  • Median age: 47 years
  • Wildlife contact: 1.2%
  • Median incubation period: 3 days (range 0-24 days [CDC: 2-14 days])
  • Symptoms/Signs:
    • Fever - 88%
    • Cough - 68%
    • Sputum production – 33%
    • Lymphopenia – 82%
    • CXR/CT – bilateral patchy shadowing – 9%; ground glass opacity – 5%
  • Possible risk factors: diabetes – 7.4% (16% among those with severe disease)
  • ICU admission: 5%
  • Mortality: 1.36% among patients with symptomatic infection

• Japan
  • 565 citizens repatriated from Wuhan: 8 positive for virus, 4 of whom were asymptomatic

• CDC
  • Increased risk of infection in older persons, underlying health conditions (including diabetes), compromised immune system
## COVID-19 in Florida

<table>
<thead>
<tr>
<th>Age group</th>
<th>Cases</th>
<th>Hospitalizations</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 years</td>
<td>27</td>
<td>0%</td>
<td>1</td>
</tr>
<tr>
<td>5-14 years</td>
<td>46</td>
<td>1%</td>
<td>2</td>
</tr>
<tr>
<td>15-24 years</td>
<td>579</td>
<td>8%</td>
<td>13</td>
</tr>
<tr>
<td>25-34 years</td>
<td>1,137</td>
<td>15%</td>
<td>41</td>
</tr>
<tr>
<td>35-44 years</td>
<td>1,180</td>
<td>16%</td>
<td>93</td>
</tr>
<tr>
<td>45-54 years</td>
<td>1,352</td>
<td>18%</td>
<td>140</td>
</tr>
<tr>
<td>55-64 years</td>
<td>1,308</td>
<td>17%</td>
<td>192</td>
</tr>
<tr>
<td>65-74 years</td>
<td>1,031</td>
<td>14%</td>
<td>233</td>
</tr>
<tr>
<td>75-84 years</td>
<td>616</td>
<td>8%</td>
<td>193</td>
</tr>
<tr>
<td>85+ years</td>
<td>215</td>
<td>3%</td>
<td>82</td>
</tr>
<tr>
<td>Unknown</td>
<td>4</td>
<td>0%</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>7,495</td>
<td>990</td>
<td>101</td>
</tr>
</tbody>
</table>

The table above shows the distribution of COVID-19 cases, hospitalizations, and deaths by age group in Florida.
Routes of Transmission

• Sources
  • Respiratory secretions (most common)
    • Present in secretions for several days before onset of symptoms; can persist in secretions for week or more after resolution of symptoms
    • Can be present in persons who never have symptoms (up to 50% of infected persons may be asymptomatic, but can excrete the virus)
  • Stool
  • Urine

• Routes of transmission
  • Close contact
    • Droplets, from cough or sneeze, present briefly in the air, and then on surfaces
  • Airborne
    • Can “drift” in air for several hours
      • Infection of choir in Washington State: 60 people together at choir rehearsal, none symptomatic
        • 45 ill, 2 died
Detection

• Detection of virus itself
  • Genetic approach – detection of virus itself
    • Currently requires RT-PCR, which remains standard assay for the virus
      • Technically difficult, requires special instrumentation, appropriate operator safety precautions
      • National problem with shortage of supplies
        • Lack of swabs for nose and throat
        • Lack of reagents to run machines
        • Lack of Personal Protective Equipment for people collecting samples
    • Rapid tests approved, but generally not available
  • Antibody approach – looking for presence of antibodies to see if people have been infected
    • Generally requires blood sample
    • Assays still under development; rapid test approved, but generally not available
SCCAHS Response to COVID-19

- NIOSH Center addresses worker health and safety topics in the **agriculture**, **fishing**, and **forestry** industries throughout Southeastern coastal states.

- Key networks to share information through during pandemic:
  - SCCAHS stakeholders, including but not limited to:
    - Florida Department of Agriculture and Consumer Services
    - Florida Farm Bureau
    - Florida Fruit and Vegetable Association
    - Farmworker Association of Florida
  - UF Institute of Food and Agricultural Sciences (IFAS) Extension
  - Extension Disaster Education Network (EDEN)
    - [https://extensiondisaster.net/] (https://extensiondisaster.net/)
    - Florida specific information: [https://piecenter.com/resources/natural-disaster-resources/] (https://piecenter.com/resources/natural-disaster-resources/)
SCCAHS Response to COVID-19

• Hosted annual Community Stakeholder Advisory Board Meeting virtually on March 12
  • Panel discussion topic: stress and resilience among ag workers
  • Shared concerns of COVID-19 in context of resiliency

• **March 16**: started consistently sharing COVID-19 information on Facebook from credible sources such as CDC, WHO, UF and FL Department of Health

• Created webpage on SCCAHS website with COVID-19 resources in English and Spanish. Includes:
  • General COVID-19 information from CDC
  • Information on stress and resiliency during a pandemic
  • Disaster preparedness resources
SCCAHS Response to COVID-19

• Providing information on development of portable handwashing stations available to those in agriculture, fishing, and forestry (AFF)
• Hosting virtual webinars and meetings with stakeholders regarding COVID-19
• Conducted interviews with key stakeholders about COVID-19 impacts
• Developing survey to identify health/economic impacts of COVID-19 on AFF
Severe acute respiratory syndrome coronavirus 2 = SARS CoV-2

SARS CoV-2 causes COVID-19
Isolation of coronavirus in cell cultures

Non-infected cells

Coronavirus-infected cells

Workers wearing powered air-purifying respirators (PAPR)
Determination of SARS-CoV-2 genomic codes

Virus genomic RNA

Track source of virus

Create better tests

Vaccines, Basic Research
Infectious Droplets & Droplet Nuclei Travel Lengths

- 1-3 Feet
- 3-5 Feet
- 5-160+ Feet
Prototype of a highly efficient (effective) air sampler developed at UF that works well for collecting virus aerosols and maintaining the viability of the collected virus particles.
COVID-19 Projections under different levels of non-pharmaceutical interventions

Ira Longini, Ph.D.
Professor of Biostatistics
University of Florida
Research Activities

• Randomized, adaptive phase 3 trials for COVID-19 therapeutics
  • Therapeutic use
  • Prophylactic use
• Randomized, adaptive phase 2b and 3 trials for COVID-19 vaccines
• Mathematical modeling of the transmission and control of SARS-CoV-2 on local and global scales
Preliminary modelling results going live in the next day or so

Alessandro Vespignani, Northeastern University

M. Elizabeth Halloran, U. Wash. and Ira Longini, U FL
Daily new infections incidence in different scenarios in California
Cumulative infections per 100 individuals for the different scenarios stay at home for 12 weeks in California.
Cumulative number of deaths interventions are implemented 12 weeks in California
Cumulative clinical attack rate (AR) and cumulative number of deaths in California

<table>
<thead>
<tr>
<th>Time</th>
<th>Stay at home (March 16-March 31) and after April 16 (in bracket the 90% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2+2 weeks</td>
</tr>
<tr>
<td></td>
<td>Clinical AR(%)</td>
</tr>
<tr>
<td>March 31</td>
<td>0.07 [0.02-0.16]</td>
</tr>
<tr>
<td>April 30</td>
<td>0.39 [0.09-0.86]</td>
</tr>
<tr>
<td>May 31</td>
<td>5.33 [1.49-9.92]</td>
</tr>
<tr>
<td>June 30</td>
<td>38.23 [30.87-39.8]</td>
</tr>
</tbody>
</table>

The colors of the cells, from green to orange, indicate when the daily number of ICUs needed will surpass the state's capacity.
Thank you