Welcome to the
AHMP – Cyber Chapter
& ChABSA Presentation of
“COVID-19, Technical Details for Safety and Biosafety Professionals”

Presented by
Dr. Michael Sauri
Occupational Health Consultants
Moderated by
Bruce Donato

Contact information.

For technical consultation on infectious diseases or other occupational health related illnesses, please contact:
Christopher L. Sibley, RN, MS-HSMgT Occupational Health Consultants
2301 Research Blvd., Suite 125
Rockville, MD 20850
Tel 301-738-6420
Fax 301-990-3534
csibley@ohcmd.com
www.ohcmd.com
What is the AHMP Cyber Chapter?

- Our Mission is to provide professionals who are managing hazardous materials with a virtual forum to exchange information and ideas and assist them in adapting to the changing aspects of the profession of hazardous materials management as it is related to the environment, health and safety, transportation, disaster planning, emergency management and homeland security.

- The Cyber Chapter offers a convenient alternative to traditional Chapter membership, with the same networking and continuing education options available, in an easily accessible on-line format.

- Cyber Chapter membership provides a broader national perspective on issues facing CHMMs and EHS&S professionals.

- The Cyber Chapter also provides the opportunity to network with professionals from many different locations and disciplines.

www.ahmpcyber.org

What is ChABSA?

- The Chesapeake Area Biological Safety Association (ChABSA) is an incorporated, non-profit organization that is an affiliate of ABSA International (formerly the American Biological Safety Association)

- ChABSA was established in 1987 and serves the MD, VA, WV, and DC areas

- ChABSA is dedicated to expanding biological safety awareness and reducing the potential for occupational illness and adverse environmental impact from infectious agents or biologically derived materials

- ChABSA hosts seminars and symposiums that offer members and guests the opportunity to network and socialize with other local biological safety professionals working in government, military, academia, commercial and not-for-profit companies while learning from experts in a variety of fields

www.chabsa.org
Dr. Michael Sauri

Dr. Michael Sauri is an Infectious Diseases and Occupational Medicine specialist in private practice for over two decades in Rockville, Maryland. He serves as the Medical Director of Occupational Health Consultants that services over 130 biomedical research laboratories and multinational Companies in the Washington Metropolitan area. He serves as a Tropical Medicine consultant to international corporations and travelers visiting the Travel Advisory and Immunization Clinic.

He received his Medical Degree from Loyola University and Masters in Public Health/Tropical Medicine and Hygiene from Tulane University. Dr. Sauri received Residency training in General Preventive Medicine in the USAF and Internal Medicine in the US Army and Fellowship training in Infectious Diseases in the US Navy. He is board certified in Internal Medicine, Occupational Medicine and Tropical Medicine and board-eligible for Medical Toxicology.

Dr. Sauri is a Clinical Professor at both the Johns Hopkins Bloomberg School of Public Health and the Uniformed Services University of Health Sciences. Since 1992, Dr. Sauri has been selected consecutively eleven times by his peers as one of the Top Physicians in Internal Medicine and Infectious Diseases in the Washington Metropolitan Area.

COVID-19 Pandemic
ChABSA and AMHP Cyber Chapter Webinar
March 10, 2020

Michael A. Sauri, MD, MPH&TM, FACP, FACPM, FACOEM, FRSTMH, CTropMed
Medical Director
Occupational Health Consultants
301-738-6420
www.ohcmd.com
msauri@ohcmd.com
COVID-19 (aka 2019 n-CoV, SARS-2)

Global Spread of COVID-19 (2-26-20)

Figure 1. Countries, territories or areas with reported confirmed cases of COVID-19, 26 February 2020
Department of Health and Human Service Response

• Screening at US airports in Chicago, NY, Atlanta, SF and LA
• Nonessential travel warning issued
• Screening of person under investigation (PUI) thru State Health Department with samples run by CDC
• Screening close contacts of cases (contact investigation)
• Ramp up of test kits by CDC (reagent fiasco)
• Accelerated Vaccine and Drug Development

COVID-19 TEST KITS
MD Hospitals Response: Specimen Collection

State Epidemiologist:
Maryland Department of Health
410-767-6700 during working hours
Or
410-795-7365 after working hours

Holy Cross Hospital (Silver Spring) is the identified Assessment Hospital for Montgomery County. Currently, all Montgomery county PUI are triaged and tested in the ER.

Hospitals Response

Broadened EMR form to triage in ER for PUI using CDC case definition
Case Definition

<table>
<thead>
<tr>
<th>Fever and symptoms of lower respiratory illness (e.g., cough, difficulty breathing)</th>
<th>and</th>
<th>In the last 14 days before symptom onset, a history of travel from China. – or – In the last 14 days before symptom onset, close contact with a person who is under investigation for 2019-nCoV while that person was ill.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever or symptoms of lower respiratory illness (e.g., cough, difficulty breathing)</td>
<td>and</td>
<td>In the last 14 days, close contact with an ill laboratory-confirmed 2019-nCoV patient.</td>
</tr>
</tbody>
</table>


Epidemiology of COVID-19

- Patterned from SARS and MERS
- Close contacts
- Coughing, sneezing
Nosocomial Transmission

<table>
<thead>
<tr>
<th>Virus</th>
<th>Nosocomial Transmission</th>
<th>Case Fatality rate</th>
<th>Pandemic</th>
<th>Nosocomial cases per report</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019-nCoV</td>
<td>Yes</td>
<td>Unknown</td>
<td>Unknown</td>
<td>15</td>
</tr>
<tr>
<td>SARS-CoV</td>
<td>58% cases from nosocomial transmission</td>
<td>9.5%</td>
<td>Yes</td>
<td>128</td>
</tr>
<tr>
<td>MERS-CoV</td>
<td>70% cases from nosocomial transmission</td>
<td>34.4%</td>
<td>No</td>
<td>186</td>
</tr>
</tbody>
</table>

COVID-19 Q & A – Method of Transmission

- Droplet and Contact
- Possible fecal oral
- Possibly consumptions of reservoir host (Bat, Civet Camel, etc.)

**Prevention**
- Cough Etiquette and use a mask (“Droplet precaution”)
- Wash your hands (an unnatural human act)
- Avoid touching your face (Note: humans touch their face about 20 x/hour)
- Health Care workers require more stringent PPE due to potential to develop aerosols
Infection Prevention and Control Steps

1. Put a surgical mask on the PUI
2. Place patient in a private room with the door closed, ideally an airborne infection isolation room if available.
3. Health care providers entering the room of a PUI should use:
   - Standard precautions
   - Contact precautions
   - DROPLET precautions (incl. eye protection)

Timeline of Public Health Interventions During the 2003 SARS Epidemic in Toronto

Close Contact

Defined as:

- a) being within approximately 6 feet (2 meters), or within the room or care area, of a 2019-nCoV case for a prolonged period of time while not wearing recommended personal protective equipment (PPE) (e.g., gowns, gloves, NIOSH-certified disposable N95 respirator or PAPR, eye protection); close contact can include caring for, living with, visiting, or sharing a health care waiting area or room with a 2019-nCoV case

or

- b) having direct contact with infectious secretions of a 2019-nCoV case (e.g., being coughed on) while not wearing recommended PPE.

Note: Length of exposure has not been determined by CDC as of this time.
Personal Protective Equipment

Respiratory and contact isolation

- Eye protection
- N95 mask or PAPR
- Gown and Gloves

### Pathogens

<table>
<thead>
<tr>
<th>Precaution</th>
<th>No pathogen</th>
<th>Influenza, RSV</th>
<th>Influenza virus with sustained human-to-human transmission</th>
<th>Novel influenza virus with sustained human-to-human transmission</th>
<th>SARS</th>
<th>Novel organisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand hygiene</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Gloves</td>
<td>R/A</td>
<td>R/A</td>
<td>R/A</td>
<td>R/A</td>
<td>R/A</td>
<td>R/A</td>
</tr>
<tr>
<td>Gown</td>
<td>R/A</td>
<td>R/A</td>
<td>R/A</td>
<td>R/A</td>
<td>R/A</td>
<td>R/A</td>
</tr>
<tr>
<td>Eye protection</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Medical mask on HCPs and caregivers</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Particulate respiratory and eye protection for room entry</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Particulate respiratory and eye protection for aerosol-generating procedures</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Medical mask on patient when outside isolation area</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Airborne Precaution</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

R/A - Risk Assessment
**COVID-19 Q & A – What is it?**

WHO wanted to avoid stigmatizing a country or particular group, so it chose a name on 2-11-2020 that did not refer to a geographical location, animals, an individual or a group of people. COVID-19 (CoronaVirus Disease – 2019)

Examples of enveloped (lipid coated) ss RNA viruses

- Coronavirus (SARS & MERS)
- H1N1 (Spanish flu)
- HIV
- Ebola
- Rhabdovirus (rabies)
- Herpes
- Hepatitis C

**COVID-19 Q & A – COVID vs SARS vs MERS**

- **SARS** (Severe Acute Respiratory Syndrome)
  - 2002-2003
  - 8,100 cases; 800 deaths; **CFR 10%** (initially CFR 75%); spread to 17 Countries

- **MERS** (Middle East Respiratory Syndrome)
  - 2012 to Present
  - 2494 Cases; 850 deaths; **CFR 34%**; spread to 27 Countries

- **COVID-19**
  - 2019 to Present
  - 105,000 Cases; 21,000 hospitalizations (20%); 3600 deaths; **CFR 3.4%**; spread to 95 Counties

- Seasonal Influenza
- Since Spanish Flu 1914
- 34 Million Cases, 350,000 hospitalizations (1%); 20,000 deaths; **CFR 0.5%**; USA (2019-2020 season)
COVID-19 Q & A – How Virulent is COVID-19

• While the range of symptoms for the 2 viruses is similar, the fraction with severe disease appears to be different.

• For COVID-19 patients appear to have mild or asymptomatic infection 80% of the time, but severe and critical infection appears higher than influenza infection; 15% are severe (requiring oxygen), and 5% are critical infections (requiring ventilation).

• For influenza, the most at-risk population for severe influenza infection are children, pregnant women, elderly, those with underlying chronic medical conditions and those who are immunosuppressed.

• For COVID-19, our current understanding is that older age and underlying conditions increase the risk for severe infection.

• Crude Mortality Ratio (the number of reported deaths divided by the reported cases) for COVID-19 appears higher (3—5%) than for Seasonal influenza (usually < 0.1%).

• While the true mortality (the number of reported deaths divided by the number of infections) of COVID-19 is still unclear but will likely be lower. However, mortality is also determined by access to and quality of health care.


<table>
<thead>
<tr>
<th></th>
<th>Confirmed</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Globally</strong></td>
<td>81,109</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(871 new)</td>
<td></td>
</tr>
<tr>
<td><strong>China</strong></td>
<td>78,191</td>
<td>2,718</td>
</tr>
<tr>
<td></td>
<td>(412 new)</td>
<td>(52 new)</td>
</tr>
<tr>
<td><strong>Outside of China</strong></td>
<td>29,181</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>(459 new)</td>
<td>(10 new)</td>
</tr>
<tr>
<td></td>
<td>37 countries</td>
<td></td>
</tr>
</tbody>
</table>

3.5% CFR

1.5% CFR
Epidemics function exponentially

### COVID-19 Q & A – COVID vs “Flu” vs ”Cold”

The Reproductive number (number of secondary infections generated from one infected individual) is very context- and time-specific, making direct comparisons more difficult.

**COVID-19 virus reproductive number** is felt to be between 2 and 2.5 compared to 1.24 for influenza.

Children are important drivers for influenza virus transmission in the Community compared to COVID-19 virus, where initial data indicate that children (0-19) are less affected than adults.

Furthermore, preliminary data from household transmission studies in China suggest that children are infected by adults, rather than vice versa for influenza.
Reproductive Number for COVID-19

European Hand Washing Rates, 2015
COVID-19 Q & A – Incubation Period

• Influenza has a shorter median incubation period (the time from infection to appearance of symptoms) ranging 1-4 days (average 2 days) compared with COVID-19 (3 to 14 days).

• Influenza has a shorter serial interval (the time between successive cases) of 3 days compared to COVID-19 virus (5-6 days). This means that influenza can spread is faster than COVID-19.

• However, Influenza generally shed virus in the first 3-5 days of illness (beginning 1 day before onset of symptoms and for 5-7 days after becoming sick) where as

• COVID-19 patients can shed virus 24-48 hours prior to appearance of symptoms. At present, this does not appear to be a major driver of transmission for COVID-19.

COVID-19 Q & A – Clinical Presentation

COVID-19 vs “Flu” vs ”Common Cold”

• Similar disease presentation

• Note: Common cold presents with coryza (i.e. no stuffy nose, runny nose, sneezing, and post-nasal drip) in contrast to Influenza and COVID-19

• Both cause respiratory disease, which presents as a wide range of illness from asymptomatic or mild through to severe disease and death.

• Both viruses are transmitted primarily by droplets but contact with contaminated surfaces also plays role in transmission.

• Therefore, the similar public health measures (i.e. hand hygiene and good respiratory etiquette (coughing into your elbow or into a tissue and immediately disposing of the tissue) can prevent infection.
Clinical Features

- Fever
- Cough
- Myalgia/fatigue
- Severe Dyspnea

- 30% patients in study with ARDS
- 15% died
- 16 HCW infected

https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30183-5/fulltext

COVID-19 Radiographic features
COVID-19 Q & A – Environmental Persistence?

• The analysis of 22 studies reveals that human coronaviruses such as Severe Acute Respiratory Syndrome (SARS) coronavirus, Middle East Respiratory Syndrome (MERS) coronavirus or endemic human coronaviruses (HCoV) can persist on inanimate surfaces like metal, glass or plastic for up to 9 days.

• This new virus is not heat-resistant and will be killed by a temperature of just 26/27 degrees. It hates the Sun. Heat and humidity play a factor in how far the virus can travel and persist outside the body


COVID-19 Q & A – Which Disinfectants Work?

In the light of the comparable genetic characteristics with SARS-CoV and MERS-CoV suggest that 2019-nCoV may likely susceptible to disinfectants with proven activity against enveloped viruses, including:

• sodium hypochlorite (bleach) (e.g. 1,000 ppm (0.1%) for general surface disinfection and 10,000 ppm (1%) for disinfection of blood spills),
• 62-71% ethanol,
• 0.5% hydrogen peroxide,
• quaternary ammonium compounds and
• phenolic compounds, if used according to manufacturer’s recommendations.

• Other biocidal agents can be less effective
  • 0.05-0.2% benzalkonium chloride or
  • 0.02% chlorhexidine digluconate.

COVID-19 Q & A – Expectation of this becoming Seasonal

• Seasonal Flu
  • Usually starts to circulate during the winter time in each Hemisphere

• COVID-19
  • Coronaviruses (SARS, MERS, Coronaviruses) do not transmit efficiently in high humidity environments
  • Survival of Coronavirus is reduced at higher temperature

That said, it is expected to decline during the summer months (less community spread) but due to its Reproductive number, is likely to return in the Fall.
Treatments: Virally Targeted Agents

• Ribavirin (a guanine derivative nucleoside analogue approved for treating HCV (with interferon alfa-2a and -2b) and respiratory syncytial virus (RSV)) (SE: severe anemia)
• Remdesivir (GS-5734) is a phosphoramidate prodrug of an adenine derivative with a chemical structure similar to that of tenofovir alafenamide, an approved HIV reverse transcriptase inhibitor.
• Favipiravir is an experimental Japanese Protease Inhibitor Influenza drug
• Kaletra (dual PI: Lopinavir and ritonavir) inhibit HIV “aspartic” protease but may inhibit the “3-chymotrypsin-like” protease of SARS and MERS
• Hydroxychloroquine (Plaqueril) (an immune modulator shows inhibitory effects against COVID-19.
• Note: Kaletra (dual PI) and Plaqueril from Spain and Austria in critically ill patients
• Disulfiram, an approved drug to treat alcohol dependence, has been reported to inhibit the papain-like protease of MERS and SARS in cell culture.
• Angiotensin Converting Enzyme (ACE) Inhibitors used in treatment of hypertension may block the target of COVID-19 in the lungs bronchial cells

Treatments: Host Targeted Agents

• Interferon alfa-2a and -2b, approved for the treatment of HBV and HCV (with ribavirin), can stimulate innate antiviral responses in patients infected with 2019-nCoV,
• Small-molecule agents:
  • Hydroxychloroquine (Plaqueil) and Chloroquine are immune modulators that shows inhibitory effects against COVID-19. Kaletra (dual PI) and Plaqueil used Spain/Austria
  • Disulfiram, an approved drug to treat alcohol dependence, has been reported to inhibit the papain-like protease of MERS and SARS in cell culture.
  • Angiotensin Converting Enzyme (ACE) Inhibitors used in treatment of hypertension may block the target of COVID-19 in the lungs bronchial cells
• Vaccine Therapies:
  • There are currently no licensed vaccines or therapeutics for COVID-19; There are currently 20 vaccines in development in the USA and Worldwide.
  • Note: While the influenza vaccine is not effective against COVID-19 virus, it is highly recommended to get vaccinated each year to prevent influenza infection.
Economic Impact of Prior World Epidemics

Economic Impact of COVID-19 in CHINA Demonstrated by Satellite Pollution Production 2-25-20

That said, when past outbreaks erupted, they were more geographically contained. Furthermore, while China was also hit hard during the SARS epidemic, in 2003 the country accounted for only 4% of global GDP; today that number is closer to 16%.

A map shows the sharp decline in emissions over China between early January and late February as parts of the country went on lockdown in an attempt to contain the COVID-19 coronavirus.

(Image: © NASA Earth Observatory)
FAQs about Biosafety (Handling of COVID-19)

• How should the laboratory perform a risk assessment to identify and mitigate risks?
• Are certified Class II biological safety cabinets (BSCs) required to process COVID-19 specimens? Should laboratory staff put procedures in place to minimize personnel exposure if there is no certified Class II BSC?
• What biosafety level is recommended for handling clinical specimens from suspected COVID-19 PUIs?
• What disinfectant should personnel use to decontaminate work surfaces?
• How should personnel remove biohazardous waste from the laboratory or testing area for decontamination and disposal? Does an autoclave need to be available in the facility?
• How should staff members transport clinical specimens from suspected COVID-19 PUIs within a facility?
• What are Standard Precautions?
• What are infectious aerosols and droplets?
• What procedures can generate aerosols and droplets?

FAQs on about Biosafety (Shipping Specimens of COVID-19)

• Do people packing specimens for transport need to be trained and competent?
• What specific packaging should personnel use when shipping clinical specimens from suspected COVID-19 PUIs?
• At what temperature should specimens be shipped?
• What information is required on the outer package for shipment of specimens with ice packs?
• What information is required on the outer packages for shipment of specimens with dry ice?
• What information is required on an overpack if used for specimen shipment?
• Is a shipper’s declaration required? What documentation is required for shipment? What if specimens are shipped on dry ice?
• Is a Responsible Person required on the shipping paperwork?
• Once packaging of the samples is complete should staff members decontaminate the work area?
References


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  • https://apps.who.int/iris/bitstream/handle/10665/69707/WHO_CDS_EPR_2007_6_eng.pdf;jsessionid=8FDAB0F90007F9831F1382029F8E3288?sequence=1

• Laboratory biosafety guidance related to the novel coronavirus (2019-nCoV) Interim Guidance, 2-12-20

  • https://www.cdc.gov/infectioncontrol/pdf/guidelines/isolation-guidelines-H.pdf

• Environmental Cleaning and Disinfection Recommendations; Interim Recommendations for US Households with Suspected/Confirmed Coronavirus Disease 2019

• Webpage on Infection Prevention:

• Reference Document regarding COVID-19:

• Maryland Health Department COVID-19:
  https://phpa.health.maryland.gov/Pages/Novel-coronavirus.aspx

• Documents
  • Pui-form.doc
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• Clinical details: Lancet, NEJM
  https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30183-5/fulltext
  http://weekly.chinacdc.cn/en/article/id/e3c63ca9-dedb-4fb6-9c1c-d057adb77b57

References
The End