Biosafety and Bioethics Part II
Example of Biosafety Measures taken during Epidemics and Pandemics

SARS, MERS, COVID-19

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SARS-CoV

- SARS (Severe Acute Respiratory Syndrome) is a viral respiratory illness caused by the SARS-associated coronavirus
- Considered the first emerging epidemic of the 21st century, SARS emerged in Asia in February 2003 and spread in North America, South America, Europe, and Asia
- It was a first Select Agent declared that has the potential to pose a severe threat to public health and safety
- SARS is spread by close person-to-person contact, most readily by respiratory droplets
- Symptoms of the disease include high fever, headache and body aches, sometimes diarrhea and pneumonia
- Severe cases often evolve rapidly to respiratory distress and require intensive care

MERS-CoV

- Middle East respiratory syndrome (MERS) is a viral respiratory disease caused by a novel coronavirus (Middle East Respiratory Syndrome Coronavirus) that was first identified in Saudi Arabia in 2012
- The MERS symptoms include fever, cough and shortness of breath, occasional Pneumonia, Gastrointestinal symptoms including diarrhoea
- It was a zoonotic virus which transmitted between animals and people
- Studies have shown that humans were infected through direct or indirect contact with infected dromedary camels
- MERS-CoV outbreak was identified in several countries in the Middle East, Africa and South Asia with the largest outbreaks seen in Saudi Arabia, United Arab Emirates, and the Republic of Korea

Laboratory Biosafety Guidelines for SARS-CoV and MERS-CoV

1. Handling of specimens

- Respiratory and Stool specimens, Unfixed lung tissue, Viral cultures and the laboratories performing diagnostic tests under Biosafety Cabinet Class II and under Biosafety Level (BSL)-2 work practices
- Any procedure with the potential to generate fine-particulate aerosols (vortexing or sonication of specimens) and physical containment devices (centrifuge safety buckets; sealed rotors) should be operated under BSL 2
- Aliquoting and diluting specimens, Performing diagnostic tests that do not involve propagation of viral agents in vitro or in vivo and preparation and heat-fixing of smears for microscopic analysis should be done BSL 2

2. Acceptable methods of respiratory protection

- A properly fit-tested, NIOSH-approved filter respirator (N-95 or higher level)
- A powered air-purifying respirator (PAPR) equipped with high-efficiency particulate air (HEPA) filters with accurate fit testing
- Personnel with limitations should wear loose-fitting hooded or helmeted PAPRs

3. Effective and timely communication

- The clinical and laboratory staff is to be communicated necessarily timely to minimize the risk incurred in handling specimens from patients with possible infections
- Such specimens should be labeled accordingly, and the laboratory should be alerted to ensure proper specimen handling

4. Laboratory Activities

- **Propagation of virus in cell culture must be performed in a BSL-3 facility using BSL-3 work practices**
- **Initial characterization of viral agents recovered in cultures should also be done under BSL -3 facility**

5. Public Awareness

- Public awareness is important in managing the spread of diseases includes, increased attention to hygiene and avoiding crowds
- Awareness also supports rapid identification and treatment of new cases and facilitates collective responses
- WHO has been confirmed its responsibility to take on a strong coordinating role in leading the fight against the disease
- All countries are urged to report cases promptly and transparently, and to provide information requested by WHO that could help prevent international spread

COVID -19

- A pneumonia of unknown cause detected in Wuhan, China was first reported to the WHO Country Office in China on 31 December 2019
- On 11 February 2020, WHO announced a name for the new coronavirus disease COVID-19
- The first symptoms were reported on December 2019, but there was no solid evidence of human-to-human transmission until January 10th, 2020, when a patient, who did not travel to Wuhan, became infected with the virus after several days of contact with four family members
- The virus that causes COVID-19 is mainly transmitted through droplets generated when an infected person coughs, sneezes, or exhales
- These droplets are too heavy to hang in the air, and quickly fall on floors or surfaces

Laboratory biosafety guidance related to coronavirus disease (COVID-19) (WHO, March 2020)

1. Handling of Specimens and Laboratory Activities

- All procedures must be performed based on risk assessment and in strict observance of any relevant protocols
- Initial processing (before inactivation) of all specimens should take place in a validated biological safety cabinet (BSC)
- Non-propagative diagnostic laboratory work (Ex. sequencing, nucleic acid amplification test [NAAT]) should be conducted at a facility using procedures equivalent to Biosafety Level 2 (BSL-2)
- Propagative work (Ex. virus culture, isolation or neutralization assays) should be conducted at a containment laboratory with inward directional airflow (BSL-3)

- **Appropriate disinfectants should be used (Ex. hypochlorite [bleach], alcohol, hydrogen peroxide, quaternary ammonium compounds, and phenolic compounds)**
- **Appropriate personal protective equipment (PPE), should be worn by all laboratory personnel handling these specimens**
- **Patient specimens from suspected or confirmed cases should be transported as UN3373 Biological Substance Category B**
- **Viral cultures or isolates should be transported as Category A UN2814, infectious substance, affecting humans**

2. Public Awareness

- Protecting yourself and others from the spread COVID-19
- Advice on the safe use of alcohol-based hand sanitizers
- Be Ready, Be Supportive and Be Informed by the disease
- Follow home care advice for ill peoples, all members and caretakers
- Care must be taken to cope with stress

Thank you……