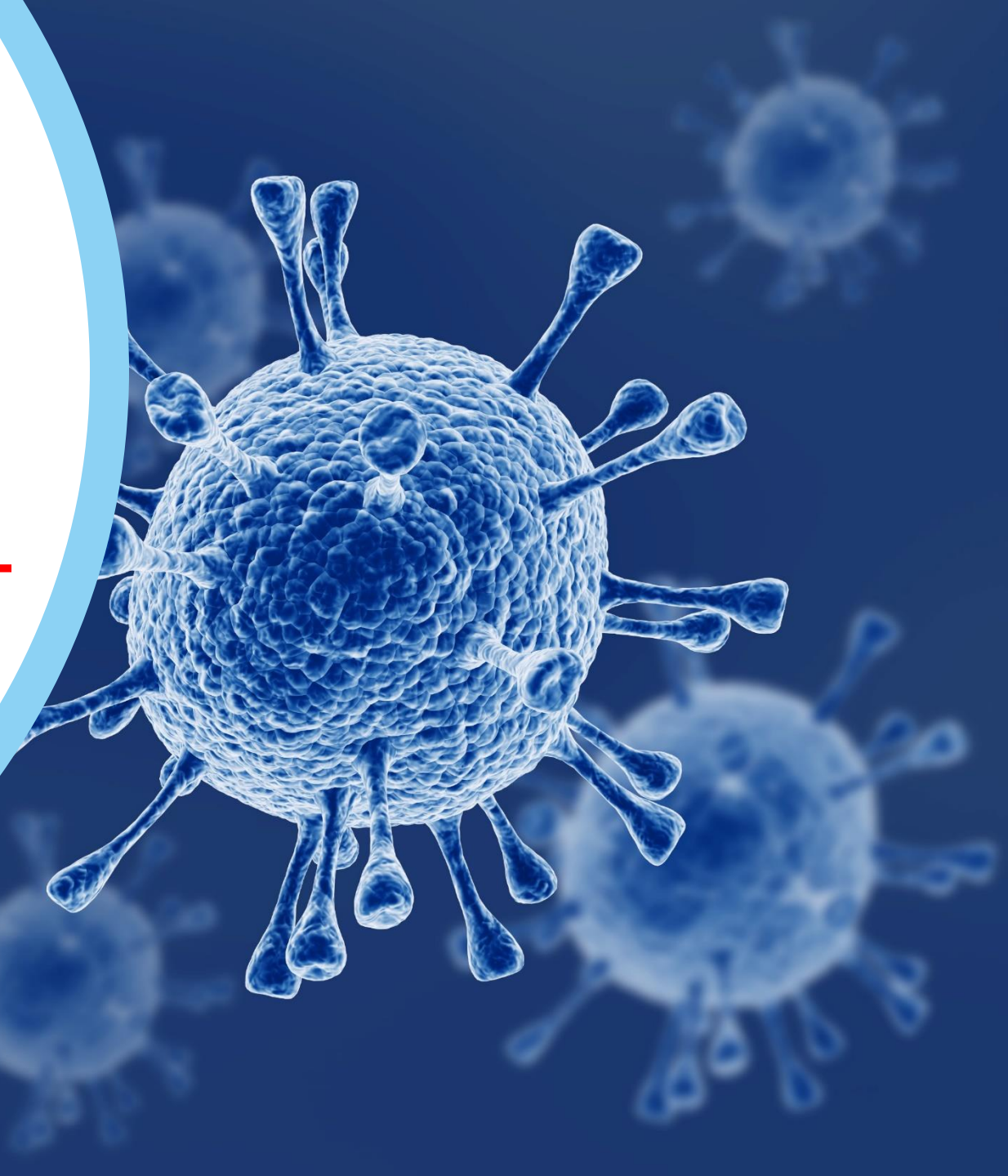
# DETROIT CULTURAL CENTER SYMPOSIUM

## SCIENTIFIC UPDATE
## COVID-19 HAZARD & CONTROL

DR RUBY LEE



# Goal

Scientific Update on COVID-19

Hazard & Control

1. Close contact
2. Aerosol
3. Silent spreaders
4. Fomite contact
5. More

# Introduction

What is the risk level of visiting a local cultural center / museum during pandemic?

A. High

B. Medium

C. Low

# COVID-19 Risk Index

Risk levels for exposure vary based on four main factors:

**Enclosed space**

**Crowds**
Density of people + challenges for social distancing

**Duration of interaction**

**Forceful exhalation**
Sneezing, yelling, singing, and coughing

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**Staying at home**
Alone or with members of your household

**Walking outdoors**
With or without pets

**Outdoor picnic or porch dining**
With non-household people and physical distancing
**Risks:** Potential crowding and activity

**Running or biking**
Alone or with another person
**Risks:** Close contact or potential clustering of people

**Picking up takeout food, coffee, or groceries from stores**
**Risks:** Potential crowding

Risk Level

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**Playing "distanced" sports outside**
Ex. Tennis or golf

**Grocery shopping**
**Risks:** Indoor, close contact, potential clustering of people, high-touch surfaces

**Retail shopping**
**Risks:** Indoor, close contact, potential clustering of people

Risk Level
Low/Medium

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**Visiting hospital emergency department**
**Risks:** Indoor, potential clustering of people

**Medical office visit**
**Risks:** Indoor, close contact, potential clustering of people, high-touch surfaces

**Dentist appointment**
**Risks:** Indoor, close contact, potential clustering of people, patient not wearing a mask

**Outdoor restaurant dining**
**Risks:** Close contact, potential clustering of people, challenge to wear a mask during eating

**Taking a taxi or a ride-sharing service**
**Risks:** Dependency on frequency of cleaning, duration of ride, and number of passengers

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**Museum**
**Risks:** Indoor, close contact/potential clustering of people

Risk Level
Medium

**Exercising at a gym**
**Risks:** Indoor, close contact/potential clustering of people, high-touch surfaces, difficult to wear a mask, high respiratory rate

**Hair/nail salon and barbershops**
**Risks:** Prolonged close contact, difficult to wear a mask

**Indoor restaurant or coffee shop**
**Risks:** Indoor, prolonged close contact/potential clustering of people, difficult to wear mask while eating and drinking

**Working in an office**
**Risks:** Indoor, high-touch surfaces, prolonged close contact/potential clustering of people

Risk Level
Medium/High

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**Indoor party**
**Risks:** Indoor, prolonged close contact/potential clustering of people
**Additional risks:** alcohol (loss of inhibition), shared joint/pipe (coughing)

**Bars and nightclubs**
**Risks:** Enclosed space, prolonged close contact/potential clustering of people, high respiratory rate, yelling/projection of voice

**Public transportation**
Subway or bus
**Risks:** Enclosed space, prolonged close contact/potential clustering of people, and high-touch surfaces

**Concert**
**Risks:** Enclosed space, prolonged close contact/potential clustering of people, high-touch surfaces, yelling/projection of voice

**Movie theater or live theater**
**Risks:** Enclosed space, prolonged close contact/potential clustering of people, high-touch surfaces

**Religious services**
**Risks:** Enclosed space, prolonged close contact/potential clustering of people, high-touch surfaces, singing/projection of voice

**Playing contact sports**
Football, basketball, soccer, etc
**Risks:** Prolonged close contact/potential clustering of people, high respiratory rate, unable to wear a mask

**Air travel**
**Risks:** Enclosed space, prolonged close contact/potential clustering of people, and high-touch surfaces

**Watching sports**
**Risks:** Prolonged close contact/potential clustering of people, high-touch surfaces, yelling/projection of voice, enclosed space (if indoor)

Risk Level
High

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# Introduction

Museums have implemented many controls to reduce COVID-19 risk factors (indoor & potential close contact)

- November 17
- Second survey of 850 museums
- Museums are operating at 35% capacity on average to reduce potential close contact


# 1. Hazard: Close Contact

- October 21 CDC Updated Definition
- ≤ 6-feet + 15-minute (short, multiple, cumulative contacts in 24-hour)
- 2 days before illness onset (pre-symptomatic) or 2 days prior to test specimen collection (asymptomatic) until the time the patient is isolated

# 1. Control: Close Contact

Lesson learned from super-spreading outbreaks

- 20-year-old Vermont correctional officer, wore a mask and goggle, had multiple brief encounters with 6 pre-symptomatic transferred prisoners in cell doorways or recreational room without masks for 17 minutes total during an 8-hour shift
- CDC highlights the importance that everyone wear masks in public

# 1. Control: Close Contact

Universal masking protects everyone in public

- Don’t choose mask with exhalation valve or vent as it may release unfiltered respiratory droplets
- Choose mask preferably with 3 layers as source control to protect others by blocking respiratory droplets

# 1. Control: Close Contact

- June
- NSF International Webinar
- Reopening Your Business and the Use of Face Masks
  - DIY mask material for optimal filtration and breathability

# 2. Hazard: Aerosol

Transmission Modes (< July)

- Larger respiratory droplets (> 5 µm) < 6 ft close contact
- Contact: direct and fomite
- Aerosol (< 5 µm) in medical aerosol generating procedures
- **??? Aerosol suspended in air > 6 ft in non-medical**

# 2. Hazard: Aerosol

July 9 WHO Scientific Brief: Transmission of SARS-CoV-2: implications for infection prevention precautions

- Lesson learned from some outbreak reports related to non-medical environment: choir practice, restaurants or fitness classes
- Indoor, crowded, inadequately ventilated spaces over a prolonged period of time with infected persons
- Short-range aerosol transmission cannot be ruled out

# 2. Hazard: Aerosol

October CDC Scientific Brief: SARS-CoV-2 and Potential Airborne Transmission

- Larger respiratory droplets (> 5 μm) < 6 ft close contact
- Contact: direct and fomite
- Aerosol (< 5 μm) in medical aerosol generating procedures
- **Aerosol in non-medical environment**
  - **No efficient spread of aerosol long distance and time**
  - **Aerosol under special circumstances**

# 2. Hazard: Aerosol

Factors that increase aerosol exposure risk

- Incubation time (symptom onsets with highest viral shedding)
- Distance (short)
- Time (long)
- Density (high)
- Dilution (little: indoor with poor ventilation)
- Activity: aerosol (cough, sing, shout, talk)

# 2. Hazard: Aerosol

Aerosol generated from normal talking

- 3,000 1-μm particle / min x 250 virion / particle

= 750,000 virion / min

- Unknown infectious dose for SARS-CoV-2
- Similar to SARS-CoV ? = 300 virion ?

# 2. Control: Aerosol

Lesson learned from China Guangzhou restaurant outbreak

- Aerosol transmission of SARS-CoV-2 due to poor ventilation may explain the community spread of COVID-19
- Poor ventilation rate = 0.75 – 1 L / sec / person

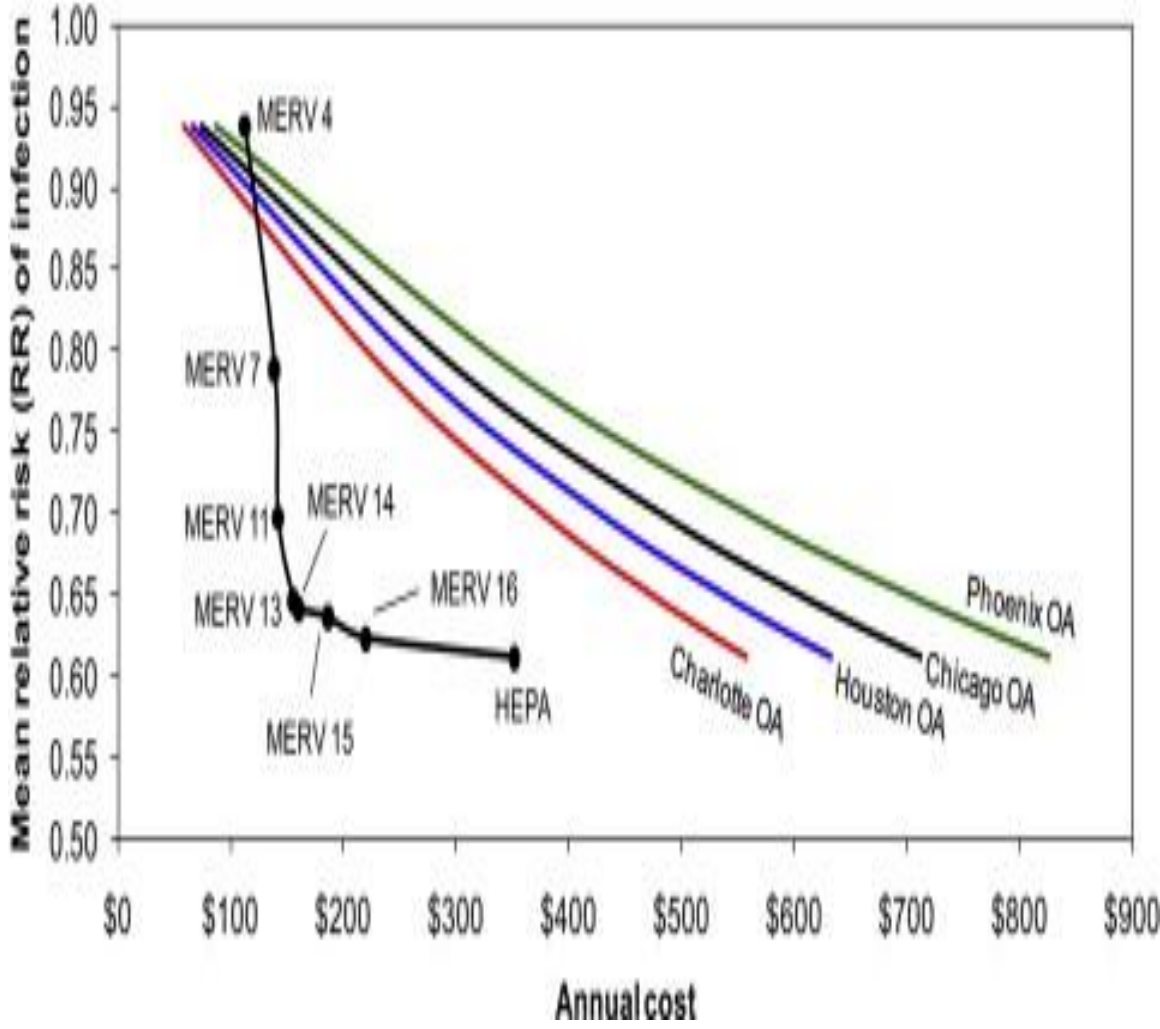
ANSI / ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) Standard 62.1 Ventilation of Acceptable Indoor Air Quality: Minimum outdoor air

- Restaurant > 5.1 L / sec / person
- Museum > 4.6 – 5.3 L / sec / person

# 2. Control: Aerosol

2013 Azimi & Stephens HVAC filtration for controlling infectious airborne disease transmission in indoor environments: Predicting risk reductions and operational costs

- HVAC filtration (MERV 13-16) appears more cost effective than outdoor air ventilation for risk reduction.



# 2. Control: Aerosol

Basic

- Minimum outdoor air (e.g. ASHRAE 62.1: Museum > 4.6 – 5.3 L / sec / person)
- Filtration MERV 13 or equivalent for recirculated air

Supplemental

- Air cleaners: stand-alone HEPA filters, UVC or other effective/safe technologies
- Increased outdoor air

# 3. Hazard: Silent Spreaders

September 10 CDC COVID-19 Pandemic Planning Scenarios

- Current best estimate about viral transmission from silent spreaders (asymptomatic and pre-symptomatic) in the US
- From asymptomatic = 40%
- During pre-symptomatic = 50%
- Viral shedding from asymptomatic vs symptomatic = 75%

# 3. Control: Silent Spreaders

Rapid tests to identify and isolate silent spreaders

- Rapid tests involve home swabbing and mail out for lab testing
- November 17 FDA authorizes first COVID-19 test for self-testing at home for prescription use = Lucira COVID-19 all-in-one test kit

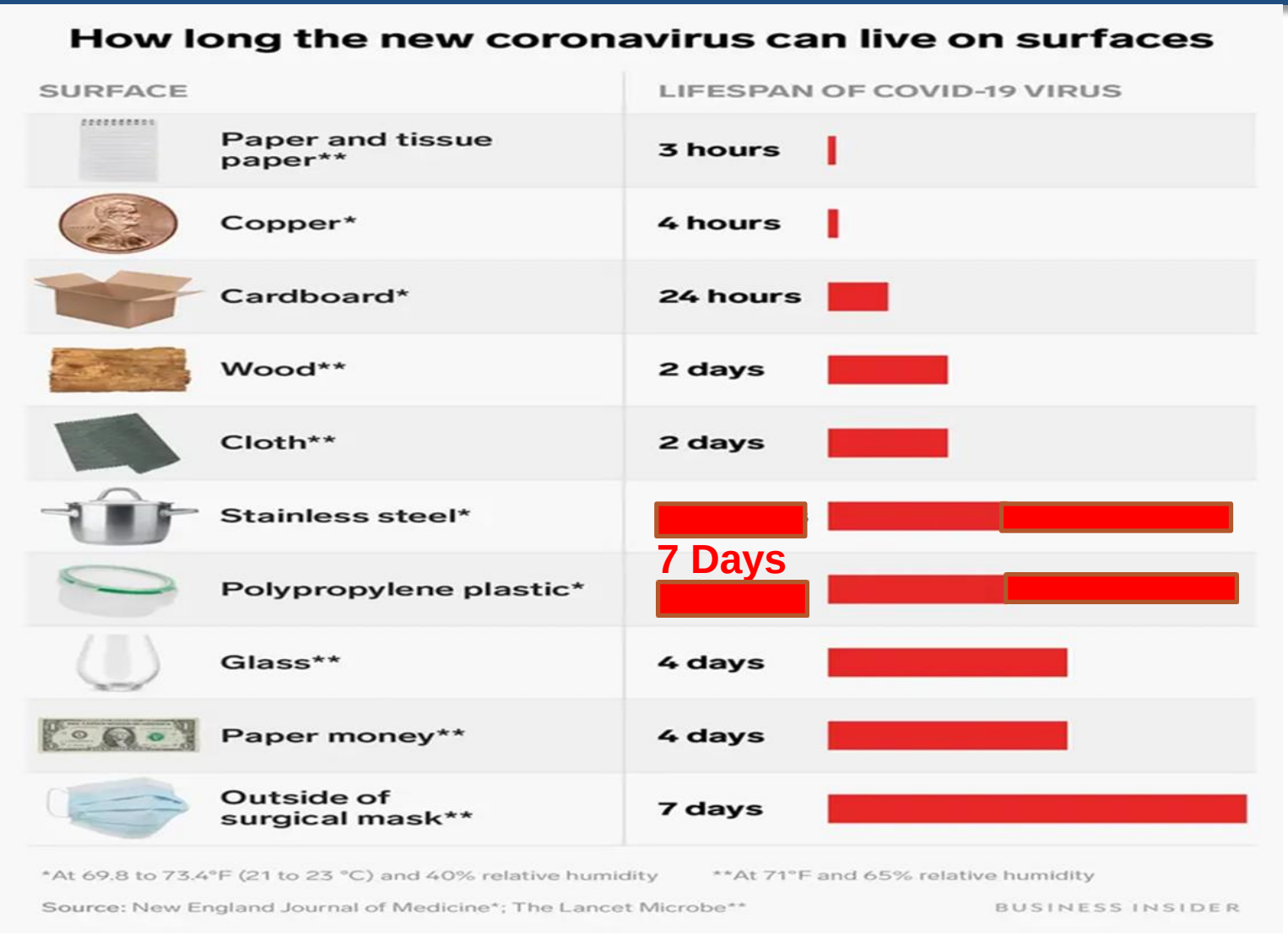
# 3. Control: Silent Spreaders

- Rapid: 30 minutes
- Simple: Swab, stir in vial, automated loop mediated amplification reaction (LAMP) in test cartridge, read.
- Accurate: In a community testing study (n =352)
  - 94% + % agreement
  - 100% + % agreement when excluding samples with very low levels of virus that possibly not active infection
  - 98% - % agreement.
- Affordable: ≤ $50

# 3. Control: Silent Spreaders

- Home use with self-collected nasal swab samples for ≥ age 14 who are suspected of COVID-19 prescribed by health care provider
- Point-of-care use (Dr. offices, hospitals, urgent care centers, ER) for all ages but samples collected by a healthcare provider when the test is used for < age 13
- Prescribing health care providers are required to report all test results they receive from individuals who use the test to their relevant public health authorities for tracking

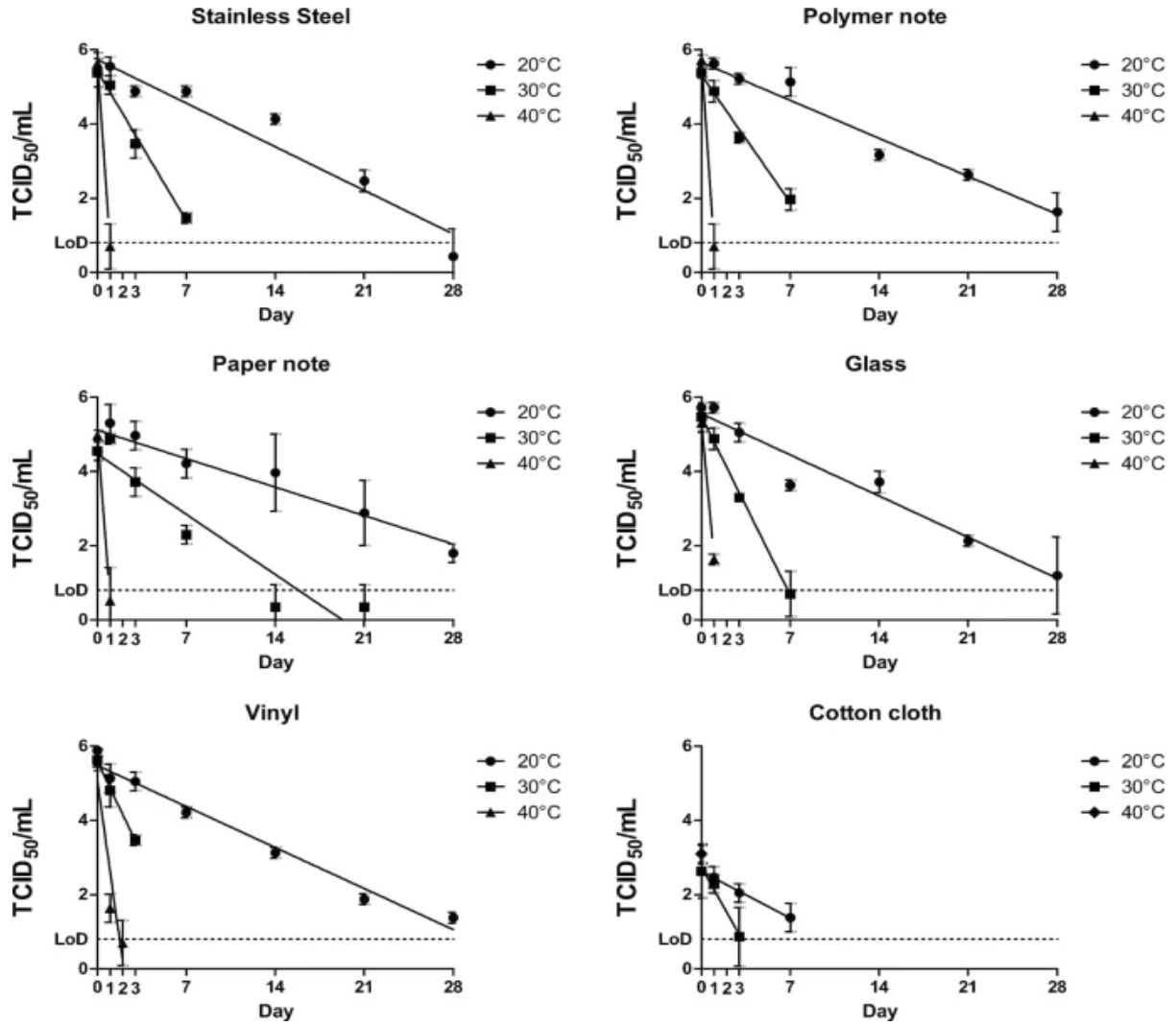
# 4. Hazard: Fomite Contact




- April, 2020
- Stability of SARS-CoV-2 in different environmental conditions
- Chin et.al. Hong Kong
- **7 days**
- Infectious SARS-CoV-2 decreases over time
- Limitation: 30-min contact may not reflect casual contact

# 4. Hazard: Fomite Contact

- October 7, 2020
- The effect of temperature on persistence of SARS-CoV-2 on common surfaces
- Shane Riddell et al. Australia
- Viable SARS-CoV-2 was isolated for **> 28 days** at 20°C 50% RH in the dark from non-porous surfaces (glass, stainless steel, paper and polymer banknotes)
- SARS-CoV-2 can remain infectious for significantly longer time periods than generally considered possible
- 1 day at 40°C 50% RH in the dark



# 4. Control: Fomite Contact

- Follow WHO, CDC, EPA Guidance for Cleaning and Disinfecting

# 5. Hazard: Long-Term Effects

November 13: CDC Updated Long-Term Effects of COVID-19 After Recovery

- Most Common: fatigue, shortness of breath, cough, joint pain, chest pain
- Common: brain fog, depression, muscle pain, headache, intermittent fever, heart palpitations
- Less common systemic:
  - Respiratory: lung function abnormalities
  - Cardiovascular: inflammation of the heart muscle
  - Renal: acute kidney injury
  - Dermatologic: rash, hair loss
  - Neurological: smell and taste problems, sleep issues, difficulty with concentration, memory problems
  - Psychiatric: depression, anxiety, changes in mood

# 5. Control: FDA EUA Drugs

- FDA Emergency Use Authorization (EUA) drugs
- November 9: Eli Lilly (bamlanivimab) mAb &
  November 21: Regeneron (casirivimab and imdevima) monoclonal antibodies
  - Bind to spike protein of SARS-CoV-2 to prevent virus attachment and human cell entry
  - Treat mild to moderate outpatients adults and pediatric patients (>12 years > 40 kg) at high risk for progressing to severe COVID-19
- November 19: Eli Lilly baricitinib in combination with remdesivir to treat hospitalized patients needing oxygen

REGENERON

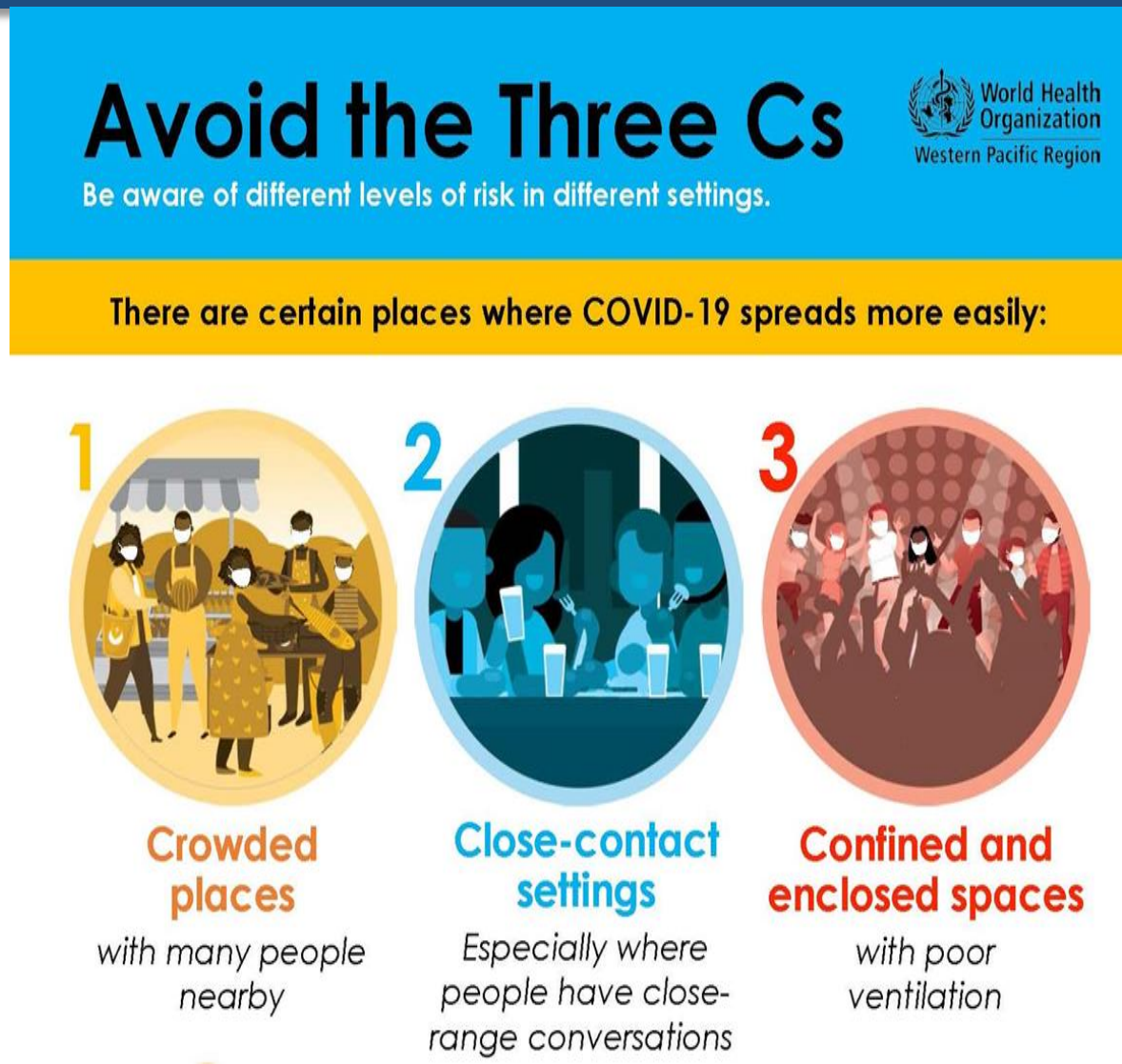
Lilly

# 5. Control: Vaccines in 2021

- Pfizer & BioNTech: 95% efficacy
- Moderna: 94.5 efficacy
- Seeking FDA emergency use authorization
- Messenger RNA vaccine: human cells use mRNA to make spike protein of SARS-CoV-2 to stimulate human body to build immunity
- 50% efficacy + 70% vaccinated = $R_0 > 1.0$
- 95% efficacy + 70% vaccinated = $R_0 < 1.0$


# 5. Control: Basic Multiple Hurdles

- Monitor health
- Stay home
- Wear mask in public
- Physical distancing
- Avoid 3C
- Maintain hand hygiene
- Clean & disinfect



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