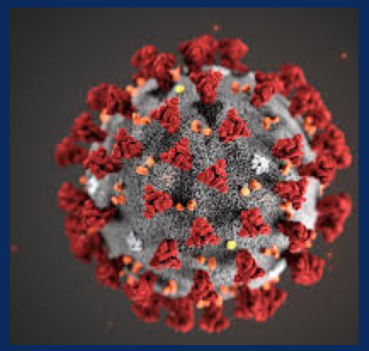


COVID-19 Scientific Advisory Board Legislature Presentation May 21, 2020

- President UMaine & UMM Joan Ferrini-Mundy, Ph.D., Chair
- Vaccines/Antivirals - Melissa Maginnis, Ph.D., UMaine
- Diagnostic Testing - Kristy Townsend, Ph.D., UMaine
- Serology Testing/Immunity - Rob Wheeler, Ph.D., UMaine
- Epidemiology and Contact Tracing - Sara Huston, Ph.D., USM
- Transmission in the Environment/Surfaces - Caitlin Howell, Ph.D., UMaine

COVID-19 Vaccines and Therapeutic Development

Vaccines

140 Vaccines in development

4 Leading candidates in clinical development

	Clinical Trial Status	Manufacturing	Company Guidance for Availability
1 ChAdOx1 nCov-19 (Viral Vector) — THE JENNER INSTITUTE / AstraZeneca	Phase 1 - complete • Phase 2 - March • Phase 3 – May/summer (US)	Partnered with AstraZeneca for global development and distribution BARDA ($1b) funding to support	*400 million doses starting in October, and capacity secured for 1 billion doses 2020-21*
2 mRNA-1273 (RNA Vaccine) — moderna	Phase 1 - complete • Phase 2 - approved May 6 • Phase 3 - July	Partnered with Lonza, 10-year agreement BARDA ($483m) funding to support	*Partnership with Lonza enables worldwide vaccine distribution of 1 billion doses/year.*
3 INO-4800 (DNA Vaccine) — inovio	• Phase 1 - April • Phase 2 - summer • Phase 3 - fall	Partnered with Richter-Helm Biologics	Indicates end of year availability
4 BNT162 program (RNA Vaccine) — Pfizer BIONTECH	• Phase 1 - April • Phase 2 - April • Phase 3 - TBD	Partnered with Pfizer	Emergency use or accelerated approval starting in the fall

Antivirals

219 Drugs in development

2 Leading candidates

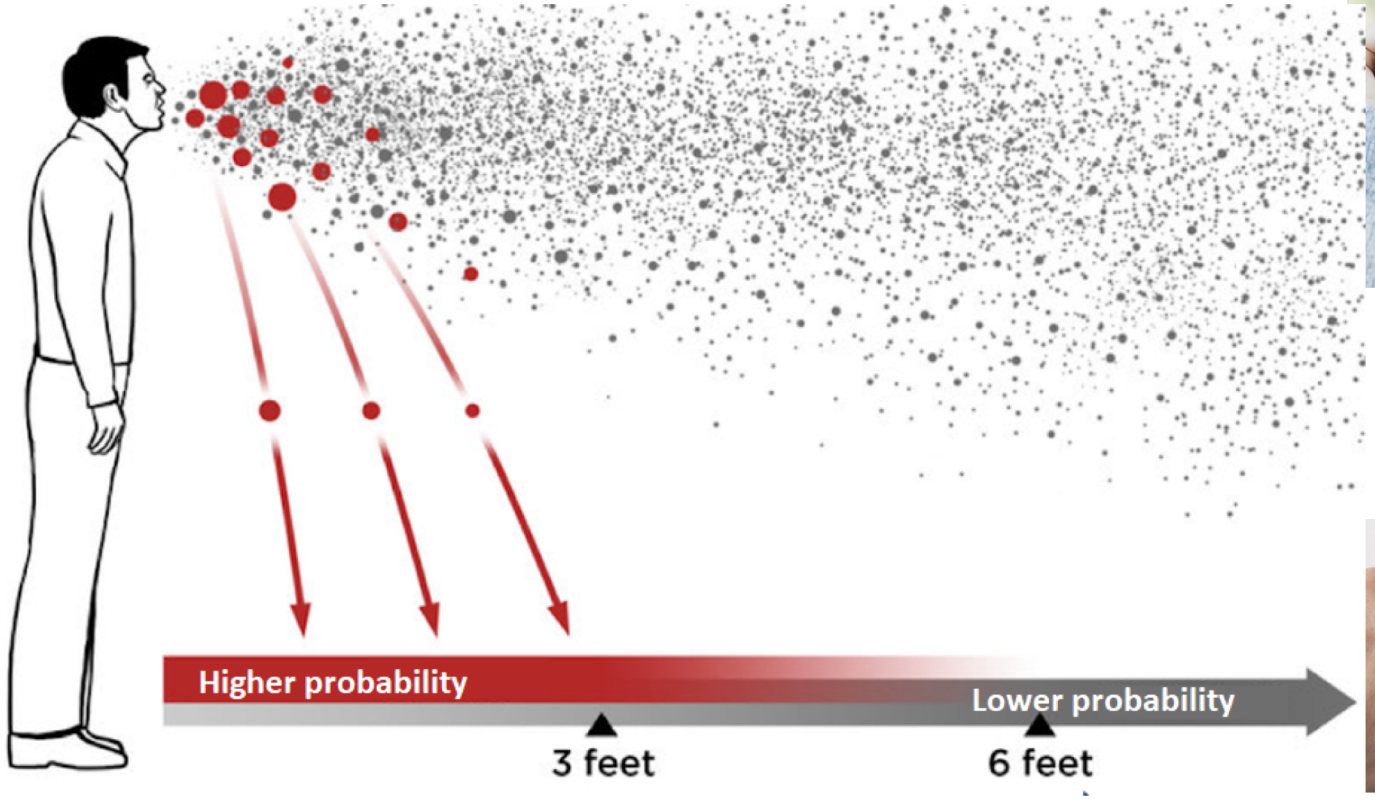
	Clinical Trial Status	Manufacturing	Distribution
1 Remdesivir (Nucleotide Inhibitor) — GILEAD	• Phase 1-3 – ongoing (5 trials) May 1: FDA issued emergency use authorization for patients with severe disease	Building global consortium of manufacturers Aim to treat >1 million patients by the end of 2020	Providing 1.5 million free doses to patients
2 Convalescent plasma (anti-CoV Antibodies)	• Clinical trials • Expanded access • Emergency IND approval	Hospital based FDA-registered donations	Relies on donations from recovered patients

BARDA = Biomedical Advanced Research and Development Authority; IND – Investigational New Drug

Melissa Maginnis

Primary Transmission Route: Aerosolized Droplets Containing Virus

Coughing, Sneezing, and ***Speaking***



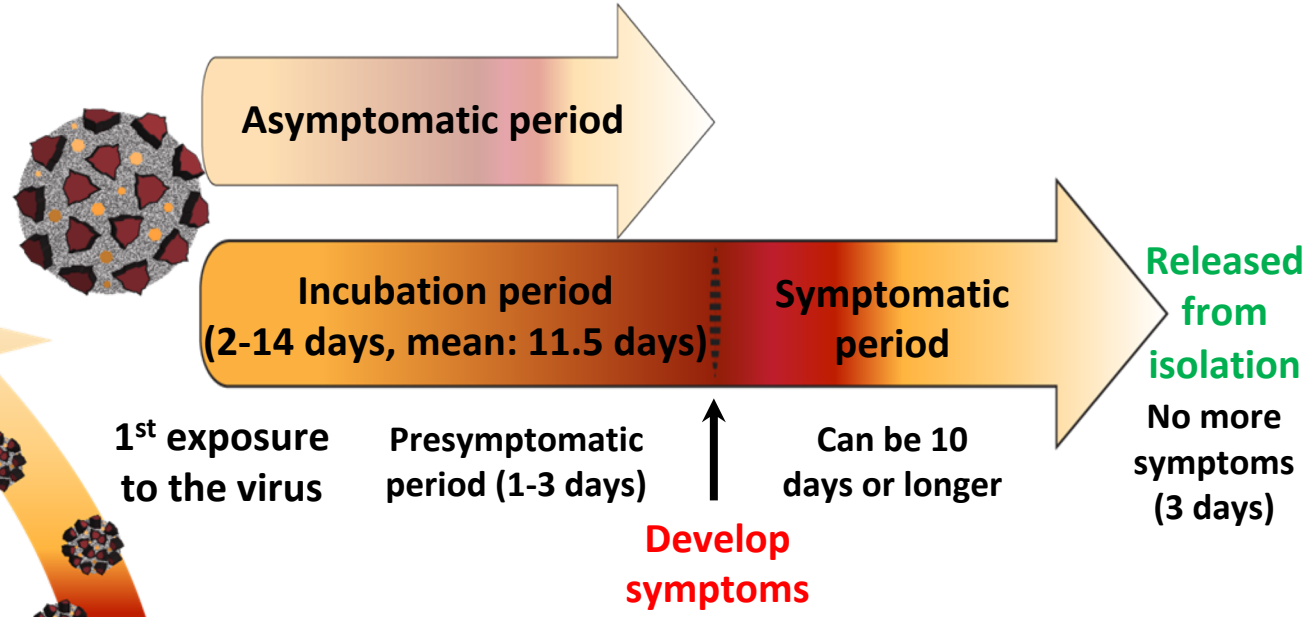
- Virus can remain stable for up to **3 hours in air**, up to **3 days on surfaces**
- **25-80%** infected individuals from non-healthcare settings ***show no symptoms***
- Highest transmissibility likely occurs 2-3 days before symptoms show
- ***Increased population density increases probability of presence of virus. Thus, physical distancing and social distancing are key.***
- Transmission appears to be increased with activities that require **heavy or deep breathing** (exercise/singing).

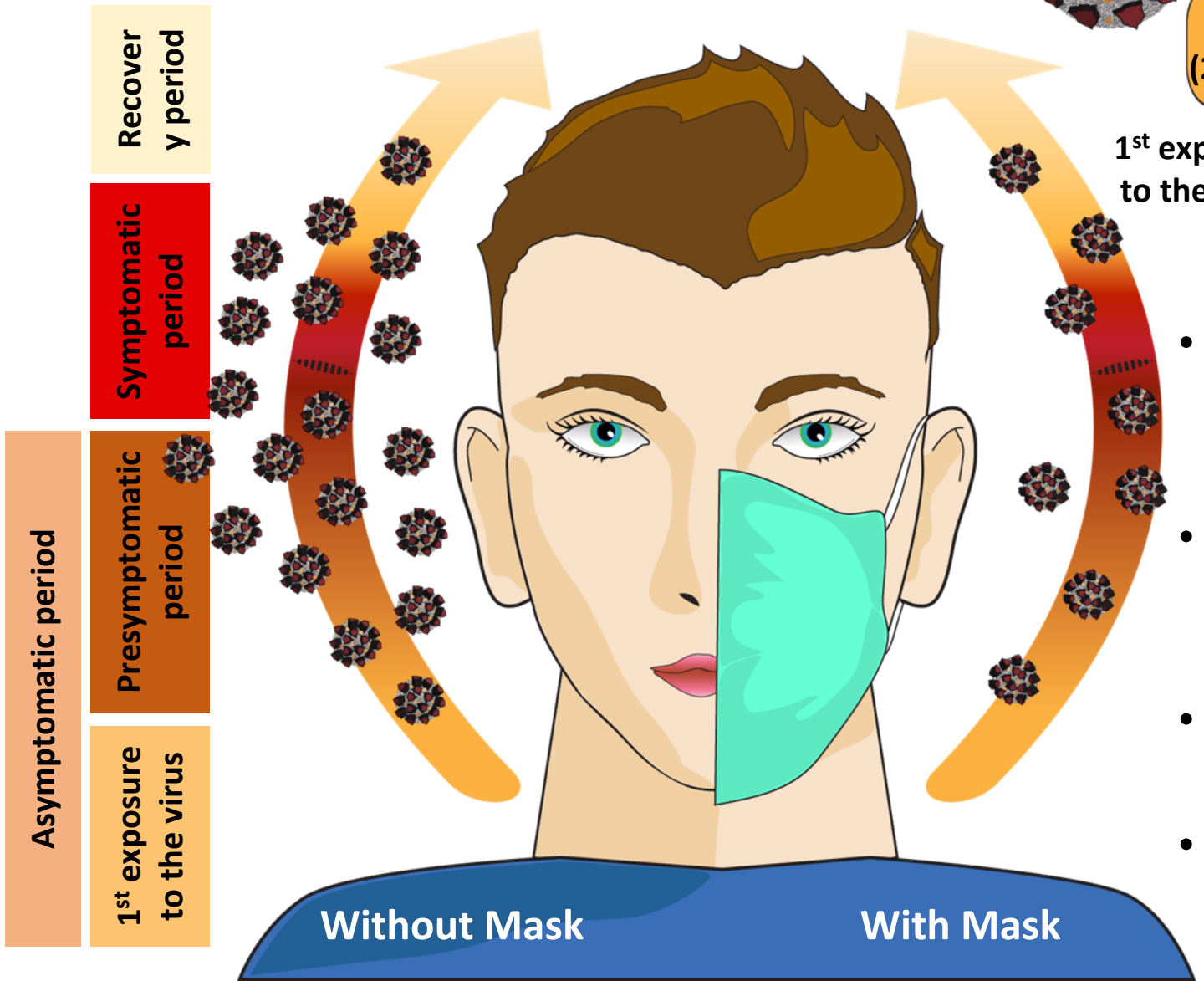
However: Barriers, masks, and other engineered solutions slow the spread if used correctly with high compliance and in conjunction with distancing.

Caitlin Howell

COVID-19 risk: Total virus exposure

= # of virus particles x time





- Risk of transmission likely the highest **before** the onset of symptoms (Asymptomatic/**presymptomatic period)**
- **# of virus particles:** The more people in an area, the higher the chance of virus being present, and in greater amounts
- **Time:** The longer people remain together, the higher the chance of
- Properly fitted cloth masks reduce the number of virus particles entering shared air

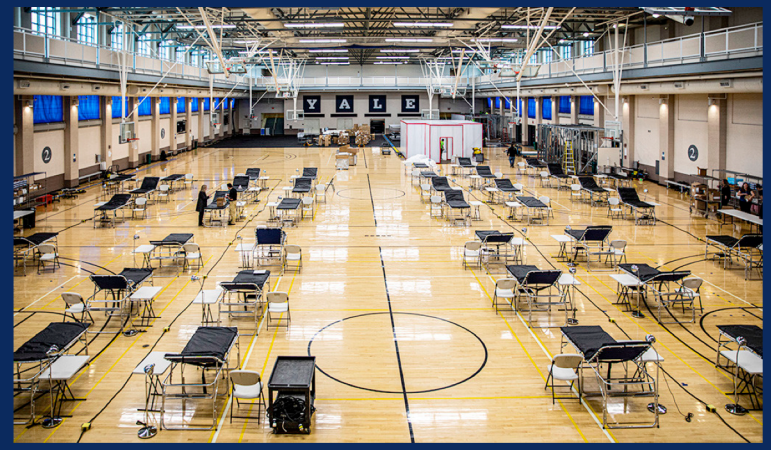
Caitlin Howell

Current National Guidance on COVID-19 Management*

Test → Trace → Isolate

Rapid, high-throughput diagnostic testing for the entire community

Contact tracing of COVID-19+ (contacts within <6ft for >30 min are quarantined)



Isolation of COVID-19+ patients in infirmaries until healthy to return

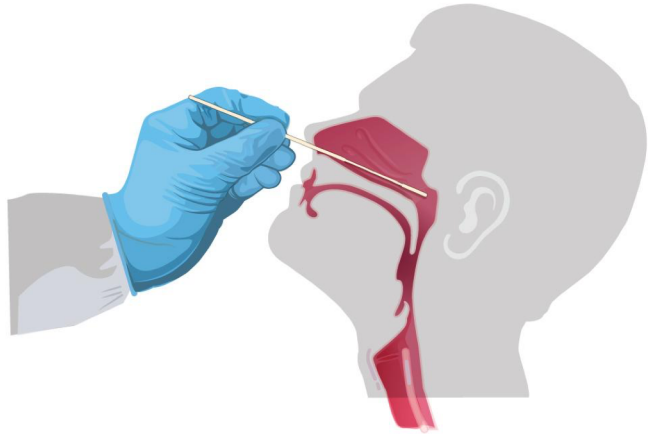
14-day Quarantine: keeps individuals from transmitting disease during the known period of incubation (2-14 days, 5 days median) for SARS-CoV-2[1]

* Based on procedures that have been successful in "flattening the curve" around the globe

Kristy Townsend

Testing for SARS-CoV-2 Infection: An important part of the arsenal to prevent spread of COVID-19

Period of positive diagnostic test (measures viral RNA by PCR or similar methods)

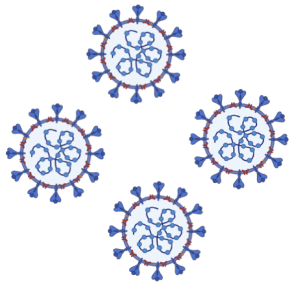


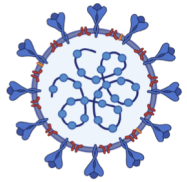
- Active cases are detected, starting about 1wk before symptoms[2]
- Workflow is well-validated, good sensitivity and specificity
- Can be cost-effective (high-throughput costs more, may have more false results)
- Positive tests are isolated until recovery
- After about 3wks since symptomatic, lose PCR detection (below threshold for limit of detection)[2]

Period of antibody detection by serology tests

- Detects antibodies from previous infection (IgM & IgG detectable from 2-23d after symptomatic[1]; highest around wk 3 [2])
- Recent data indicate nearly 100% of cases develop antibodies (within 19d of symptom onset)[1]
- Antibody+ patients could donate convalescent serum for treatment of active cases
- Unclear if antibody presence indicates immunity (research ongoing)

SARS-CoV-2 Infection





Latency period

Incubation Period:

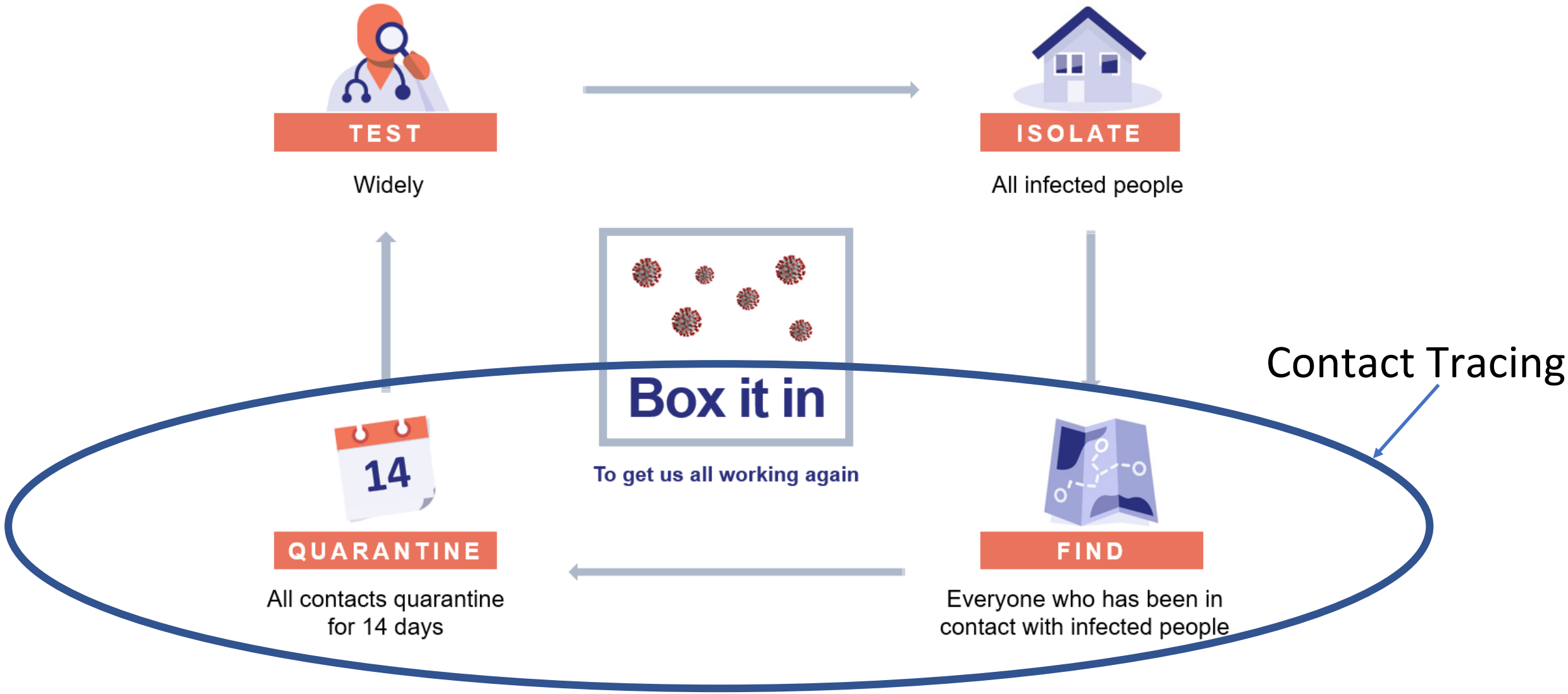
- viral replication, shedding (contagious)
- Pre-symptomatic

3 days | 14+ days | Variable days depending on disease progression, complications | RECOVERY

Timeline since initial infection

Kristy Townsend
Rob Wheeler

Preventing Spread: Isolate Cases, Quarantine Contacts



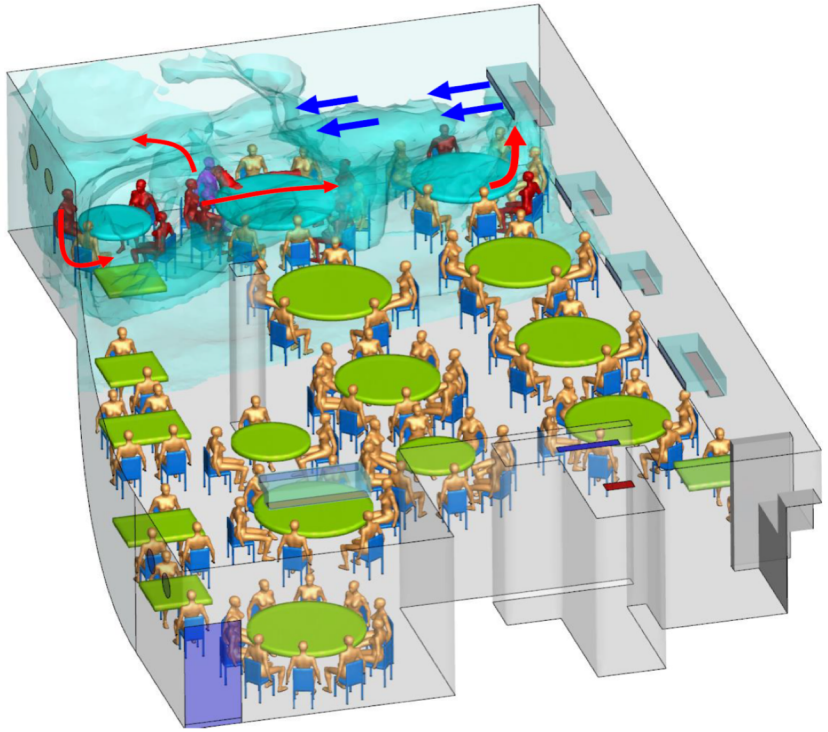
Source: A Coordinated, National Approach to Scaling Public Health Capacity for Contact Tracing and Disease Investigation, Association of State & Territorial Health Officers; and Resolve to Save Lives

Sara Huston

Transmission, Mitigation, and Safety in the Built Environment

Caitlin Howell, PhD Assistant Professor of Biomedical Engineering

Movement of virus-containing droplets in the environment



- Li et al. 2020 medRxiv

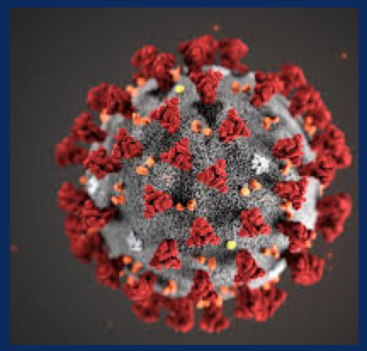
- **Speaking** can generate aerosols[1]
- **Masks** are effective when used correctly and **compliance is high**[2,3]
- **Good ventilation** is critical; recirculation contributes to spread[4]

Role of surfaces in person-to-person transfer of virus

- Virus can land on surfaces and be **re-aerosolized**[4]
- Virus traces found on shoes as well as handles, chairs, etc. [4]
- **Regular disinfection** is effective[4]

Other potential routes of infection and opportunities for detection

- Infectious virus found recently found in feces[5], viral traces in **toilet areas**[4]
- **Wastewater monitoring** can assist in early identification of outbreaks[6]



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