Pacific Northwest
NATIONAL LABORATORY

# Behind the Mask: The Science on Stopping the Spread

Tuesday, March 16

**Featuring: Katrina Waters**

PNNL Laboratory Fellow,
Biological Sciences Director

**DEMYSTIFYING COVID:**

A Special Edition
Seminar Series

COMMUNITY
SCIENCE &
TECHNOLOGY
SEMINAR SERIES
@PNNL

# Where are you joining from? (3/16/2021)

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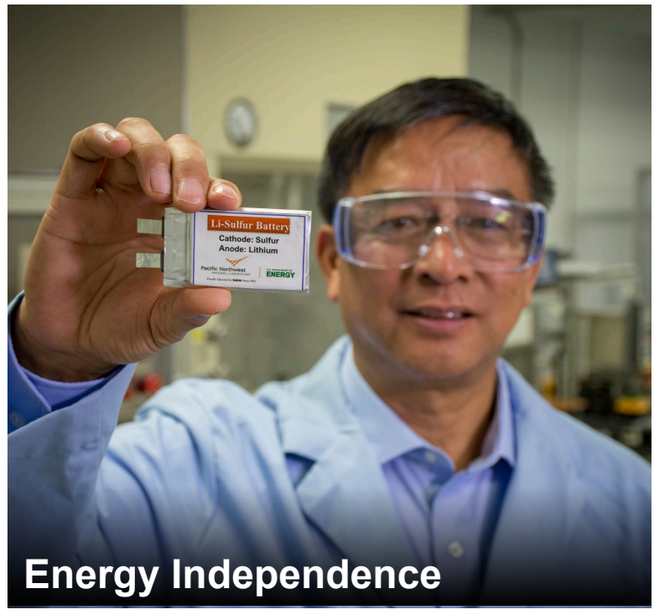
NATIONAL LABORATORY

# **PNNL** is Focused on **DOE's MISSIONS** and Addressing Critical **NATIONAL NEEDS**

Scientific Discovery



Energy Independence


National Security

Environmental Management

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# PNNL is an ECONOMIC ENGINE

**4,997**
Employees

**340**
Inventions

**$1.67B**
Total Economic Output (FY 2019)

**$1.1B**
Annual Spending

**81**
Patents

**8,200**
Jobs Generated in Washington (FY 2019)

**$487M**
Total Payroll (FY 2019)

**36**
Licenses

**194**
Companies with PNNL Roots (FY 2019)

# 50+ years developing goodwill

| Historical | FY 2019 | Historical | FY 2019 | Historical | FY 2019 |
|---|---|---|---|---|---|
| **$28.5M** | **$0.52M** | **347,000** | **30,000** | **>120** | **56** |
| Philanthropic Investments | | Team Battelle Volunteer Hours | | Community Organizations | |

Visit **pnnl.gov/events**

COMMUNITY
**SCIENCE & TECHNOLOGY**
SEMINAR SERIES
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# DEMYSTIFYING COVID:

## A Special Edition Seminar Series

EVERY TUESDAY
IN MARCH
**5:00-6:00 P.M.**

## MARCH02

**Hindsight is 2020: The Science Behind COVID-19**

**Presented by Steve Wiley**

What lessons have we learned over the last few months? What's left for us to uncover? And seriously what is the difference between a cold, a flu, and COVID symptoms?

## MARCH09

**What Do Bats Have to Do with It?**

**Presented by Amy Sims**

Bats, pangolins, and humans—oh my! This talk will explore the role wild animals play in the emergence of new diseases.

## MARCH16

**Behind the Mask: The Science on Stopping the Spread**

**Presented by Katrina Waters**

What measures keep our communities safe? And why do some strange, sometimes serious health effects linger even after COVID-19 has gone, including a loss of taste and smell or COVID toe? Join us to find out.

## MARCH23

**Testing, Testing, 1, 2, 3 (And What's Up With The New Vaccine, Anyways?)**

**Presented by Kristin Omberg**

If you're confused about COVID-19 testing and vaccines, you're not alone. This talk will explore the science behind the 400+ diagnostic tests and 200+ vaccine candidates produced over the last year.

## MARCH30

**Model Me This: COVID-19 Scientific Predictions and Where We Go from Here**

**Presented by Tim Scheibe**

Using mathematical models, scientists across the globe are beginning to arrive at a more complete picture of how and why COVID-19 spread across geographical locations and human populations.

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# COMMUNITY REPRESENTATIVES

EVERY TUESDAY
IN MARCH
**5:00-6:00 P.M.**

## LoAnn Ayers

**President & CEO**

United Way of Benton
& Franklin Counties

## Kate McAteer

**Vice Chancellor | Academic and Student Affairs**

WSU Tri-Cities

## Justin Raffa

**Artistic Director**

Mid-Columbia
Mastersingers

## Martin Valadez

**Interim Executive Director**

Tri-Cities Hispanic
Chamber of Commerce

**Regional Director**

Tri-Cities Campus
Heritage University

# TODAY'S SPEAKER

EVERY TUESDAY
IN MARCH
**5:00-6:00 P.M.**

## Katrina Waters

**PNNL Laboratory Fellow**

**Division Director**
Biological Sciences

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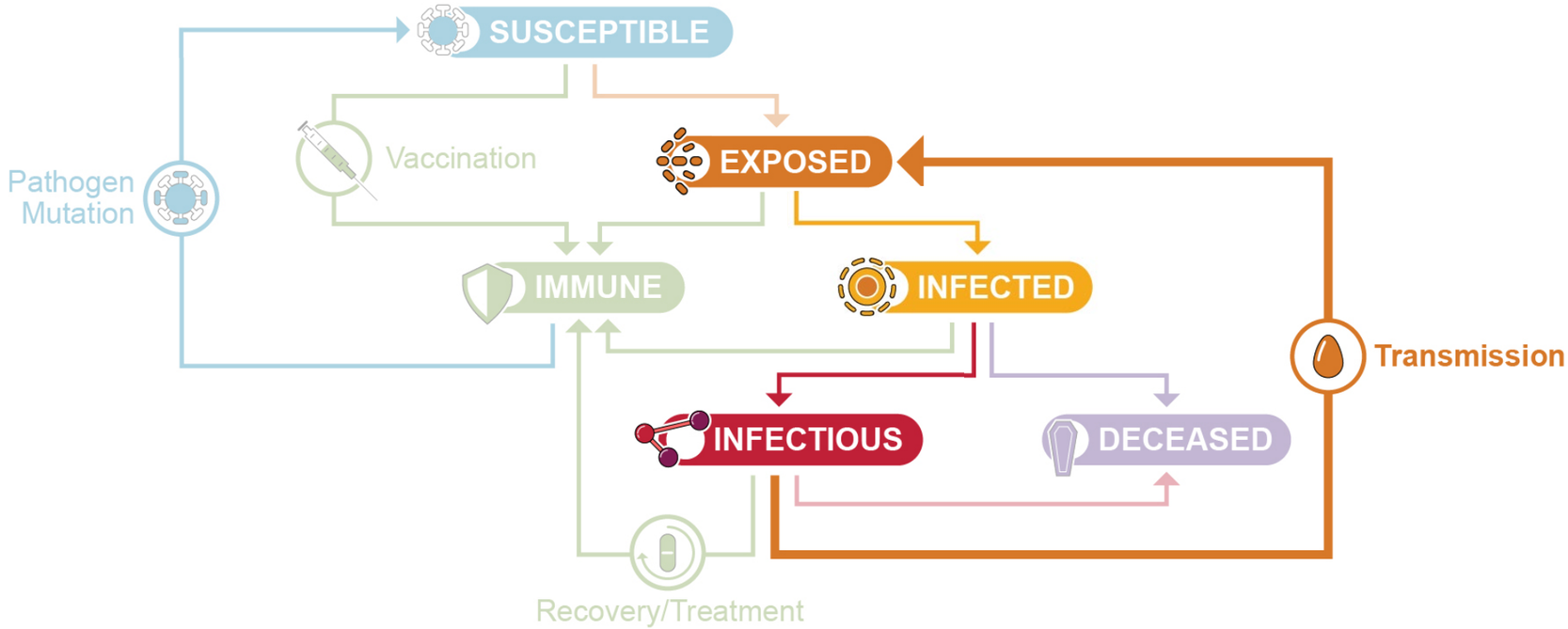
**Today's discussion:** **transmission and infected states** in the viral infection process

## VIRAL INFECTION OVERVIEW



# Terminology

## Pandemic

- An outbreak of a disease that is prevalent over a continent or the world

NOTE: An **epidemic** is more localized

## Transmission

- Spreading a disease

## Mutation

- Changes to the genome of a pathogen or organism that may affect transmission, symptoms, or prior immunity

## Infectious/Contagious

- The state of being able to transmit a disease to another person

## Vaccine

- A preventative measure to build immunity against a specific disease

## Model

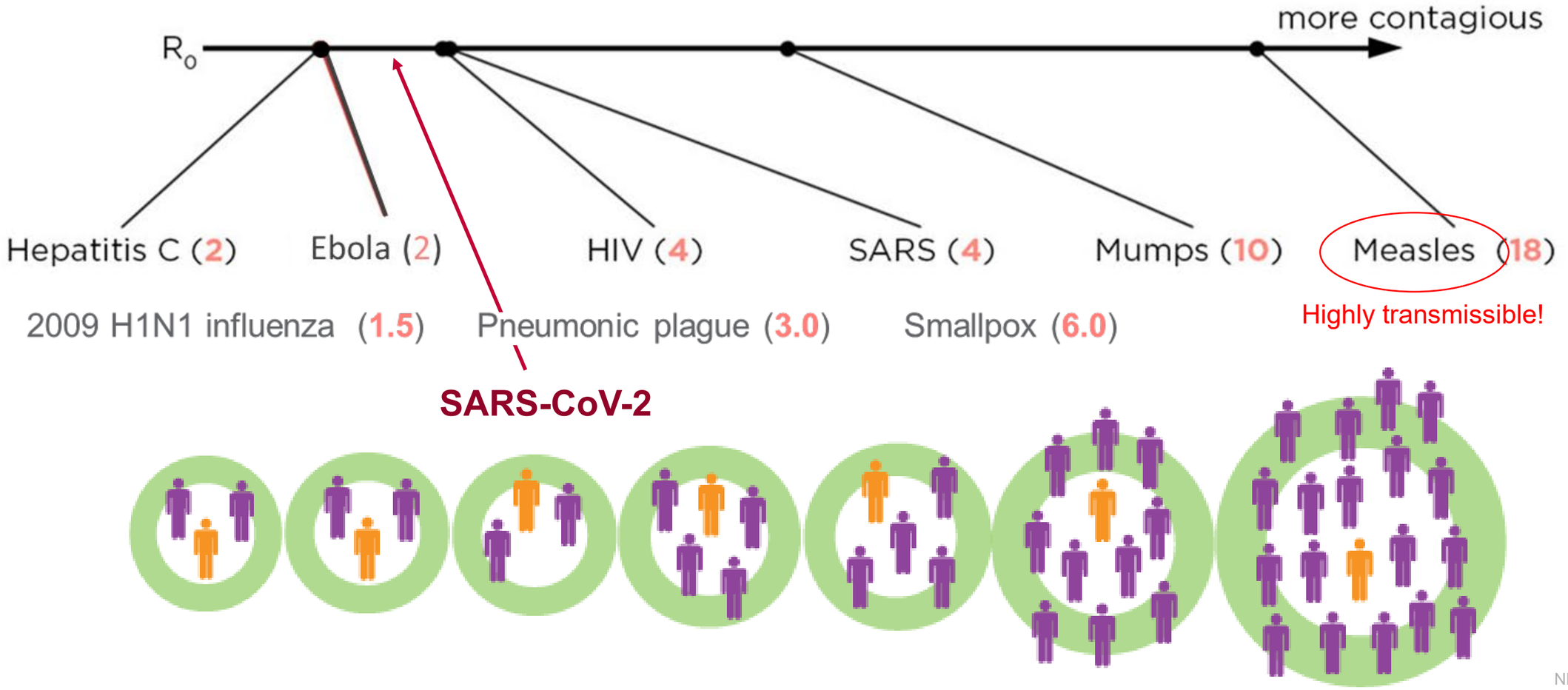
- A representation of a disease or process that can recapitulate key aspects

## Reservoir

- Any person, animal, plant, soil, or substance in which an infectious agent normally multiplies

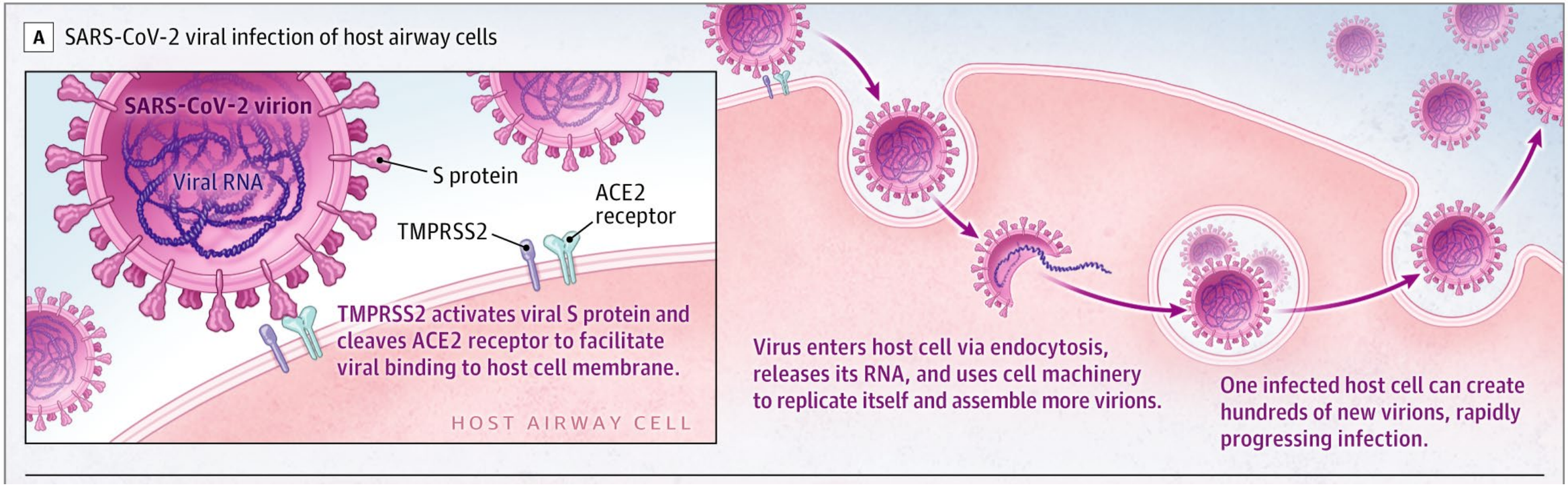
# Transmission is a measure of contagion

The number of **people** that **one sick person** will infect (on average) is called $R_0$.
Here are the maximum $R_0$ values for a few viruses.



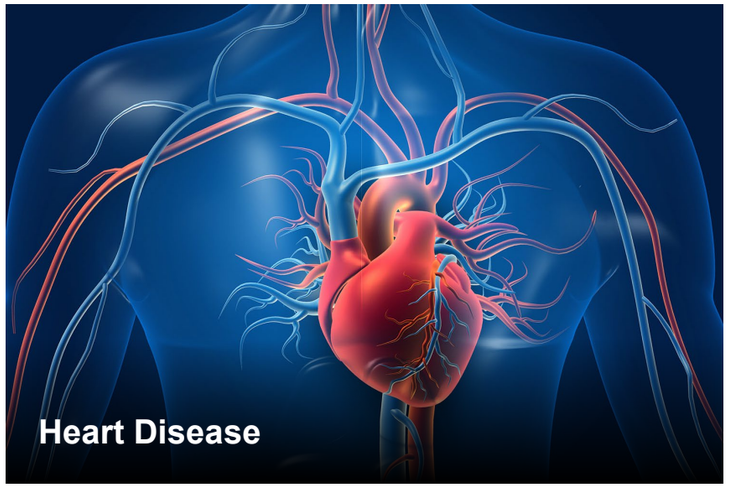

NPR.org

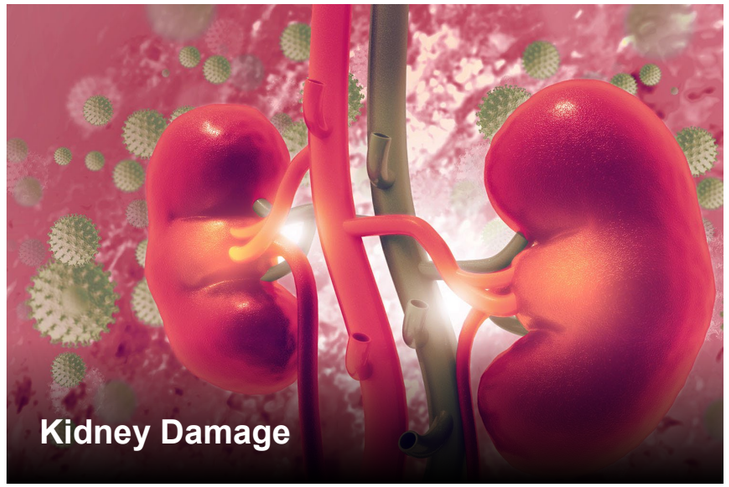
# How does SARS virus infect cells?



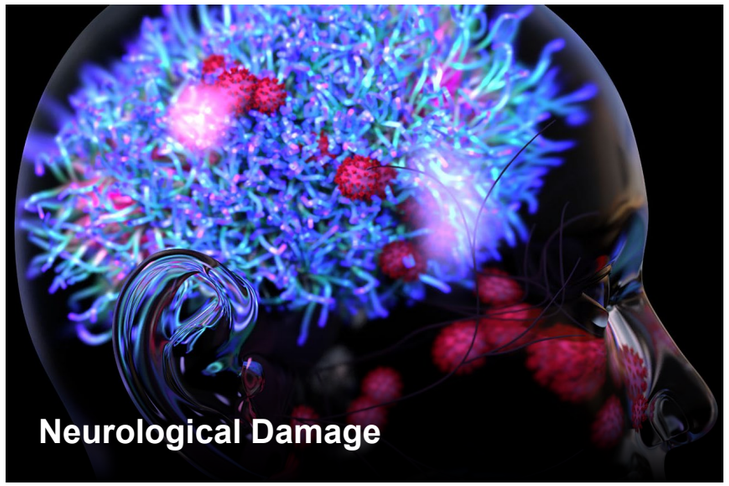

JAMA. 2020;324(8):782-793. doi:10.1001/jama.2020.12839

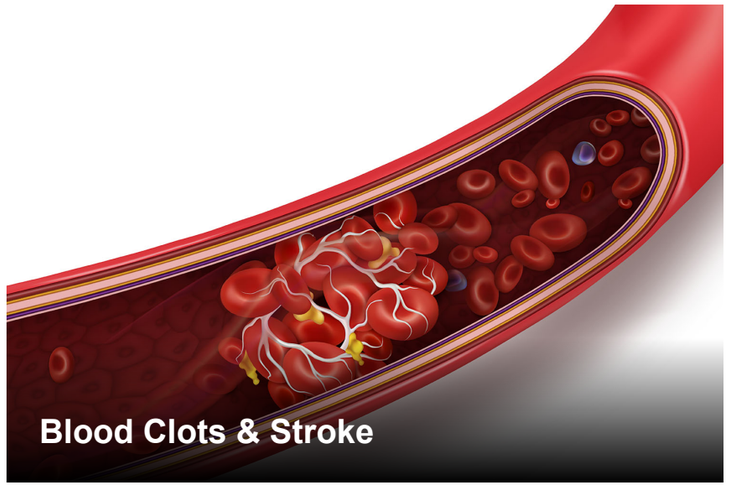
# Long-term effects of COVID are emerging





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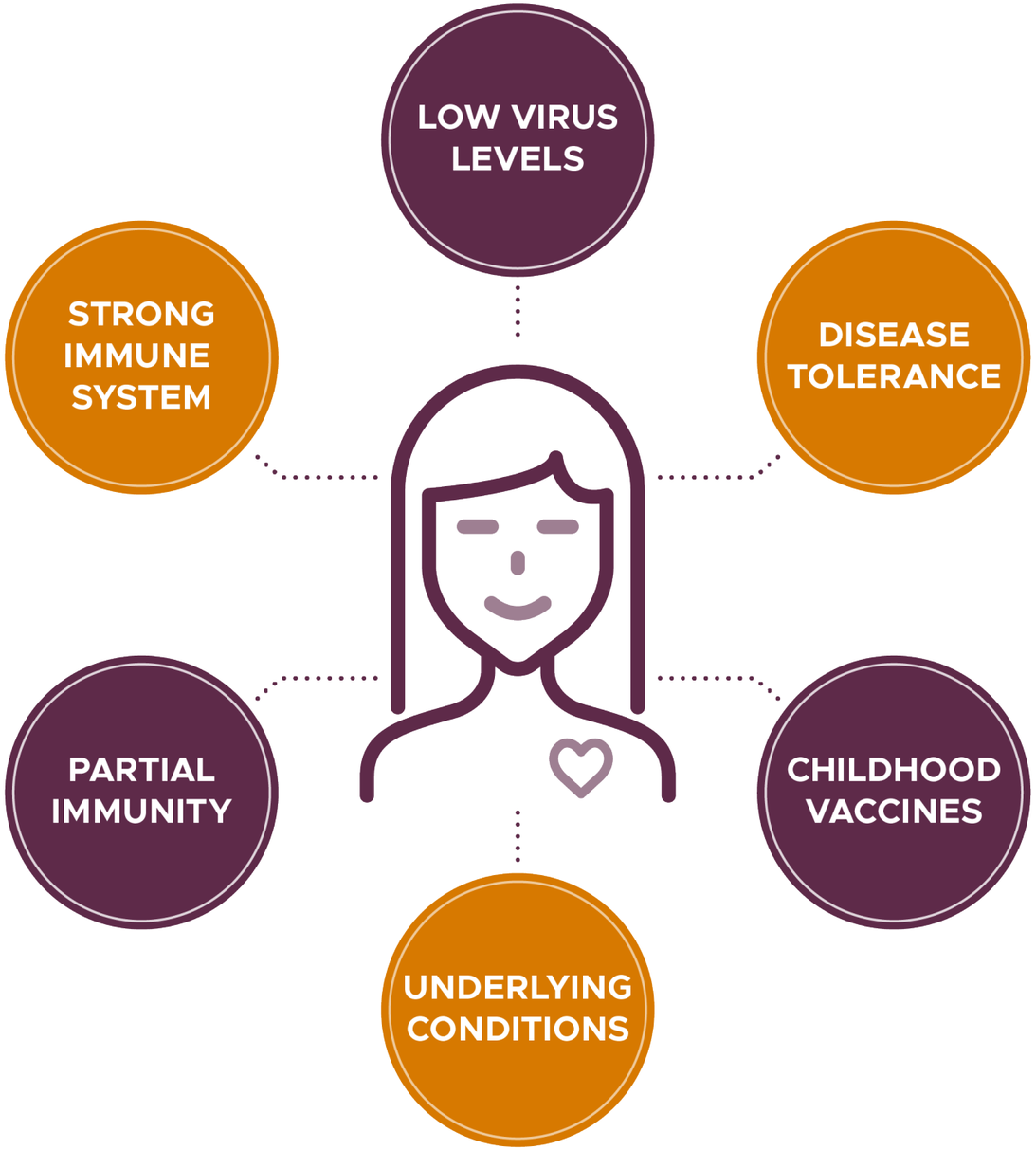
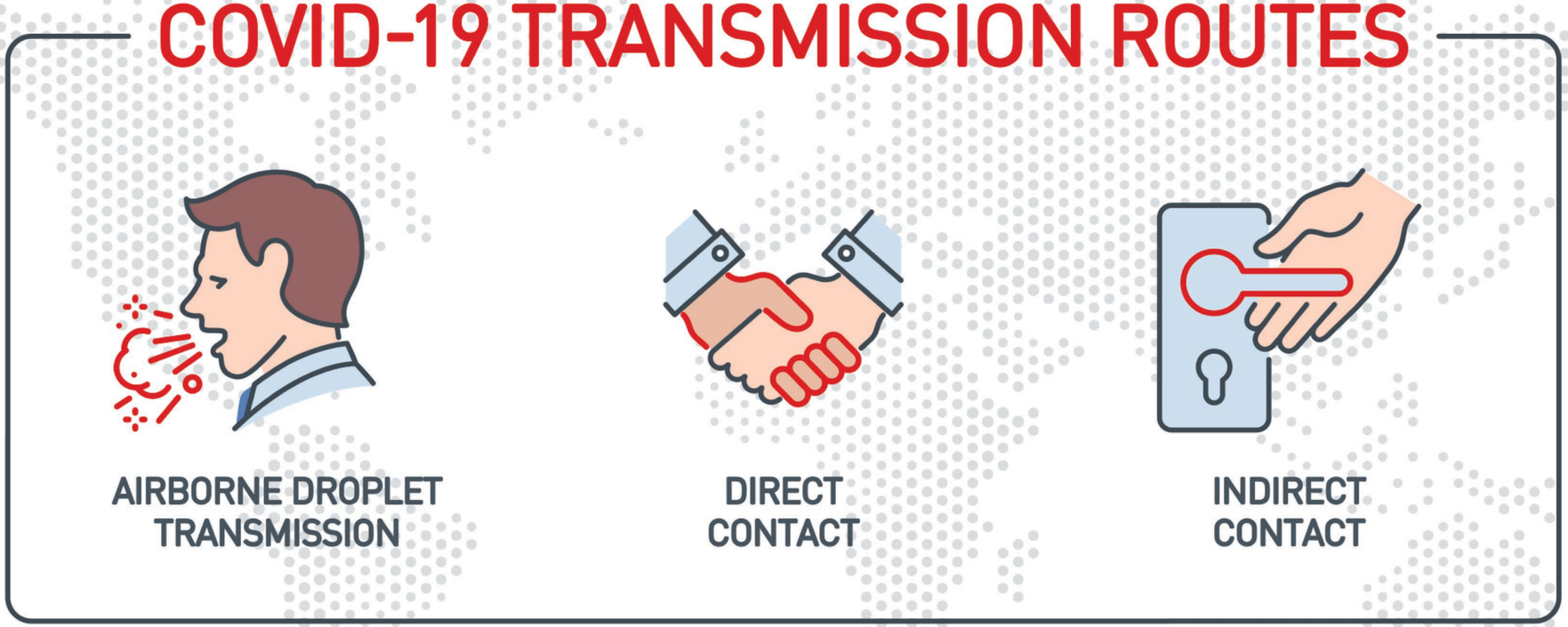
# Why are some infected people asymptomatic?



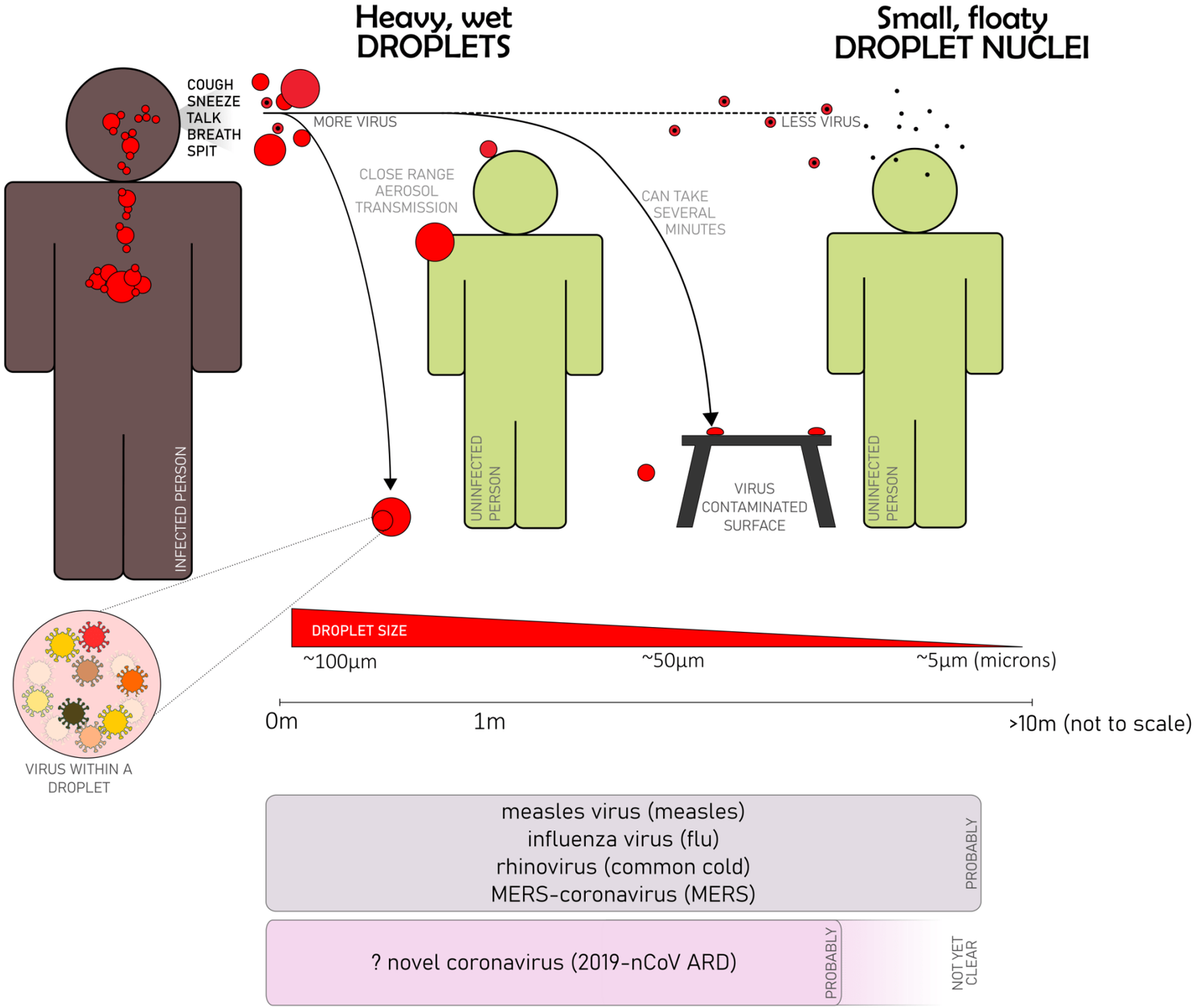
# How is the virus transmitted?



# Why social distancing works

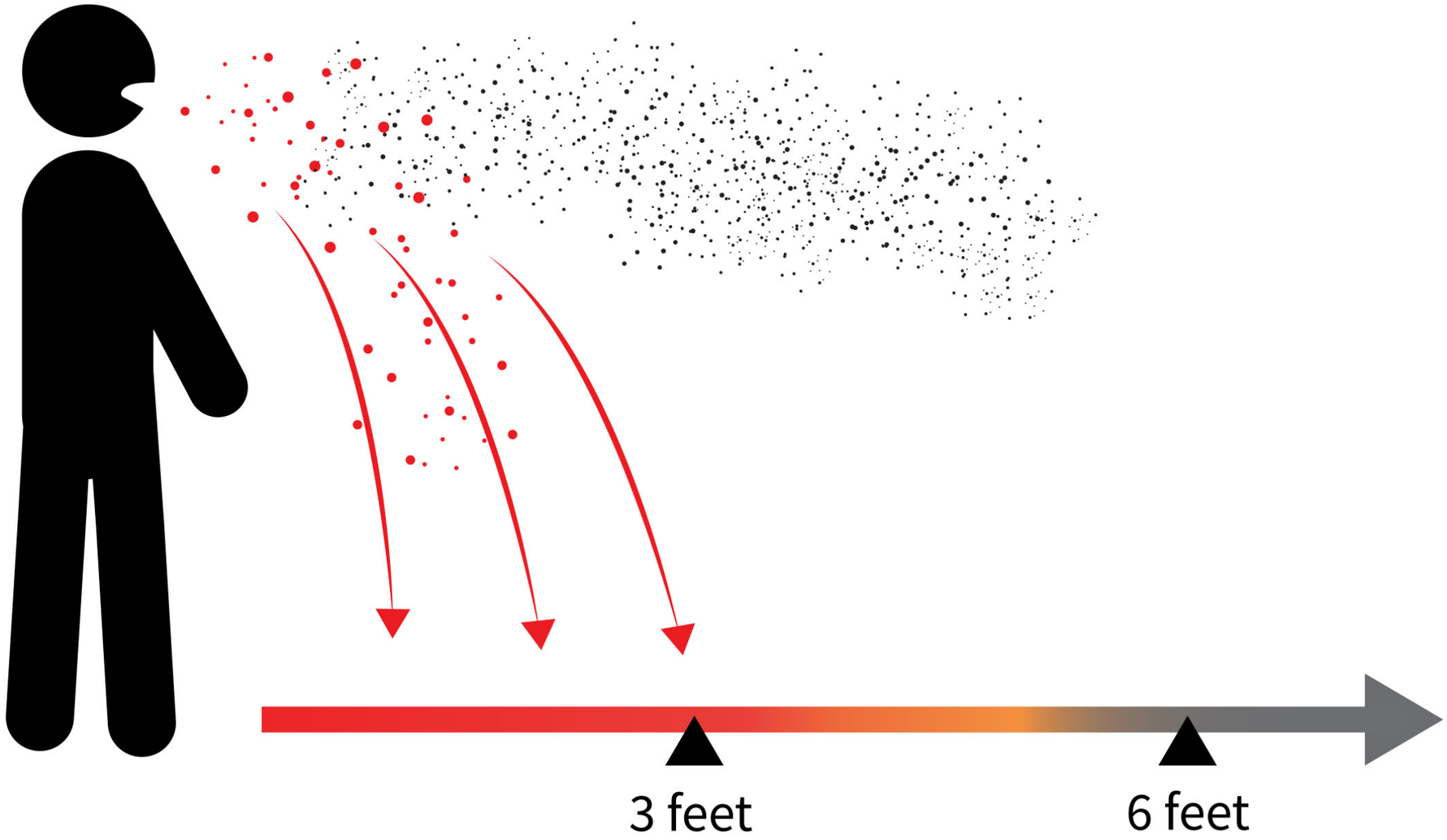
## Transmission distance is dependent on:

- Droplet size
- Humidity
- Temperature
- Velocity

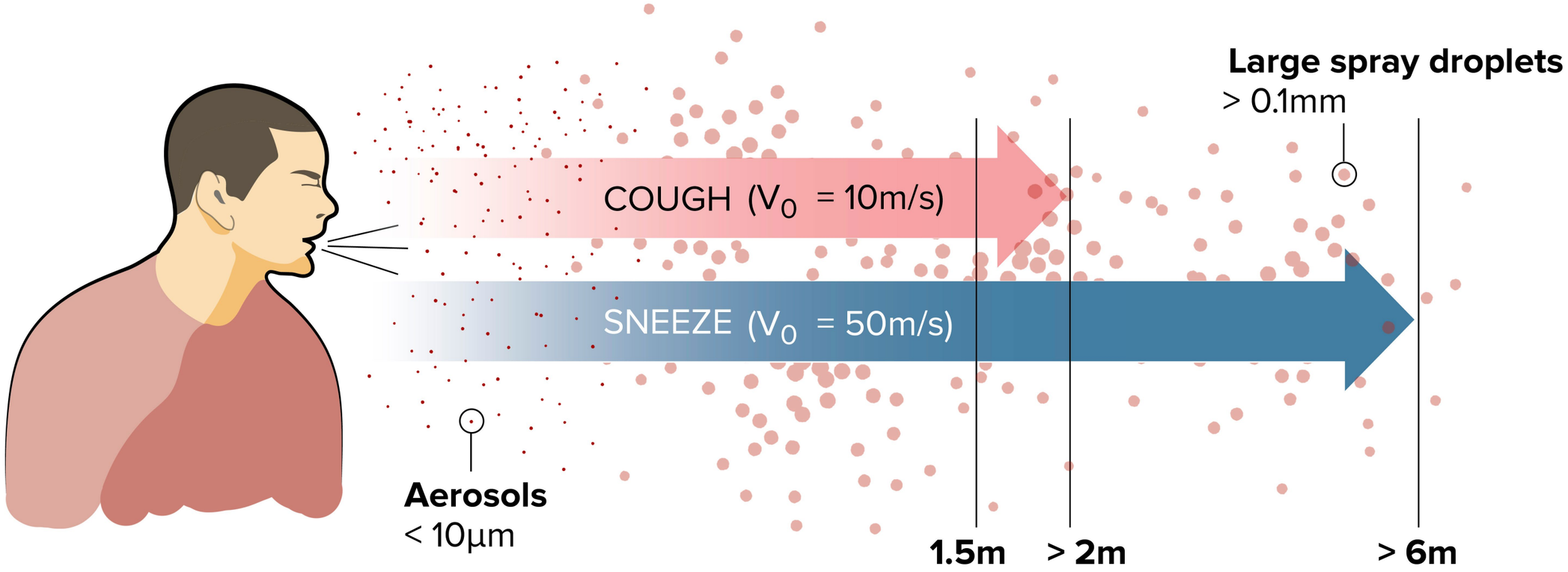



Ian M Mackay, PhD
ver12 17MAR2020 AEST
virologydownunder.com

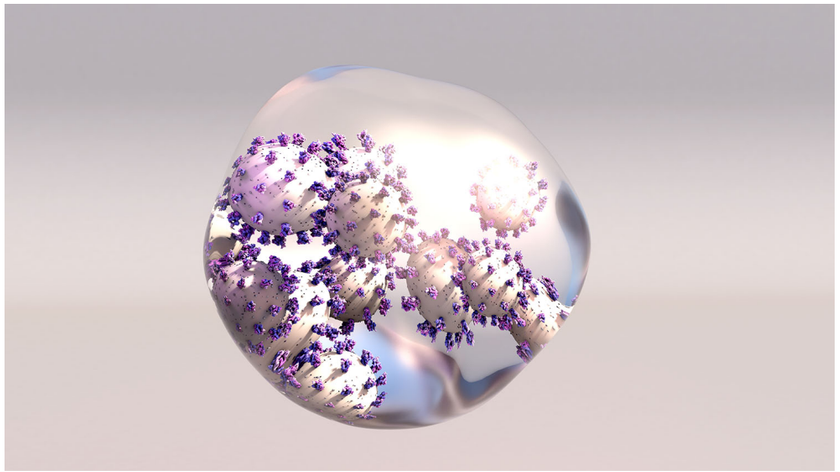
# Why 6 feet of social distancing?

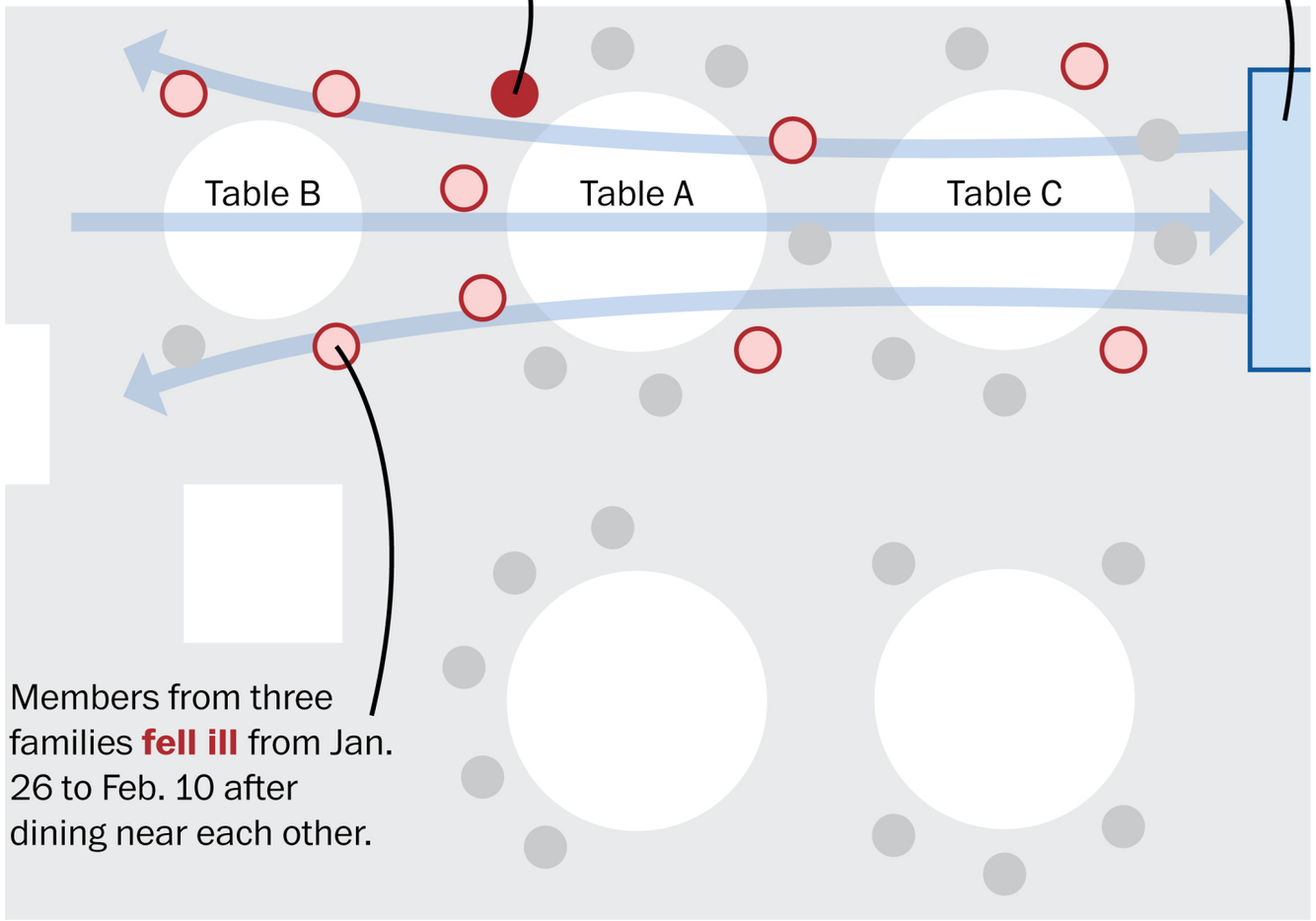


# Is 6 feet far enough?



# Transmission has been documented in restaurants





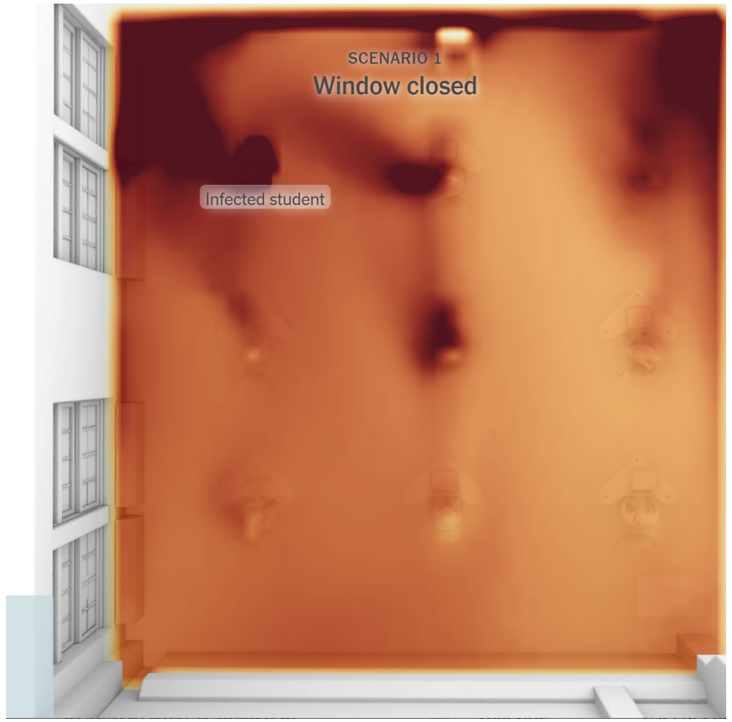

Note: Arrangement of restaurant not true to scale.

Source: Guangzhou CDC

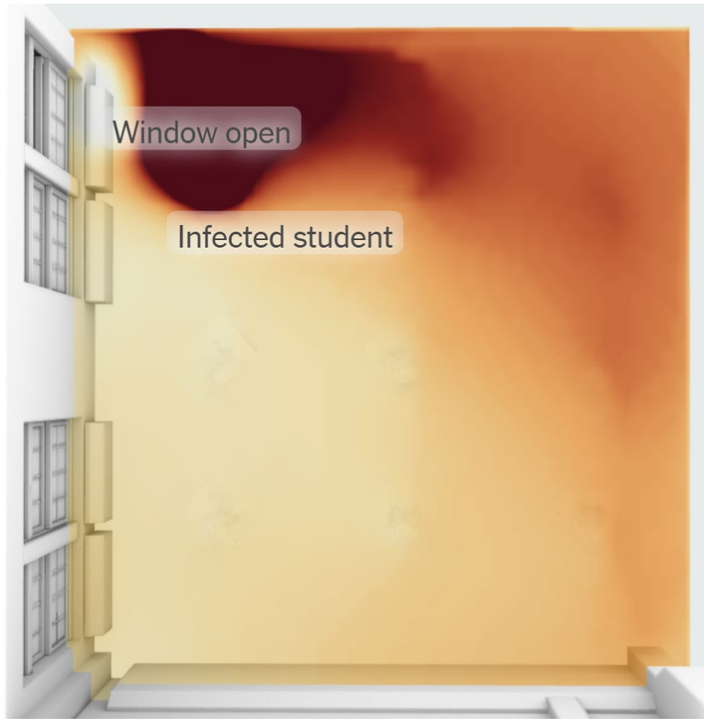
SHELLY TAN/THE WASHINGTON POST

# Outside air ventilation can reduce transmission

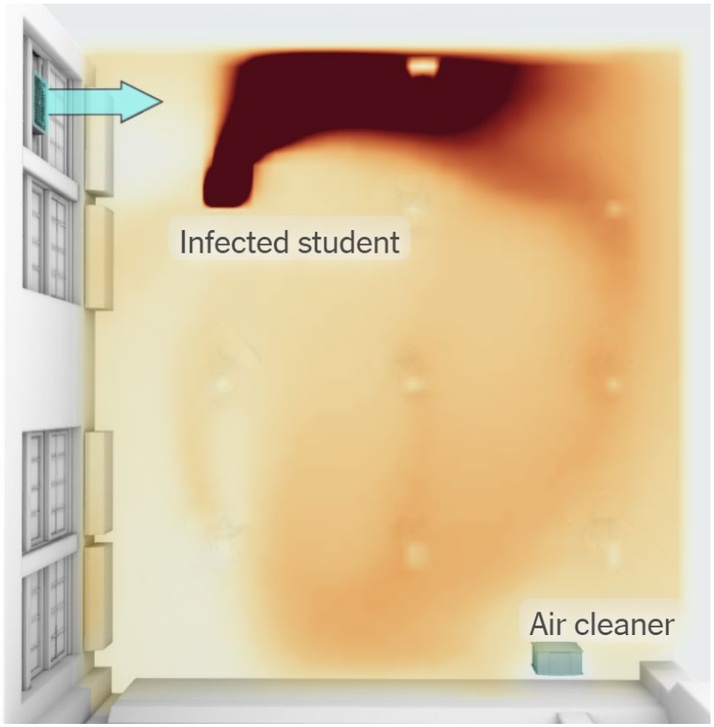
Closed windows




Open window

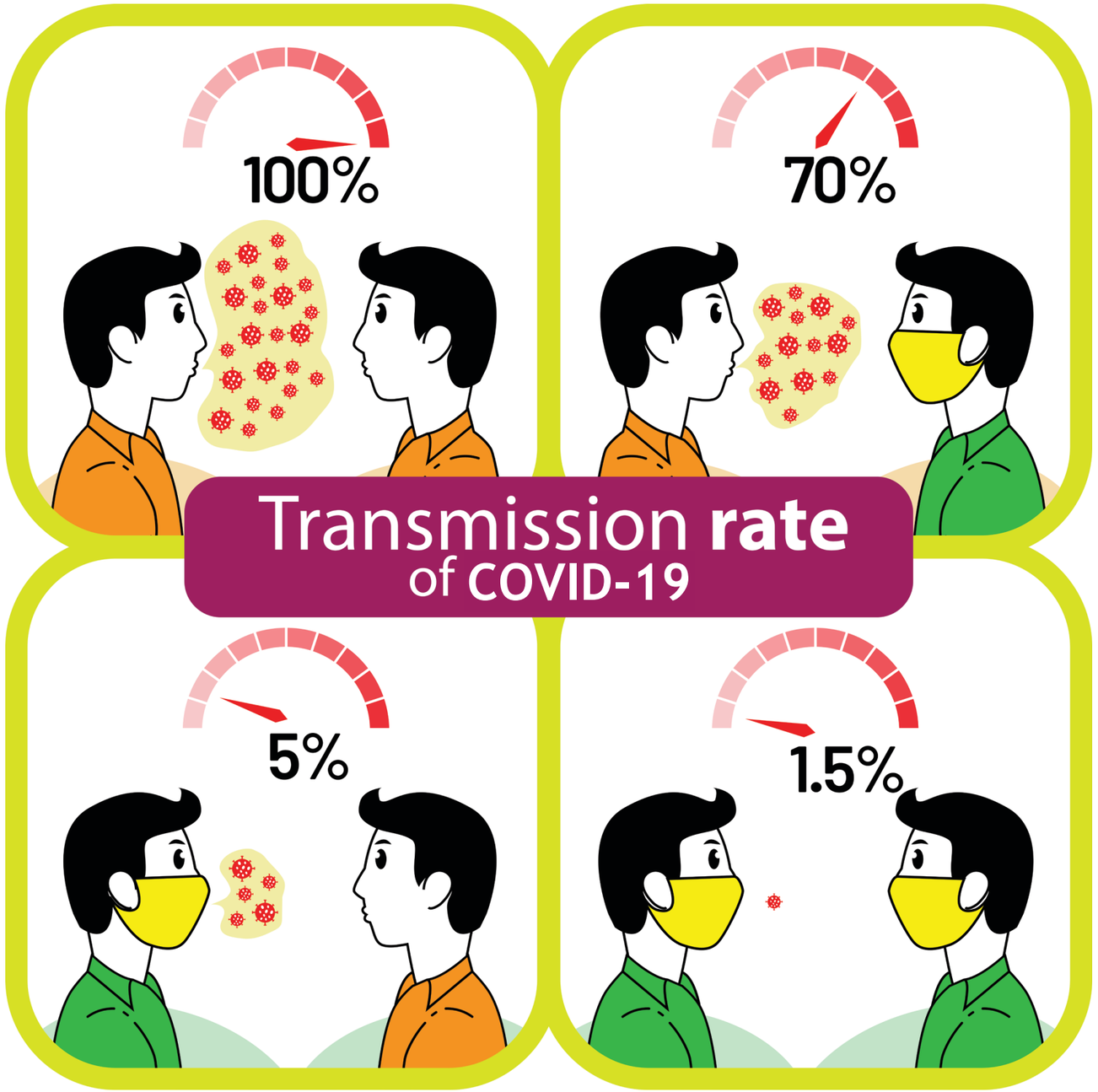



Open window + air purifier

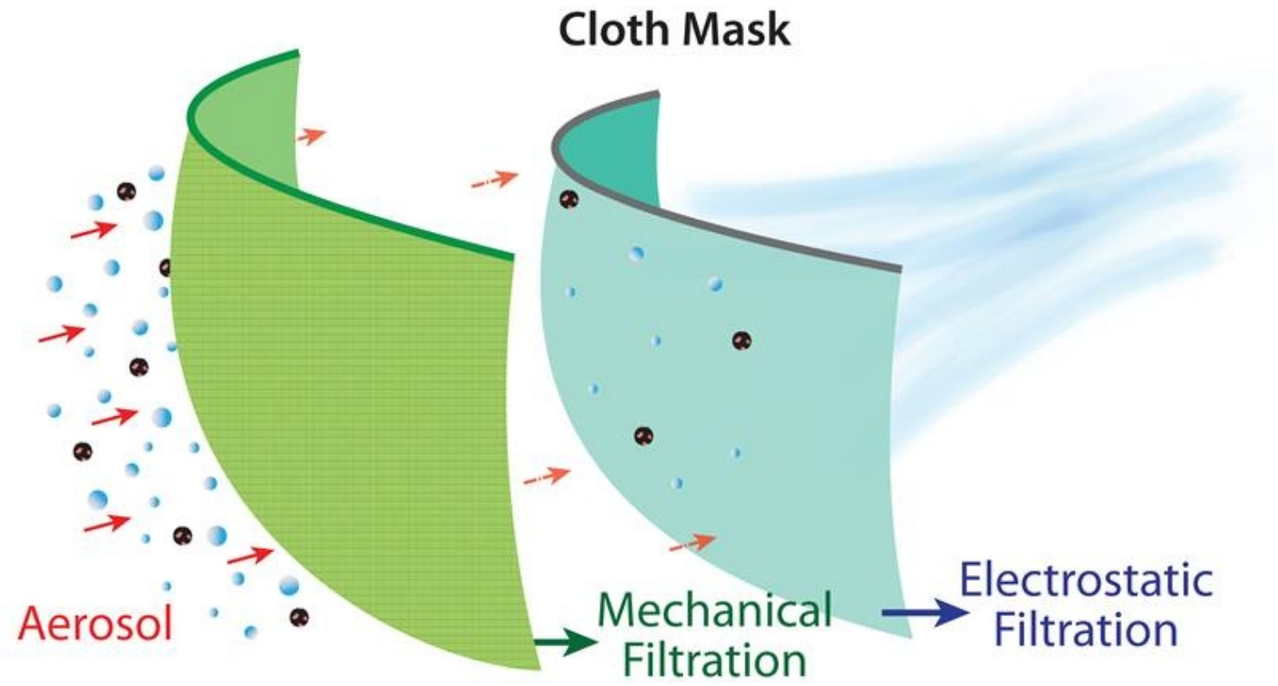



https://www.nytimes.com/interactive/2021/02/26/science/reopen-schools-safety-ventilation.html

# Masks provide a physical barrier to reduce transmission



# Why do masks work? Are all masks equal?




| | 1 layer | 2 layers |
|---|---|---|
| Cotton (80tpi) | 14% | 49% |
| Cotton (600tpi) | 98% | 99% |
| Flannel | 44% | |
| Poly blend | 73% | 90% |
| Silk | 56% | 65% |
| Gaiter | 50% | 50% |
| Cotton+flannel | | 96% |
| Cotton+poly | | 99% |
| Double gaiters | | 90% |

ACS Nano 2020, 14, 6339−6347

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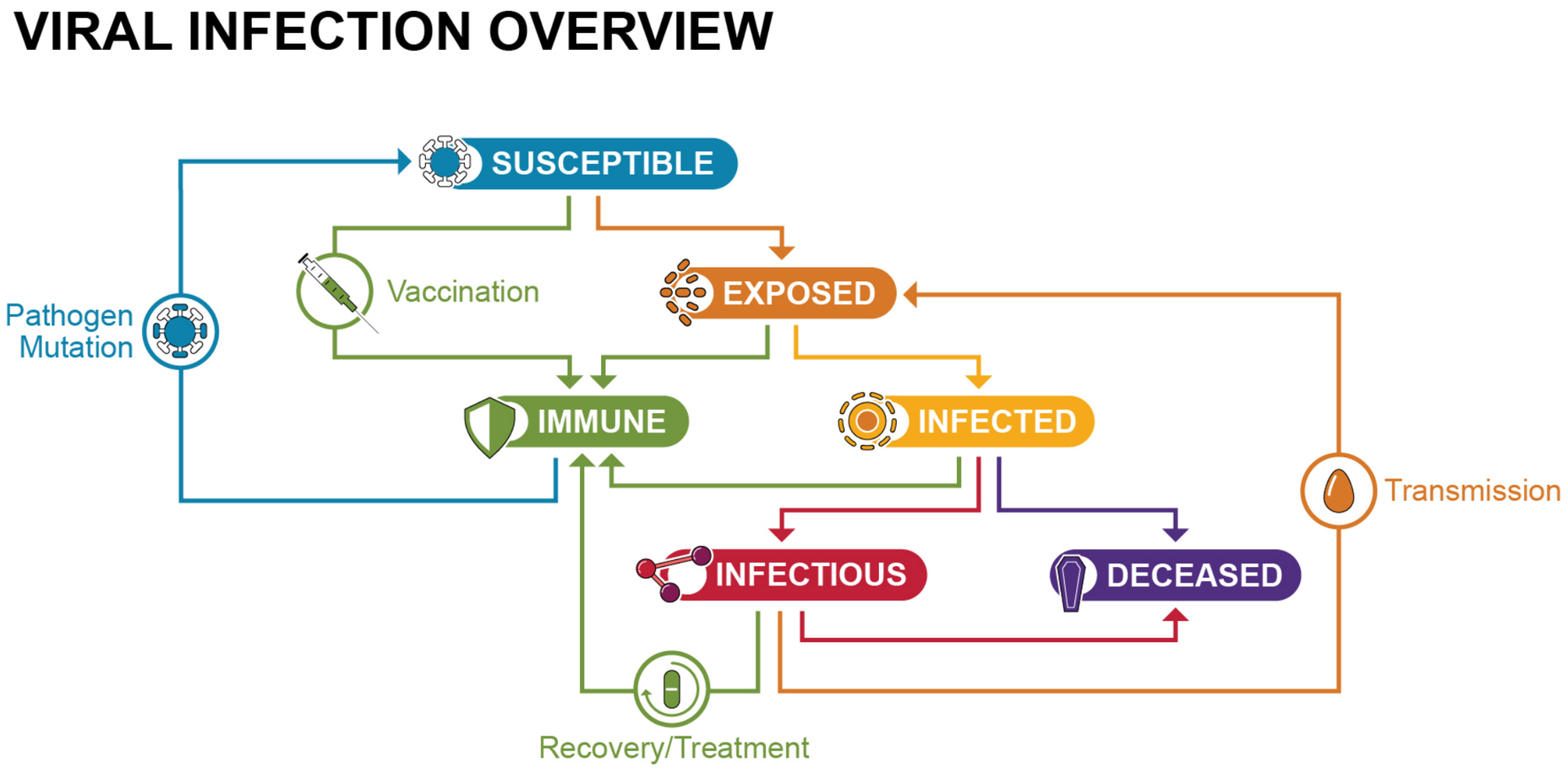
# Vaccines will also slow the spread

# What can you do to keep your community safe?

- Wash your hands
- Wear your mask
- Socially distance
- Keep your contact circle to a minimum
- Get vaccinated
- Stay vigilant




# Next: we will discuss testing and vaccines



# UPCOMING EVENTS

## EVERY TUESDAY IN MARCH
## 5:00-6:00 P.M.

**23 MAR**

**Testing, Testing, 1, 2, 3 (And What's Up With The New Vaccine, Anyways?)**

**Kristin Omberg**
Group Leader
Chemical and Biological Signatures

**30 MAR**

**Model Me This: COVID-19 Scientific Predictions and Where We Go from Here**

**Tim Scheibe**
Lead Scientist
River Corridor Scientific Focus Area Project

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# SUBMIT YOUR QUESTIONS VIA THE DISCUSSION CHAT

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# Thank you

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