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

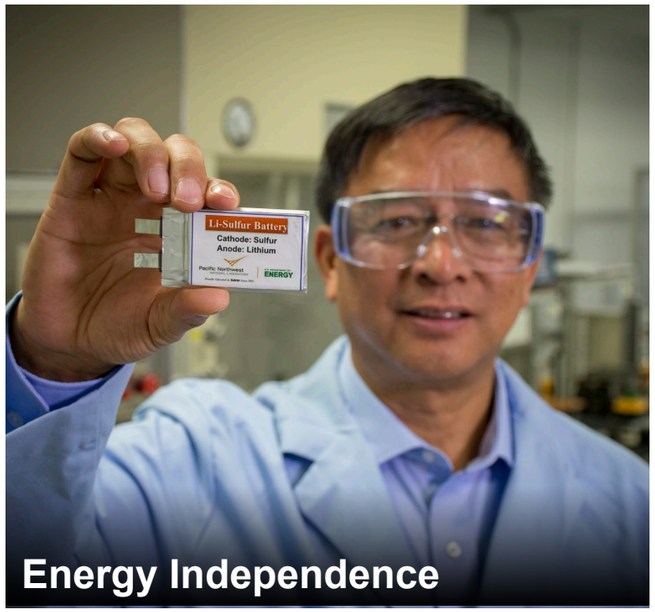
Where are you joining from? (3/16/2021)

Start the presentation to see live content. For screen share software, share the entire screen. Get help at **pollev.com/app**

Pacific Northwest
NATIONAL LABORATORY

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

Scientific Discovery



Energy Independence

National Security

Environmental Management

Pacific Northwest
NATIONAL LABORATORY

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
$28.5M	**$0.52M**
Philanthropic Investments	

Historical	FY 2019
347,000	**30,000**
Team Battelle Volunteer Hours	

Historical	FY 2019
>120	**56**
Community Organizations	

Visit **pnnl.gov/events**

COMMUNITY
SCIENCE & TECHNOLOGY
SEMINAR SERIES
@PNNL

DEMYSTIFYING COVID:

A Special Edition Seminar Series

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

MARCH**02**

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?

MARCH**09**

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.

MARCH**16**

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.

MARCH**23**

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.

MARCH**30**

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.

Pacific Northwest
NATIONAL LABORATORY

Pacific Northwest
NATIONAL LABORATORY

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.

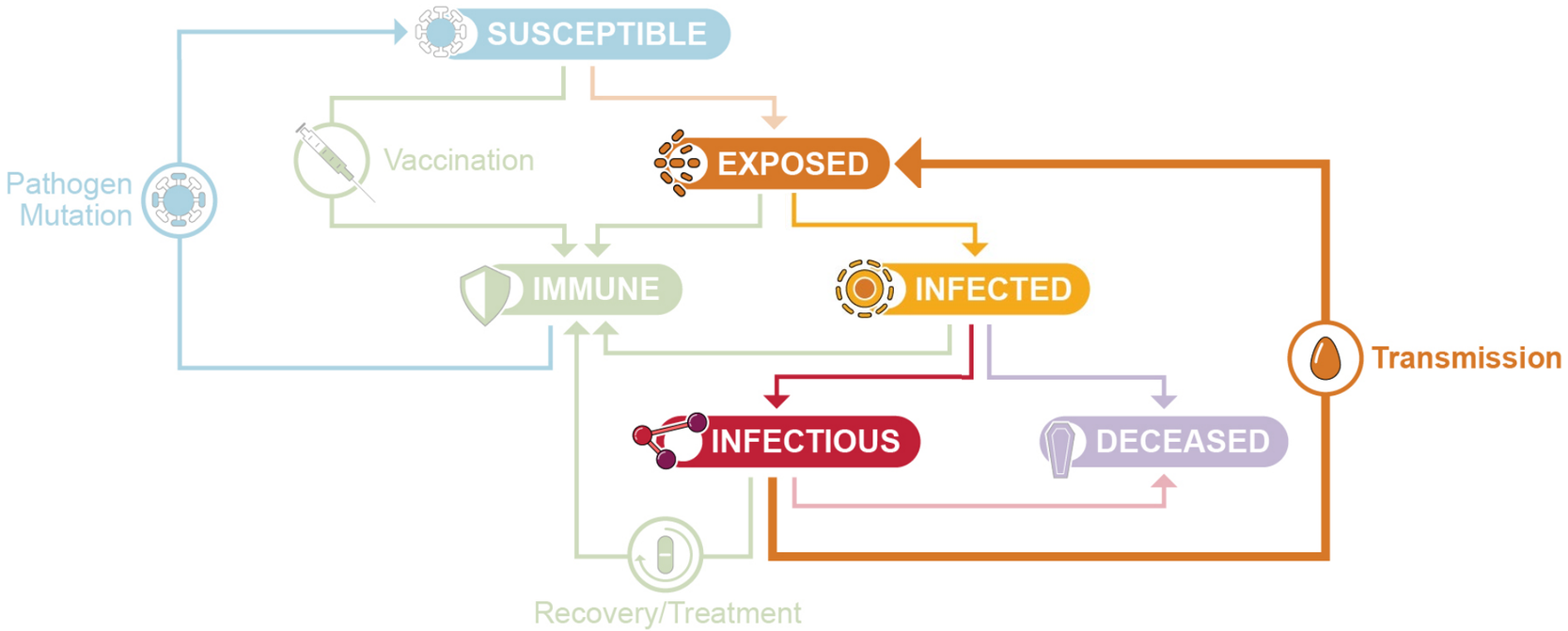
Katrina Waters

PNNL Laboratory Fellow

Division Director
Biological Sciences

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

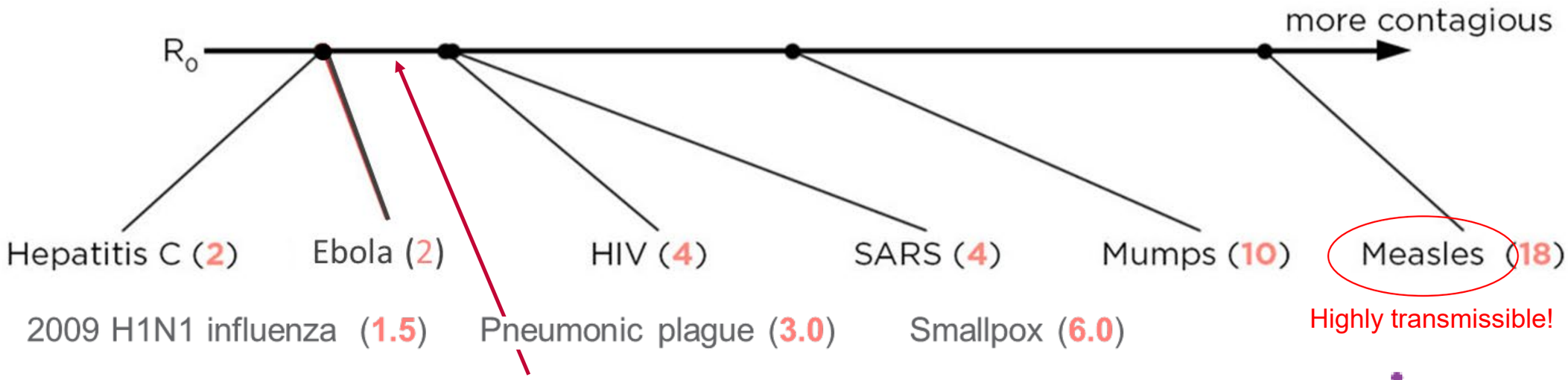
- A representation of a disease or process that can recapitulate key aspects

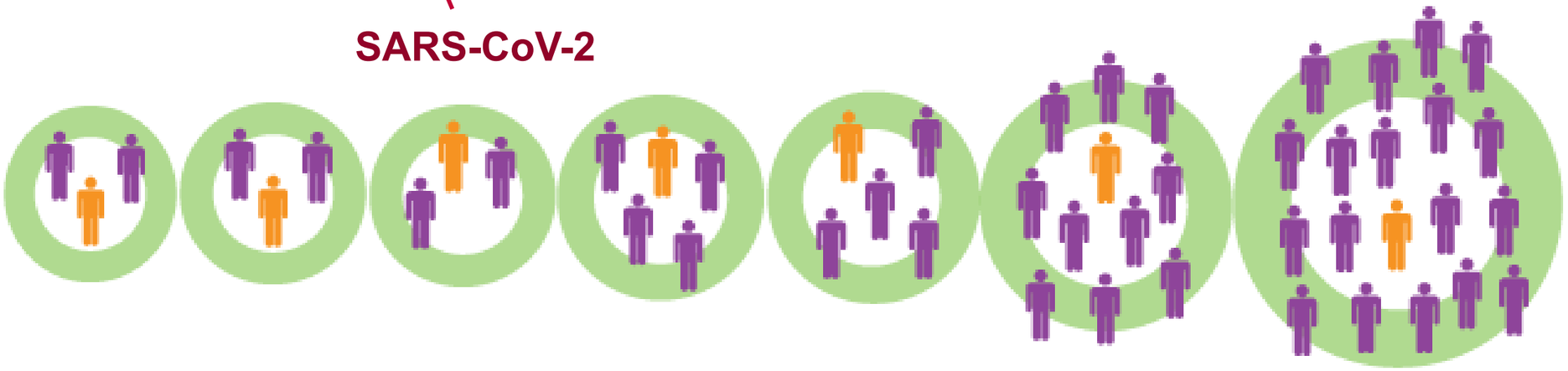
Reservoir

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

Transmission is a measure of contagion

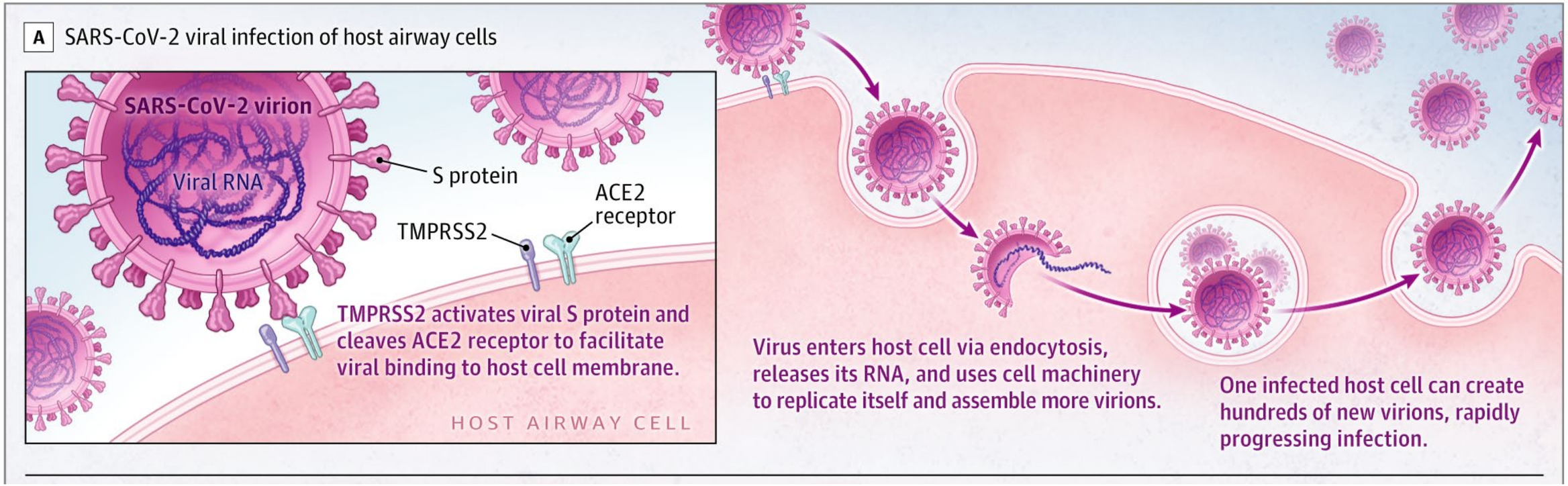
The number of people that **one sick person** will infect (on average) is called R_0.
Here are the maximum R_0 values for a few viruses.





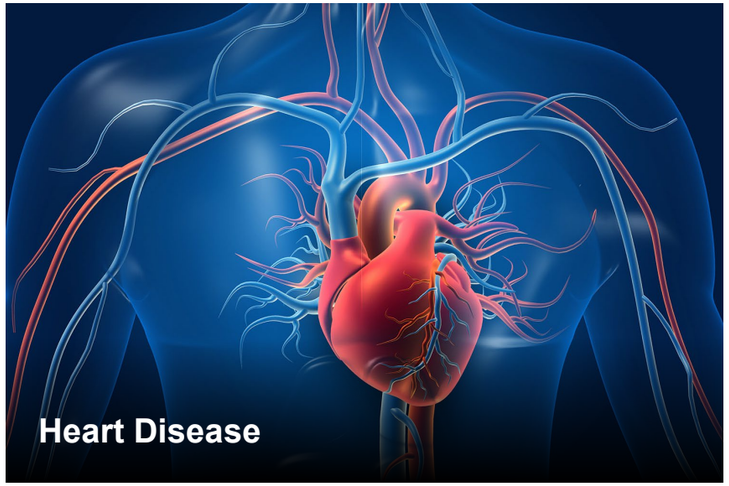
NPR.org

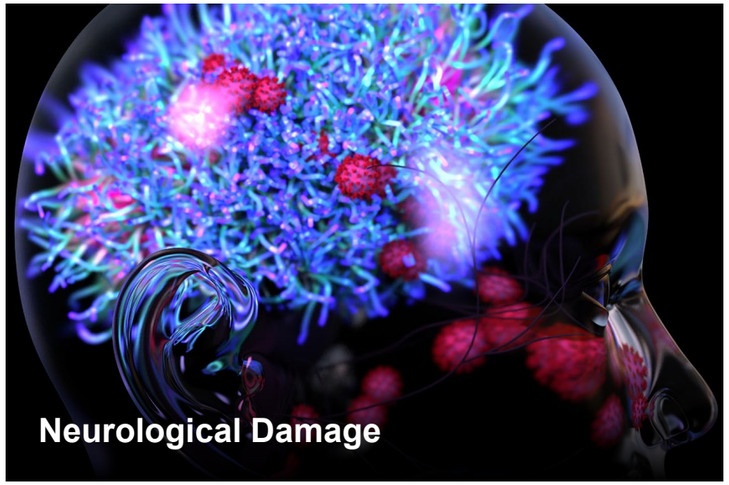
How does SARS virus infect cells?

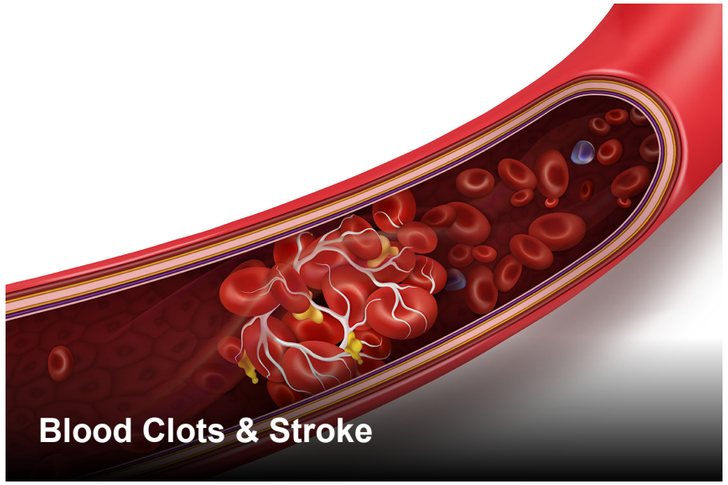


JAMA. 2020;324(8):782-793. doi:10.1001/jama.2020.12839

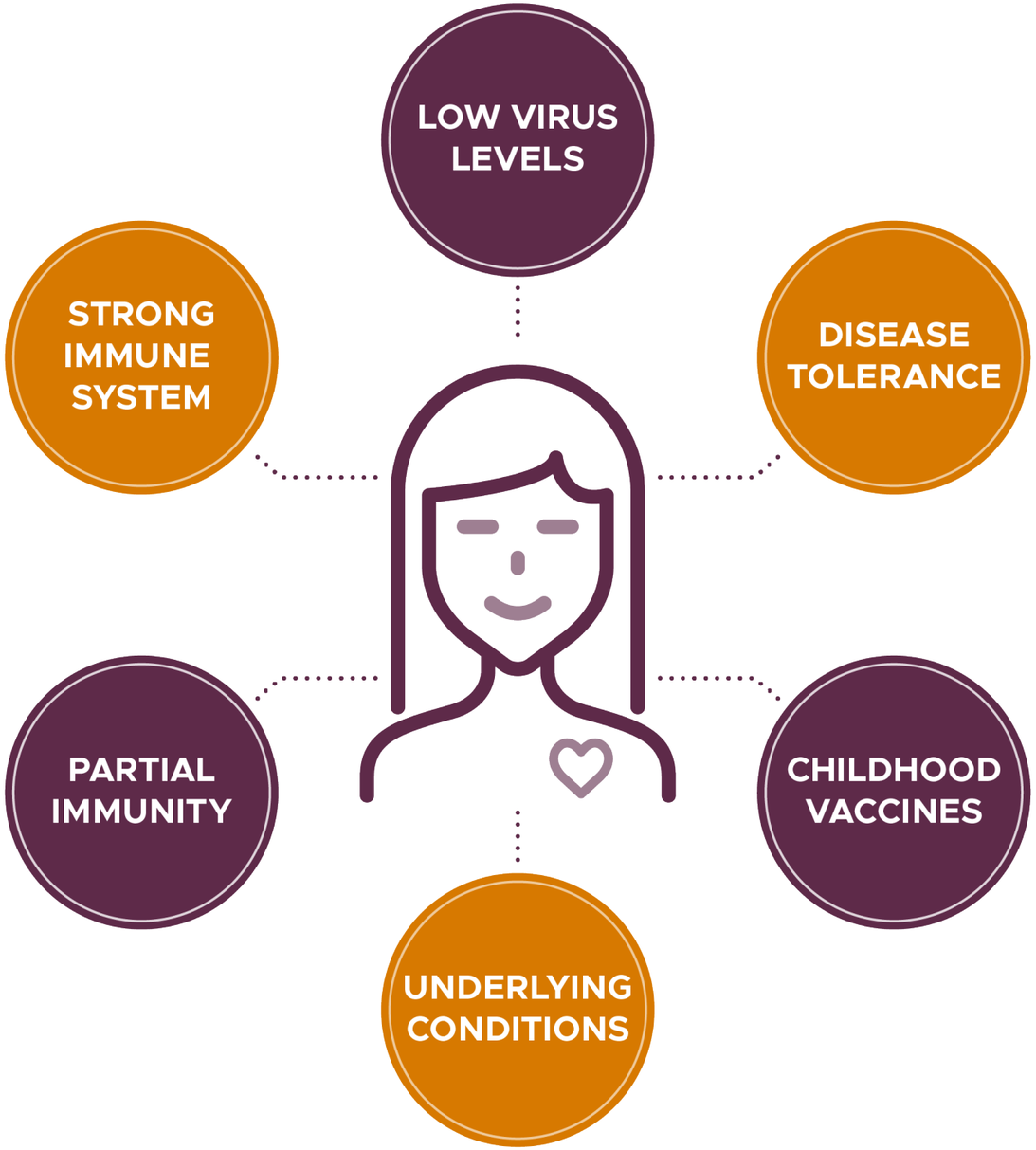
Long-term effects of COVID are emerging







Why are some infected people asymptomatic?

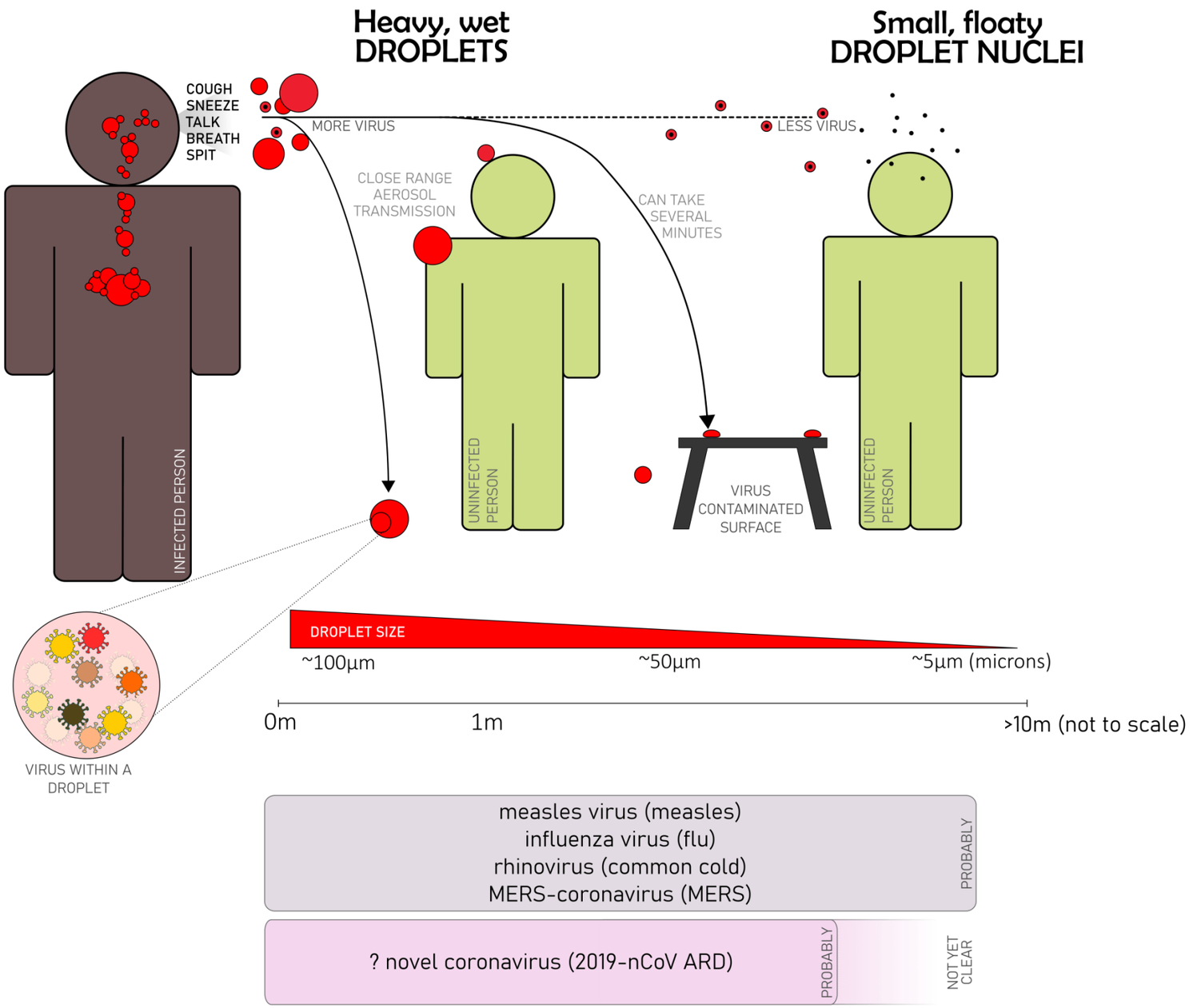


How is the virus transmitted?

Why social distancing works

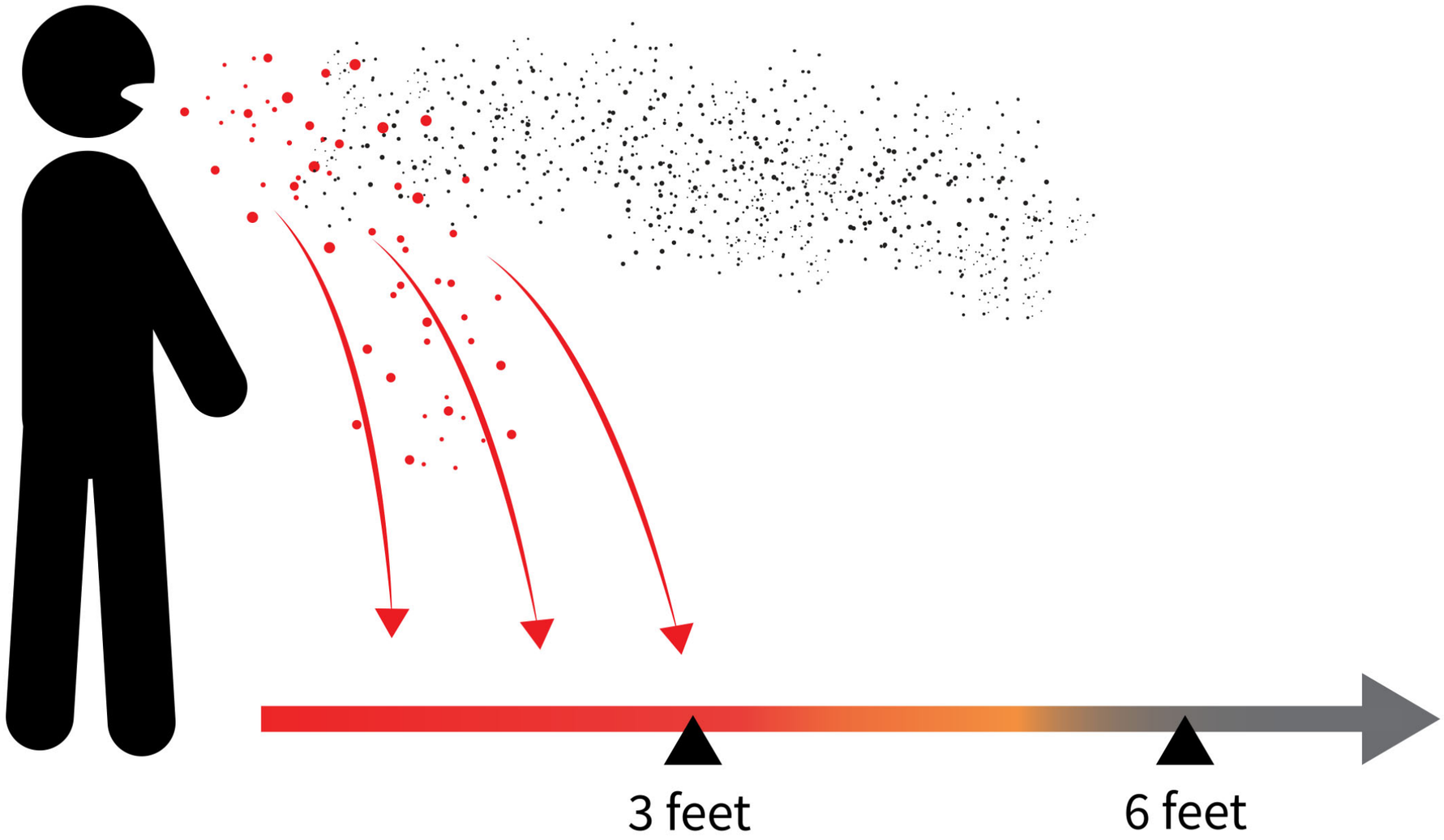
Transmission distance is dependent on:

- Droplet size
- Humidity
- Temperature
- Velocity

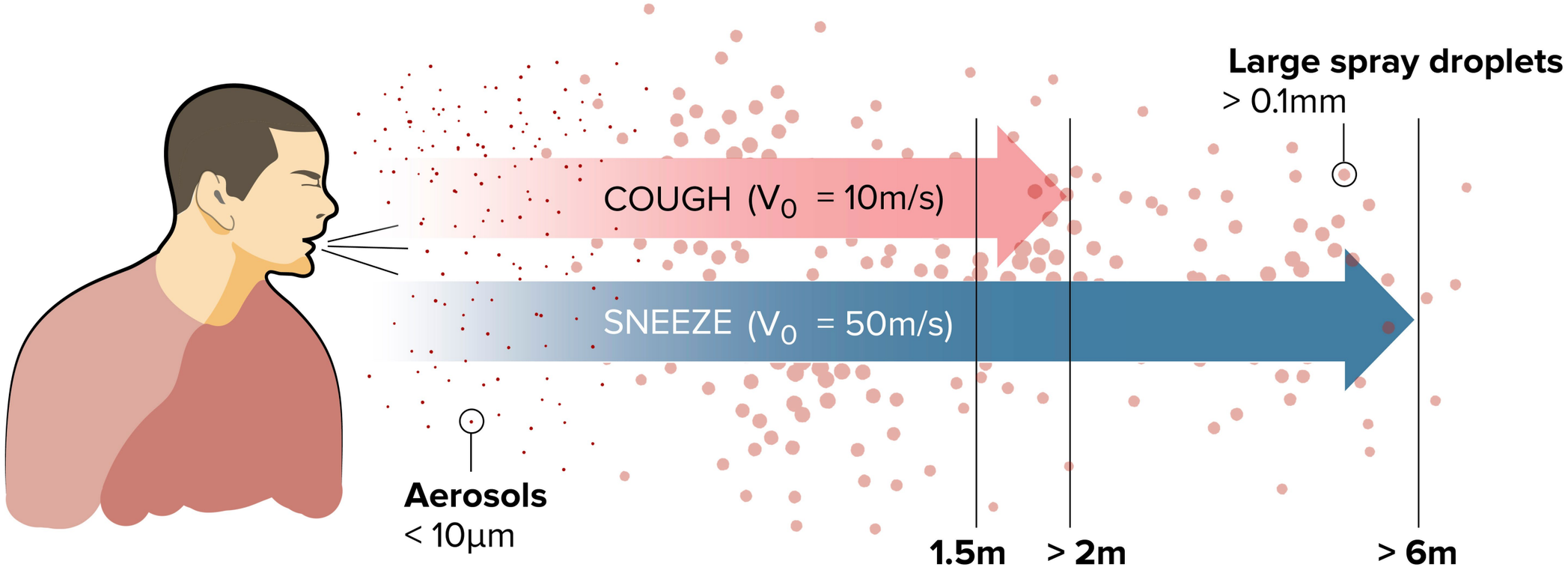


Ian M Mackay, PhD
ver12 17MAR2020 AEST
virologydownunder.com

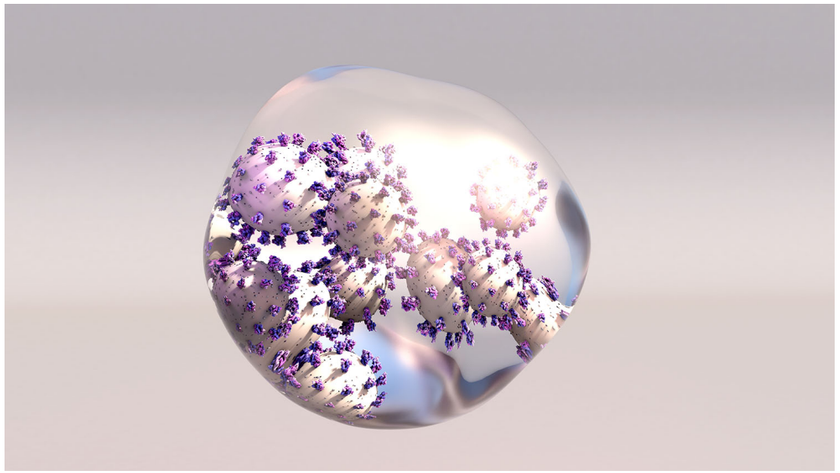
Why 6 feet of social distancing?

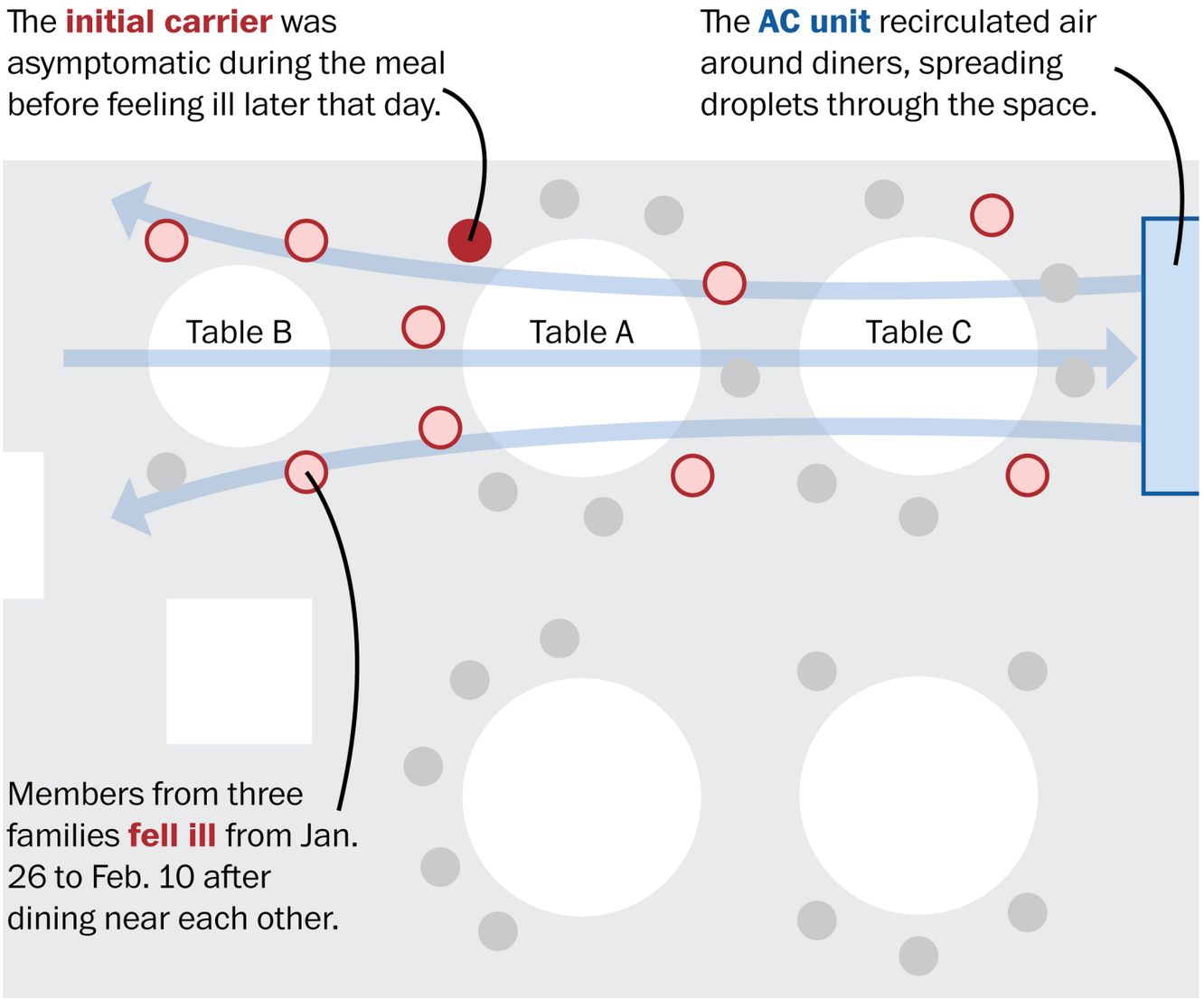


Is 6 feet far enough?



Transmission has been documented in restaurants





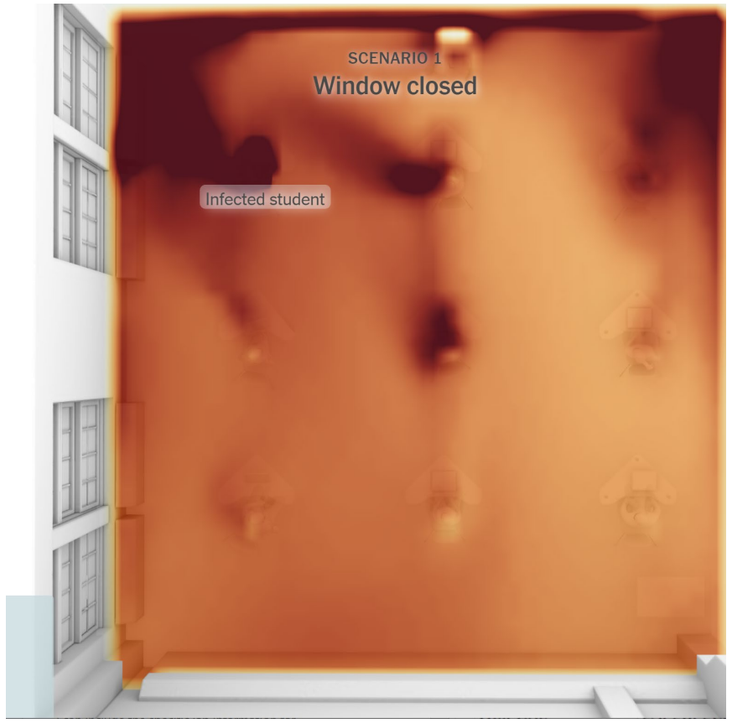
Note: Arrangement of restaurant not true to scale.

Source: Guangzhou CDC

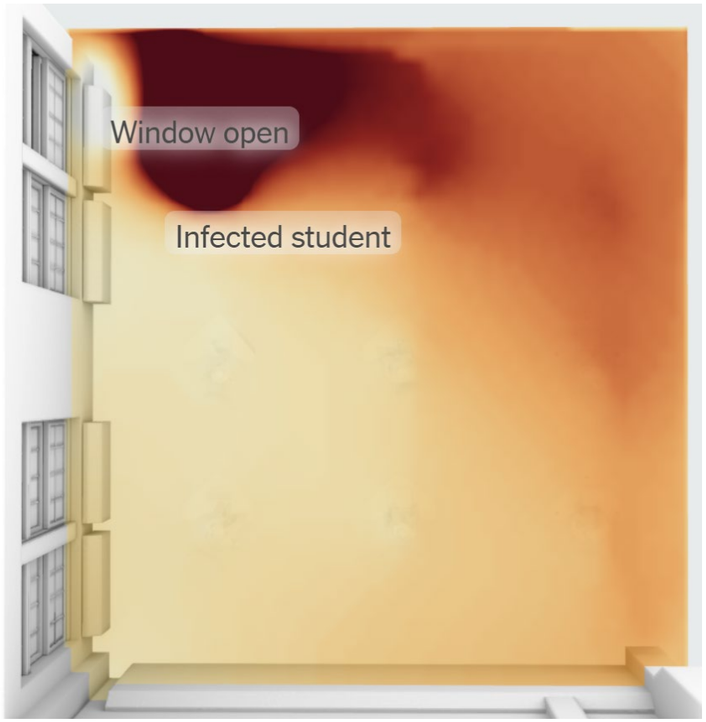
SHELLY TAN/THE WASHINGTON POST

Outside air ventilation can reduce transmission

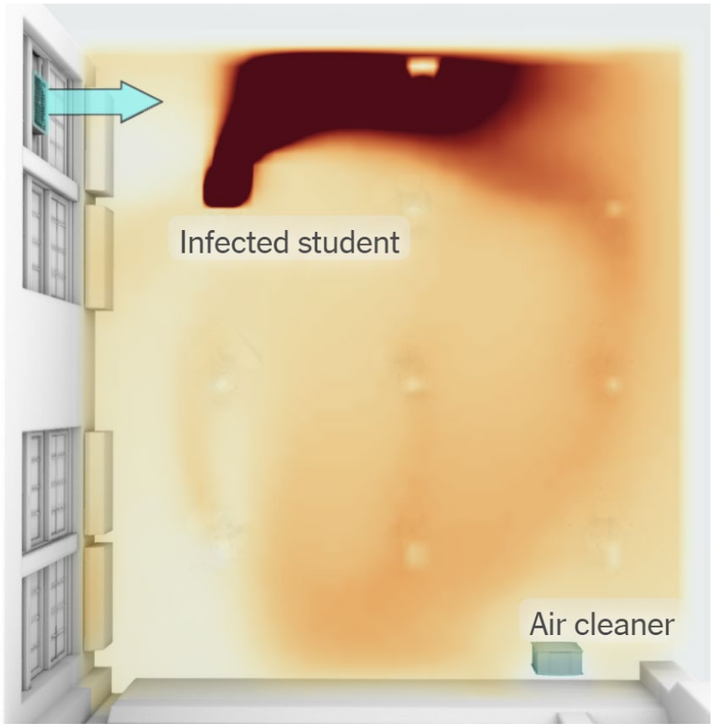
Closed windows



Open window

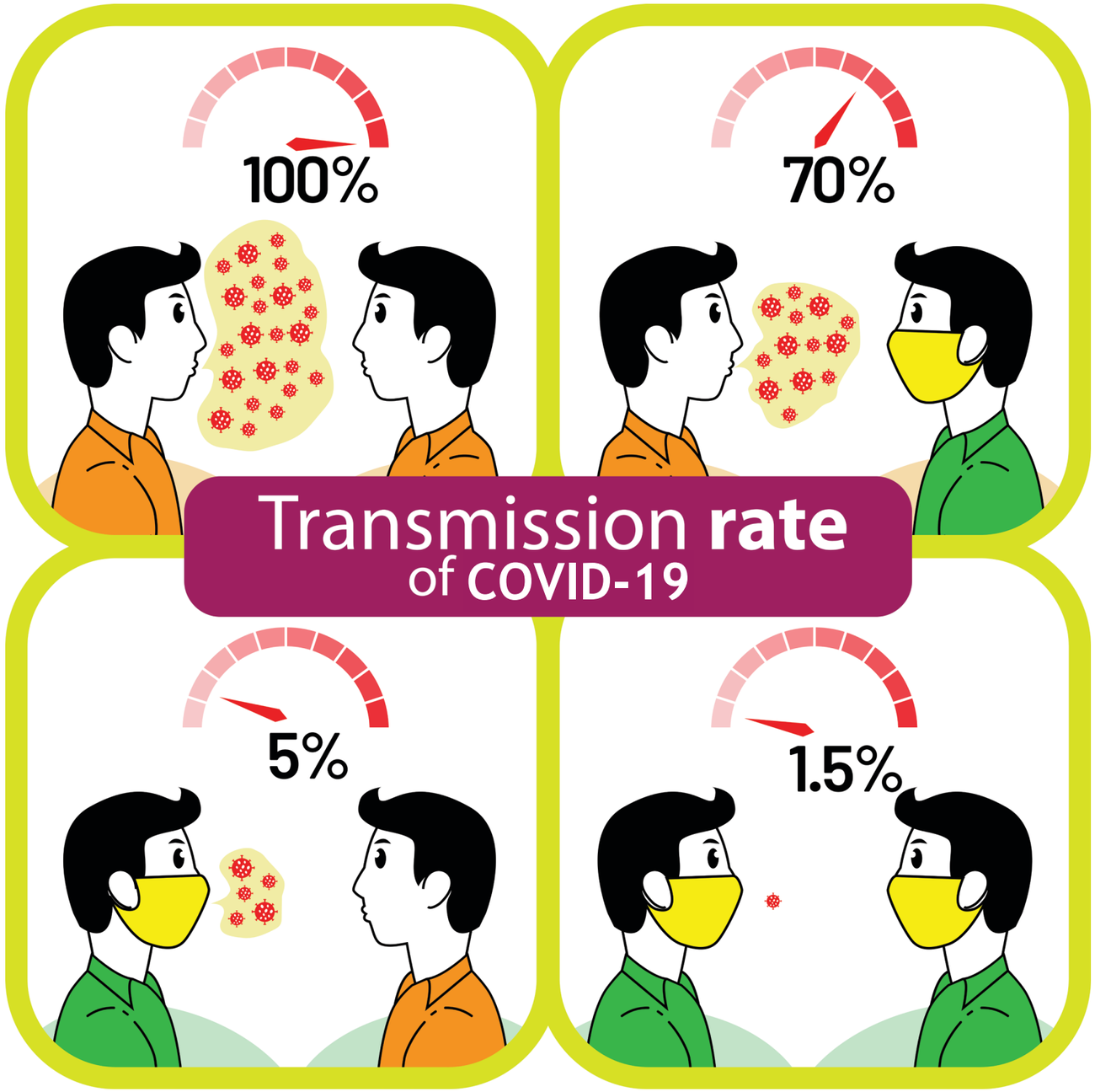


Open window + air purifier

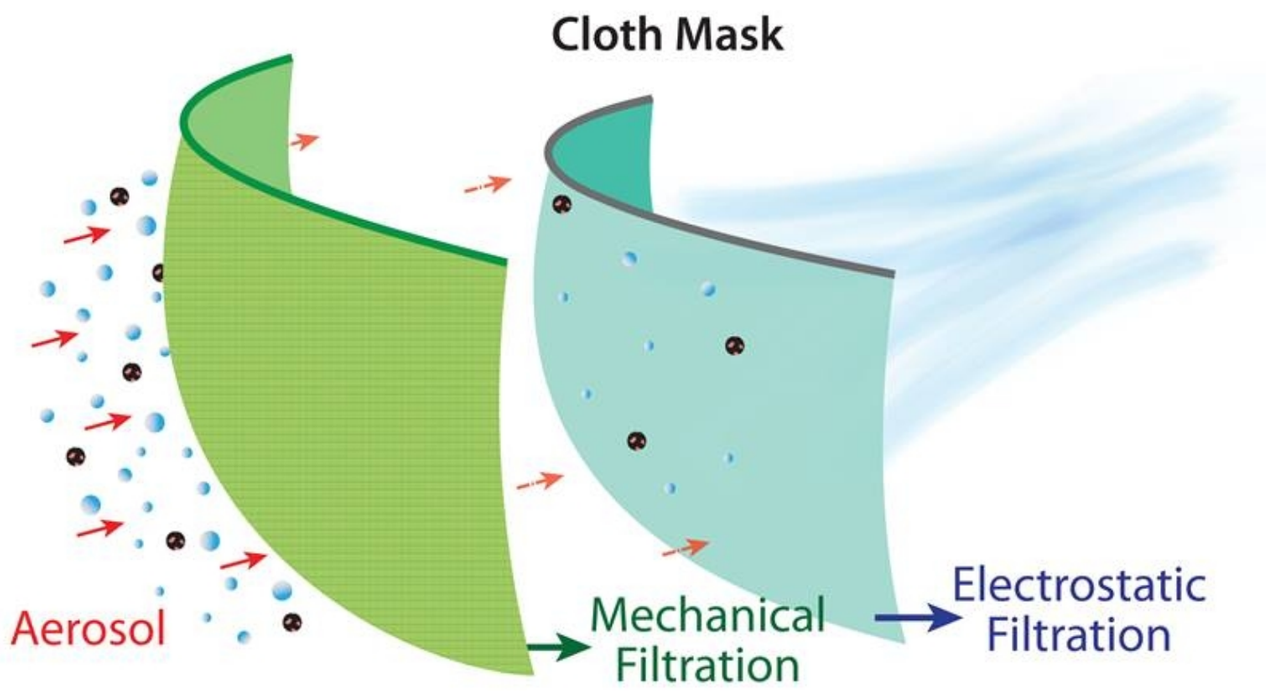


https://www.nytimes.com/interactive/2021/02/26/science/reopen-schools-safety-ventilation.html

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

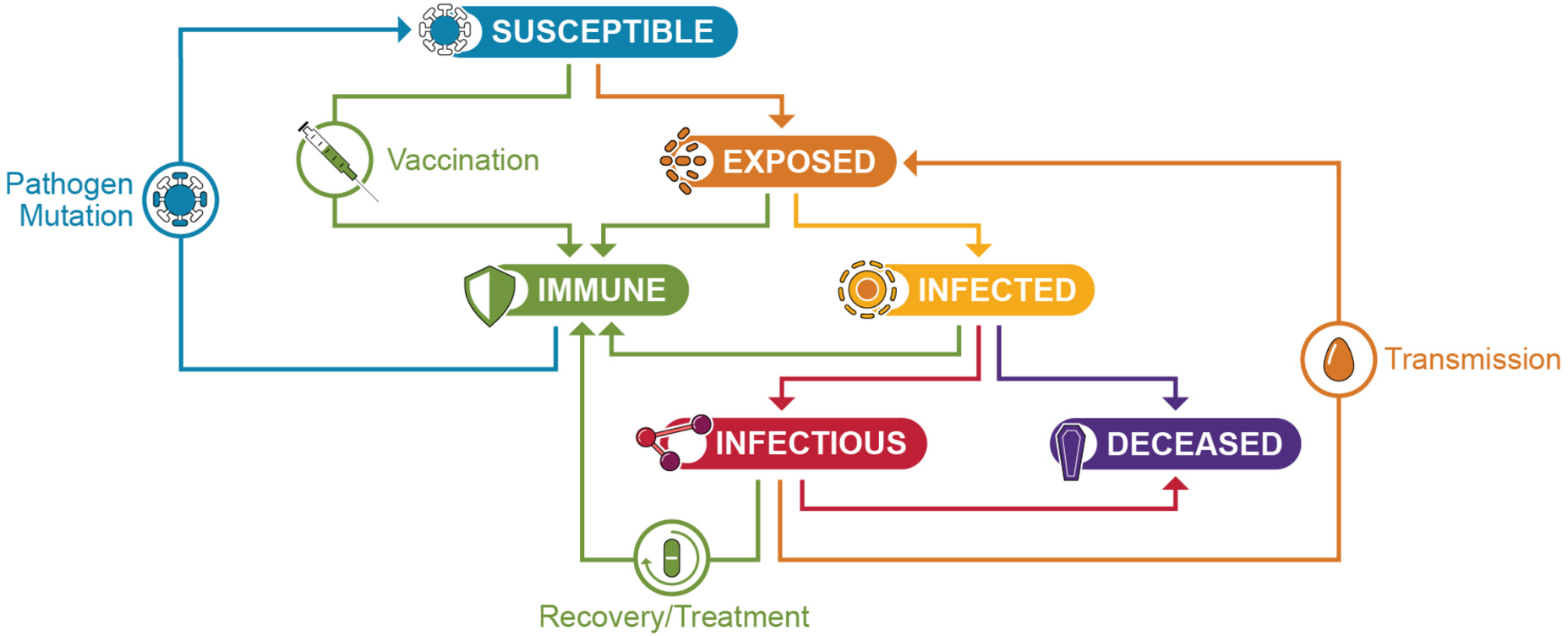
Vaccines will also slow the spread

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

VIRAL INFECTION OVERVIEW



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

SUBMIT YOUR QUESTIONS VIA THE DISCUSSION CHAT

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

COMMUNITY SCIENCE & TECHNOLOGY SEMINAR SERIES @PNNL

DEMYSTIFYING COVID:

A Special Edition
Seminar Series

Thank you

Pacific Northwest NATIONAL LABORATORY