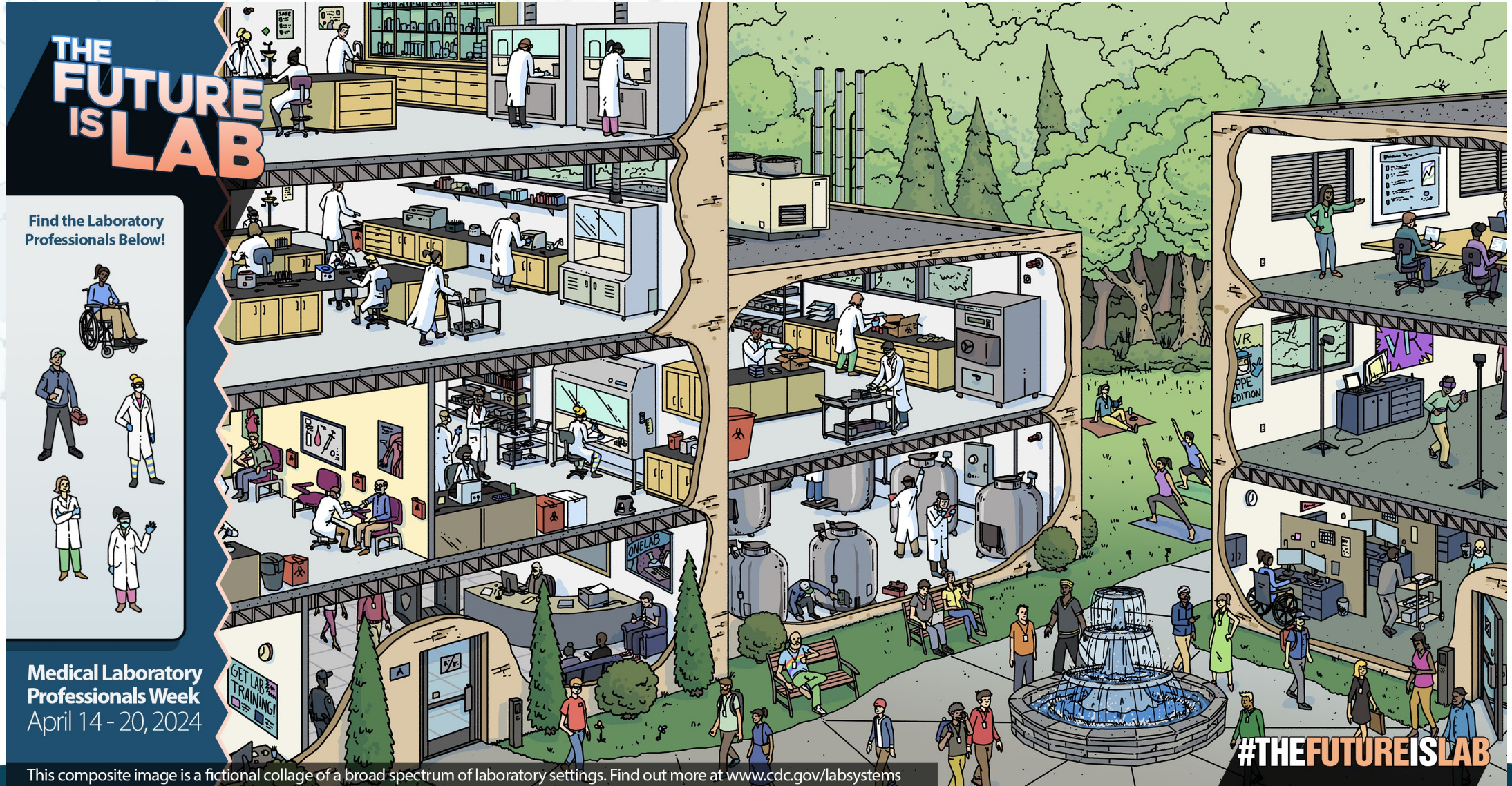


# Thank you for joining, we'll begin the call momentarily.



Medical Laboratory Professionals Week  
April 14 - 20, 2024

This composite image is a fictional collage of a broad spectrum of laboratory settings. Find out more at [www.cdc.gov/labsystems](http://www.cdc.gov/labsystems)

#THEFUTUREISLAB

# Laboratory Outreach Communication System (LOCS) Call

Monday, August 19, 2024, at 3:00 P.M. ET

- **Welcome**
  - Sean Courtney, CDC Division of Laboratory Systems
- **SARS-CoV-2 Variants Update**
  - Natalie Thornburg, CDC Coronavirus and Other Respiratory Viruses Division
- **OneLab VR**
  - Joe Rothschild, CDC Division of Laboratory Systems
- **Dengue Update**
  - Gilberto Santiago, CDC Division of Vector-Borne Diseases

# About DLS

## Vision

Exemplary laboratory science and practice advance clinical care, public health, and health equity.

# Four Goal Areas



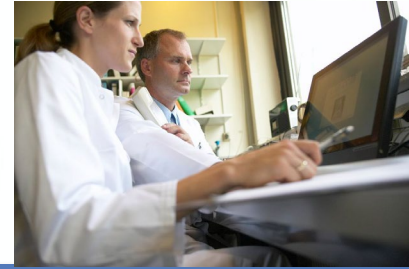
## Quality Laboratory Science

- Improve the quality and value of laboratory medicine for better health outcomes and public health surveillance



## Highly Competent Laboratory Workforce

- Strengthen the laboratory workforce to support clinical and public health laboratory practice



## Safe and Prepared Laboratories

- Enhance the safety and response capabilities of clinical and public health laboratories



## Accessible and Usable Laboratory Data

- Increase access and use of laboratory data to support response, surveillance, and patient care

# DLS ECHO Biosafety Program

- **Date:** August 27, 12:00 PM ET
- **Topic:** Operations – Planning and Maintaining
- **Speakers:** Esmeralda Meyer, MD, JM, RBP (ABSA), CBSP (ABSA), BRM (IFBA), CPIA (PRIMR); Emory University
- For questions, contact [DLSbiosafety@cdc.gov](mailto:DLSbiosafety@cdc.gov)



Scan QR code to  
register

[www.cdc.gov/safelabs/resources-tools/echo-biosafety.html](http://www.cdc.gov/safelabs/resources-tools/echo-biosafety.html)

# We Want to Hear From You!

## Training and Workforce Development

Questions about education and training?

Contact [LabTrainingNeeds@cdc.gov](mailto:LabTrainingNeeds@cdc.gov)



# LOCS Calls

DLS Home > CDC's Laboratory Outreach Communication System (LOCS)

DLS Home

- About Us
- LIVD Mapping Tool for SARS-CoV-2 Tests
- Strengthening Clinical Laboratories
- CDC's Laboratory Outreach Communication System (LOCS)**
  - LOCS Messages Archive
  - LOCS Calls**
  - LOCS Calls Archive
  - CLCR Call Archive
  - LOCS Message Level Types
- Laboratory Communicators' Network
- Free Educational Materials for

**CLCR calls are now LOCS calls!**

Clinical Laboratory COVID-19 Response (CLCR) Calls are now Laboratory Outreach Communication System (LOCS) Calls. Find an archive of CLCR call audio files, transcripts, and slide presentations, [here](#).

CDC's Division of Laboratory Systems (DLS) convenes regular Laboratory Outreach Communication System (LOCS) calls with clinical laboratories and other audiences. The calls are an opportunity for CDC and other participants (such as federal partners and professional organizations) to provide updates and answer questions from the laboratory and testing community. These calls take place on the third Monday of each month at 3:00 PM Eastern time. DLS posts the audio, slides, and transcripts online after each call.

To submit questions for consideration, email [DLInquiries@cdc.gov](mailto:DLInquiries@cdc.gov) in advance or use the question and answer (Q&A) function in Zoom during the call. Because we anticipate a large number of participants on this call, and many questions, we may not be able to directly and immediately address every issue. However, we will note your questions and feedback and tailor the content of future calls accordingly.

On this page, you can find:

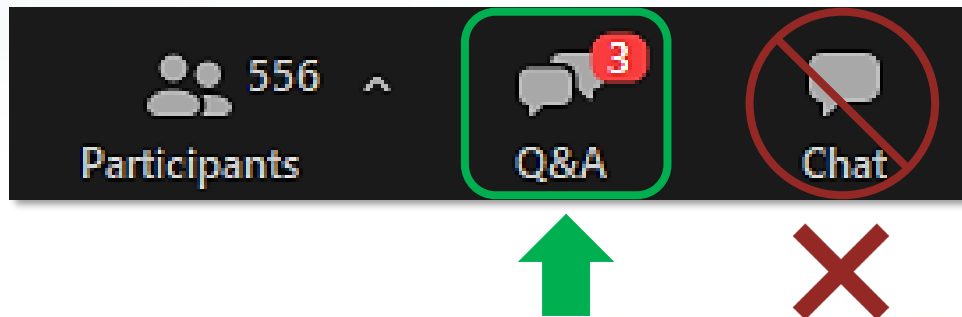
- LOCS Call information
- Transcripts
- Slides
- Audio Recordings

<https://www.cdc.gov/locs/calls>

# How to Ask a Question

- **Using the Zoom Webinar System**
  - Click the **Q&A button** in the Zoom webinar system
  - Type your question in the **Q&A box** and submit it
  - **Please do not submit a question using the chat button**

- For media questions, please contact CDC Media Relations at [media@cdc.gov](mailto:media@cdc.gov)
- If you are a patient, please direct any questions to your healthcare provider





## Division of Laboratory Systems

Slide decks may contain presentation material from panelists who are not affiliated with CDC. Presentation content from external panelists may not necessarily reflect CDC's official position on the topic(s) covered.



# Division of Laboratory Systems

## SARS-CoV-2 Variants Update

Natalie Thornburg

CDC Coronavirus and Other Respiratory Viruses Division



## Laboratory Training: Virtual Reality (VR)

Laboratory Outreach Communication System (LOCS) Call  
August 19, 2024

**Joe Rothschild**

Virtual Reality Team Lead

Training and Workforce Development Branch  
Division of Laboratory Systems



# Benefits of VR Training

## Built-in Instructor

- One-on-one attention from a digital instructor who responds to individual actions, gives specific feedback, and teaches consistently across every learner experience

## Mobility

- Headsets can be stored and transported to any location and are small enough to fit into a backpack. You can learn from anywhere - all you need is an initial WiFi connection and a small space.

## Knowledge Retention

- VR training delivers 3-4x higher information retention compared to traditional learning methods such as lectures, videos, or reading. Learners build confidence that translates to real job skills.

## Accuracy of Content

- VR training is built in collaboration with SMEs, giving learners a true sense of the tasks and ensuring they're ready to work on day one.

## Cost Effective

- Perform real-world training without an expensive physical facility or purchasing supplies for a training lab. CDC training simulations are updated with the latest equipment, regulations, and processes that are used on the job.



# DLS VR Training Development Timeline

## 2019

- Began developing VR training
- Pilot-tested VR training with internal staff

## 2020

- Released CDC's first VR laboratory training course, "LabTrainingVR: Biosafety Cabinet Edition"

## 2021

- Released "LabTrainingVR: Personal Protective Equipment Edition"
- Developed multiplayer VR programming
- Created proof-of-concept for "OneLab VR" - a virtual, multiplayer environment

## 2022

- Ported and released "LabTrainingVR: Biosafety Cabinet Edition" on Meta Quest
- Established Push-Pack Program
- Expanded "OneLab VR" programming and added multiplayer laboratory training

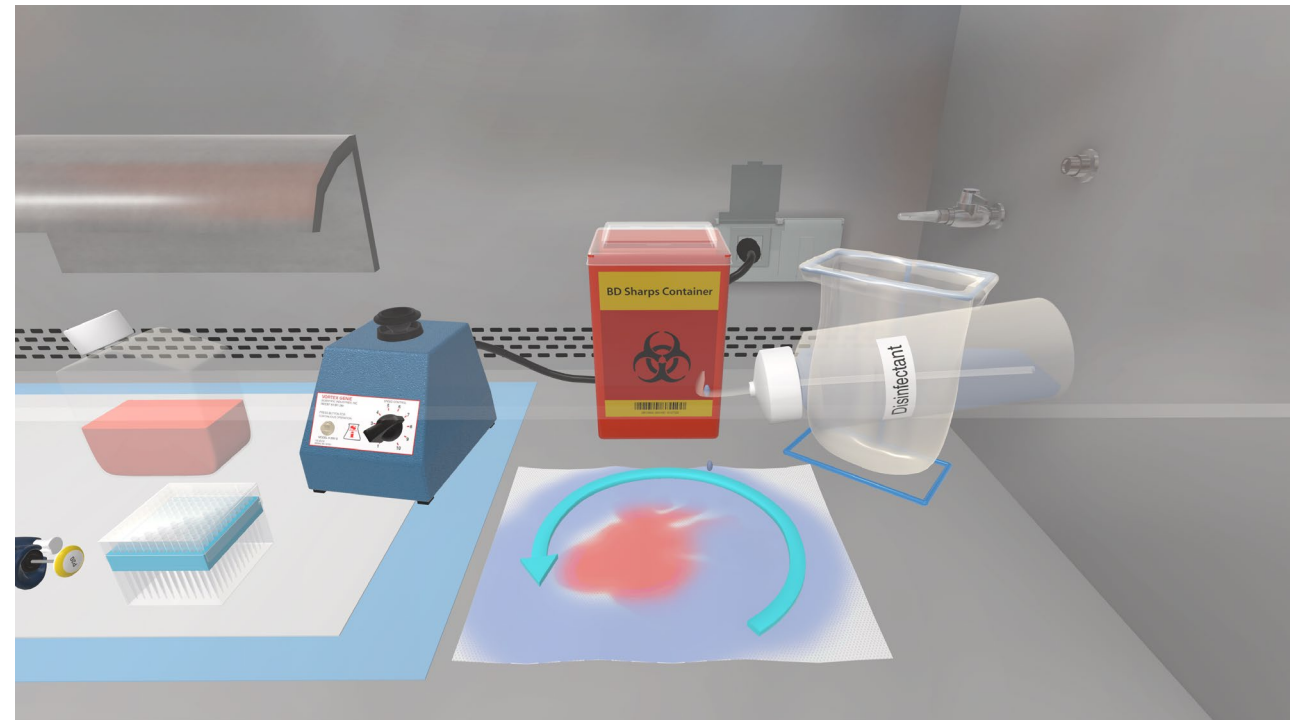




# Lab Training VR: Biosafety Cabinet Edition



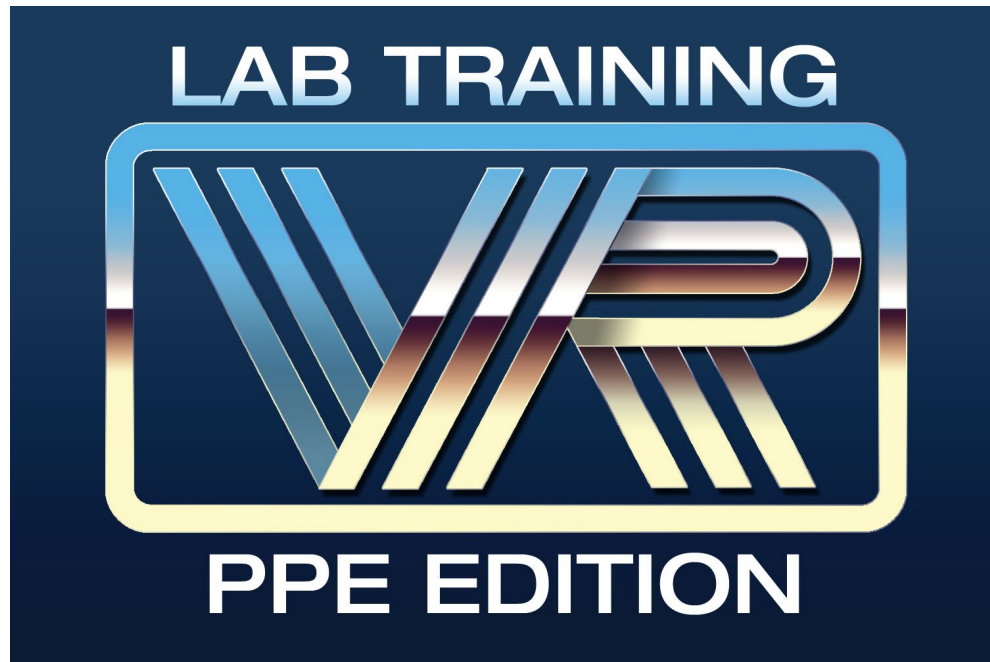
<https://reach.cdc.gov/course/labtrainingvr-biological-safety-cabinet-edition>



<https://www.youtube.com/watch?v=m92OQCAvQcs>



# Lab Training VR: Personal Protective Equipment Edition



<https://reach.cdc.gov/course/labtrainingvr-personal-protective-equipment-ppe-edition>



<https://www.youtube.com/watch?v=ikq5-AUDrFQ>



# OneLab VR



50,000+ square feet of laboratory space with 100+ custom-built pieces of laboratory equipment including:

- Rotary microtome, tissue processors
- Dark field microscopes
- Incubators, refrigerators, freezers
- Real-Time PCR machines
- Centrifuges, microfuges
- Biosafety cabinets / fume hoods
- Chemistry analyzers
- Microbial identification systems
- And more...



# OneLab VR Walkthrough



# VR-Ready Laboratories Program



## 2022 Pilot (Push-Pack Phase 1):

- Sent out **40** headsets

## 2022 (Push-Pack Phase 2):

- Sent out **120** headsets

## 2023 (Push-Pack & VR-RLP Started):

- Sent out **137** headsets

## 2024 (VR-RLP):

- Sent out **115** headsets



# VR-Ready Laboratories Program



**400+**

**HEADSETS  
DISTRIBUTED**



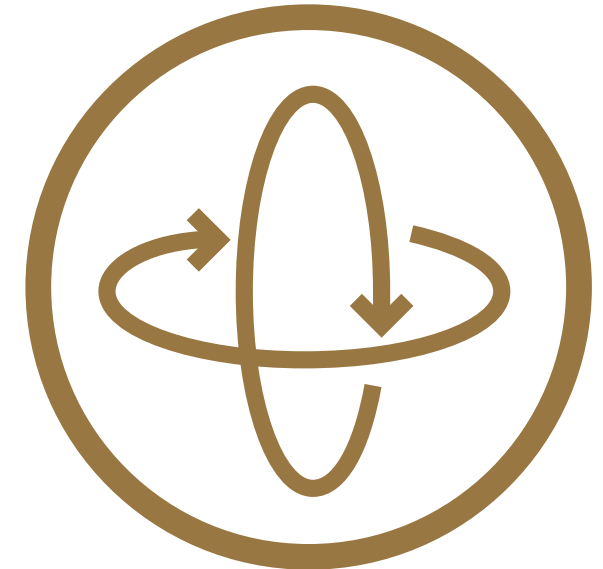
**108**

**LABORATORIES  
RECEIVED HEADSETS**



**41**

**STATES  
RECEIVED HEADSETS**



**1,150+**

**LABORATORY STAFF  
RECEIVED VR TRAINING**

# CDC Laboratory Training Website



Log in | [Create OneLab REACH™ Account](#)



[My Learner Hub](#) [Training](#) [Job Aids & Resources](#) [OneLab Network](#) [OneLab TEST](#) [OneLab Summit](#) [OneLab VR](#)

[About Us](#) [Help](#)



Access free laboratory resources through CDC's Rapid Education and Capacity-building Hub (REACH)

## Sign In

Email Address \*

eqj3@cdc.gov

Password \*

.....

Log in

Sign Up

[reach.cdc.gov](https://reach.cdc.gov)

# Questions?

For more information, contact CDC  
1-800-CDC-INFO (232-4636)  
TTY: 1-888-232-6348 [www.cdc.gov](http://www.cdc.gov)

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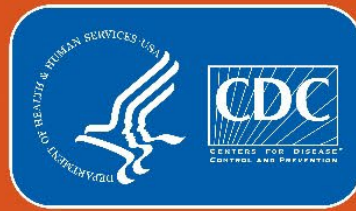
Use of trade names is for identification only and does not imply endorsement by U.S. Centers for Disease Control and Prevention.

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of Centers for Disease Control and Prevention.



**VR@CDC.GOV**





# Laboratory Readiness for Dengue Testing During an Epidemic

**Gilberto A. Santiago, PhD**

Laboratory Team Lead (Acting)

Dengue Branch

August 1, 2024

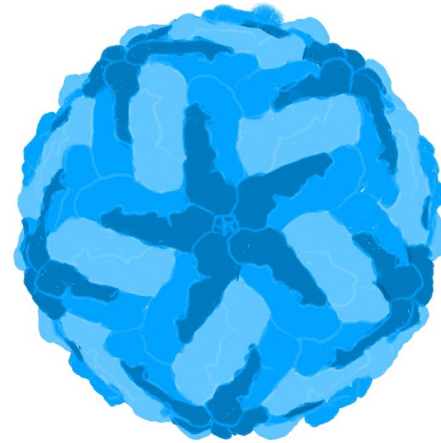
# Dengue Viruses (DENVs)

- **DENV-1, 2, 3, 4**

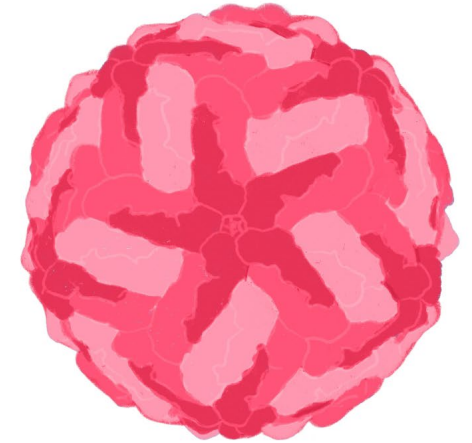
- **Lifelong** DENV type-specific immunity
- **Short-term** cross-immunity (~1–2 years)
- Individuals can be **infected up to 4 times** in their life.

- **Clinical Course**

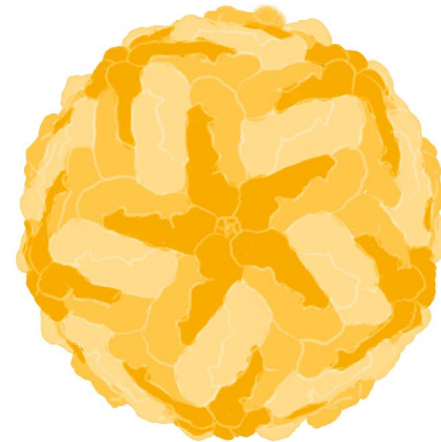
- ~3 in 4 DENV infections are **asymptomatic**.
- If symptomatic, onset occurs abruptly after an **incubation period of 5–7 days** (Range: 3–10).
- Early clinical findings are **non-specific**
  - Can be difficult to distinguish from other pathogens.
- Can be life-threatening
- Specific “warning signs” predict progression to severe disease



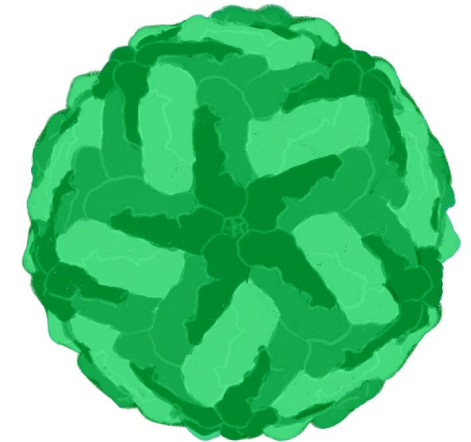
**Dengue 1**



**Dengue 2**



**Dengue 3**



**Dengue 4**



# DENV Transmission

- Vector-borne
  - Saliva of infected *Aedes spp.* mosquito
- Other modes
  - Vertical from mother to baby
  - Blood transfusion or organ transplantation
  - Needle stick, mucocutaneous, or hospital/laboratory accident
  - Breast milk



*Aedes aegypti*

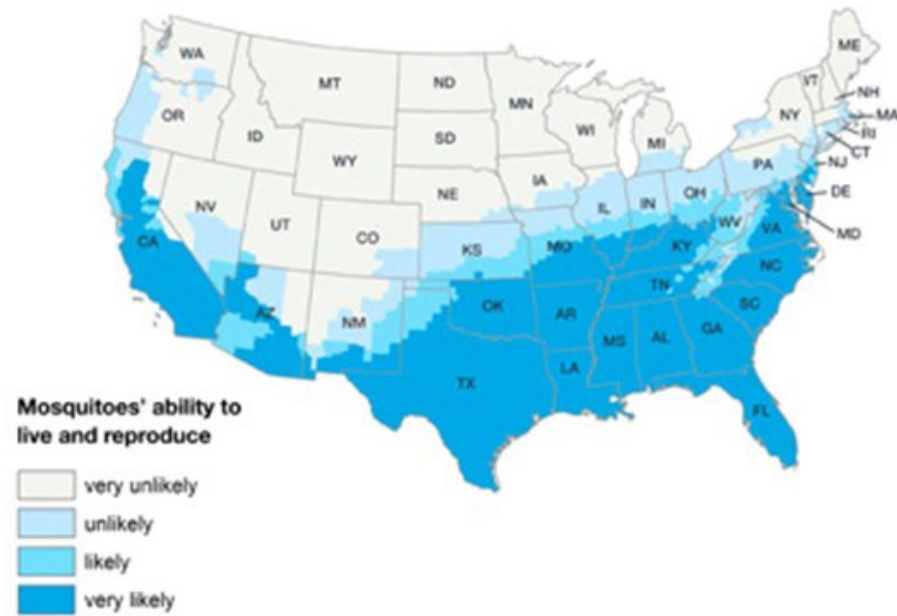


*Aedes albopictus*

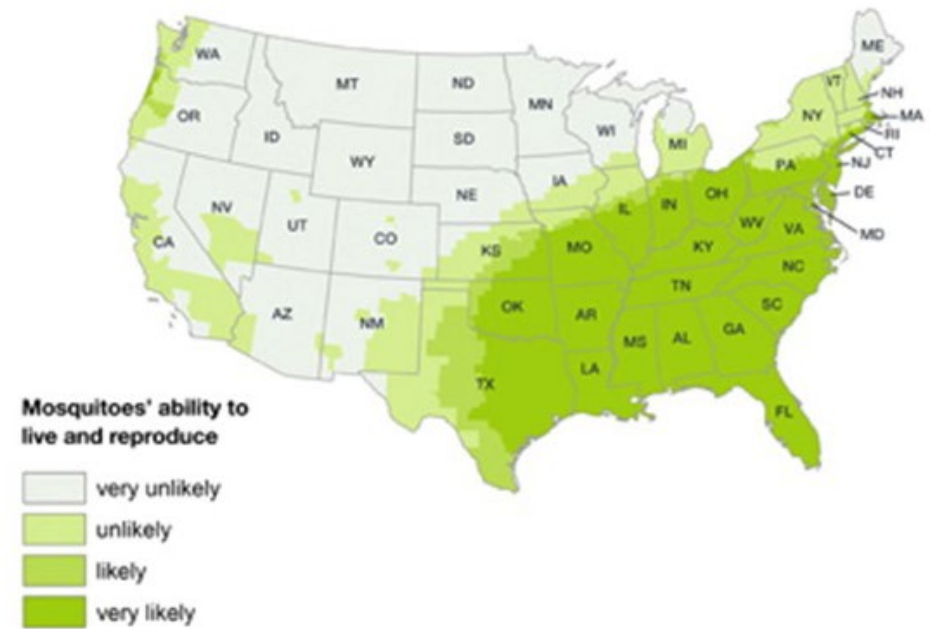
# Mosquito Vector Geographical Range

Dengue vectors are present across much of the US.

Estimated Potential Range of *Aedes aegypti* in the United States, 2017

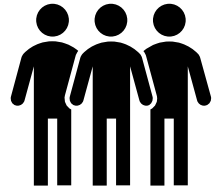


Estimated Potential Range of *Aedes albopictus* in the United States, 2017



# WHO Global Dengue by the Numbers

2023



- **5 million cases** reported worldwide



- **80 countries/territories** reporting cases
  - All 6 WHO regions



- **5,000** dengue related deaths

2024 (up to July)

- **10.9 million cases** reported worldwide

- **>90 countries/territories** reporting cases
  - All 6 WHO regions

- **6,000** dengue related deaths

# Dengue cases in the Americas, 1980–2024\*

More than 10.9 million cases reported as of August 2024

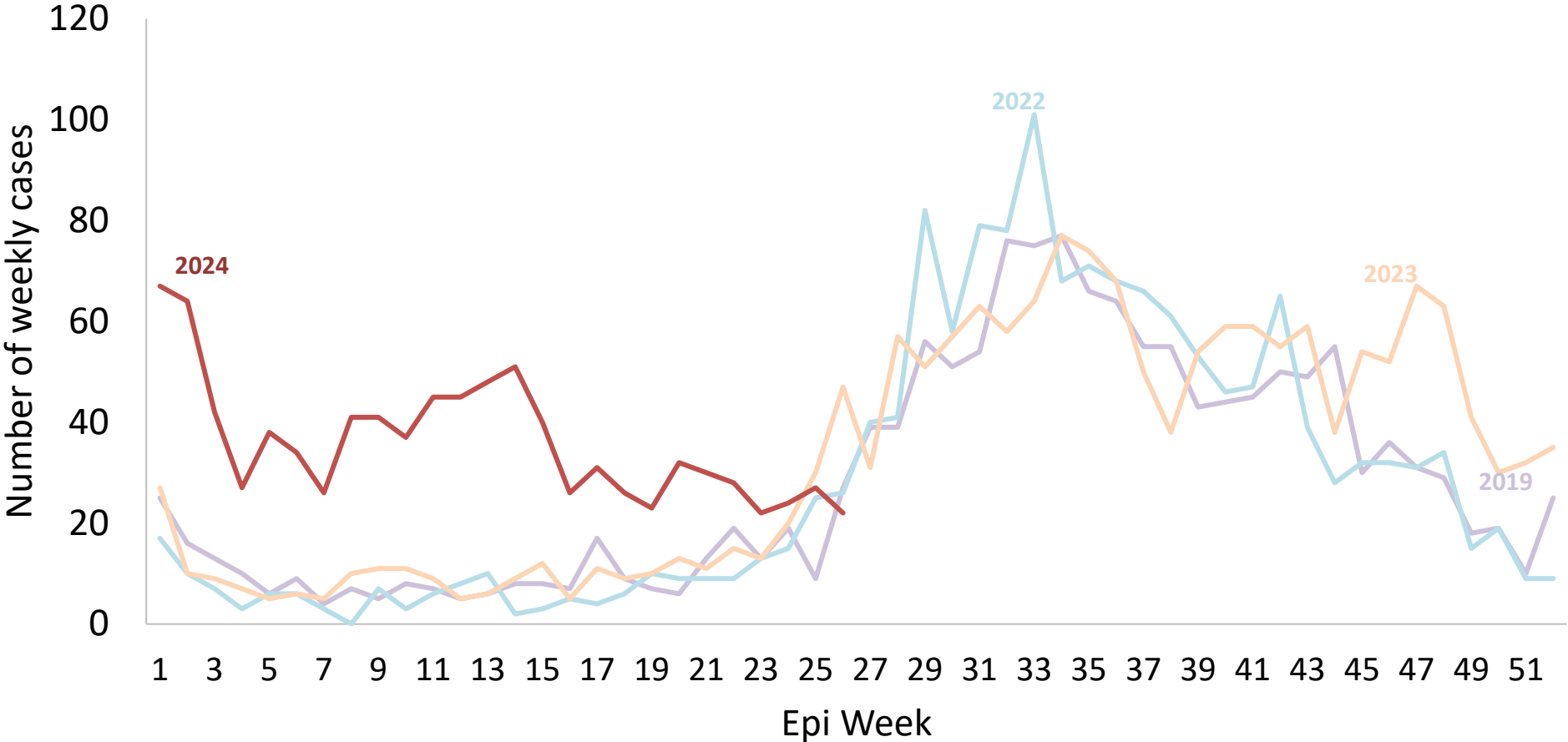


\*Data from PAHO PLISA Health Information Platform for the Americas. <https://www3.paho.org/data/index.php/es/temas/indicadores-dengue.html>. Accessed 8/6/2024



Among dengue cases reported to ArboNET from 2010–2022,  
**most dengue cases in U.S. states (>94%) were  
associated with travel to endemic areas.**

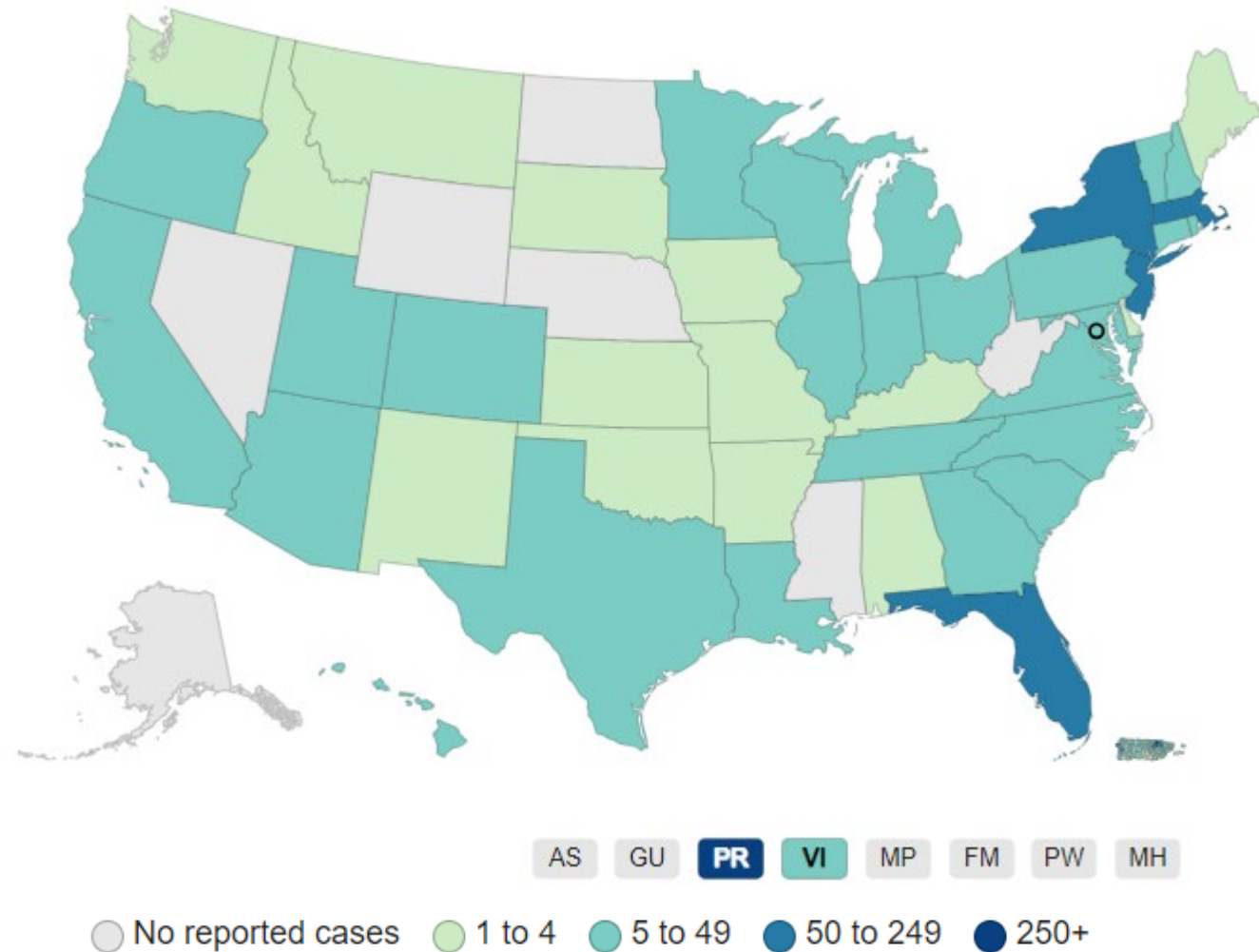
# Travel associated dengue cases reported in the US by week, 2024 and comparison years\*



\*Data from: [Data and Statistics on Dengue in the United States | Dengue | CDC](#). Accessed 8/4/2024. Cases for 2023 and 2024 are preliminary.

# Locally Acquired Dengue in US States, 2010–2024

- Sporadic cases historically limited to outbreaks in:
  - Florida, Hawaii, Texas
- Recently, more states are reporting local DENV transmission.
  - Arizona, n=2 (2022)
  - California, n=2 (2023)



# Increased Risk of Dengue Virus Infections in the United States

[Print](#)



Distributed via the CDC Health Alert Network

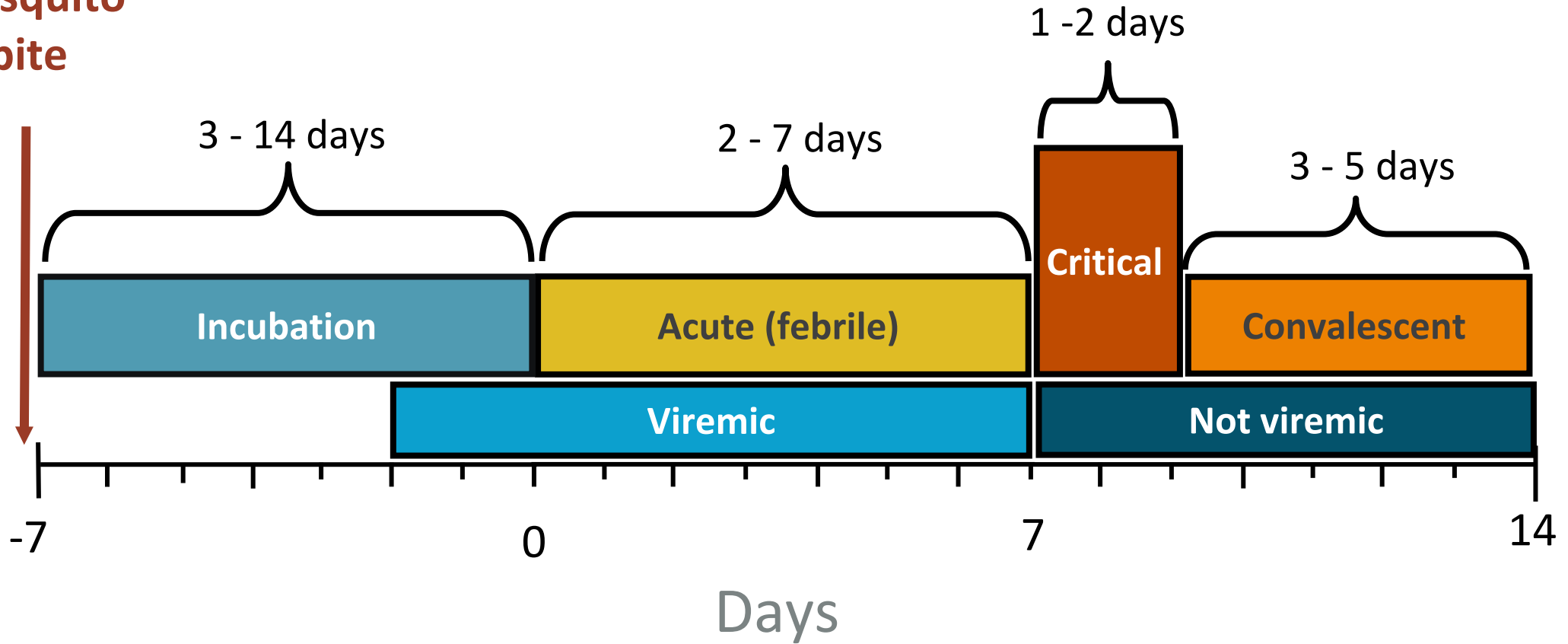
June 25, 2024, 2:30 PM ET

CDCHAN-00511



# Acute and Convalescent Phase

Mosquito bite



# Laboratory testing is most sensitive when performed within the first 7 days of illness.

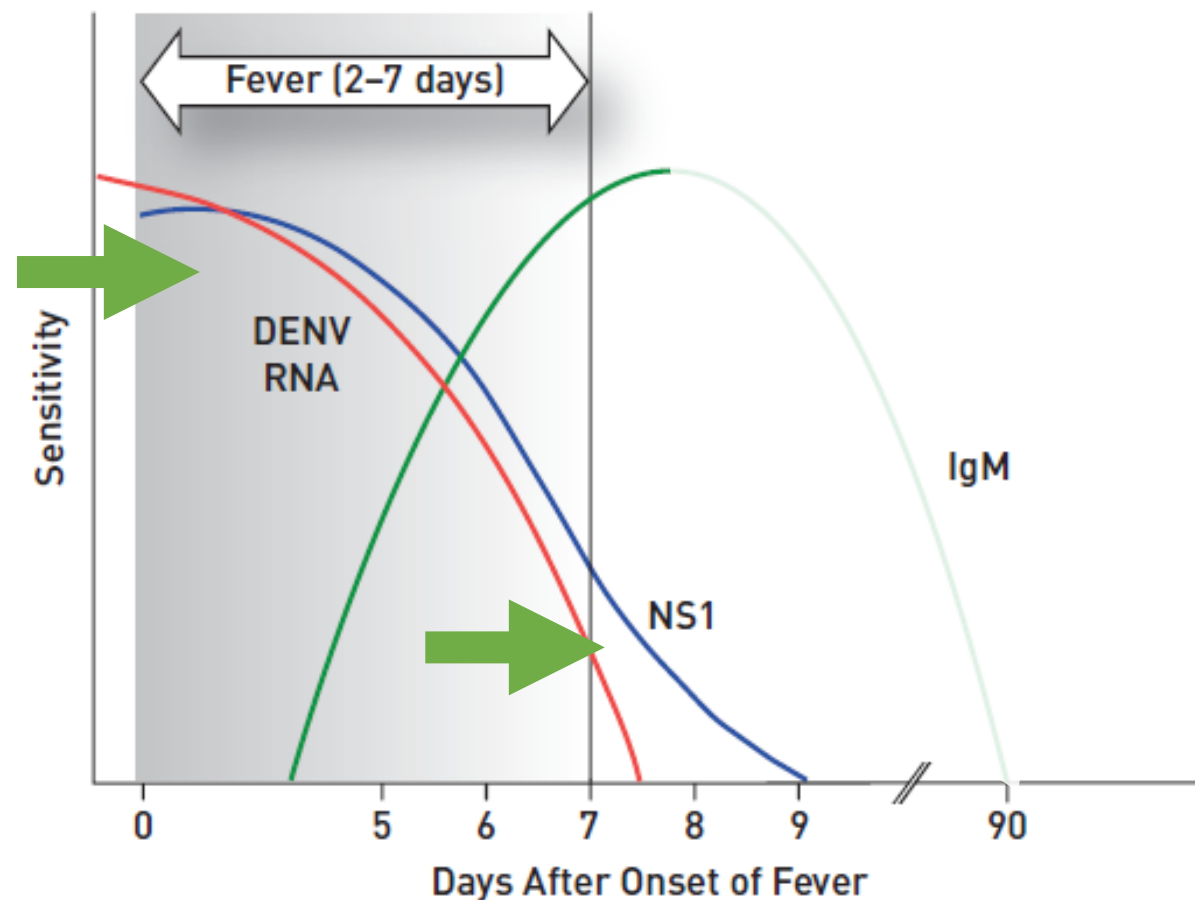
- **Within 7 days** of symptom onset, test with:

**RT-PCR + IgM ELISA**

or

**NS1 antigen ELISA + IgM ELISA**

Using this test combination provides a laboratory diagnosis in >90% of dengue cases.\*



For more information on testing, visit: [www.cdc.gov/dengue/healthcare-providers/testing/](http://www.cdc.gov/dengue/healthcare-providers/testing/)

\*Hunsperger, E. A., et al. (2016). "Performance of Dengue Diagnostic Tests in a Single-Specimen Diagnostic Algorithm." J Infect Dis 214(6): 836-844.

# Testing >7 days After Illness Onset

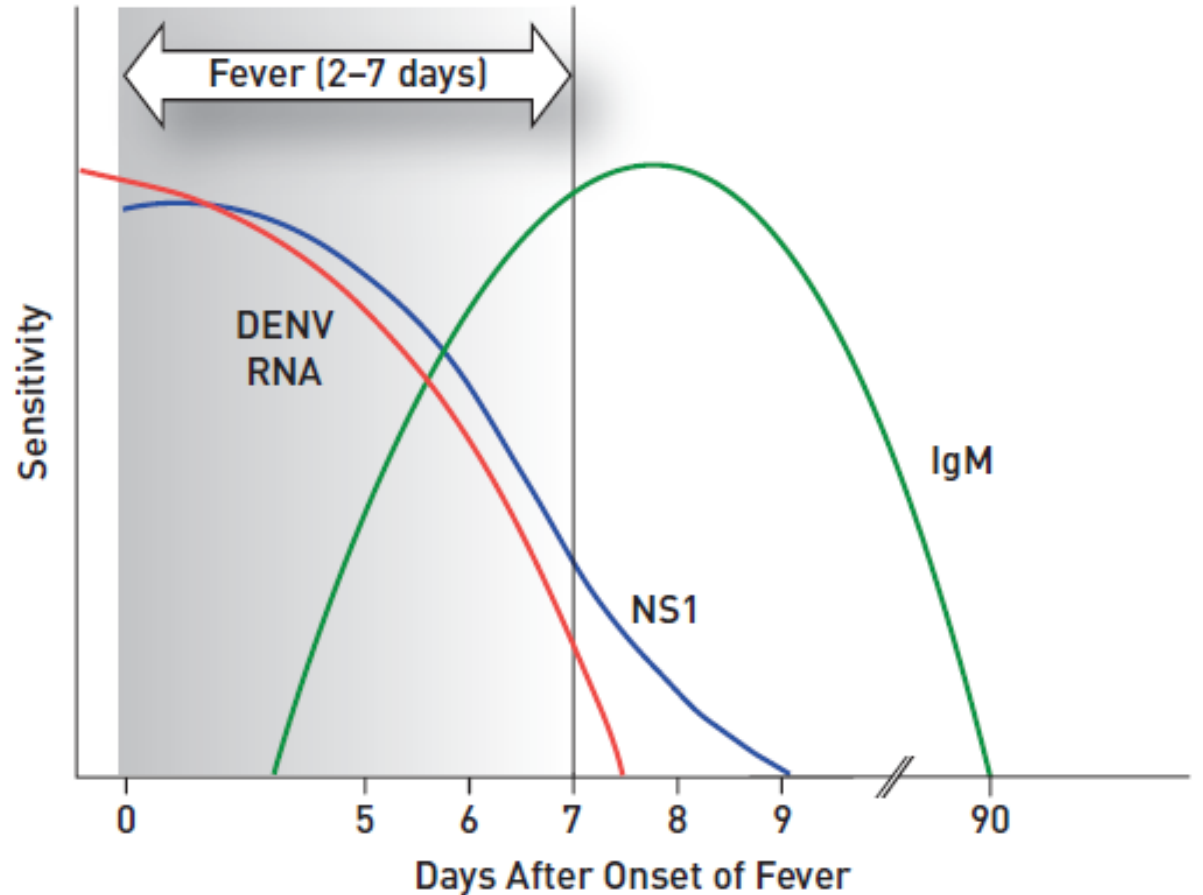
- Test with:

**IgM serology**

and consider (optional)\*

**NS1 antigen ELISA or RT-PCR**

*(lower sensitivity compared to days 0–7)*



\*Testing guidance may vary by jurisdiction, especially in endemic areas.

For more information on testing, visit: [www.cdc.gov/dengue/healthcare-providers/testing/](http://www.cdc.gov/dengue/healthcare-providers/testing/)

# Public health labs can run FDA approved IgM, CDC RT-PCR, or NS1 tests.

| Test                                    | FDA approval | Commercially available | Public health labs     |
|---|--------------|------------------------|------------------------|
| CDC DENV-1-4 RT-PCR                     | IVD (510k)   | No                     | Yes                    |
| CDC Triplex RT-PCR (ZIKV, DENV, CHIKV)* | IVD (EUA)    | No                     | Yes                    |
| InBios IgM ELISA*                       | IVD (510k)   | Yes                    | Tests can be purchased |
| InBios NS1 ELISA*                       | IVD (510k)   | Yes                    | Tests can be purchased |

\***Does not** identify DENV type. CDC DENV-1–4 RT-PCR testing or Plaque Reduction Neutralization Tests (PRNT) **will identify** DENV type.

# Private labs can purchase commercially available FDA approved IgM and NS1 antigen tests.

| Test                                    | FDA approval | Commercially available | Public health labs     | Private labs           |
|---|--------------|------------------------|------------------------|------------------------|
| CDC DENV-1-4 RT-PCR                     | IVD (510k)   | No                     | Yes                    | No                     |
| CDC Trioplex RT-PCR (ZIKV, DENV, CHIKV) | IVD (EUA)    | No                     | Yes                    | No                     |
| InBios IgM ELISA*                       | IVD (510k)   | Yes                    | Test can be purchased  | Tests can be purchased |
| InBios NS1 ELISA*                       | IVD (510k)   | Yes                    | Tests can be purchased | Tests can be purchased |

\***Does not** identify DENV type. CDC DENV-1–4 RT-PCR testing or Plaque Reduction Neutralization Tests (PRNT) **will identify** DENV type.

# Characteristics of the CDC RT-PCR Tests

- **Intended use**

- For use with samples taken from **symptomatic** patients.

| Pathogen                  | Trioplex | DENV-1–4 |
|---------------------------|----------|----------|
| Zika virus (ZIKV)         | ✓        |          |
| chikungunya virus (CHIKV) | ✓        |          |
| dengue virus (DENV)       | ✓        |          |
| • DENV-1                  |          | ✓        |
| • DENV-2                  |          | ✓        |
| • DENV-3                  |          | ✓        |
| • DENV-4                  |          | ✓        |

| Specimen type       | Trioplex | DENV-1–4 |
|---------------------|----------|----------|
| Serum               | ✓        | ✓        |
| Plasma              | ✓        | ✓        |
| Urine*¥             | ✓        |          |
| Whole blood (EDTA)* | ✓        |          |
| CSF*                | ✓        |          |
| Amniotic fluid*¥    | ✓        |          |



**\*must be tested alongside a patient-matched serum sample  
¥ for Zika testing only**

# Equipment validated for use with CDC RT-PCR Tests

| Process        | Triplex RT-PCR test<br>CURRENT  | DENV-1-4 RT-PCR Test<br>CURRENT |
|----------------|---------------------------------|---------------------------------|
| RNA extraction | MagNA Pure LC* (Roche)          | MagNA Pure LC (Roche)*          |
|                | MagNA Pure 96 (Roche)           |                                 |
|                | MagNA Pure Compact* (Roche)     |                                 |
| PCR Cyclers    | NucliSENS easyMAG (bioMérieux)  |                                 |
|                | ABI7500 Fast Dx* (ThermoFisher) | ABI7500 Fast Dx* (ThermoFisher) |
|                | QuantStudio Dx* (ThermoFisher)  |                                 |

\* Equipment is or will be discontinued by the vendor

# Future

## Equipment validated for use with CDC RT-PCR Tests

| Process        | Trioplex RT-PCR test<br>CURRENT | DENV-1-4 RT-PCR test<br>CURRENT | Trioplex and DENV-1-4 RT-PCR<br>FUTURE |
|----------------|---------------------------------|---------------------------------|--|
| RNA extraction | MagNA Pure LC* (Roche)          | MagNA Pure LC (Roche)*          | KingFisher Apex (ThermoFisher)         |
|                | MagNA Pure 96 (Roche)           |                                 | MagNA Pure 96 (Roche)                  |
|                | MagNA Pure Compact* (Roche)     |                                 |  |
|                | NucliSENS easyMAG (bioMérieux)  |                                 |  |
| PCR Cyclers    | ABI7500 Fast Dx* (ThermoFisher) | ABI7500 Fast Dx* (ThermoFisher) | QuantStudio Dx (ThermoFisher)          |
|                | QuantStudio Dx (ThermoFisher)   |                                 | QuantStudio 5 Dx (ThermoFisher)        |

\* Equipment is or will be discontinued by the vendor



# Example format for presenting test results and interpretations

| Test                                | Analyte                           | Result   | Interpretation                |
|-------------------------------------|-----------------------------------|----------|-------------------------------|
| CDC DENV-1-4 Real Time RT-PCR Assay | Dengue 1 RNA detection by rRT-PCR | Negative | No dengue type 1 RNA detected |
|                                     | Dengue 2 RNA detection by rRT-PCR | Negative | No dengue type 2 RNA detected |
|                                     | Dengue 3 RNA detection by rRT-PCR | Negative | No dengue type 3 RNA detected |
|                                     | Dengue 4 RNA detection by rRT-PCR | Negative | No dengue type 4 RNA detected |

or

| Result   | Interpretation                        |
|----------|---------------------------------------|
| Positive | Current dengue virus type 1 infection |
| Positive | Current dengue virus type 2 infection |
| Positive | Current dengue virus type 3 infection |
| Positive | Current dengue virus type 4 infection |

| Test              | Analyte                 | Result   | Interpretation                  |
|-------------------|-------------------------|----------|---------------------------------|
| Dengue InBios IgM | Dengue IgM final result | Negative | No dengue IgM antibody detected |

or

| Result   | Interpretation                |
|----------|-------------------------------|
| Positive | Recent dengue virus infection |

# Ordering Information for CDC RT-PCR Testing

- **Contact us to request tests!**

- Send requests for Trioplex to:

[trioplexPCRordering@cdc.gov](mailto:trioplexPCRordering@cdc.gov)

- Send requests for DENV-1–4 (serotyping) to:

[denguePCRordering@cdc.gov](mailto:denguePCRordering@cdc.gov)



Include the following information in your message:

- Laboratory name and address
- Qualified contact person
- Phone number
- Email address
- Shipping address

For more information, visit: <https://www.cdc.gov/dengue/healthcare-providers/testing/molecular-tests/>

# Best practices for sending samples to CDC

- **Review** specimen handling and shipping in the [CDC Test Directory](#)
- **Request** testing through CSTOR Web Portal (for public health labs).
- If not using CSTOR...
  - **Complete** CDC Form 50.34.
  - **Send** with the sample.
  - **Contact** CDC lab before sending sample.

CDC Centers for Disease Control and Prevention  
CDC 24/7: Saving Lives. Protecting People™

Search

## Infectious Diseases Laboratories

CDC > Infectious Diseases Laboratories > Submitting Specimens to CDC

### Infectious Diseases Laboratories

- Submitting Specimens to CDC
- Test Directory**
- Currently Unavailable Test Orders
- Who May Submit Specimens
- CSTOR Web Portal
- Specimen Submission Form
- Help & FAQs
- Shipping and Packing
- CDC Drug Service

## Test Directory

Submitting Specimens to CDC

[Print](#)

**Attention!**  
Several test orders are currently unavailable. Please click "More Info" for the full list.

[More info](#)

CDC's Infectious Diseases Laboratories accepts specimens from state public health laboratories and other federal agencies for analysis. Specimens from private healthcare providers and institutions should be submitted to the local state health department laboratory (state, county, city) for appropriate processing. The searchable Test Directory features an up-to-date list of orderable tests and provides information on specimen requirements, contact information, test turnaround times, and other supplemental information. Access the directory here or while completing a Specimen Submission Form.

You may also [download a copy](#) [PDF - 630 pages] of the entire Test Directory.

Effective March 28th, 2024, an updated directory is available. View the [list of major changes from the last update here](#) [PDF - 11 pages].

**Specimens submitted for testing must be accompanied by [CDC Form 50.34](#).**

[Get Email Updates](#)

To receive email updates about this page, enter your email.

## Don't forget:

- **Recognize** dengue in your emergency rooms
- **Know the warning signs** for progression to severe dengue
- **Test** appropriately for dengue

For more information, contact CDC  
1-800-CDC-INFO (232-4636)  
TTY: 1-888-232-6348 [www.cdc.gov](http://www.cdc.gov)

Gilberto A. Santiago , PhD  
[GSantiago@cdc.gov](mailto:GSantiago@cdc.gov)

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.



# Next Scheduled Call

Monday, September 16  
3 PM - 4 PM ET



<https://www.cdc.gov/locs/calls>

# CDC Social Media

<https://www.facebook.com/CDC>



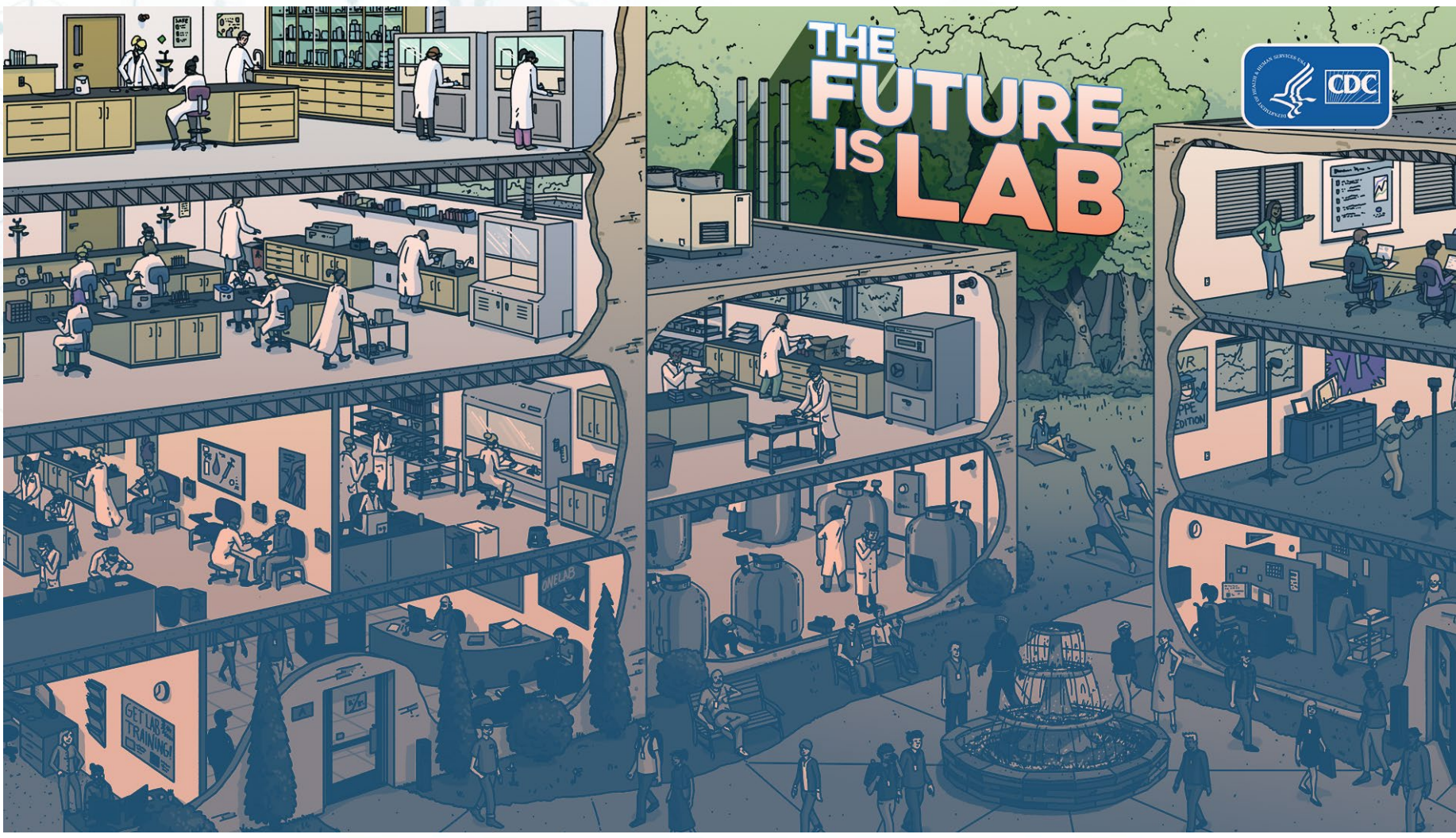
<https://x.com/cdcgov>

<https://www.instagram.com/cdcgov>



<https://www.linkedin.com/company/cdc>

# Thank You For Your Time!





For more information, contact CDC  
1-800-CDC-INFO (232-4636)  
TTY: 1-888-232-6348 [www.cdc.gov](http://www.cdc.gov)

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