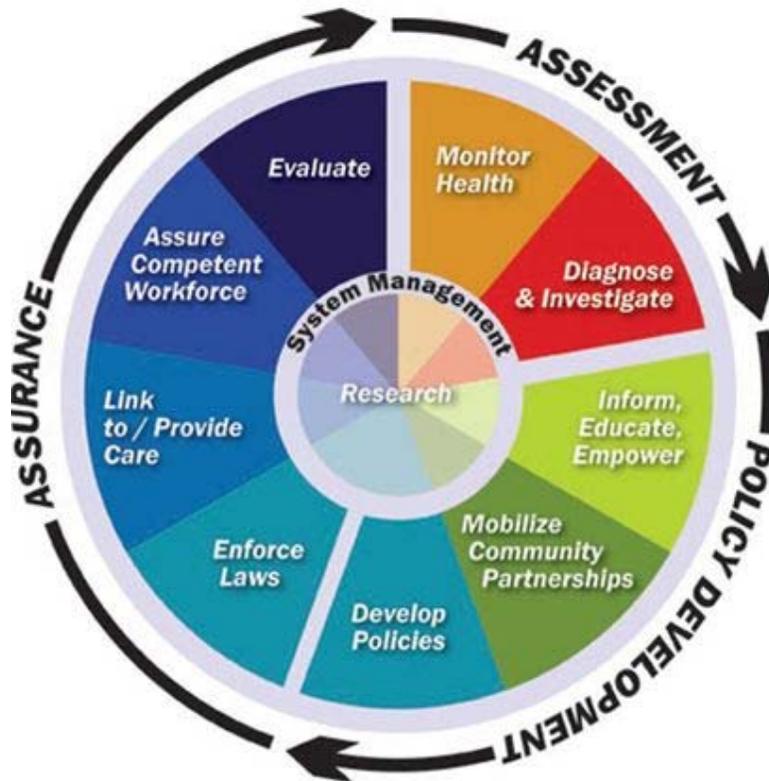


A wide-angle photograph of a modern laboratory. The room is filled with biosafety cabinets (BSCs) and laboratory benches. A scientist in a white lab coat and a face mask is standing at a BSC on the left, looking down at something on the work surface. In the background, another person is visible at a desk. The ceiling has recessed lighting and a grid pattern. The floor is a light-colored, polished material. The overall atmosphere is clean and professional.

Improving Capacity for Public Health Laboratories in California

CHEAC Annual Meeting
October 9, 2019

10 Essential Functions of Public Health Laboratories



Disease surveillance



Investigate infectious food-water- and vector-borne diseases



Lab tours and outreach events



MOUs, networks and collaborations with other labs



Participate in strategic planning



Enforce NGHA regulations



Provide lab testing when no other resources available



Laboratory competency and training



Continuous quality improvement



Applied research from observations during routine testing



The California Public Health Laboratory Response Network and its role in Public Health Infrastructure

Katya Ledin, PhD MPH, HCLD(ABB)
California Department of Public Health
Infectious Diseases Laboratory Branch



Research ⇔ Public Health Labs ⇔ Clinical



Innovation

Response

Regulation

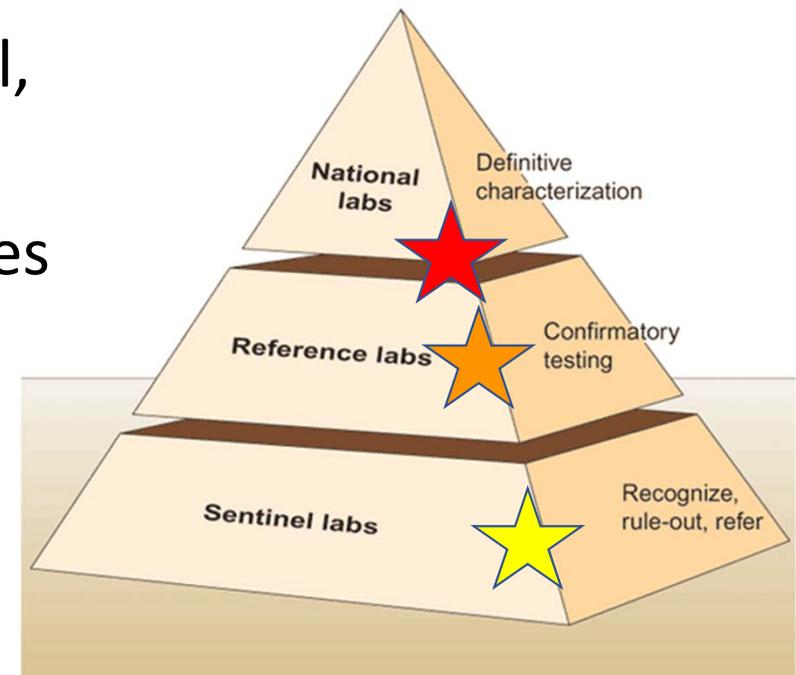
Public Health Laboratories

- Focused on health of population (not individual clinical treatment)
- Test human, animal and environmental samples
- Test for reportable diseases, emerging diseases and outbreaks
- Often have tests not available in commercial laboratories; can develop new tests as needed
- Required to follow clinical and environmental testing regulations, employ licensed personnel, and pass regulatory inspections

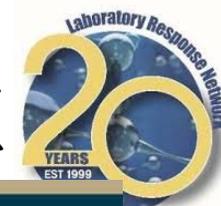
Laboratory Response Network

- National laboratory network to detect biological, chemical and radiological threats and emerging pathogens
- Categories of laboratories: Sentinel, Reference, Advanced and National
- California Public Health Laboratories participate at Sentinel, Reference and Advanced levels

<https://emergency.cdc.gov/lrn/>



Laboratory Response Network



By the Numbers

120+

LRN-B member laboratories in the US

84%

of US population lives within 100 miles of an LRN-B lab

45

distinct tests for biological threats, emerging infectious diseases, and other high-consequence pathogens—like Ebola, plague, and smallpox

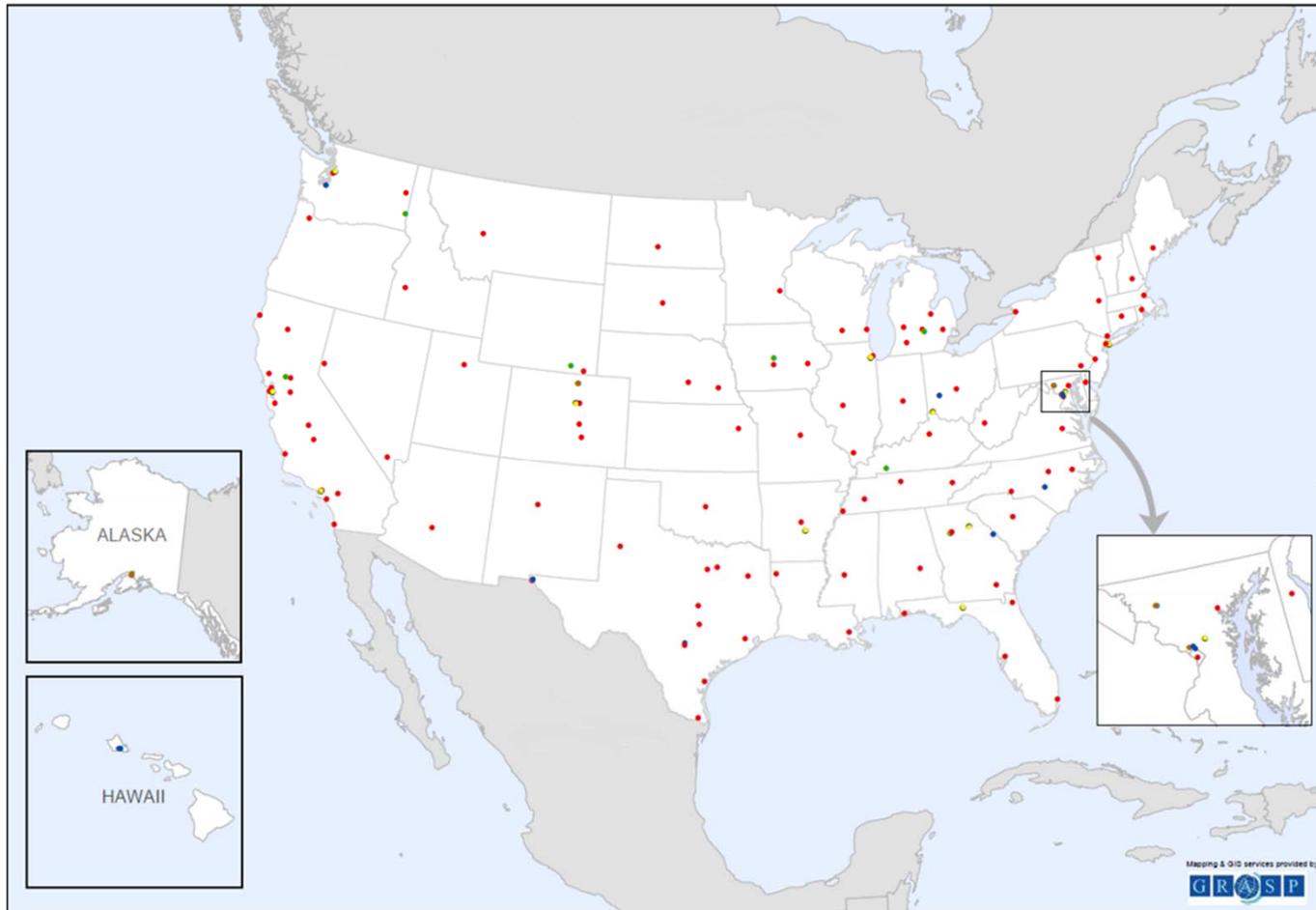
67,000

specimens LRN-B member laboratories tested for Zika in 2017

3,000

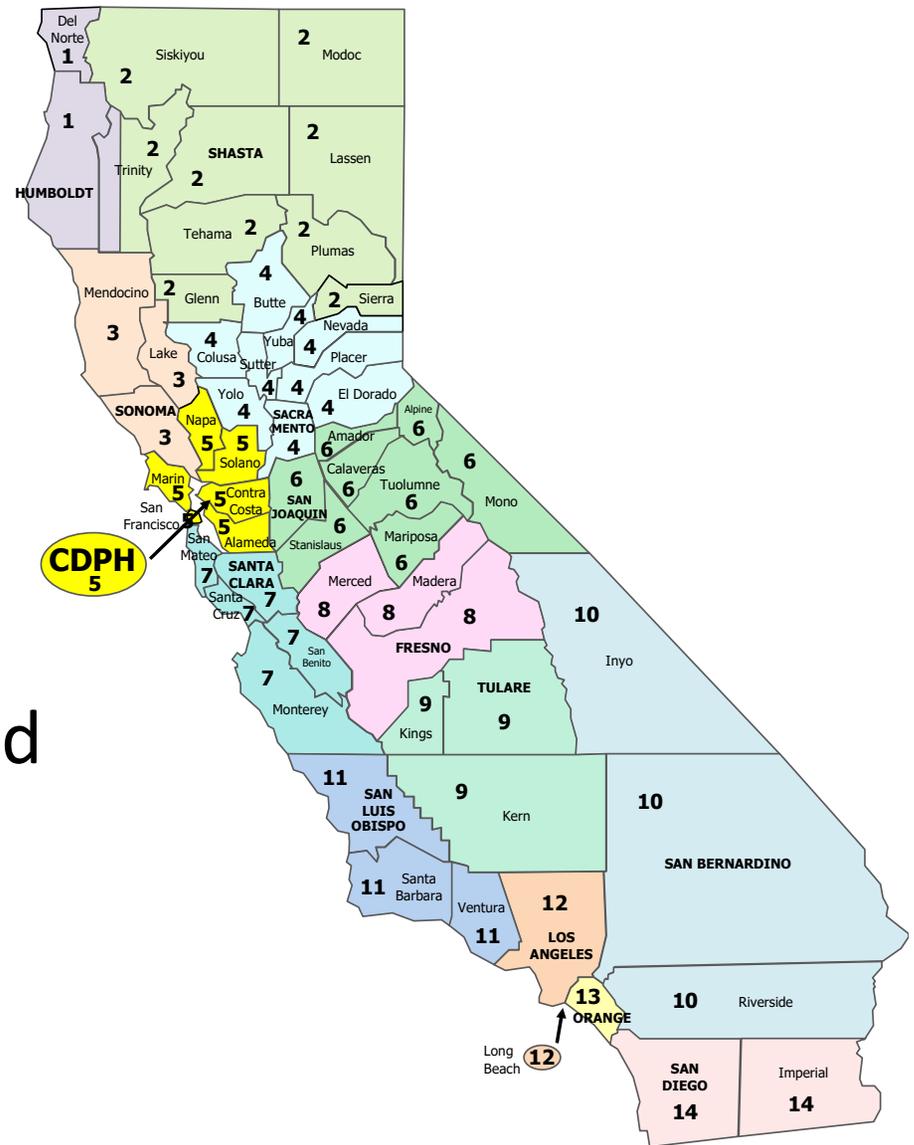
specimens LRN-B member laboratories tested for potential threat agents in 2017

Laboratory Response Network



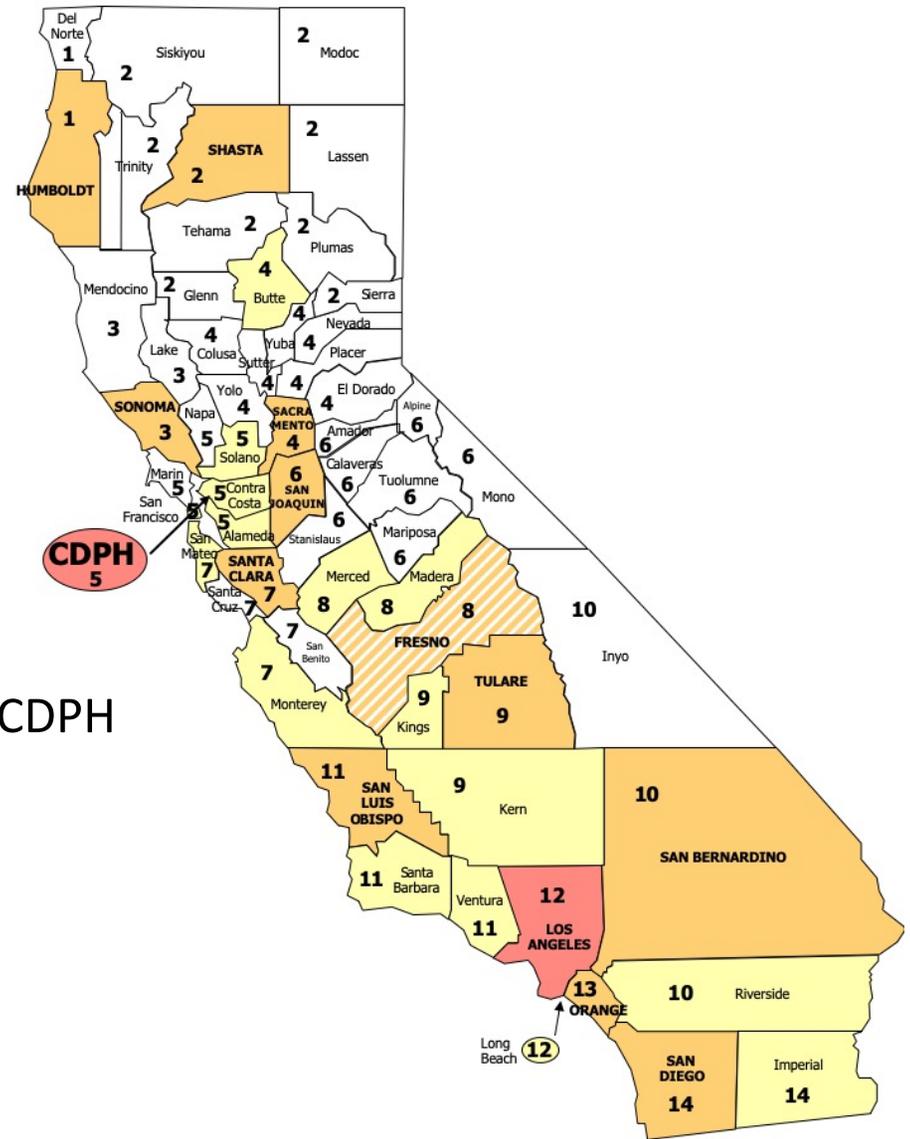
California's Laboratory Response Network

14 Catchment Areas organized around Public Health Reference Laboratories



California's Laboratory Response Network

- Tier 1 Advanced State Public Health Lab – CDPH
- Advanced Local Public Health Lab – LA
- Reference Local Public Health Labs – 12
- Sentinel Local Public Health Labs – 16

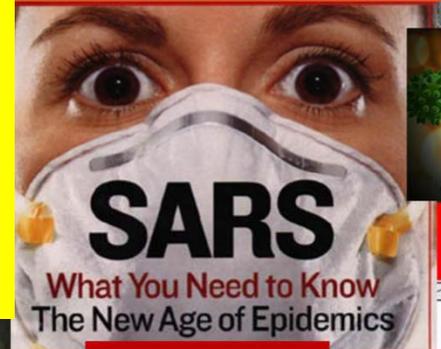


EMERGING Diseases



Candida auris:
A drug-resistant germ that spreads in healthcare facilities

Novel Influenza A Viruses



RE-EMERGING Diseases

Hepatitis A Hepatitis A outbreaks between Jan. 2016 - July 2017

Do You Remember the
MEASLES

Shiga toxin producing
E. coli (STEC) O157



DRUG-RESISTANT NEISSERIA GONORRHOEAE

246,000	11,480	180,600
DRUG-RESISTANT GONORRHEA INFECTIONS	WOMEN SUSCEPTIBILITY TO EXTENSIVE	WOMEN SUSCEPTIBILITY TO EXTENSIVE
820,000	2,460	WOMEN SUSCEPTIBILITY TO EXTENSIVE
CONDOMS, INFECTIONS PER YEAR		

VALLEY FEVER

The fungus that causes valley fever (*Coccidioides immitis*) grows one way in the ground and another way in an infected person or animal.

- 1 Valley fever fungus grows in dry, sandy soils in parts of the Southwest.
- 2 Living fungal spores take flight. Wind and other disruptions release the spores into the air. The spores' wings allow them to travel long distances.
- 3 Once airborne, the spores can be easily inhaled. In the lungs, the spores change form once more. They become balls called spherules. They are filled with baby spherules that are released.

LEGIONNAIRES' DISEASE



Mumps

Syphilis

ABOUT	SYMPTOMS	TREATMENTS
Sore	Body rash	After inter organ
Stage 1 3-90 days after exposure	Stage 2 4-10 weeks after initial infection	3 in

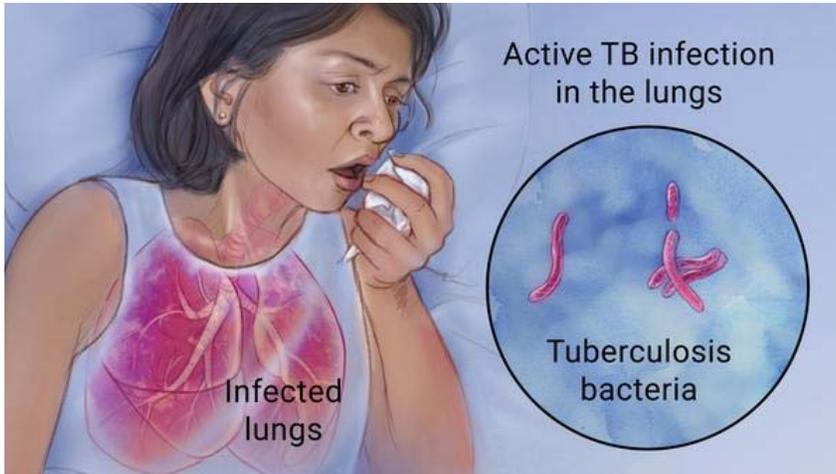
ENTEROVIRUS D68

Acute Flaccid Myelitis

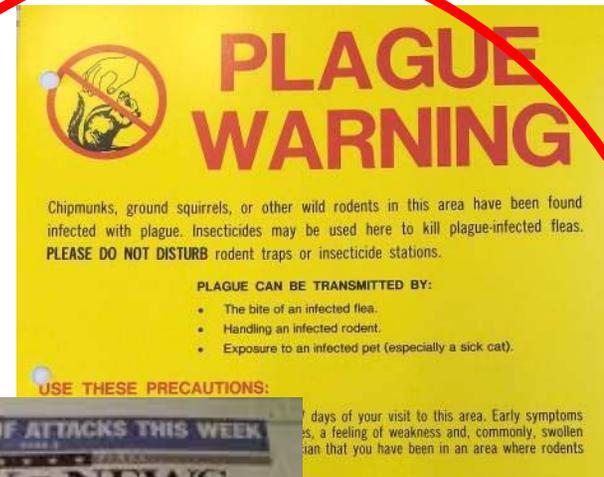
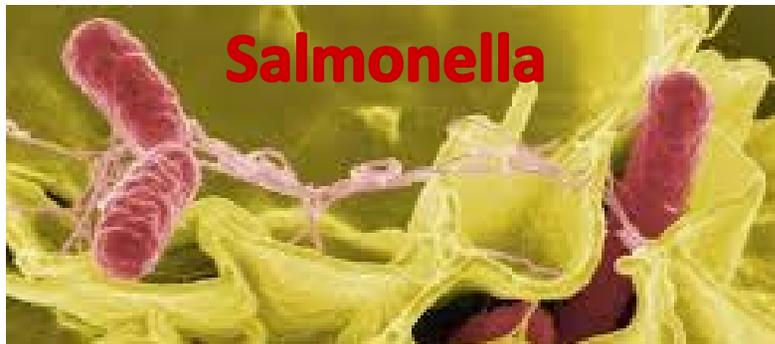


Diseases – continuing threats

Tuberculosis (TB)

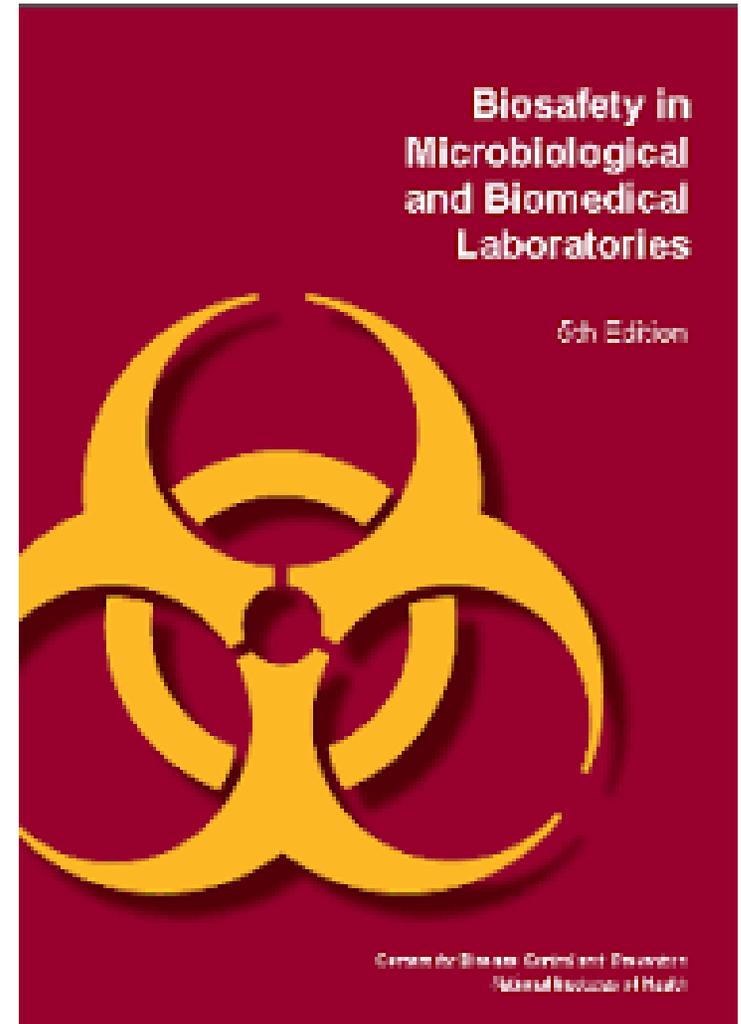
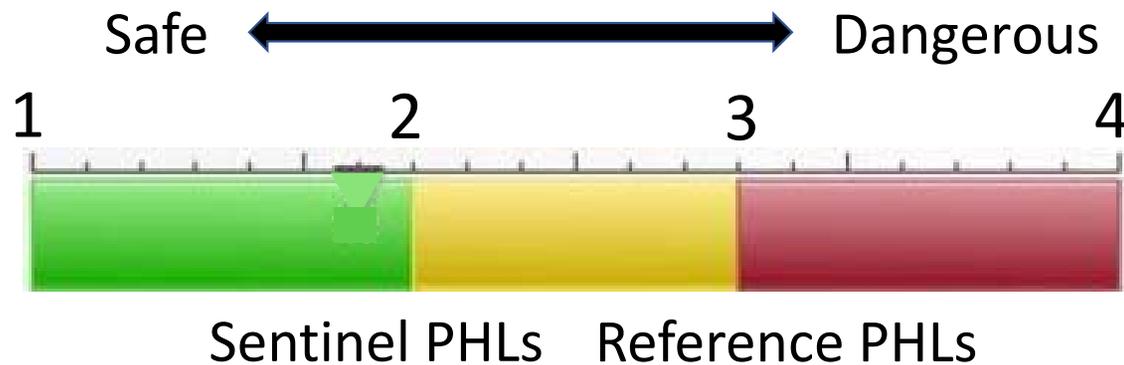


Multi-Drug Resistant (MDR) TB
Extremely Drug Resistant (XDR) TB



BIOSAFETY LEVELS

- Biological organisms (viruses, bacteria, fungi, parasites) can cause disease
- Biosafety level assigned according to:
 - Contagiousness
 - Difficulty to cure

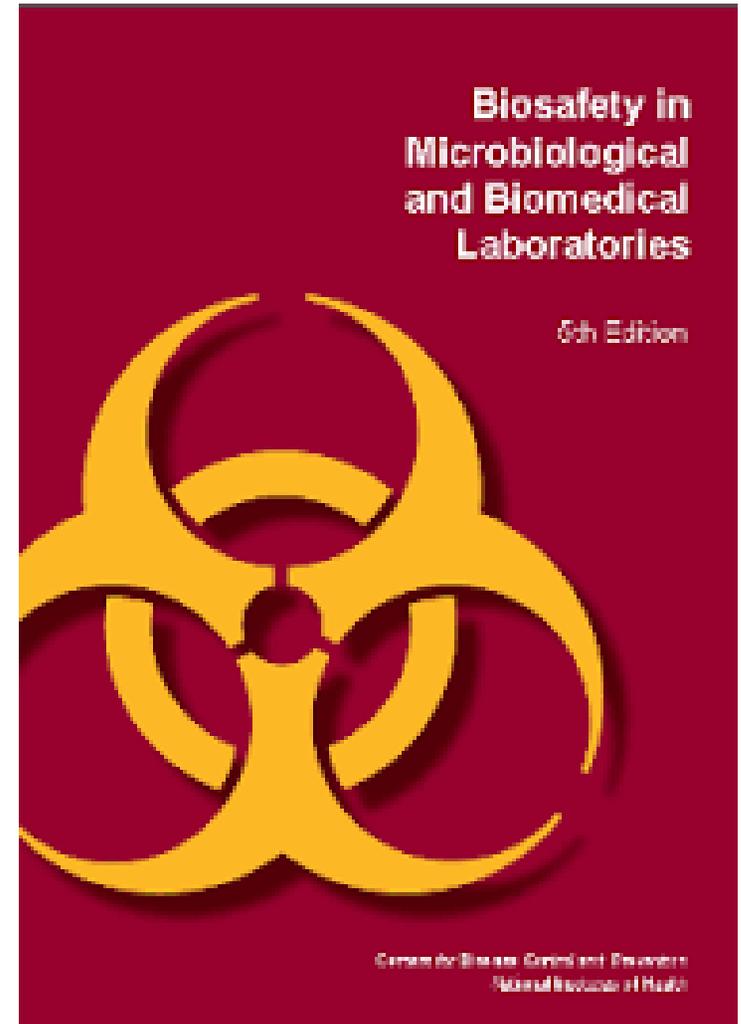
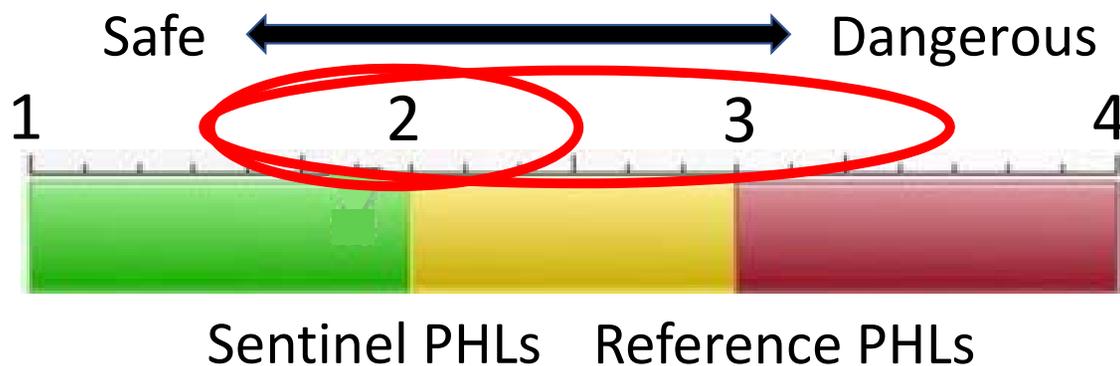


Biosafety levels: Pathogens

Pathogen	Ability to spread	Risk of death or disability	Biosafety Level
HIV	Low	Medium but treatable	2
Tuberculosis	Medium	High but treatable if diagnosed early	2+
Measles virus	Very high	High but preventable with vaccine	3
Avian influenza H5N1, SARS corona virus	Medium	High	3+

BIOSAFETY LEVELS

- Biological organisms (viruses, bacteria, fungi, parasites) can cause disease
- Biosafety level assigned according to:
 - Contagiousness
 - Difficulty to cure



California Laboratory Response Network

BSL-2+

- | | |
|-----------------|--------------------------------|
| 1. Alameda | 10. Monterey |
| 2. Butte | 11. Napa-Solano-
Yolo-Marin |
| 3. Contra Costa | 12. Riverside |
| 4. Imperial | 13. San Francisco |
| 5. Kern | 14. San Mateo |
| 6. Kings | 15. Santa Barbara |
| 7. Long Beach | 16. Ventura |
| 8. Madera | |
| 9. Merced | |

BSL-3+

- | | |
|-------------------|---------------------|
| 1. CDPH* | 9. San Joaquin |
| 2. (Fresno) | 10. San Luis Obispo |
| 3. Humboldt | 11. Santa Clara |
| 4. Los Angeles* | 12. Shasta |
| 5. Orange | 13. Sonoma |
| 6. Sacramento | 14. Tulare |
| 7. San Bernardino | |
| 8. San Diego | |

* Advanced-level laboratories

Biosafety levels: Protective equipment

2



Safety Goggles or Glasses

Lab Coat or Long Sleeves

Gloves

Long Pants

Closed-toe Shoes

+ wash hands

3



+ change clothes

4



+ full chemical disinfection

Biosafety levels: Facilities

2



Open bench

3



Solid & liquid containment

4



Complete air containment

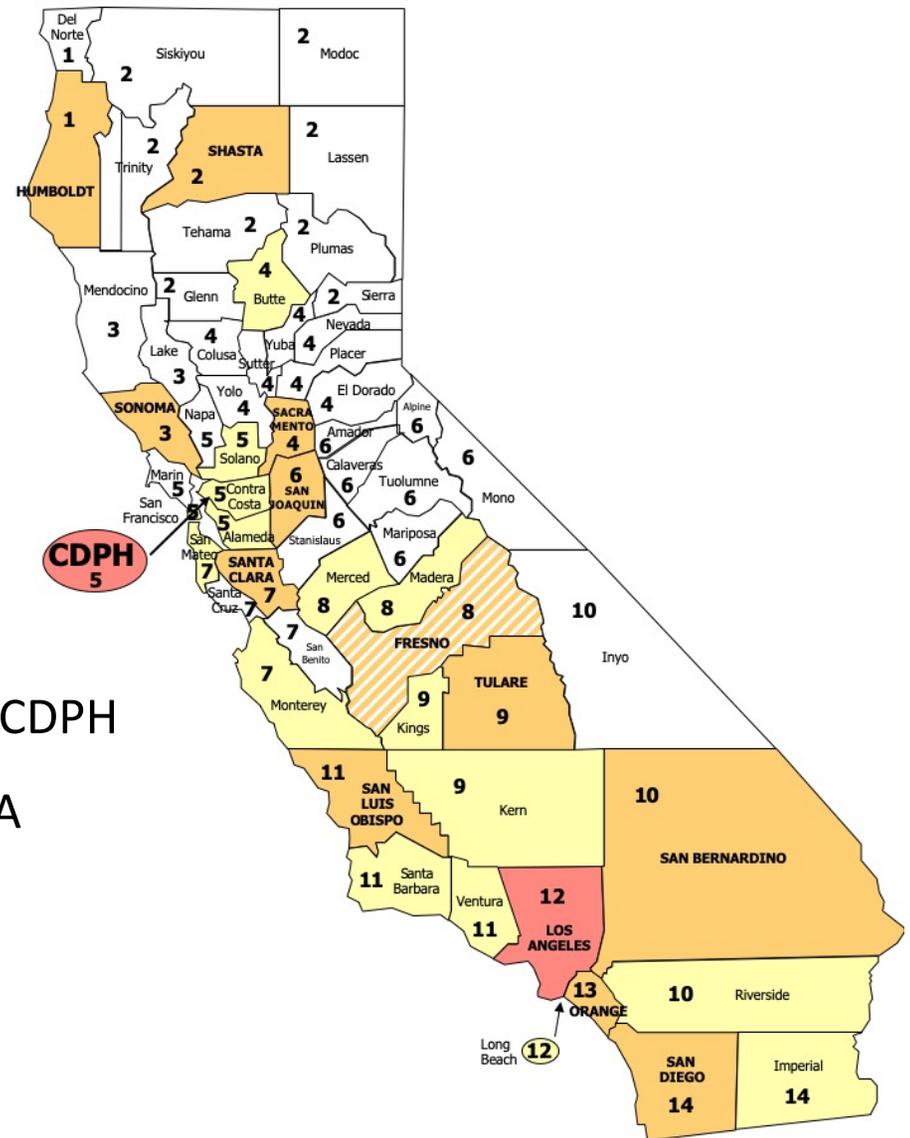
Laboratory Response Network (LRN) protects Biosafety & Biosecurity

- Maintain specialized facilities and lab tests
- Train personnel
- Practice with exercises and proficiency tests
- Provide training and guidance for hospital and clinical laboratories

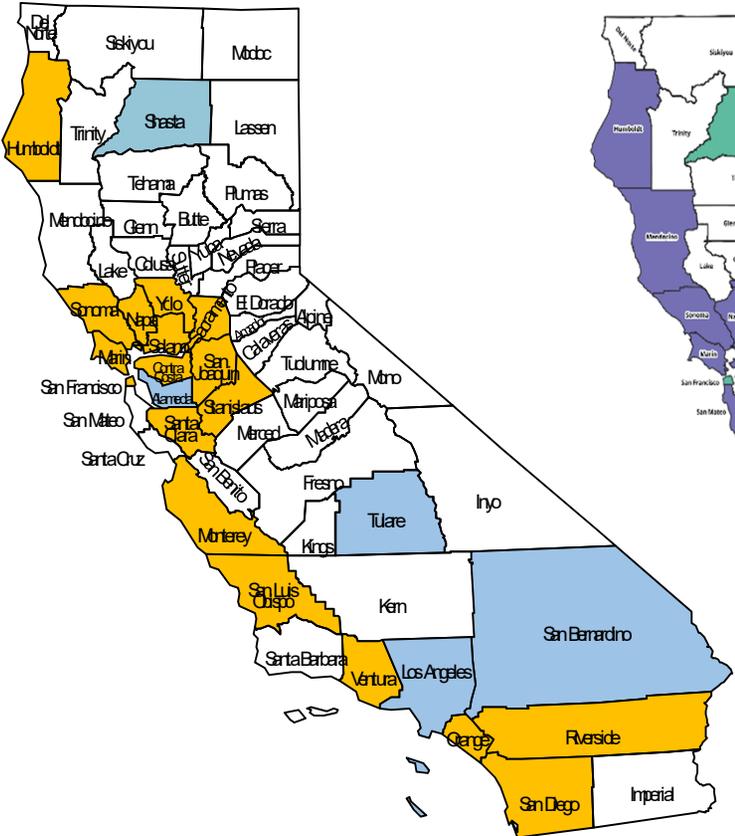


California's Laboratory Response Network

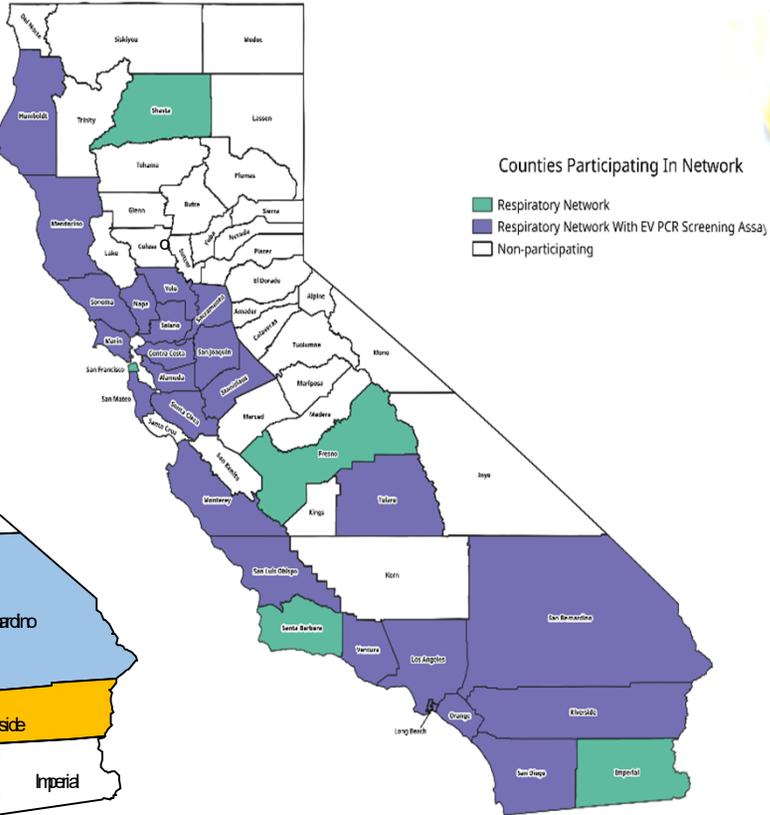
- Tier 1 Advanced State Public Health Lab – CDPH
- Advanced Reference Public Health Lab – LA
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- Sentinel Local Public Health Labs – 16



California's PHL Networks



MeaslesNet & MumpsNet



Respiratory (Influenza)

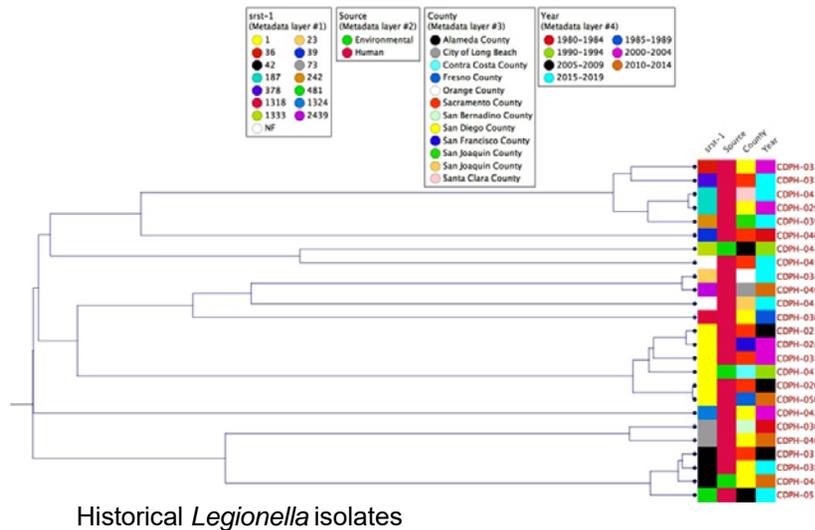
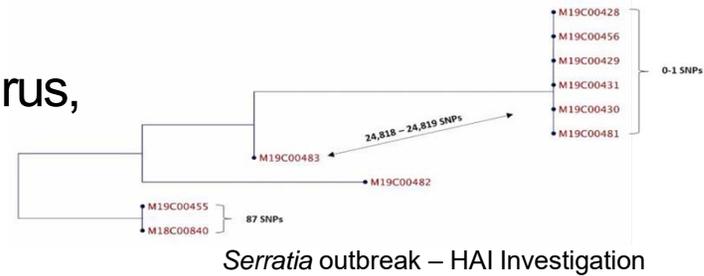


National Foodborne Disease Surveillance
PulseNet

FoodNet, NoroNet, RabiesNet, WNV/Zika and more

New Technologies

- Whole Genome Sequencing (WGS) and Next Generation Sequencing (NGS)
- PulseNet, TB, Shigella, Influenza, Norovirus, Measles, Hepatitis A
- Technical consultation for WGS wet lab applications and data analysis



Google images

LRN Infrastructure: Best Practices

- Network for disease surveillance and outbreak detection
- Standardized methods & equipment through regularly updated lab protocols and communications with Sentinel and Reference PHLs
- Functional redundancy
- Communication and collaborations among different jurisdictions
- Resource for guidance and training
- Relationships with local clinical labs
- Relationships with first responders
- Important for PHLs to be involved in preparedness exercises and Homeland Security drills to maintain communication and contacts

Frequently asked questions

- How many BSL-4 labs are there in California?
 - None
 - Only 14 Advanced BSL-3 laboratories in the US
- Can we borrow a BSL-3 lab in an emergency?
 - Unless everything is exactly the same, would need days-weeks to start testing
 - Clinical regulations (CLIA) require test validation, equipment verification and personnel competency for any changes



Questions?

California Laboratory Response Network (LRN-B) Reference Laboratory Catchment Areas

