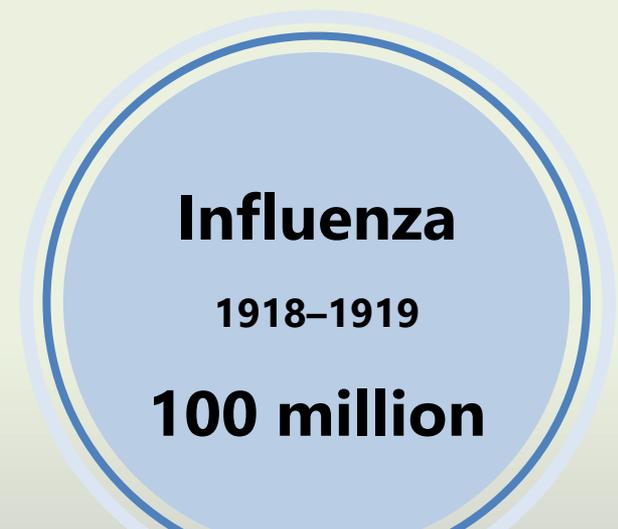
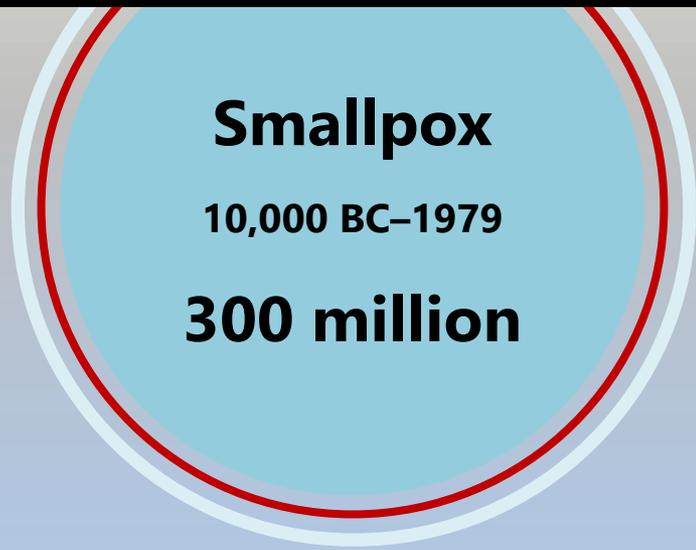


# Diagnosing Infectious Disease





**Emerging pathogens threaten global health**

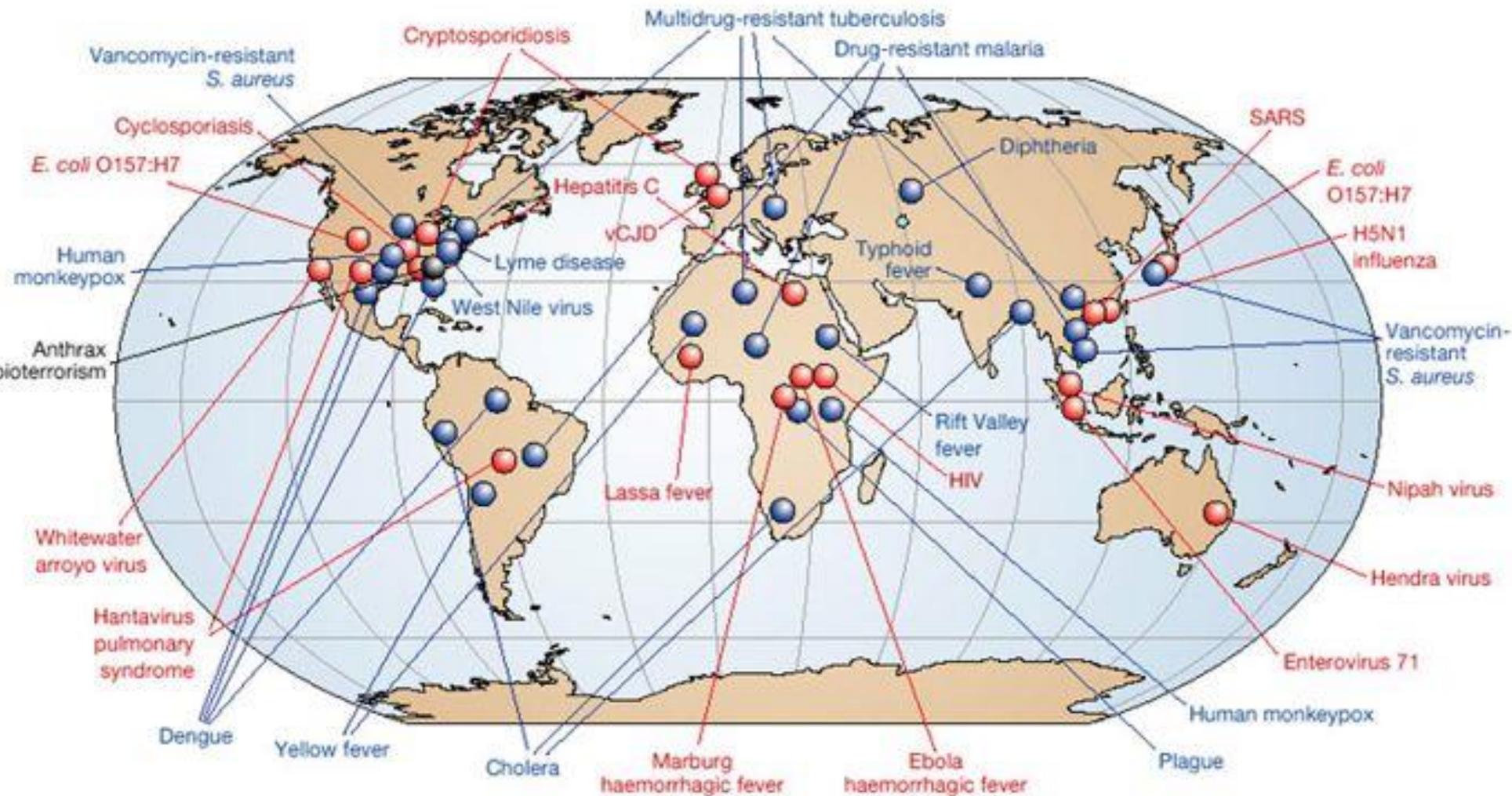


# The Need



Rapid. Agnostic. Deployable. Simple.





**It is impossible to have specific and targeted diagnostics and therapeutics for all emerging pathogens!**

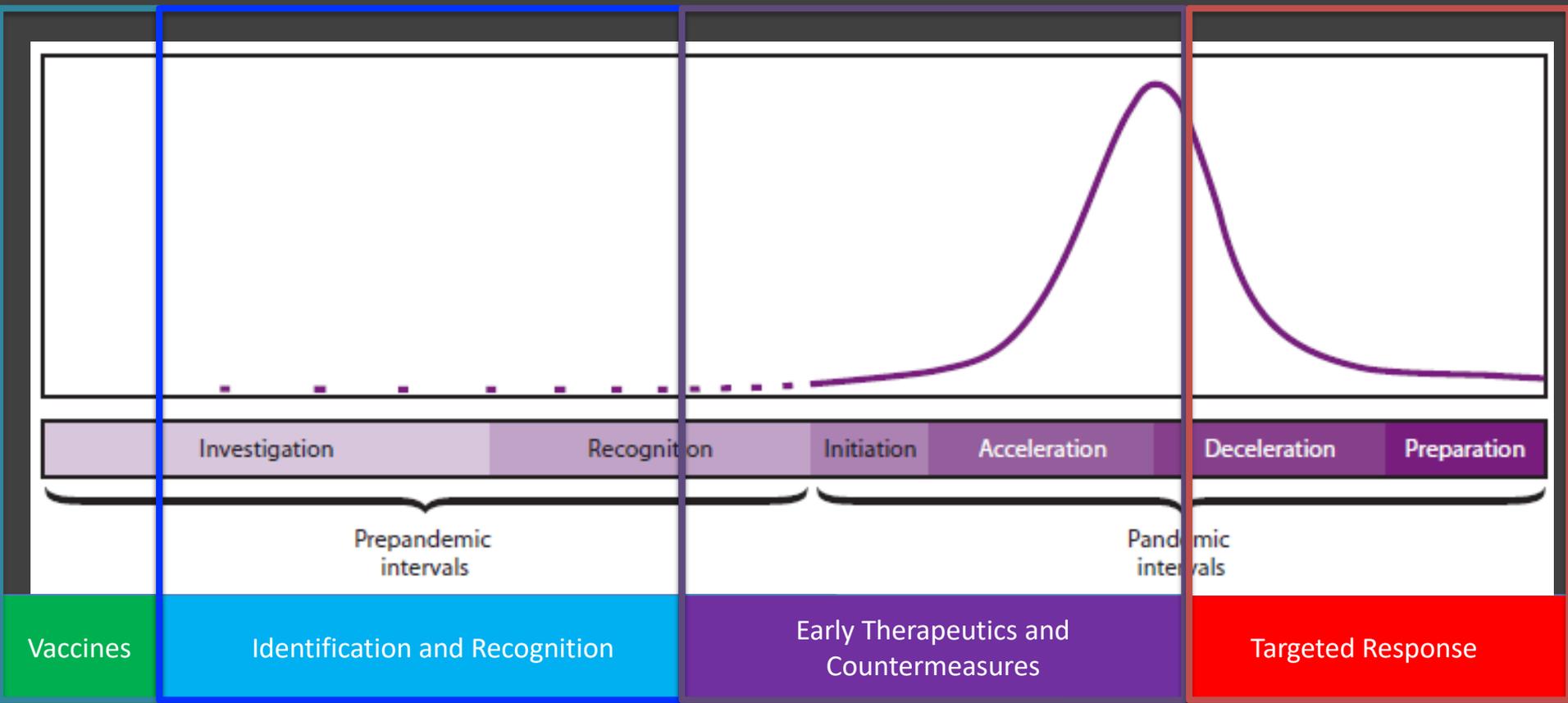
# The Challenge

- Sample?
- Assay?
- Target?
- Resources?

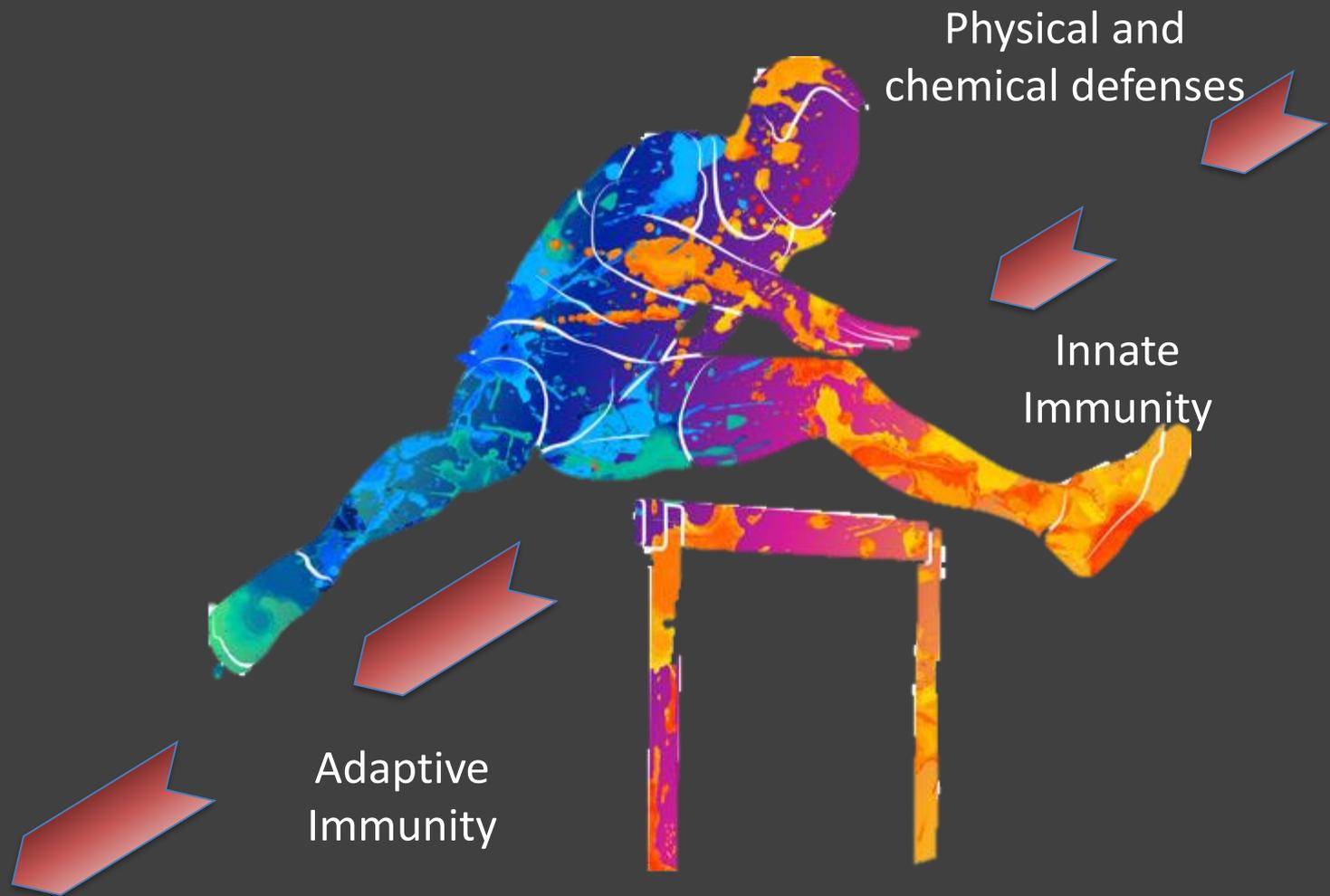


Consider the end-user, the real-world application

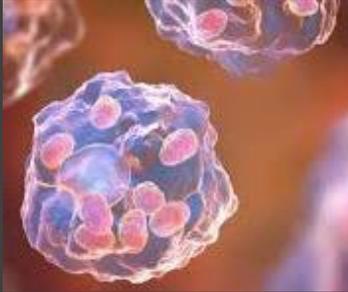
# Combating Emerging Infectious Disease



Timeliness of discovery, validation, scale-up production and deployment



## Innate Immunity



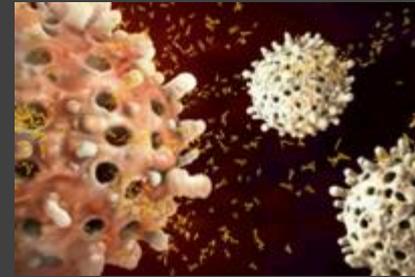
Immediate response

Universal, but discriminates self from foreign

Limited specificity and diversity

No memory

## Adaptive Immunity



Delayed response

Universal, but discriminates self from foreign

Excellent specificity and diversity

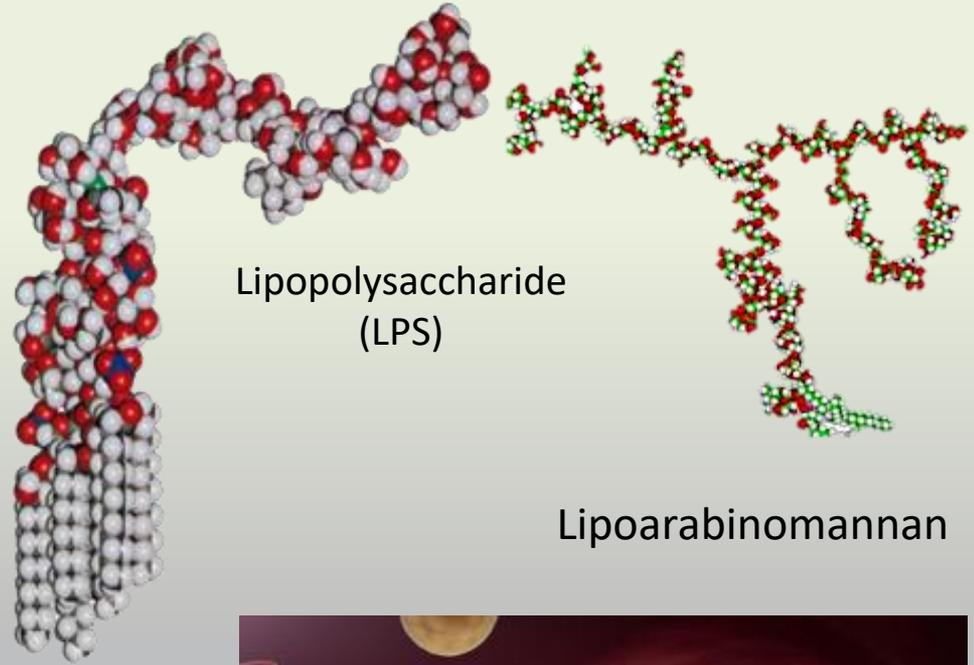
Memory

**A Layered Response to Invading Pathogens**



# Advantages

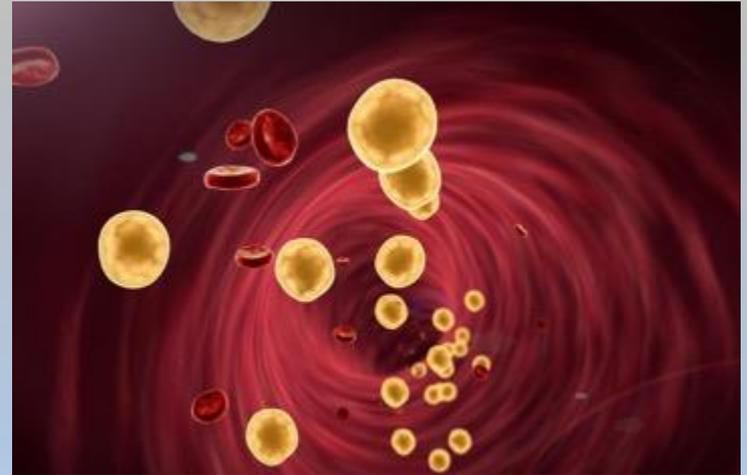
- A single sample – blood
- Early diagnosis - guide treatment, monitor prognosis
- Universal
- Human and veterinary application
- Exposure from infection, bacterial from viral



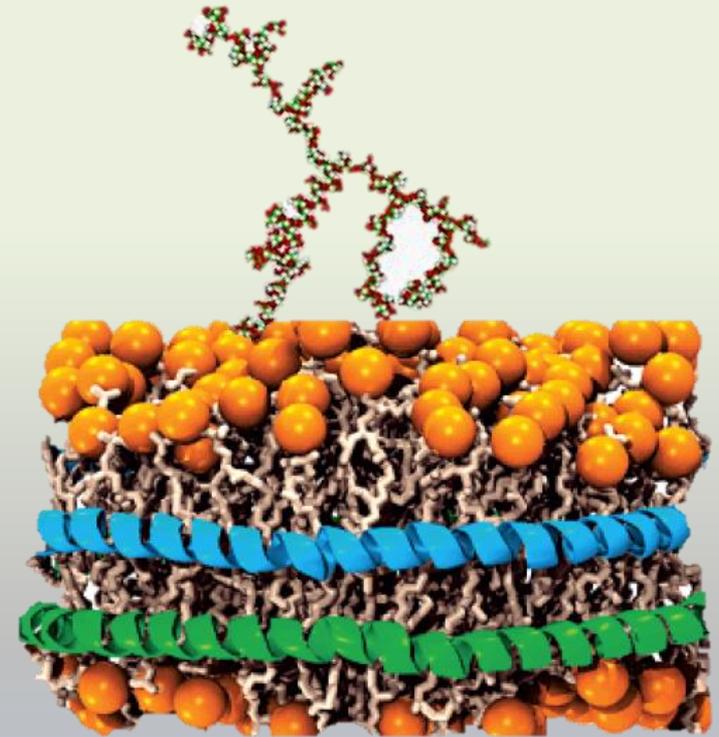
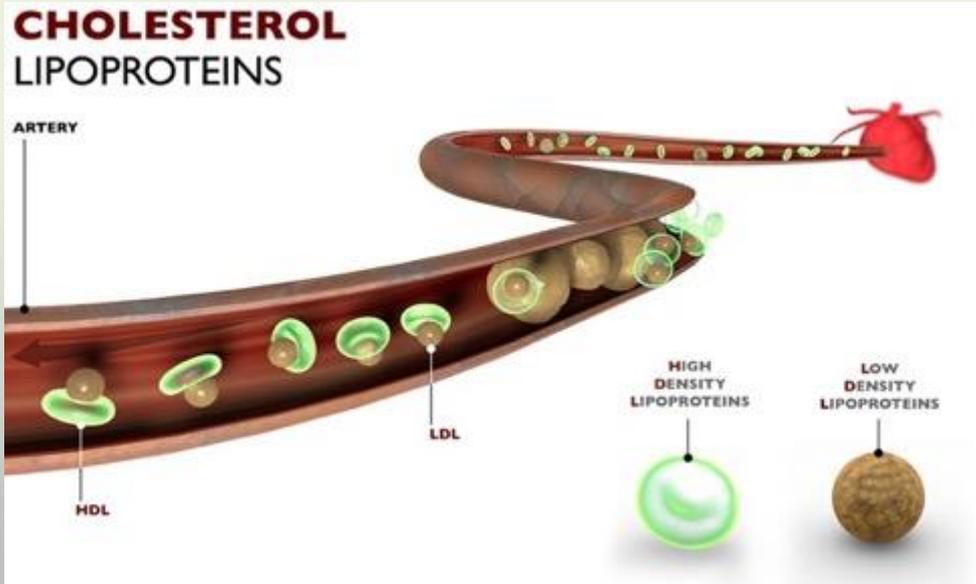
# Challenges

- *The targets are amphiphiles – greasy sticky molecules*

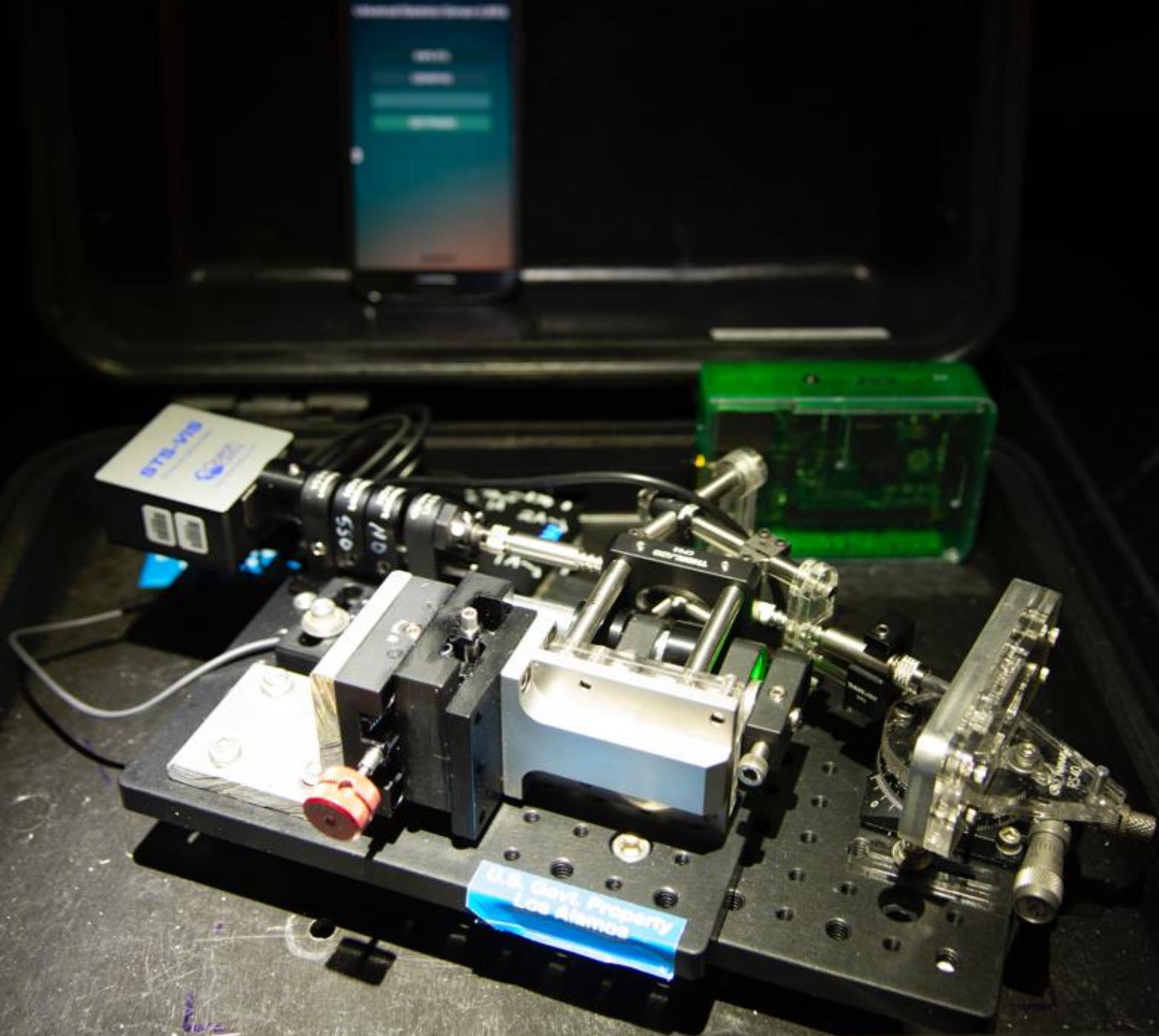
***Oil and water do not mix!!***



# HDL and LDL carry these guys in blood....



*A Biological Taxi Service*

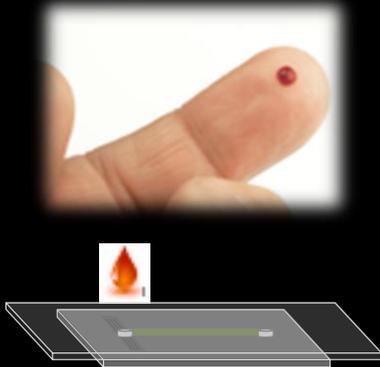


U.S. Govt. Property  
Los Alamos

# A Universal Bio-Sensor

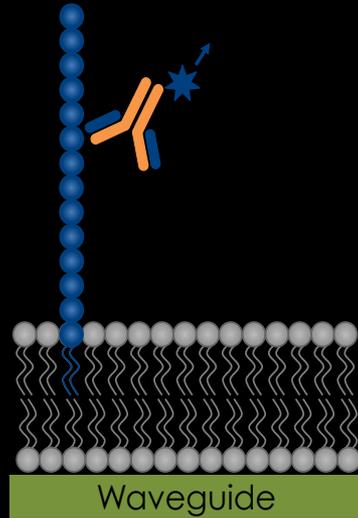
1

drop of blood  
applied to  
assay cartridge



2

bacterial  
assay  
performed



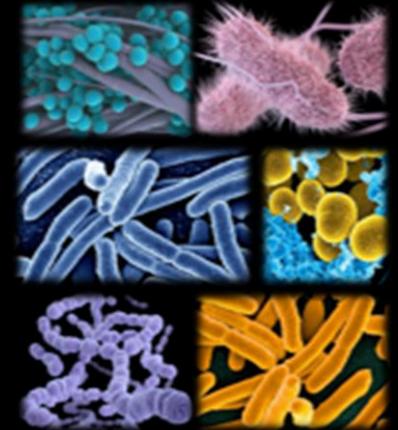
3

measurement  
taken in  
sensor



4

infection  
result  
displayed



# Validation in the Real world



## Salmonella infection

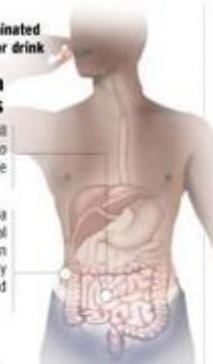
Almost any kind of food or beverage can carry the bacteria that causes salmonella infection, although meat and eggs the most are common sources.

Contaminated food or drink

### How salmonella progresses

Bacteria travel to small intestine, adhere to lining, begin life cycle

In severe cases, bacteria break through intestinal wall to bloodstream; can be deadly if not properly treated



### Symptoms

**Within 12-72 hours**  
Nausea, vomiting, fever, diarrhea, abdominal cramps

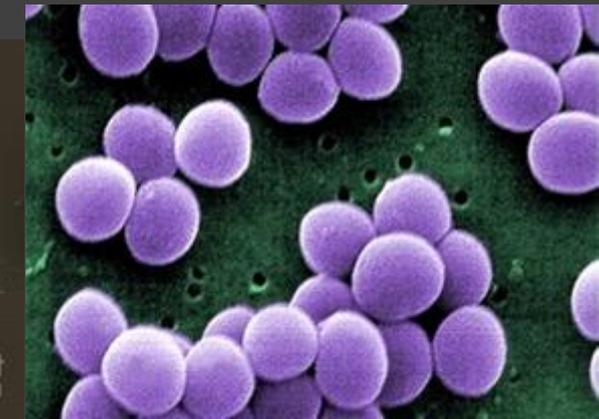
**4-7 days** Illness ranges from mild to severe; most people recover without treatment

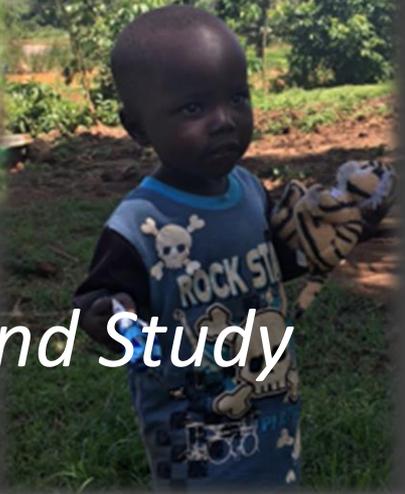
**Severe cases** More likely with infants, elderly, people with impaired immune systems

### Treatment

Oral or injected antibiotics, usually for 2 weeks

Source: U.S. Food and Drug Administration, Current Medical





*Thank you!  
Sponsors, Collaborators, Advisors, and Study  
Participants*

