

The background of the slide is a microscopic image of Naegleria fowleri cells. The cells are numerous and appear as small, pear-shaped organisms with a large, central nucleus and a smaller, eccentric nucleus. They are stained with a purple dye, likely Giemsa or Wright's stain, which highlights the nuclei. The cells are scattered across the field of view, with some showing more prominent features than others.

# LAMP for detection of *Naegleria fowleri* at point of care

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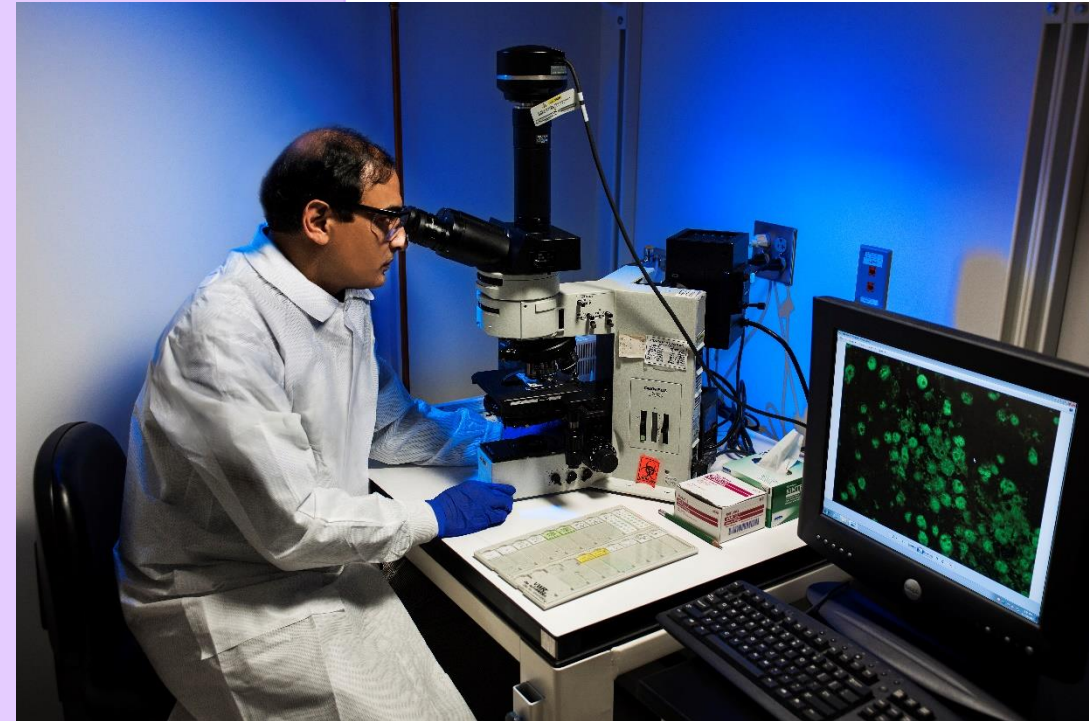
Jennifer Cope, MD, MPH

Ibne K. Ali, PhD



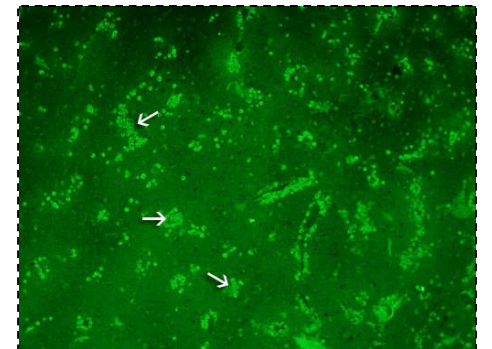
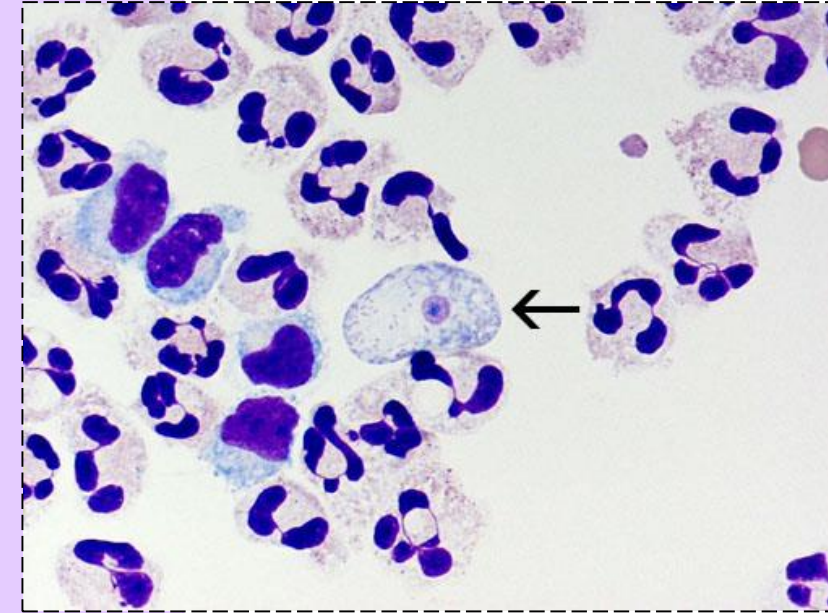
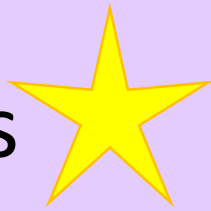
# Background

- 4 survivors in U.S.
- Rapid diagnosis was a key factor for survival (between 2-3 days)
- CDC national reference lab



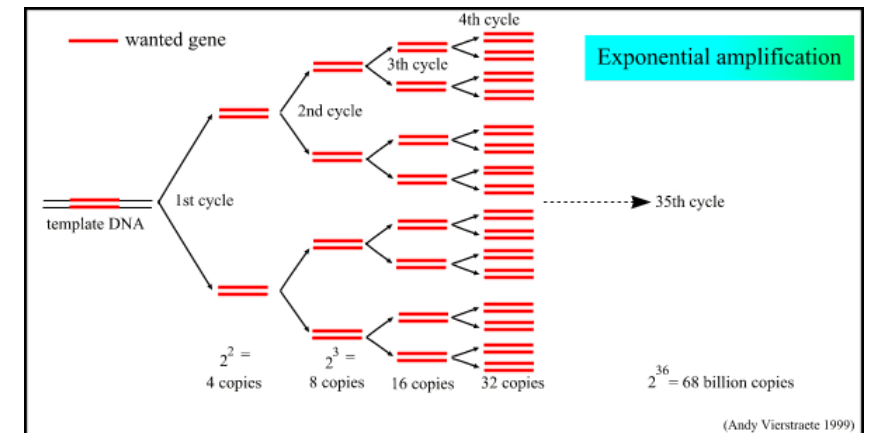
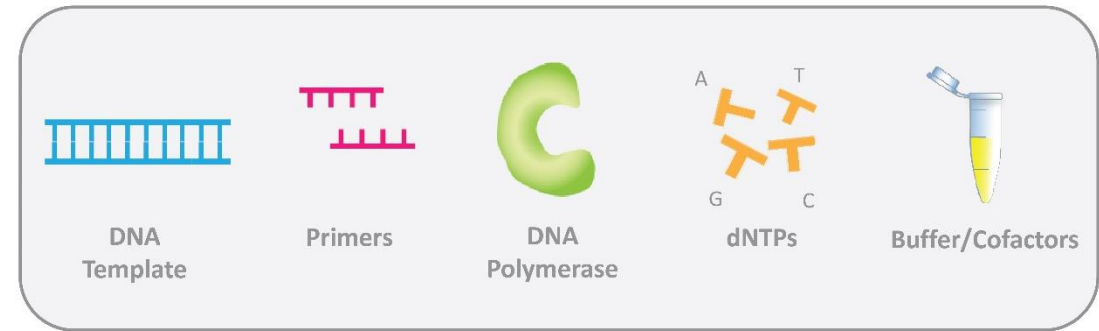
# Diagnostic methods

- Microscopy
- ELISA
- Immunohistochemical (IHC) assays
- Indirect immunofluorescence (IIF) assays
- PCR assays



# PCR?

- Polymerase chain reaction
- Amplifies target DNA



# Gold standard PCR

Free-living ameba (FLA)  
real-time PCR



- ✓ Reasonably fast ~3 hours
- ✓ Sensitive (LOD: ~1 ameba/reaction)
- ✓ Specific
- ✓ Reliable

# Why we need a new diagnostic test

## FLA real-time PCR disadvantages

- Only available in reference and research laboratories
- Requires a relatively complex DNA extraction step
- Requires expensive real-time PCR instrument
- Real-time PCR and data analysis requires expertise

Not suited in  
hospital settings

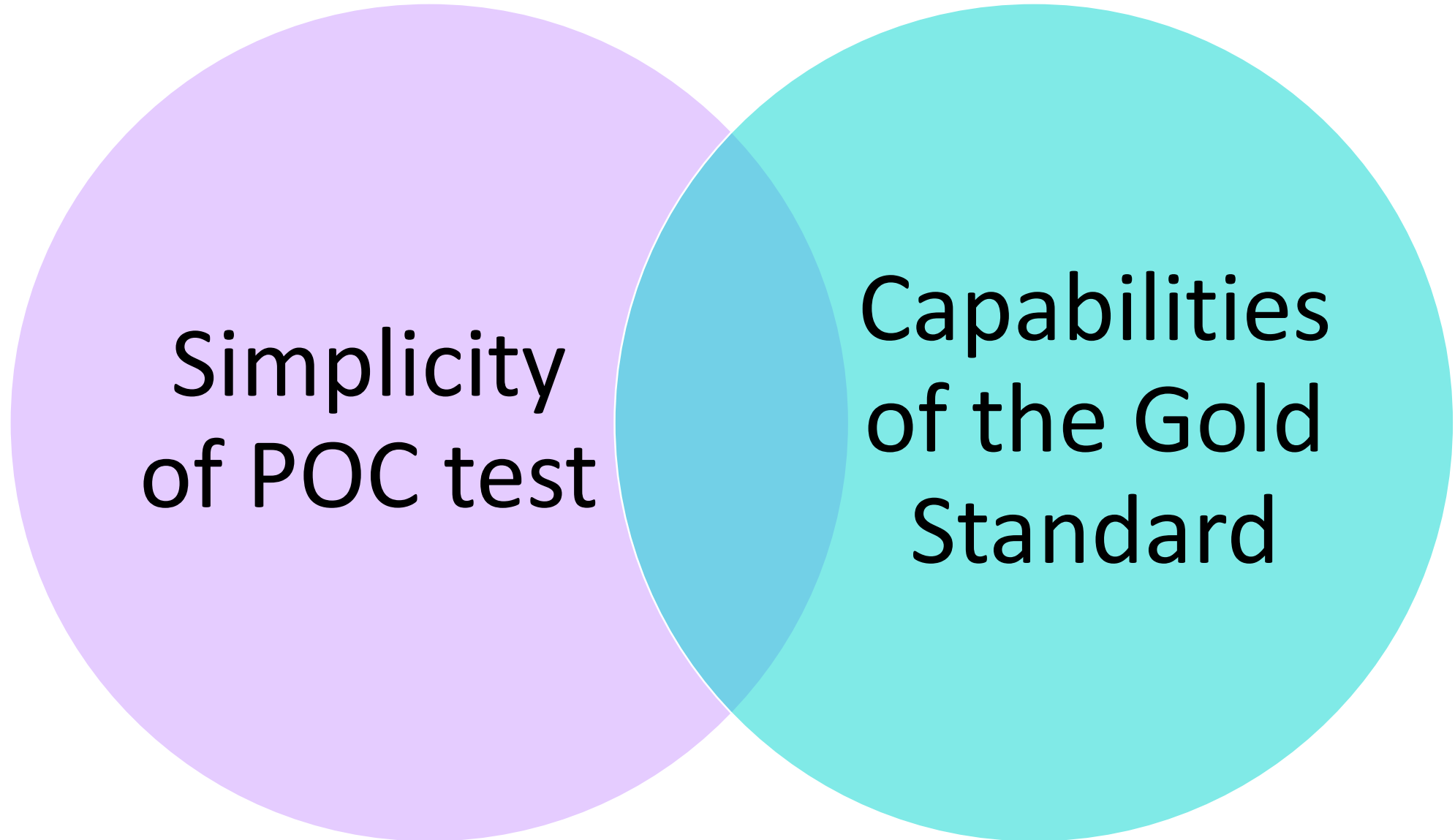
**Solution: Point-of-Care (POC) test**

# Common point-of-care tests



Any test that is performed at or near the patient or generally in a healthcare setting and not in a lab

# Why LAMP as POC?





# LAMP Assay

Loop mediated isothermal amplification assay



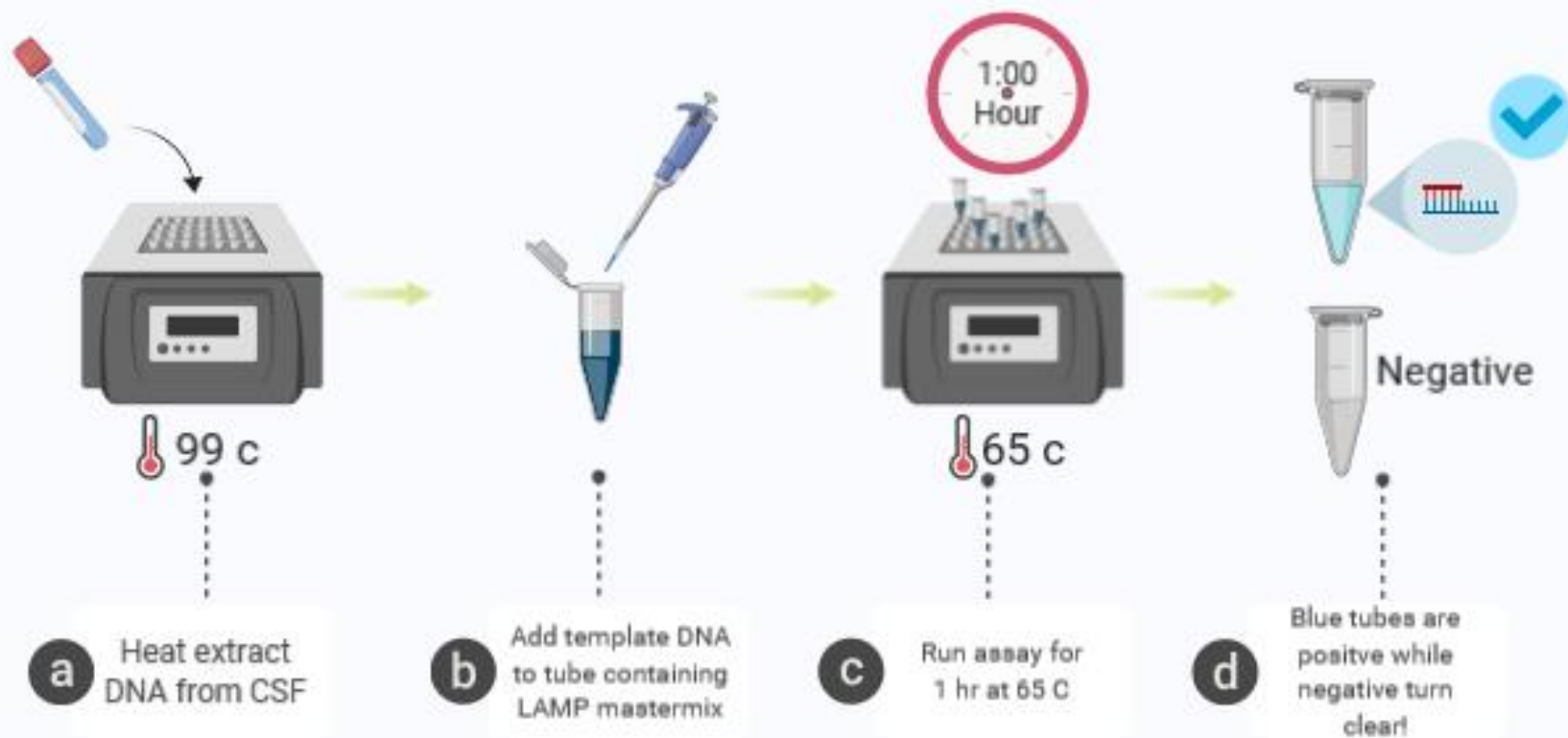
Results in ~1 hr

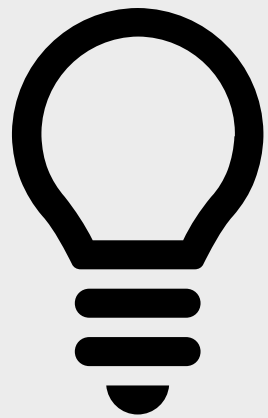
Single tube reaction

Colorimetric  
indicator

No special  
equipment

# *N. fowleri* LAMP Assay



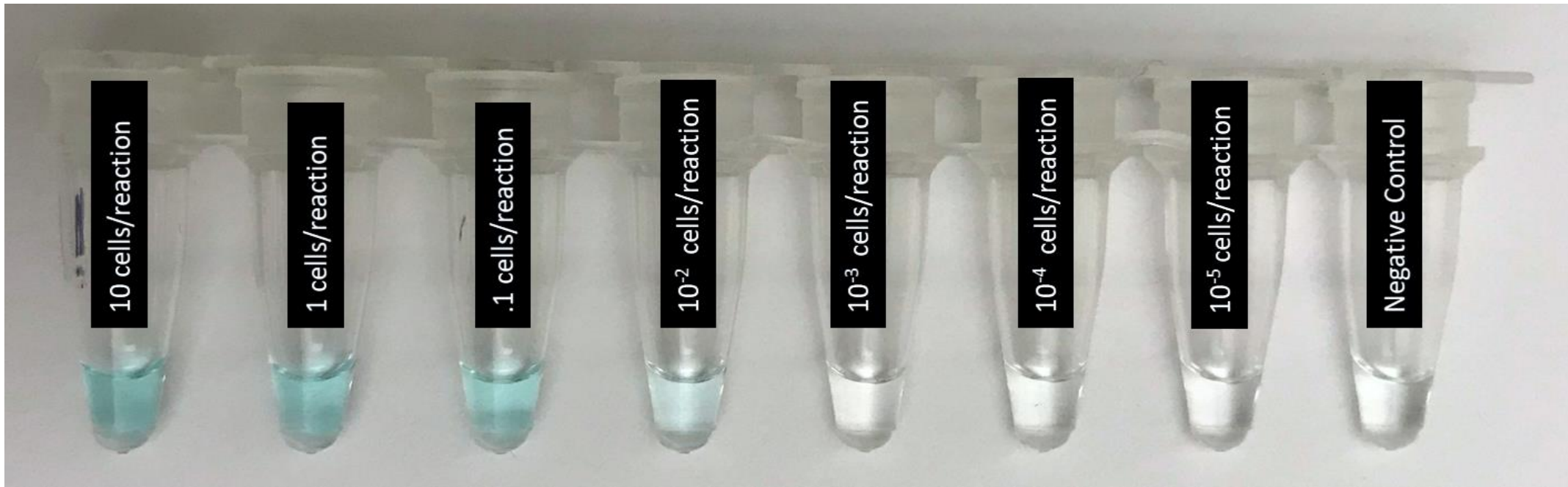


Does it work?

# Results: what you can expect from lamp?

**Limit of detection:** it can detect *N. fowleri* present at the same concentration as FLA real time PCR

**Specificity:** only cross reacts with *Naegleria Lovaniensis* due to overlap in target region



# Sensitivity and specificity: gold standard v. LAMP

Positive LAMP

Negative LAMP

**Positive**  
FLA real  
time PCR

9

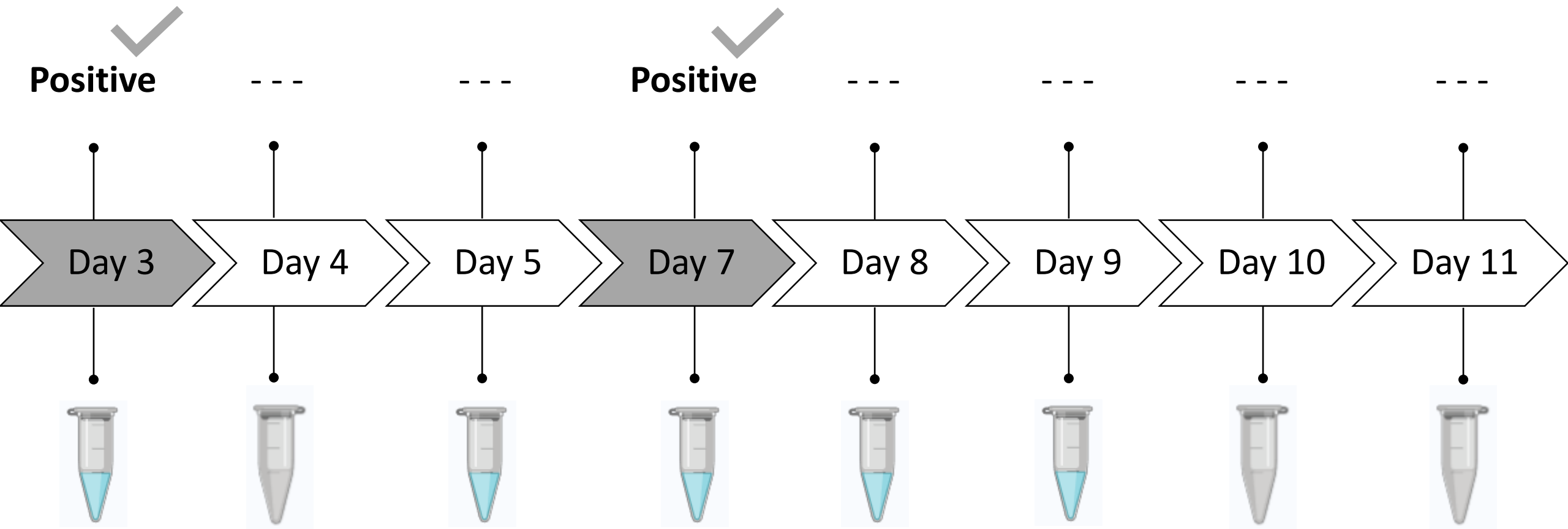
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**Negative**  
FLA real  
time PCR

0

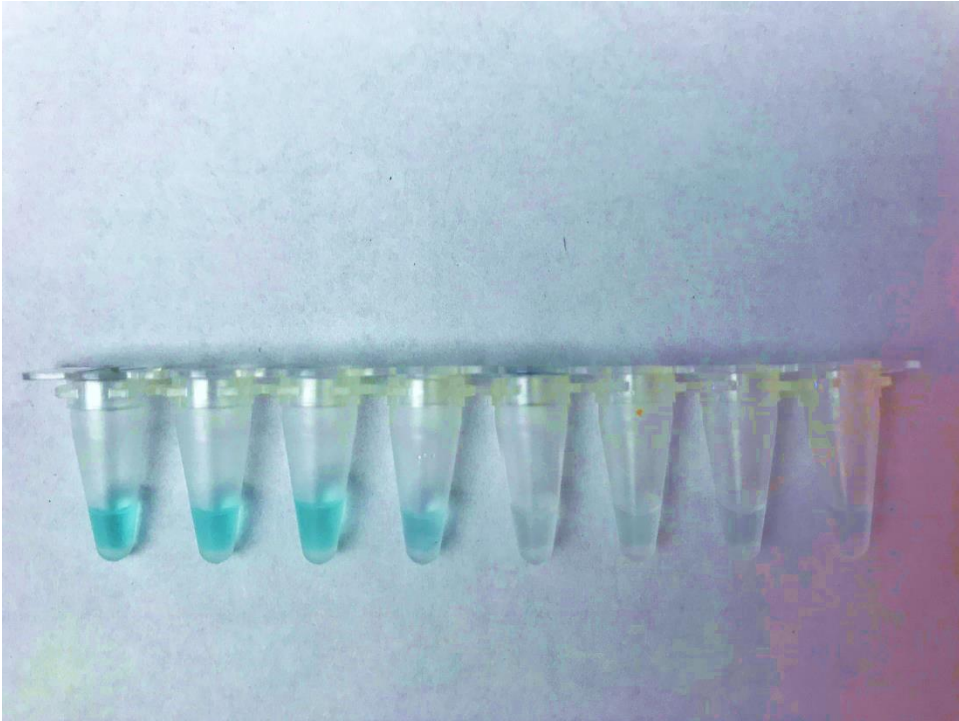
17

# FLA real-time PCR



LAMP Assay

# Benefits



- ❖ Time efficient
- ❖ Crude extraction method
- ❖ Easy to read
- ❖ Portable
- ❖ Inexpensive

# Ongoing work

- Preparing the tubes for distribution and testing in healthcare setting
- Evaluation of LAMP in hospital settings



# Acknowledgements

- Jordan Smelski and Kyle Lewis Foundations
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- CDC Biotechnology Core Facility

\*\*\*images created with BioRender @biorender.com

\*\*\*All other images from Google