



Multiplexed Detection Platform for Point-of-Service Testing of Zika Virus

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Outline

- ◆ Introduction
 - Zika virus (ZIKV)
 - Current methods

- ◆ Integrated methods for ZIKV detection
 - DNA-based genetic identification
 - Immunoassay-based detection

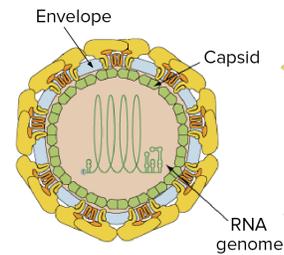
- ◆ Summary



Zika virus (ZIKV)

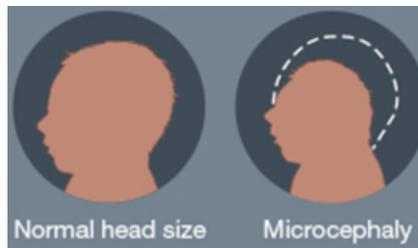
◆ ZIKV

- Mosquito-borne RNA virus
- Member of the genus Flavivirus



*ViralZone, Swiss
Institute of
Bioinformatics*

- ### ◆ Primary public concern of ZIKV infection
- Microcephaly in newborns



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CDC

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Challenges

- ### ◆ Similar symptoms with other virus infection
- Symptoms: fever, joint pains, rash, etc.
 - Viruses: dengue, chikungunya, etc.
 - Accurate ID for better clinical management
- ### ◆ Up to 80% asymptomatic*, thus difficult to
- Map transmission pattern
 - Safeguard blood supply
- ### ◆ Solution
- Low cost, easy-to-use, point of service (point of care) devices

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*Musso & Gubler, *Clin Microbiol Rev*, 2016, 29, 487–524

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FDA's Emergency Use Authorization

- ◆ Trioplex reverse transcription polymerase chain reaction (RT-PCR) assay
 - Serum or urine samples
 - Within 14 days after possible exposure (e.g., traveling to an infected region)
 - Positive: ZIKV, but negative: not rule out
- ◆ IgM antibody capture enzyme-linked immunosorbent assay (MAC-ELISA)
 - Serum or cerebrospinal fluid (CSF)
 - Day 4 after symptoms and continuing for 12 weeks
 - Negative: no ZIKV, but positive: not definitive

<http://www.cdc.gov/zika/index.html>

Integrated Method

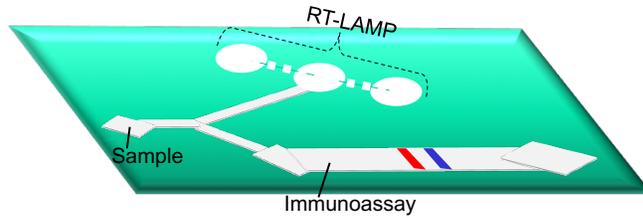
- ◆ Borrow from pregnancy test strips
- ◆ Create laminated paper-based analytical devices (LPAD)



Cassano, et al. *Microfluid Nanofluid.* 2013, 15, 173–181.

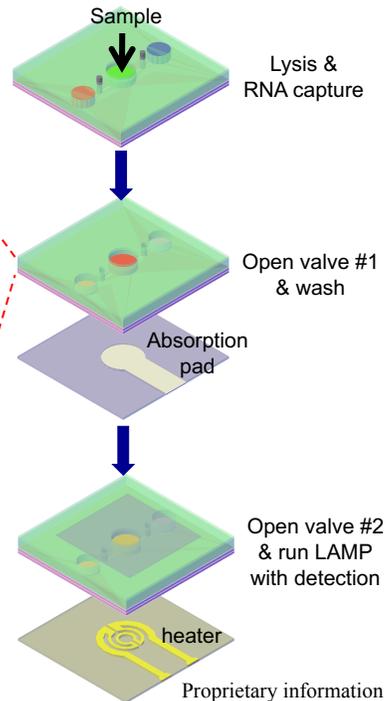
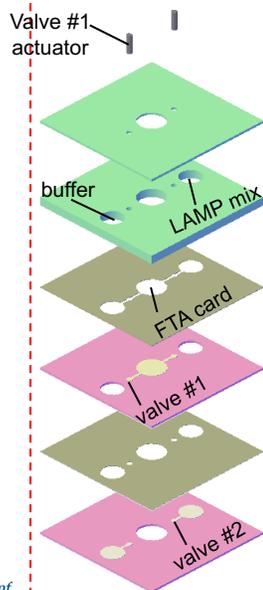
Liu, et al. *Anal. Chem.* 2013, 85, 10270–10276.

Platform for ZIKV Detection

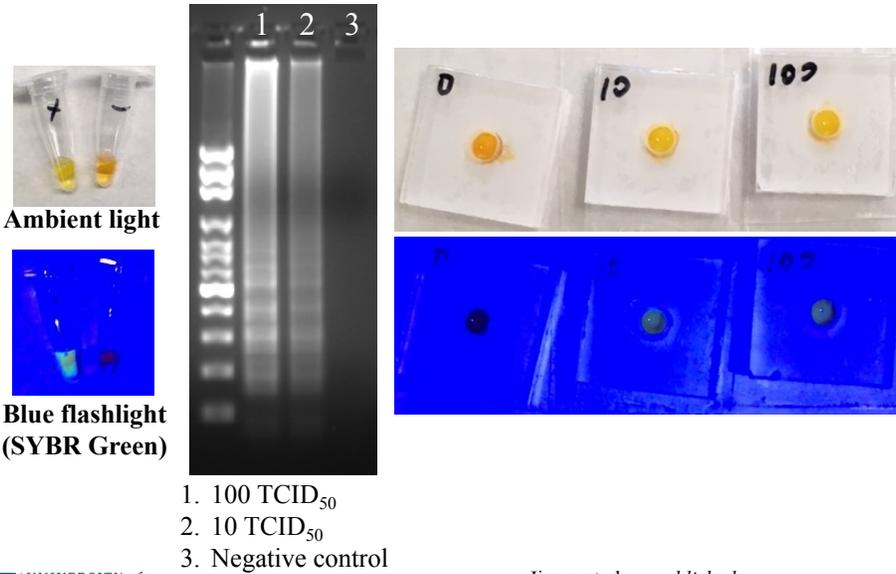


- ◆ Reverse transcription loop-mediated isothermal amplification (RT-LAMP)
 - Lower cost and easier to use because of isothermal DNA amplification reactions
 - More sensitive and faster due to loop primers

RT-LAMP Module



RT-LAMP Results (H1N1 Flu virus)

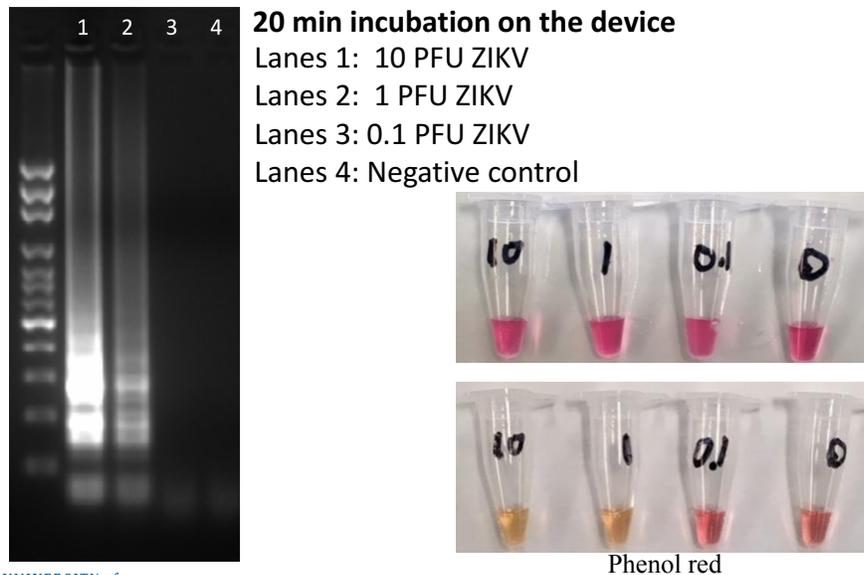


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Jiang, et al. *unpublished.*

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RT-LAMP Results (Puerto Rico ZIKV virus)



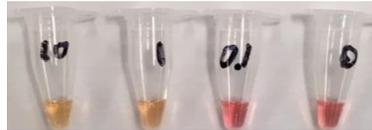
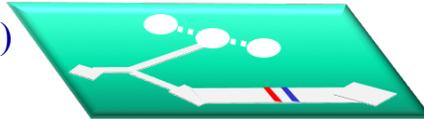
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Jiang, et al. *unpublished.*

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Summary

- ◆ A point-of-service testing platform in the field
 - Screen asymptomatic patients
 - Monitor possible ZIKV transmission
 - Safeguard the blood supply
- ◆ Integrated approach offers benefits in
 - Accuracy (less false + or -)
 - Testing window
- ◆ ZIKV has been successfully detected in devices using RT-LAMP



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