

Smartphone-Based Multiplex 30-minute Nucleic Acid Test of Live Virus from Nasal Swab Extract

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Rapid, sensitive and specific detection and reporting of infectious pathogens is important for patient management and epidemic surveillance. [1] We demonstrated a point-of-care system integrated with a smartphone for detecting live virus from nasal swab media, using a panel of equine respiratory infectious diseases as a model system for corresponding human diseases such as COVID-19. [2] Specific nucleic acid sequences of five pathogens were amplified by loop-mediated isothermal amplification (LAMP) on a microfluidic chip and detected at the end of reactions by the smartphone. Pathogen-spiked horse nasal swab samples were correctly diagnosed using our system, with a limit of detection comparable to that of the traditional lab-based test, polymerase chain reaction, with results achieved in ~30 minutes.

REFERENCES

[1] P. Yager, G. J. Domingo and J. Gerdes, *Annu. Rev. of Biomed. Eng.*, 10 (2008): 107-144.

[2] F. Sun, A. Ganguli, J. Nguyen, R. Brisbin, K. Shanmugam, D. L. Hirschberg, M. B. Wheeler, R. Bashir, D. M. Nash and B. T. Cunningham, *Lab on a Chip*, 2020.

FIGURES

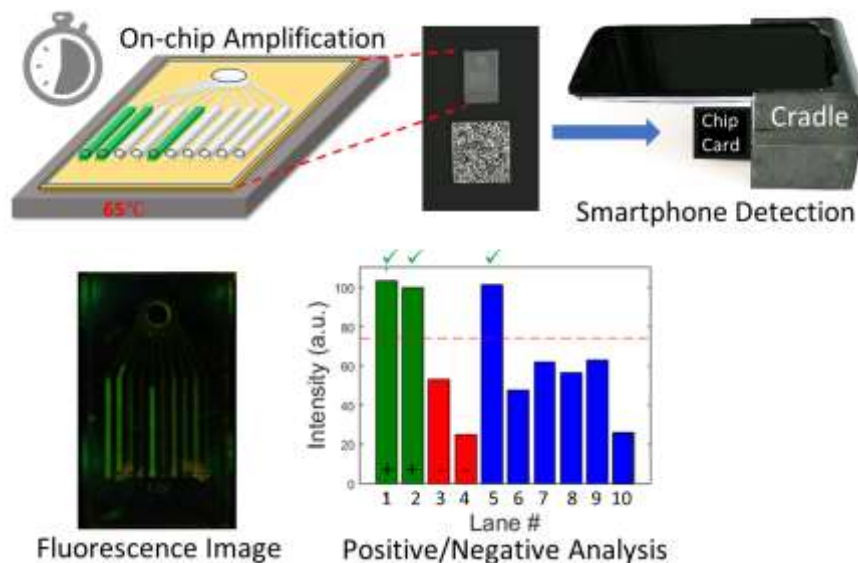


Figure 1: Detection protocol: extracted nucleic acids from samples will be mixed with fluorescence dye and LAMP reagents to perform 30-min amplification at 65 °C on a silicon microfluidic chip. The amplified chip will then be inserted into a customized detection cradle for fluorescence imaging by a smartphone. Qualitative results will be obtained by analysing fluorescence intensities in reaction channels.