In the field with Loop – mediated isothermal amplification (LAMP)

Dr Stacey Lynch BSc.(Hons) Ph.D.
Senior Research Scientist
Microbial Sciences, Pests and Disease
Agriculture Victoria Research

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Biosecurity supports food systems to prevent, respond and recover from pests and disease.

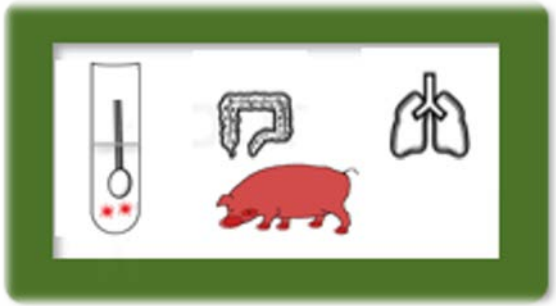
- **Underpinned by rapid detection of a pathogen**
- **LAMP (Loop-mediated isothermal amplification) detects a genome of a pathogen**
- **Adaptable and dynamic**
  - Varied pathogen genome
  - Different sample types (inc. environmental)
- **Fast detection**




Agriculture Victoria is working in our regions, and within our borders, to develop, verify and implement LAMP assays for biosecurity outcomes

Biosecurity supports food systems to prevent, respond and recover from pests and disease.

- **Sample → Result**
  - Nucleic acid extraction is not required
  - Optimised for each virus and sample combination
- **Robust**
  - Application in resource limited settings
  - Field deployable and used as a point-of-care tool



Scientific rigour and assay validation principles provide the foundation of the LAMP assays for biosecurity outcomes

Scientific rigour to lay the foundation for implementation and real impact

Foot and mouth disease (FMD) is a severe, highly contagious viral disease of livestock that has a significant economic impact.

It is disruptive to regional and international trade in animals and animal products.

Application of an internal positive control in Bhutan for FMDV LAMP

- **Independent verification of sample quality**
- **Confirmation of clinical FMDV cases**
- **Statistic analysis confirmed this new RT-LAMP-FMDV test as fit-for-purpose as a herd diagnostic tool with diagnostic specificity >99% and sensitivity 79% on unextracted field samples (oral swabs).**

Source: Bath C, et al.. Further development of a reverse-transcription loop-mediated isothermal amplification (RT-LAMP) assay for the detection of foot-and-mouth disease virus and validation in the field with use of an internal positive control. Transbound Emerg Dis. 2020 Nov;67(6):2494-2506

Scientific rigour to lay the foundation for implementation and real impact

FMD is a highly contagious animal disease that would have severe consequences if introduced into Australia.

Australia estimates that a small FMD outbreak , controlled in 3 months, could cost around $AUD 7.1 billion, while a large 12 month outbreak would cost $AUD 16 billion.

Application of proficiency testing of users in Victoria for FMDV LAMP

- **Testing kits: easy, field practical and low equipment**
- **Training of over 20 Agriculture field veterinary officers**
- **Proficient testing panels to assess competency**
- **Full implementation in development**

Source: Bath C, Scott M, Sharma PM, Gurung RB, Phuentshok Y, et. al. Further development of a reverse-transcription loop-mediated isothermal amplification (RT-LAMP) assay for the detection of foot-and-mouth disease virus and validation in the field with use of an internal positive control. Transbound Emerg Dis. 2020 Nov;67(6):2494-2506. Photos: Grant Rawlin, Berwyn Squire.

Scientific rigour to lay the foundation for implementation and real impact

African swine fever virus causes high mortality in pigs (80-100%) and detected in Timor-Leste in September 2019

Field verification and diagnostic performance of ASFV LAMP in Timor Leste

- **Diagnostics performance**
- **Supported whole country prevalence survey of ASFV (436 samples, 48 villages)**
- **Biobanking of positive samples for triage to Australia**
- **Ongoing test support**

Source: Mee, P. T., et. al. (2020). Field Verification of an African Swine Fever Virus Loop-Mediated Isothermal Amplification (LAMP) Assay During an Outbreak in Timor-Leste. *Viruses*, *12*(12), and Phillips DE, et. al. Front Vet Sci. 2021 Jun 21;8:672048.

Robust quality platform

- Adaptable to detection of additional targets

Other Agriculture Victoria LAMP assays in development

  - Khapra Beetle (in Australia in PNG)*
  - Fall Army Worm

Source: Photo: Agriculture Victoria. * Rako L, Agarwal A, Semeraro L, Broadley A, Rodoni BC, Blacket MJ. A LAMP (loop-mediated isothermal amplification) test for rapid identification of Khapra beetle (Trogoderma granarium). Pest Manag Sci. 2021 Dec;77(12):5509-5521

Acknowledgements

ASFV / FMDV LAMP Assays

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