

Simple and rapid diagnostic technology that can be used in the field to enable early quarantine measures for foot-and-mouth disease

Production

Demonstration

Item: Livestock

Transboundary disease prevention

Outline

Using a portable gene amplification device, we developed a technology that can detect foot-and-mouth disease (FMD) viruses with high sensitivity within 20 minutes from tissues collected at farms. This technology enables the early detection of infected animals on farms and rapid quarantine measures after the occurrence of infectious diseases.

Background/effect/note

Foot-and-mouth disease (FMD) is a highly contagious transboundary infectious disease that affects cattle and swine. In countries where FMD has occurred, economic losses have been enormous due to the reduced productivity of livestock and restrictions on the export of livestock products. We developed a simple, rapid genetic diagnosis method for FMD using a portable device (Fig. 1). The device can be powered by a portable smartphone battery, which allows diagnosis on site (Fig. 2). Using this portable gene amplification device, FMD can be diagnosed with high sensitivity within 20 minutes using tissues collected from animals with suspected infections on the farm (Fig. 3). Furthermore, the system can be applied to diagnostic methods using dried reagents that do not require refrigeration, even under hot and humid climatic conditions. Compared with conventional FMD viral antigen detection kits, this technology can detect the virus with high sensitivity, and this diagnostic method will enable rapid identification of FMD-positive farms and highly effective quarantine measures. Currently, operational procedures and manuals are being developed and preparations for implementation are underway in Thailand.



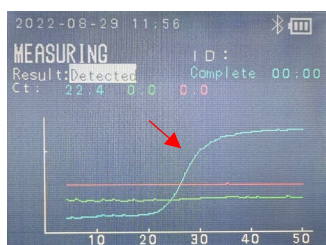
Fig. 1. Portable gene amplification device PicoGene® PCR1100



Fig. 2. A rapid diagnosis is conducted by carrying a portable set of necessary items to the farm.



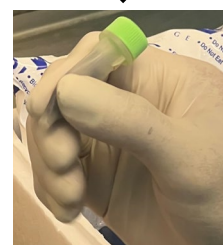
Collecting lesion tissue on the farm



Positive response for FMD virus (red arrow).



Mix the mashed lesion tissue with the reaction reagent and load it into the measuring chip.



Mash the lesion tissue.

Fig. 3. Procedures for rapid diagnosis of foot-and-mouth disease on farms

Technical details:



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<https://www.nature.com/articles/d42473-023-00311-5>

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