

agarose gels corroborated sequence amplification in solutions that turned blue, and lack of amplification in solutions that remained purple.

The examples set forth above and in the enclosed appendices herein incorporated by reference in their entirety, are provided to give those of ordinary skill in the art a complete disclosure and description of how to make and use the embodiments of the devices, systems and methods of the disclosure, and are not intended to limit the scope of what the inventors regard as their disclosure. Modifications of the above-described modes for carrying out the disclosure that are obvious to persons of skill in the art are intended to be within the scope of the following claims. All patents and publications mentioned in the disclosure (including appendices) are indicative of the levels of skill of those skilled in the art to which the disclosure pertains. All references cited in this disclosure (including appendices) are incorporated by reference to the same extent as if each reference had been incorporated by reference in its entirety individually.

The entire disclosure of each document cited (including patents, patent applications, journal articles, abstracts, laboratory manuals, books, or other disclosures) is hereby incorporated herein by reference.

It is to be understood that the disclosures are not limited to particular compositions or biological systems, which can, of course, vary. It is also to be understood that the terminology used herein is for the purpose of describing particular embodiments only, and is not intended to be limiting. As used in this specification and the appended claims, the singular forms "a," "an," and "the" include plural referents unless the content clearly dictates otherwise. The term "plurality" includes two or more referents unless the content clearly dictates otherwise. Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which the disclosure pertains.

A number of embodiments of the disclosure have been described. Nevertheless, it will be understood that various modifications may be made without departing from the spirit and scope of the present disclosure. Accordingly, other embodiments are within the scope of the following claims.

LIST OF REFERENCES

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3. Dukes et al., Arch. Virol., "Novel reverse transcription loop-mediated isothermal amplification for rapid detection of foot-and mouth disease virus" 2006, vol. 151, pp. 1093-1106.
4. Reid et al., J. Vet. Diagn. Invest., "Performance of real-time RT-PCR for the detection of foot-and-mouth disease virus during field outbreaks in the United Kingdom in 2007", 2009, vol. 21, pp. 321-330.
5. Goto et al., Biotechniques, "Colorimetric detection of loop-mediated isothermal amplification reaction by using hydroxynaphthol blue", 2009, vol. 46, pp. 167-172.
6. Notomi. et al., Nucleic Acids Research, "Loop-mediated isothermal amplification of DNA", 2000, Vol. 28, e63
7. Vincent et al. EMBO reports, "Helicase-dependent isothermal DNA amplification", 2004, Vol. 5, pp. 795-800.

8. Mary Hoff, PLoS Biology, "DNA Amplification and Detection Made Simple (Relatively)" 2006, Vol. 2, e222.
9. Ferris et al., Vet. Rec., "Comparisons of original laboratory results and retrospective analysis by real-time reverse transcriptase-PCR of virological samples collected from confirmed cases of foot-and-mouth disease in the UK in 2001", 2006 Vol. 159, pp 373-378.

What is claimed is:

1. Apparatus for detecting a target nucleic acid in a sample, the apparatus comprising:
 - a containment vessel being a sealable tube, wherein the containment vessel has a container body defining a single unpartitioned cavity;
 - a sample collection element configured for removable coupling to the containment vessel;
 - a nucleic acid binding element positioned within the containment vessel, wherein the sample collection element is configured to collect the sample and to transfer the sample to the nucleic acid binding element when the sample collection element is removably coupled to the containment vessel, and wherein the sample collection element includes a lumen and a swab at one end of the lumen, the lumen being configured to deliver through the swab a fluid to the containment vessel;
 - a plurality of reagents configured for placement in fluid communication with the nucleic acid binding element, wherein the plurality of reagents comprises nucleic acid purification reagents and nucleic acid amplification reagents; and
 - a heater configured to heat the nucleic acid amplification reagents in fluid communication with the nucleic acid binding element, the heater being a disposable heater applied on an external surface around the containment vessel.
2. The apparatus of claim 1, wherein the containment vessel is sealed when the sample collection element is removably coupled to the containment vessel.
3. The apparatus of claim 1, wherein the containment vessel comprises a loading port, and wherein the plurality of reagents are configured for loading or extracting through the loading port for placement in or removal from fluid communication with the nucleic acid binding element.
4. The apparatus of claim 1, wherein the sample collection element comprises a lumen, and wherein the sample collection element is configured to transfer the sample to the nucleic acid binding element via lavaging the nucleic acid purification reagents through the lumen when the sample collection element is removably coupled to the containment vessel.
5. The apparatus of claim 4, wherein the plurality of reagents are configured for loading through the lumen for placement in fluid communication with the nucleic acid binding element.
6. The apparatus of claim 1, wherein the nucleic acid amplification reagents are suitable for isothermal amplification of the target nucleic acid.
7. The apparatus of claim 6, wherein the isothermal amplification is selected from the group consisting of loop-mediated isothermal amplification, helicase-dependent isothermal amplification and recombinase polymerase amplification.