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A CRISPR-Cas12a based nucleic acid detection method for Rift valley fever virus

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**Abstract:**

Background/Objective: Rift Valley fever (RVF) is an emerging zoonotic arthropod-borne viral disease, caused by the Rift Valley fever virus (RVFV), which primarily affects domestic livestock and humans in Africa and the Arabian Peninsula. The objective of this study was to develop a novel and reliable diagnostic method for RVFV using recombinase polymerase amplification (RPA) and the clustered regularly interspaced short palindromic repeats (CRISPR)/CRISPR associated proteins (Cas) 12a system.

Methods: The method combines RPA with CRISPR-Cas12a-based detection, resulting in a streamlined procedure that takes approximately one hour from sample to result, including DNA extraction, RPA reaction, CRISPR/Cas12a detection, and lateral flow detection.

Results: The diagnostic method exhibits high sensitivity and specificity, with no cross-reactivity against other related viruses. Preliminary evaluation using field samples shows sensitivity of 100%, specificity of 100%, and a significant advantage over traditional diagnostic methods, such as real-time PCR, by providing rapid and reliable RVFV detection.

Conclusion: The RPA-CRISPR/Cas12a method demonstrates a reliable and quick diagnostic tool for RVFV detection, with the potential to be a valuable asset in areas with limited laboratory facilities. This novel approach holds promise for the rapid and accurate diagnosis of RVFV, contributing to improved disease management and control.

Keywords: Rift Valley fever virus, RVF, RPA, CRISPR-Cas12a, rapid diagnosis, sensitivity, specificity.