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A Loop-mediated Isothermal Amplification Diagnostic for Pathogenic Free-living Amoebae

LAMP diagnostic detects Balamuthia DNA 100–1000× more sensitively than PCR in 1 hour with only a water bath and color change readout.

Traditional detection of various diseases relies on conventional laboratory techniques such as polymerase chain reaction (PCR) and gel electrophoresis for reliable test results. These techniques require specialized training and can take time ranging from days to several weeks before physicians have access to the data for determining patient outcomes. Adding to the complexity, these methods are not suitable for point-of-care testing, especially in resource-limited or time-sensitive environments.

Purdue Researchers have developed a diagnostic device for rapid and efficient detection of diseases caused by a free-living amoeba, Balamuthia, that utilizes a loop-mediated isothermal amplification (LAMP) assay. The use of LAMP in the device allows for the process to occur at a constant temperature, making it possible to use a simple water bath for the reactions, and results to be observed visually through a color change. The device also does not rely on traditional laboratory techniques such as PCR or electrophoresis. The LAMP process can utilize six unique primers to amplify target DNA sequences directly from clinical samples. This method significantly reduces the time to diagnosis, potentially leading to faster treatment decisions and improved outcomes for patients.

Technology Validation:

-PCR sensitivity experiments were conducted with 16S rRNA.1, 18S rRNA, COX1 and various other genes for optimizing LAMP conditions to traditional PCR conditions

-LAMP sensitivity was tested from the millimolar to the attomolar scale

Advantages:

Technology ID
2024-RICE-70372

Category
Biotechnology & Life Sciences/Biomarker Discovery & Diagnostics
Chemicals & Advanced Materials/Materials Processing & Manufacturing Technologies

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-100 to 1000x more sensitive than standard PCR

-Can see product via the naked via or using fluorescence

-Shorter reaction time â€“ 30 minutes to 1 hour

-Can be performed in a water bath instead of a thermocycler

-Reduced cost when compared with traditional analysis

Applications:

-Diagnostic tools for physicians

-Early detection of Balamuthia amebic encephalitis (BAE)

-Patient care

-Mitigate disease dissemination

TRL: 4

Intellectual Property:

Provisional-Patent, 2023-08-23, United States

PCT-Patent, 2024-08-22, WO

Keywords: Biotechnology, Diagnostic Device, Infectious Disease Diagnosis, LAMP, Loop-Mediated Amplification, Micro & Nanotechnologies, Pathogen Detection, point-of-care testing