HIGH-YIELDING EXTRACTION OF SINGLE-STRANDED NUCLEIC ACIDS WITH CARBON NANOTUBES

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PATENT STATUS

Patent Pending

BRIEF DESCRIPTION

The inventors have developed a method for single-stranded nucleic acid extraction from complex biofluids with DNA-wrapped carbon nanotubes. Large viral single-stranded nucleic acids can be captured by corresponding DNA-wrapped carbon nanotubes and can be concentrated for subsequent polymerase chain reaction (PCR) amplification. This method can extract nucleic acids without complicated manufacturing and experimental processes, can generate higher extraction yields than a conventional commercial PCR kit, and fits into the current PCR workflow while requiring minimal chemical reagents.

PCR amplification is widely used in basic biological research and medical diagnostic tests for various infectious diseases, and is a powerful tool for nucleic acid detection. Nucleic acid extraction is an important part of the overall workflow in PCR-based viral infection test, since its function is to separate out viral nucleic acid from the many other biological components in a nasal swab-derived sample.

SUGGESTED USES

- In viral infection diagnosis, to purify viral single-stranded nucleic acids from transport media.
- In biological research, to purify single-stranded nucleic acids from cell, tissue, and environmental samples.
- In PCR-based diagnostics for viral infections where the detection target is single-stranded DNA or RNA, to increase the sensitivity of the technique by increasing the extraction yield of the target ssDNA or ssRNA.
- To modify the current workflow of PCR-based diagnostics to decrease the cost of the workflow by introducing a cheaper recovery material, single-walled carbon nanotubes.

ADVANTAGES

This simple and accurate method uses less expensive materials and extracts higher yields of virus-specific RNA than conventional commercial polymerase chain reaction (PCR) amplification kits. Furthermore, by increasing the extraction yield of SARS-CoV-2-specific RNA in PCR through workflow modifications, this technology increases the sensitivity and detection threshold of the PCR technique as a diagnostic test.

Existing nucleic acid extraction kits contain specialized materials such as magnetic beads or membrane filters, which are vulnerable to shortages during periods of extensive PCR demands like the SARS-CoV-2 pandemic.

RELATED MATERIALS

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- SARS-CoV-2 Detection by Carbon Nanotube-Based Nanosensors
- Gene Delivery Into Mature Plants Using Carbon Nanotubes
- Method For Imaging Neurotransmitters In Vitro and In Vivo Using Functionalized Carbon Nanotubes

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OTHER INFORMATION

KEYWORDS

- carbon nanotube, SARS-CoV-2, virus diagnosis, nucleic acid purification, nucleic acid extraction

CATEGORIZED AS

- Biotechnology
- Genomics
- Medical
- Diagnostics
- Research Tools
- Screening

RELATED CASES

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