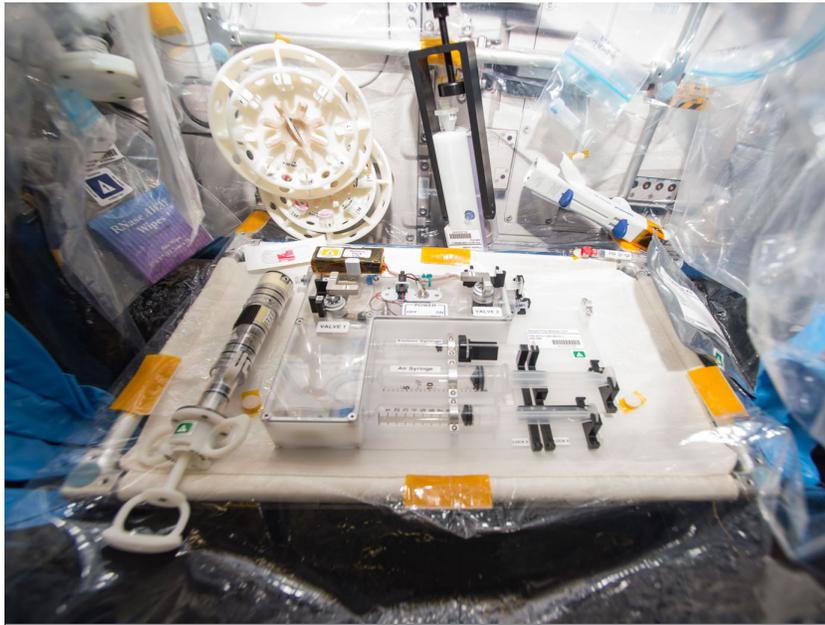




TECHNOLOGY SOLUTION

Health, Medicine and Biotechnology



Rapid Nucleic Acid Isolation Method and Fluid Handling Devices

[Smaller, simpler sample-preparation system for complex biology - analysis of gene expression](#)

Sample preparation is a common bottleneck in genetic analysis. Tools that reduce time and effort are of great value in a laboratory setting. There is a need for a genetic analysis/detection system that is not only mobile, ruggedized, and easy-to-use but that also provides an enclosed fluid handling, which diminishes the risks of Ribonucleic acid (RNA) contamination and degradation during processing. NASA Ames has developed a novel assay methodology and suite of devices to isolate nucleic acids and prepare samples for Reverse Transcriptase quantitative Polymerase Chain Reaction analysis that solves the problem of contamination and degradation. Gene expression analysis reveals valuable information about molecular and cellular mechanisms that can be applied not only for protecting human health during space missions but also for fundamental biology investigations and commercial drug discovery efforts on earth. This invention enables an end-to-end ability to process a biological sample for gene expression analysis - from raw tissue to data.

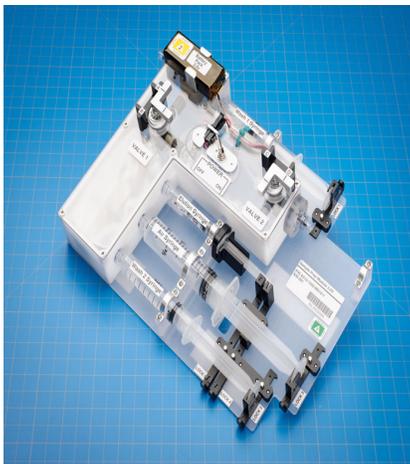
BENEFITS

- Low-toxicity reagents (aqueous-based buffers; alcohol or chaotropic salts - free)
- Enables contaminant DNA removal prior to PCR
- Harvested nucleic acids could be transferred by user to any downstream genetic analysis methods
- Fluidically-contained format reduces or eliminates contamination concerns
- Cost effective, ready-to-use and simple to operate
- Storable at room temperature
- Self-powered (battery operated)
- Uses standard syringes with luer connectors
- Single-use disposable
- Temperature and pressure safety tested
- Pre-loaded reagents
- Portable with few moving parts
- Rapid run time - only minutes of manual operation
- Can be used with any quantitative polymerase chain reaction machine

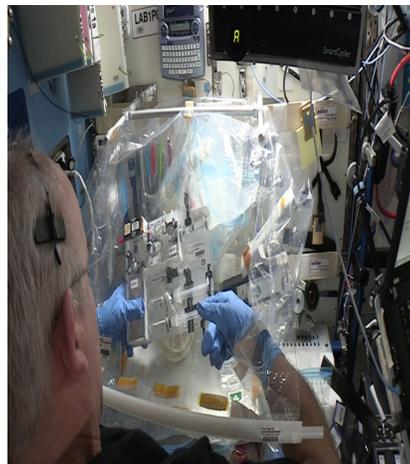
THE TECHNOLOGY

Gene expression analysis measures the activity of genes and reveals valuable information about the internal states of living cells. NASA Ames has developed a novel system for conducting quantitative, real-time gene expression analysis that not only significantly improves the sample preparation procedures and provides a quick, cost-effective solution needed in a laboratory, but also minimizes the risk of RNA contamination and degradation. The invention, a novel assay methodology and suite of devices have been developed to isolate nucleic acids from Prokaryotic and Eukaryotic cells and prepare samples for Reverse Transcriptase - quantitative Polymerase Chain Reaction (RT-qPCR) analysis.

The invention consists of a method to extract and purify nucleic acids from biospecimen that does not require organics or toxic chemicals, and provides containment for the liquids. The assay employs an aqueous-based non-alcohol method that yields robust RNA quality; and PCR reaction tubes that are pre-loaded with stabilized lyophilized reagents designed to perform RT-qPCR analysis - all in all enabling rapid, cost effective, and portable manual operation in the laboratory or remote field environments. This innovative technology greatly reduces preparation time to less than 10% of the time it would take using standard techniques. This technology could be used with any commercial quantitative Polymerase Chain Reaction (qPCR) machine.



Sample Preparation Module (SPM)



Astronaut Jeff Williams tested SPM for the first time in space to extract and purify RNA from cells before performing the qPCR analysis.

APPLICATIONS

The technology has several potential applications:

- Life sciences industry
- Diagnostic Industry including mobile diagnostics
- Biosystems industry
- Pharmaceutical industry
- Medical diagnosis
- Research institutions
- Commercial and academic research labs
- Space research stations (gene expression, microbial monitoring)
- Food quality testing companies
- Military
- Bio-threat detection
- Cruise line pathogen detection
- Disease or microbial monitoring in remote areas

PUBLICATIONS

Patent No: 10,975,425