Thioaptamer Diagnostic System (TDS)

Quickly identifies up to 32 biomarkers in a single sample

AM Biotechnologies, LLC, in partnership with Sandia National Laboratories, has developed a diagnostic device that quickly detects sampled biomarkers. The TDS quickly quantifies clinically relevant biomarkers using only microliters of a single sample. The system combines ambient-stable, long shelf-life affinity assays with handheld, microfluidic gel electrophoresis affinity assay quantification technology. The TDS is easy to use, operates in microgravity, and permits simultaneous quantification of 32 biomarkers.

In Phase I of the project, the partners demonstrated that a thioaptamer assay used in the microfluidic instrument could quantify a specific biomarker in serum in the low nanomolar range. The team also identified novel affinity agents to bone-specific alkaline phosphatase (BAP) and demonstrated their ability to detect BAP with the microfluidic instrument. In Phase II, AM Biotech expanded the number of ambient affinity agents and demonstrated a TDS prototype. In the long term, the clinical version of the TDS will provide a robust, flight-tested diagnostic capability for space exploration missions.

In-flight diagnostics for health research and monitoring
Opportunities for novel biomarker discovery
Research on the International Space Station (ISS) regarding human adaptation to microgravity

Clinical research tool for novel biomarker discovery
Handheld diagnostic system for remote, resource-poor locations
Rapid diagnostic device for use by first responders and physician offices
Affordable diagnostic system for university research laboratories and companies with limited budgets

Applications

Phase II Objectives

- Optimize binding agents demonstrated in Phase I of the project
- Select additional binding agents for next round of biomarkers
- Improve assay performance in serum
- Develop stand-alone prototype for NASA demonstrations

Benefits

- Eliminates the need to freeze samples on the ISS and return them to Earth for ground-based testing
- Operates in microgravity
- Is easy to use, self-contained, automated, and lightweight (<10 pounds)
- Requires minimal sample volumes (microliters)
- Is sensitive and rapid (<10 minutes)
- Permits simultaneous quantitation of 8–32 biomarkers
- Offers long-term reagent stability at ambient temperatures

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