

Menon Mentor-100 Biodetector System



Menon Biosensors, Inc. – Mentor-100 Biodetector System

The Mentor-100 is a fully automated and portable biodetector of biothreats in the environment. The sampling system collects particles of the appropriate size and passes them to a **microfluidic** system for processing and binding of any threats to appropriate markers. The presence of bound markers is detected by a patented application of magnetic resonance technology. The entire operation is autonomous, from sampling to detection and subsequent decontamination in preparation for the next sample. The system not only detects biothreats but identifies them. It is capable of performing both single-threat and multiplexed detection. The target library is expandable and can include fungus, viruses, parasites and bacterial threats.

Current Configuration: The MENTOR-100 is an automated and portable biodetector. Required **reagents** are stored in a replaceable cartridge. It is currently equipped with an air sampling system that collects particles of the appropriate size. Sampling can be continuous or user-initiated. Results can be displayed on a monitor near the unit or communicated securely to a remote control center.

Other Configurations: • The air sampling system can be replaced by fluid samplers or by systems to assay discrete samples. • The patented magnetic resonance assay method can be extended to the simultaneous assay of many samples. • The system can be extended for implementation of assays developed by others. • Future configurations may be even more compact and lightweight.

TECHNOLOGY HIGHLIGHTS

Novel method for biomarker detection: Nanoparticles bound to probes, which are bound to a target biomarker, vary the relaxation parameters when a magnetic field pulses through a sample volume. Within a dynamic range (which can be varied) a score quantifies biomarker presence.

Drives substantially superior performance over alternative methods: Can detect one binding event in complex matrices with pollutants. Sample prep is minimal with sample-to-result in less than an hour. Validated multiplexing up to 20 targets simultaneously.

Proven rapid assay development: Utilizes existing targeting chemistries (e.g., probes, antibodies, ligands) for rapid assay development. Known chemistries (e.g., streptavidin, biotin) bind the targeting chemistries to its nanoparticles. Standard methods allow rapid migration of existing targeting chemistry libraries into superior assay environment.

Supports portable field use with push-button simplicity: 10 watts of electricity, cubic foot system size, 10 pound weight, and lyophilized reagents.

Low disposable, system, and service cost: Assays and instruments priced at competitive rates. System is sturdy, auto-calibrates, and has few motion/vibration sensitive parts.

Developed for Department of Homeland Security (“DHS”) for biodefense: Over 3,000 samples tested for DHS in the presence of pollutants and near genetic neighbors with no false positives or negatives. Selected for the DHS Science and Technology Directorate’s Detect-to-Protect (D2P) Bio Detection project for detecting pathogens in the Boston subway system. Menon’s technological accomplishments to date, including the M² Technology platform, are a product of more than eight years of development efforts. Validated sensitivity and specificity: Has correctly detected the presence of *Yersinia pestis*, also known as the plague, in 2,248 samples with no false positives or negatives. The samples were in water, air, blood, sputum, urine and stool with concentrations as low as from 1 colony-forming unit (CFU) per sample with a limit of detection in the range of 1-100 CFU/mL with a dynamic range of 1-10⁹ CFU/mL.

Applications:

Bioweapon Detection • Homeland security applications: Government infrastructure (military installations, other government buildings), Public infrastructure (airport, metro-rail transportation facilities, cargo screening, sports stadiums, food packaging plants and water reservoirs), Corporate security (building monitoring) and Infectious agent detection.

Clinical Applications • Hospital monitoring (patients, infrastructure contamination) • Rapid patient screening (very large number of samples in a single scan)



Menon Biosensors, Inc. – Mentor-100 Biotector System Applications

Installations:

Commercial • System granted approval to be installed in stadiums and multiple Fortune-50 campus high-rise buildings.

Government • Systems installed and being tested in Boston subways to measure the real-world performance of new sensors recently developed to detect biological agents.

MENTOR-100 System Features

Operational Capability 1. System designed to detect aerosol, hydrosol and powder biotreats indoors and outdoors, including in highly populated areas. 2. Fully automated from collection to detection – no human intervention needed. 3. Uses a patented NMR bioassay detection method. 4. Results displayed in a threat/no threat format – easy to interpret. 5. Automated archiving of assay, self assessment and fault detection available. 6. Uses standard AC power. Battery operation can be installed. 7. System can be programmed to run continuously with sample collection and analysis done at specified intervals. 8. System is fully networkable and is capable of remote operation using either a wired or wireless network.

Threats Detected: Detects the biothreats *Bacillus anthracis*, *Francisella tularensis*, *Yersinia pestis* and the controls *Bacillus thuringiensis* and *Bacillus subtilis*. Capable of multiplexed detection of several bacterial agents using one assay. Assays for other biothreats including viruses and bacteria can be added to the system library by developing the appropriate NMR bioassay. The system is also capable of detecting toxins.

Multiplex capability: Assays are scalable to add probes for detecting additional biothreats in multiplexed mode.

Interferants: Assays validated against all interferants from the field provided by the United States Department of Homeland Security and the United States Army Edgewood Chemical Biological Center.

Configuration: System can be configured for fixed installation but is also man-portable.

Training: The results are presented in a simple no threat/threat format that requires no operator interpretation. Training takes two hours.

Safety and disposability: System is safe to use. All components can be disposed and/or recycled.

Physical attributes: The small footprint (1 cu. ft) and autonomous capability of the system will allow it to be used in a wide variety of locations.

Operating environment: Suitable for indoor or outdoor use. Current operating temperature is 5-50°C.

System Support: The MENTOR-100 system is supported by a team with expertise in microbiology, biochemistry, engineering, nanotechnology and instrumentation.

System Testing and Validation: Successful blind tests have been performed with the MR bioassay format using samples supplied by the United States Department of Homeland Security. The MENTOR-100 biodetector has undergone blind tests at the US Army Edgewood Chemical Biological Center.