

Ocular Scanning Imaging-Based Device

Eye Scans Quickly Screen for Exposure to Chemical Agents and Toxins



Technology and Innovation

A very frightening aspect of modern warfare is the possible use of chemical and biological agents, which can have quick and deadly effects on exposed troops and civilians. Currently, when such exposure is suspected, invasive blood tests are required to identify the agent, determine health status, and begin treatment. But these tests must be performed by trained individuals who are not always available on-site. By the time the individual can be diagnosed and treated, irreversible injury or death may have occurred.

With DARPA SBIR funding, EyeMarker Systems, Inc. is developing an ocular scanning instrument (OSI)-based imaging technology capable of determining an individual's exposure status with respect to a variety of toxic agents. Since the eyes are directly connected to multiple physiological systems (central nervous, cardiovascular, lymphatic, etc.) in the body, they can be scanned for primary and secondary ocular effects of exposure. This technology can:

- Rapidly and non-invasively identify exposure to toxic agents and the extent of exposure by scanning for specific biomarkers in the eye, including pupil size, pupillary reactivity and blood vessel oxygenation.
- Quantify and analyze these biomarkers without the need for human expertise.

- Far exceed the through-put of other toxic exposure testing methods, allowing quicker triage and medical intervention for those in need.
- Be packaged into a portable, hand-held device that makes the OSI technology highly adaptive and mobile.

Currently, the imaging device can determine exposure to four specific agents:

organophosphorous nerve agents, botulinum toxin, cyanide, and carbon monoxide. The device does not identify the agent itself but rather identifies the early physiological ocular consequences of exposure to the agent prior to the presence of normal clinical symptoms of exposure.

Alternative applications for the device include identifying and monitoring health concerns such as systemic hypertension, diabetic retinopathy, and cerebral malaria.

EyeMarker Systems developed a working prototype in 2006 and plans to have a marketable scanning device by mid to late FY07. To date, the company's focus has been on identifying which ocular biomarkers are best suited for identifying and quantifying toxic agent exposure.

Joint Collaborations

EyeMarker Systems has established ongoing collaborations with military and non-military government laboratories along with academic and



Side view of the Ocular Scanning Instrument (OSI)

private research and development entities. Collaborators include Walter Reed Army Institute of Research, Armed Forces Radiobiology Research Institute, Army Institute of Scientific Research, Air Force Medical Evaluation Support Activity, West Virginia University, University of Pittsburgh Medical Center, West Virginia High Technology Consortium Foundation, and National Institute of Justice Office of Law Enforcement Technology. The development of the prototype OSI technology has taken place via a current commercial contract with Summa Design, Los Altos, CA and a previous one with Integrated Defense Systems, Austin TX (a division of BAE).

Lessons Learned

- When submitting a DARPA SBIR proposal, make sure there is a clear project goal that meets a critical military need, benefits warfighters, and can be commercialized.
- Develop a sound corporate structure with a commercialization strategy that will lead to success.
- Always have clear project milestones with specific “go” and “no go” approval gates. Remember that good project management is essential.
- Have the company’s strongest entrepreneurs develop and cultivate end-user sponsorships. Sponsorship is critical for success.

Economic Impact

The DARPA SBIR program has enabled the company to advance the idea through proof-of-concept and initial prototype stages. The DARPA SBIR also facilitated acquisition of additional funding for Phase III commercialization of a hand-held device based on the OSI technology with the Technical Support Working Group. To date, the DARPA SBIR has supported about 50 percent of the project.



EyeMarker's OSI technology rapidly and non-invasively identifies exposure to toxic agents

This DARPA SBIR project has benefited EyeMarker Systems in many other ways as well. The company has obtained two patents and has three additional patents pending. Due to the success of the project, the company has focused development efforts exclusively on the OSI technology and changed its name (from MD Biotech) to reflect the new focus.

About the Company

Founded in 2001, EyeMarker Systems is an emerging company committed to the commercialization of innovative ocular screening technology. Company headquarters are in Morgantown, West Virginia, in close proximity to West Virginia University and the WVU Eye Institute. ■

Company Information

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