

# AquaSentinel: A Revolutionary Biosensor System for Primary-Source Water Protection

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## Biographical Sketches of Authors

Elias Greenbaum is a Corporate Fellow and Research Group Leader at Oak Ridge National Laboratory and a Professor of Biological Physics at The University of Tennessee. He received the B.S. degree in physics from Brooklyn College and Ph.D. in physics from Columbia University. Greenbaum's main area of research is in the field of photosynthesis. He was named 2000 Oak Ridge National Laboratory Scientist-of-the-Year. Greenbaum is a Fellow of the American Physical Society and American Association for the Advancement of Science. He holds 10 patents and is the author of more than 100 publications in peer-reviewed journals.

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## Abstract

AquaSentinel is an automated and field-deployable real-time monitoring system for water protection that is based on the fluorescence induction properties of algae that grow naturally in primary source waters. United Defense has acquired an exclusive commercial license from Oak Ridge National Laboratory for this technology in the United States. We report photochemical yield analysis of real-time chlorophyll fluorescence data collected for approximately a year from the Clinch River at a location in Oak Ridge, Tennessee. The Clinch River is the main source of water supply for the City of Oak Ridge. In addition, we report dose-response data collected with the biosensor *Chlamydomonas reinhardtii* after exposure to selected toxic agents. AquaSentinel(SM) uses microscopic algae as biosensors. Fluorescence induction curves are used as indicators of the health of the algae. We have demonstrated that AquaSentinel(SM) can be used by water facility managers as an early warning device. When combined with encrypted data telecommunication and a database-lookup library containing pertinent data for healthy algae, AquaSentinel(SM) provides a practical and effective approach under real-time world conditions to protection of sunlight-exposed primary drinking water supplies and regulation of water quality requirements.