

# WaterSentry™: A Continuous Real-Time Water Monitoring Biosensor System

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## Abstract

After the malicious attacks that took place on September 11, 2001, the Environmental Protection Agency has made a key national priority to assure that public drinking water supplies are secure from terrorist acts. Currently, there is an urgent need for field-deployable continuous real-time water monitoring systems. Oak Ridge National Laboratory (ORNL) has developed a technology which uses naturally-occurring microscopic algae from sunlight-exposed water supplies as biosensors. United Defense, L.P. (UDLP) has acquired an exclusive commercial license from ORNL for this technology in the United States of America and have designed a device called WaterSentry™. WaterSentry™ is a commercially available field-deployable continuous real-time system which is fully automated and does not require consumable reagents. The system uses very sensitive optoelectronic equipment to measure fluorescence induction curves as indicators of the health of the algae. We report photochemical yield analysis and dose-response sensitivity data for chlorophyll fluorescence experiments performed with water samples collected from the Clinch River in Oak Ridge, Tennessee. The Clinch River is the main source of water for the City of Oak Ridge. WaterSentry™ is fully compatible with SensorNet technology which has been developed at ORNL. SensorNet is a comprehensive management system for the real-time detection, identification, and assessment of chemical, biological, radiological, nuclear, and explosive (CBRNE) hazards. Our results demonstrate that WaterSentry™ can be used by utility facility managers to receive an early warning in the event of a terrorist attack on their water supplies. When combined with encrypted remote data telecommunication and a database-lookup library of the physiological response of algae to contaminants, WaterSentry™ provides a practical and effective approach for the protection of sunlight-exposed primary source drinking water and regulation of water quality requirements.

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