AquaSentinel: A Continuous Monitoring Biosensor System for Primary-Source Drinking Water Protection

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Introduction

There is an urgent need for continuous real-time monitoring of water quality. AquaSentinel is a revolutionary biosensor system for primary-source drinking water protection (1). It uses naturally-occurring microscopic algae as fluorometric biosensors (2). Algae are the main component of phytoplankton. Phytoplankton has been used in water monitoring programs because they tend to react rapidly to changes in water quality (3). State-of-the-art optoelectronic instrumentation measures fluorescence induction curves which are used as indicators of the physiological state of the algae (3). We demonstrated the application of this technology for the detection of chemical warfare agents in primary-source drinking water (4). Model toxic agents selected for this purpose were the blood agent potassium cyanide, the acetylcholine esterase inhibitor methyl parathion, and the herbicides Diuron and Paraquat.

Experimental

Figure 1 illustrates the conceptual idea of AquaSentinel. Naturally-occurring algae are collected from a primary-source water supply, analyzed "as is" with a Pulse Amplitude Modulated (PAM) fluorometer, and fluorescence induction curves are stored in a computer for mathematical analysis.

Experiments were performed with field samples drawn from the Clinch River at different locations in Oak Ridge, TN. In addition, experiments were performed with the green alga *Chlamydomonas reinhardtii*. An effect was detected every time a sample was exposed to the selected toxins at the concentrations tested.

Conclusions

The key conclusion of our work is that proof-of-principal of this technology has been demonstrated: chemical toxins that are known to harm humans also harm the free-living algae that are present in all surfaces waters such as rivers, lakes, reservoirs, ponds, etc. United

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Defense, LP has acquired an exclusive commercial license from Oak Ridge National Laboratory for this technology in the United States.

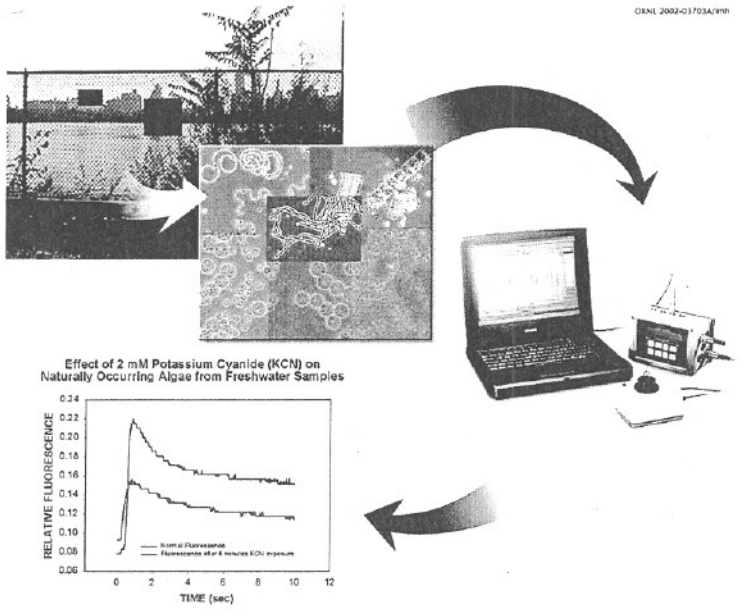

Figure 1. AquaSentinel continuous water monitoring system

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