

Algal whole cell biosensors for pollutants monitoring in marine and freshwater ecosystems

Claude Durrieu

Université de Lyon, France

The harmful effects of toxic chemicals on natural ecosystems have led to an increasing demand for early-warning systems to detect those toxicants at very low concentration levels. Biosensors can respond to this requirement, as they can provide fast, sensitive and cost-effective measurements which can be operated for on-site monitoring before pollutants produce irreversible effects. Algal whole cell biosensors have been developed and tested successfully for freshwater and marine environment in our previous works. These biosensors were designed with green algae which have not undergone any genetic modification. They are based on metabolic perturbations of immobilized algal cells in the presence of toxicants. Algal cells are chosen for their high sensitivity and their place in the ecosystem: being at the very beginning of the trophic chain, they represent a good biological marker of ecosystem pollution. We propose here to present our most notable results obtained during the last decade by different types of biosensors. They concern fiber optic biosensors for monitoring changes in chlorophyll algal fluorescence and micro conductometric biosensors based on the measurements of the local changes in conductivity resulting from the charge mobilities generated by the activity of enzymes located on the external membrane of cells. These tools have the ability to detect a group of pollutants provided they affect chlorophyll fluorescence or enzymes as alkaline phosphatase and esterase. This is the case of pesticides and heavy metals which can be detected at level under μ gramme per liter. The use of modified cells may improve the biosensor sensitivity and selectivity but are no longer able to reflect the ecosystem operating conditions. In the present work, only native cells have been used to preserve the ecological aspect of the media under study.

Biography

Claude Durrieu has completed his Ph.D in 1986 from Lyon University in France. She's currently working as researcher at Lyon University in laboratory of ecology of natural and anthropic ecosystems. She has authored numerous papers on whole cell algal biosensors and filed a patent on algal conductometric biosensor as environmental monitoring tool. During the last 15 years, she has been running PhD students, and reviewing papers on biosensors.

Claude.DURRIEU@entpe.fr