

Pesticide Detection by Using Biosensors

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Abstract

Pesticides are chemicals widely used in agriculture, industrial processes, domestic and as war materials around the World. Due to the increase in their usage in agriculture and industry, pesticides are among the most important environmental pollutants. Serious environmental problems arise from prolonged exposure to these compounds. The intensive use of organophosphorus and carbamate insecticides causes contamination of food and groundwater. The dispersion of pesticides in air, water, soil and organisms causes various physical, chemical and biological changes. At the same time, pesticides can be easily adsorbed by oral, dermal and inhalation route and dispersed rapidly into tissues in the body. Pesticides are deliberately released into the environment and create pollution through various processes. Although pesticides have a very strong relationship with many health problems, there is a serious deficiency in the monitoring and determination of these contaminants. Traditional chromatographic methods such as high-performance liquid chromatography, capillary electrophoresis and mass spectrometry are effective methods for pesticide analysis in foods. However, these methods have many limitations because of complex processes, time-consuming preliminary preparation stages, the need for expensive devices and the need for expert person for operation. During the last decade, designing of simple, fast and ultra-sensitive devices for monitoring pesticide residues in food control and safety has been carried out. Biosensors are analytical devices combined with a biological sensor and a physical transducer in order to obtain a measurable signal proportional to the concentration of analyte. Biological material interacts with the component to be determined. Significant signals are generated using transducers with electrochemical, optical, calorimetric properties and the amount of analyte is determined. Enzymes are biomolecules commonly used in biosensor design. Biosensors developed based on the inhibition of enzymes provide very sensitive and accurate results in pesticide determination.

Keywords: biosensors, enzymes, pesticides