

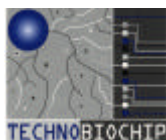
Disposable Screen Printed Biosensors for the detection of Pesticides

G. Benedetti, L. Piras, S. Fenu, I. Zolfino, M. Cocco

Techbiochip S.c.a r.l., Via della Marina 39, 57030 Marciana (LI), Italy

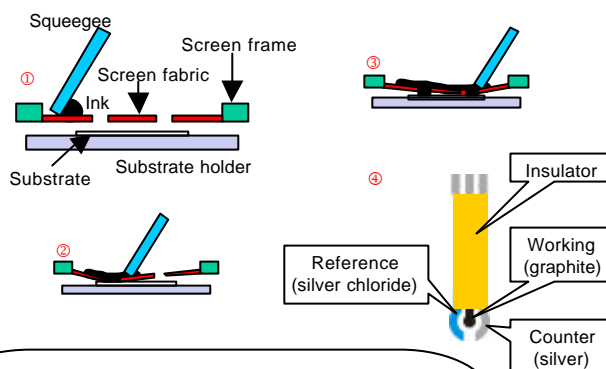
Phone: (+39) 0565 901250, Fax: (+39) 0565901136, E-mail: lab@techbiochip.com, http://www.techbiochip.com

Techbiochip is a Corporate Company with Limited Liability active since 1989 in Industrial Research in Bioelectronics and Biotechnology fields.



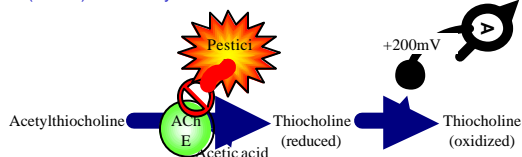
In this work we present the realization of an amperometric biosensor for the detection of pesticides. The electrodes were realised with the screen printing technique that allows to obtain electrodes simply and inexpensively.

Screen-printing



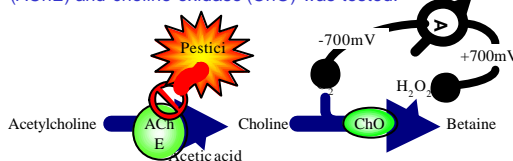
Single-enzyme System

A single-enzyme system based on acetylcholinesterase (AChE) and acetylthiocholine as substrate was tested.



Two-enzyme System

A two-enzyme system based on acetylcholinesterase (AChE) and choline oxidase (ChO) was tested.



Two different enzymatic systems were compared to obtain the best characteristics for a commercialisation-ready product.

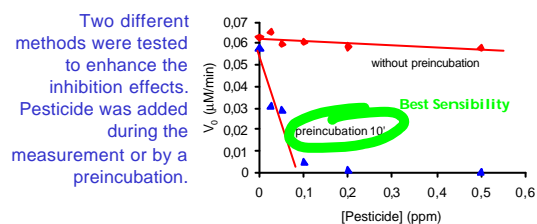
For this reason we made some particular trials:

What

Why

- ? avoid to use membranes ! less complication during the preparation procedure
- ? avoid to use ink-modification ! typical modifications are very expensive
- ? immobilisation performed by adsorption ! it is one of the most simple procedures

In both systems the steady-state current as function of substrate concentration was used as a measure of the enzyme activity. In the presence of pesticides, an irreversible inhibition of AChE occurred, resulting in a decrease in the rate of current change.

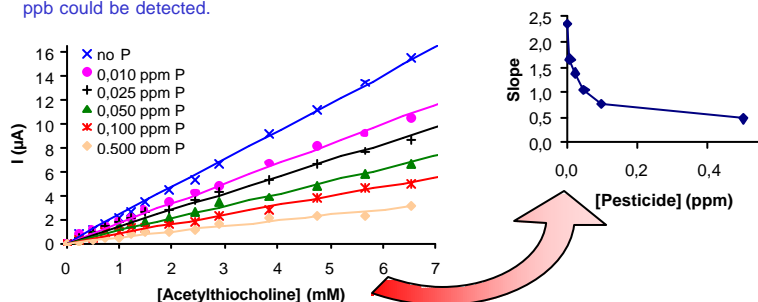


Results

	Sensitivity ($\mu\text{A} \times \text{mM}^{-1} \times \text{cm}^2$)
Single-enzyme	24,29
Two-enzyme	4,35

Considering the different sensitivities obtained with the two systems, assays with the pesticides were performed only with the single-enzyme system.

When the analysis was performed by 10-min preincubation of the single-enzyme biosensor with sample, Paraoxon (P) in concentration about 10 ppb could be detected.



Conclusions

The obtained results are of particular interest for industrial application, especially the single-enzyme system:

- > the enzymatic reaction, involving only one enzyme, is easy to monitor and avoid the kinetic problems related to the coupled reactions
- > the use of an electroactive substrate removes the problems linked to the oxygen diffusion and use of electrochemical mediators
- > the relative low potential used for the single-enzyme system reduces considerably the occurrence of interferences for application in real samples
- > the single-enzyme system works well without the use of membranes and electrode modifications
- > the realisation technique (screen-printing) is cheap and the immobilisation procedure (adsorption) is simple

We are now testing the use of the biosensor in real samples. This is the fundamental goal for the commercialisation of a product.