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RAPID ASSESSMENT OF CADAVERINE WITH A BIOSENSOR

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Cadaverine (1,5-diaminopentane) is a biogenic amine, produced in the process of microbial decarboxylation and aging of free amino acids. It is considered as a good marker for the evaluation of food quality. A good option for rapid cadaverine detection is the application of amine oxidase based biosensor. For the construction of cadaverine biosensor, catalytically active nylon threads, containing immobilized amine oxidase from pea seedlings (PSAO) were prepared. The immobilized enzyme thread had specific activity of $(4.6 \pm 0.4) \times 10^{-4}$ IU per 1 cm¹.

The enzyme-containing thread was coiled around the cathode of an oxygen sensor in the form of winding stairs with a variable step length, forming a flexible biorecognition element for cadaverine and/or putrescine. The thread could be easily renewed, replaced or modified. A layer of immobilized PSAO with the total activity ranging from 0.014 to 0.060 IU was applied by PSAO-containing threads with the length from 30 to 130 cm.

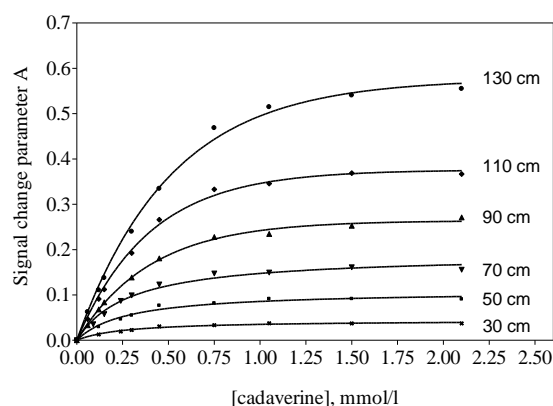


Fig. 1. Dependence of a biosensor output parameter A on the concentration of cadaverine for sensors with threads of different length.

The biosensors' calibration curves were constructed with 2 independent coefficients: $K_{1/2}$ which is a half-signal-change constant and A_{max} which is theoretical maximum of signal change, both calculated from the dynamic biosensor model². The ratio of $A_{max}/K_{1/2}$ was used to characterize the biosensor sensitivity. The sensitivity of the biosensor improved nearly 8 times with the increase of the length of the threads, ranging from 0.168 to 1.324 l/mmol. The maximal signal change value (A_{max}) increased at the same time more than 16 times, enabling significantly higher resolution and improved precision.

The biosensor with 90 cm amine oxidase – containing thread (with the sensitivity of 0.81 l/mmol) was used for the evaluation of the content of biogenic amines in fish. The samples were mixed with buffer solution and the mixture was used for studies without additional pretreatment. The biosensor results were compared and validated by HPLC analysis.

References

1. K. Kivirand and T. Rinke. *Sensor Letters*, 7(4), 580-585 (2009).
2. T. Rinke and T. Tenno. *Biosensors and Bioelectronics*, 16, 53-59 (2001).