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Nanostructured polymeric membranes for selective recognition of aflatoxin B1

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Nanostructured polymeric membranes for selective recognition of aflatoxin B1 were synthesized *in situ* and used as a basis of fluorescent sensor systems for its highly sensitive detection in food stuffs. Artificial binding sites capable of selective recognition of aflatoxin B1 were formed in the structure of the polymeric membranes using the method of molecular imprinting. A composition of molecularly imprinted polymer (MIP) membranes was optimized using the method of computational modeling. It was shown that ability of the MIP membranes to bind aflatoxin B1 selectively correlates with binding energy between aflatoxin B1 and a functional monomer, used for the formation of the mycotoxin-selective sites in the MIP membranes. The MIP membranes were synthesized using nontoxic close structural analogue of aflatoxin B1 (ethyl-2-oxocyclopentanecarboxylate) as a dummy template. The MIP membranes with the optimized composition demonstrated extremely high selectivity towards aflatoxin B1. Negligible binding of close structural analogues of aflatoxin B1 – aflatoxins B2 and G2, and oxhratoxin A was demonstrated. Binding of aflatoxin B1 by the MIP membranes was investigated as a function of both type and concentration of the functional monomer in the initial monomer composition used for the membranes' synthesis. Influence of the composition of the analyzed sample (pH, ionic strength, buffer capacity) on the sensor response was also investigated. The MIP membrane-based fluorescent sensors provide a possibility of aflatoxin B1 detection within the range 1-500 ng/ml with the detection limit 1 ng/ml. The analysis can be successfully performed in both model and real biological samples (wheat and maize extracts).

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