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Kinetics of adsorption, desorption, and exchange of α-chymotrypsin and lysozyme on poly(ethyleneterephthalate) tracked film and track-etched membrane

Vasina E., Déjardin P.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

Adsorption kinetics of 125I-radiolabeled α-chymotrypsin at pH 8.6 was studied in a laminar regime between two walls of poly(ethyleneterephthalate) tracked films and membranes. Adsorption kinetics in the presence of solution (10 μg/mL), desorption by rinsing with buffer, and the following exchange of proteins by flowing unlabeled solution were measured. At pH 8.6, α-chymotrypsin is almost neutral and can be mostly removed from the film surface, contrary to positive lysozyme adsorbed at pH 7.4. Results suggest that α-chymotrypsin is irreversibly adsorbed in pores, while desorption and exchange occur on membrane flat faces. A method is proposed to determine adsorption kinetics in the pores. Kinetics of desorption and exchange of α-chymotrypsin from the film surface can be described by stretched exponential functions in the examined time domain with the same exponent, $\beta \approx 0.62$, which does not depend also on the former adsorption duration. However, the mean residence time at the interface is about 2.5 times greater in the presence of only the buffer than that in the presence of solution. This effect could be explained by a fast exchange at the arrival of unlabeled solution for a part of the adsorbed population.

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