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The role of phosphatidylethanolamine in the biogenesis of alkaline phosphatase in *Escherichia coli*

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Abstract

Protein secretion, as is known, is determined by the primary structure of the protein and its specific domains, which contain information on the interaction with the membrane and components of the secretory apparatus. However, the structural principles of interaction between these components and the secreted protein are not fully established. This is especially true for the interaction of topo genic protein sequences with membrane phospholipids and, in particular, with phosphatidylethanolamine. Previously was shown that the signal peptide interacts with anionic phospholipids. However, the nature of this interaction in vivo has not been fully established. It is not clear whether a direct electrostatic interaction occurs between the N-terminal region of the SP (signal peptide) and anionic phospholipids, or the protein components of the secretory apparatus are involved. It remains an open question whether phosphatidylethanolamine (PEA) participates in the interaction of the signal peptide with membranes. Alkaline phosphatase is a typical secreted protein of *E. coli*, localized in the periplasm.

In our study described in this paper, the need for *E. coli* in PEA for the secretion of alkaline phosphatase *in vivo* was assessed and the relationship between this requirement and the involvement of PEA in the formation of the non-bilayer structure was identified.

Despite the fact that the protein components of the secretory apparatus are sufficiently well studied and characterized, it is impossible to understand the molecular mechanism of protein secretion without clarifying the exact behavior and contribution of membrane phospholipids whose structural and metabolic dynamism can promote protein translocation through the cytoplasmic membrane.

For a more complete understanding of the mechanism of protein translocation through membranes, it is very important to find out whether the topo genic sequences of the preprotein interact with the phospholipids of the membranes. We were able to evaluate the contribution of translocation ATPase, the SecA protein, to protein-phospholipid interaction *in vivo*.

It was also possible to identify the features of the posttranslational modification of alkaline phosphatase in the absence of phosphatidylethanolamine in membranes and to determine the effect of PEA on the biosynthesis of alkaline phosphatase.

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