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Analysis of Haloadaptation Mechanisms of DNA/RNA Binding Protein from a Halobacterium

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Summary

In this study, the halo-adaptation mechanisms of RNaseHI from a halophilic archaeon *Halobacterium* sp. NRC-1 (Halo-RNaseHI) were analyzed. Since it is well studied small globular protein, RNaseHI is an ideal model protein to study protein structure-function relationships. Although, a high-salt concentration can cause a structural destabilization of protein or inhibition of electrostatic interaction between protein and DNA/RNA substrate, halo-RNaseHI can be active in such an unfavorable condition. The Halo-RNaseHI is expected to have unknown haloadaptation mechanism which might be attractive for further engineering of enzymes used in food industry or other fields using biocatalytic reactions.

From comparison of the specific activity of both RNaseHIs, it is revealed that Halo-RNaseHI activity is only 1% of that of Eco-RNaseHI. However, Halo-RNaseHI did not decrease its activity at higher salt concentration condition while that of Eco-RNaseHI decrease to 1/1000. Since it was confirmed that the changing of salt concentration does not affect the changing of Eco-RNaseHI concentration, the decreasing of activity against salt concentration probably depends on its decreasing of affinity for DNA/RNA substrate. From the structure model of Halo-RNaseHI, there is a cluster of positively charged amino acid side-chains on the surface of substrate binding site probably contribute to the binding of the DNA/RNA substrate which are negatively charged.