Synthetic Studies of Artificial Serine Proteases (VIII) : Comparison of Enzymatic Activities of Various Polymers with Free Functional Groups on the Histidine Residue

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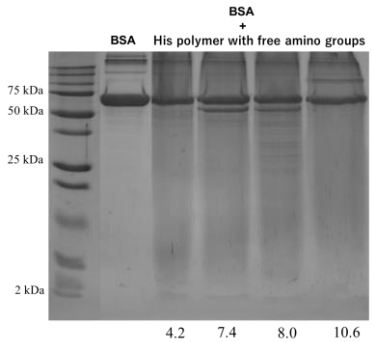
Serine protease is known as a one of hydrolyzing enzymes, which cleave a peptide bond on the protein and functions with three amino acids as the active center formed by a serine (Ser), a histidine (His), and an aspartic acid (Asp). In a previous study[1)], copolymers with a polyacrylamide main chain containing three amino acids (Ser, His, Asp) as side chains and a homopolymer containing one kind of amino acid were prepared and hydrolytic activity by means of proteins were examined. As the results, histidine homopolymer showed the highest hydrolytic activity against the proteins. In our ongoing study, we mainly focused on histidine and synthesized polymers with different functional groups and distances between histidine residues. The objective of this study is to synthesize an artificial enzyme that outperforms natural enzymes by examining the structure-activity relationship of the synthesized polymers through evaluation of their hydrolytic activity. In our previous report, we reported that the hydrolytic activity of the carboxylic functional group in the histidine structure was found to occur in the acidic to neutral range, while the hydrolytic activity of the amide functional group was found to occur only in the neutral range. The results suggest that the pH at which the hydrolytic activity occurs changes by changing the functional group in the histidine structure. Next, we synthesized histidine polymers in which amino groups in the histidine structure were released by linking the carboxy moiety of histidine with a linker.

In this presentation, the hydrolytic activity of the histidine polymers with free amino groups will be described. The histidine polymers with free amino groups showed hydrolytic activity at pH 7.4 and 8.0.



1) 矢持日奈子ら, 高分子学会第 31 回埼玉地区懇話会講演要旨集, P-11, 2019