（学位第３号様式）

学　位　論　文　要　旨

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題　目	Studies on the quality stability of hen egg-white lysozyme and the contribution of peptides derived from egg proteins (鶏卵白リゾチームの品質の安定性とそれに寄与する卵タンパク質に由来するペプチドに関する研究)

Proteins retain their function by maintaining their native structure and can be involved in life phenomena. Chicken eggs are made up of maternally derived proteins that continue to provide nutrition and crucial function to the embryo throughout development.

In this study, I first focused on how this protein can retain its function during development using egg white lysozyme (HEWL) as a model protein. HEWL was observed to have slight structural change but retained its function sufficiently. Next, the factors that contribute to the stabilization of lysozyme in chicken eggs were investigated. I found the peptides derived from chalaza that can suppress HEWL aggregation and fibrosis.

HEWL with molecular weight of 14,000 and four disulfide bonds has a compact and highly stable structure consisting of α and β domains. HEWL as development was observed slight delay of the elution of HPLC. In addition, the last stages HEWL was slightly fast on Native-electrophoresis, and was lowered by about 2 °C in the denaturation temperature (*T*m value) compared to day-0 HEWL. Changes were also seen in the secondary structure analysis by the CD spectra, showing a typical pattern of α-helix in the late stage of development. At the same time, the surface hydrophobicity was found to become high. In the experiments of the intrinsic fluorescence spectra of tryptophan and fluorescence quenching with acrylamide, the transfer of tryptophan residues to the surface was predicted. As development progressed, HEWL seems to become a slightly more hydrophobic molecule. HEWL remains to hold muramidase activity and antibacterial activity against certain Gram-positive bacteria during development. It was concluded that these functions were essentially hold even as the development process progressed, while changing small conformation and thermal stability.

HEWL is known to form amyloid fibrils due to changes in molecular structure, which is attributed to exposure to the surface of highly hydrophobic internal structures. In fact, in humans, amyloid disease develops due to amyloid fibrils of lysozyme. Although the structural change of HEWL in developing eggs is small, it is possible that the environment is prone to aggregation due to the increase in hydrophobicity. Therefore, I searched for factors that suppress aggregation and fibrosis in chicken eggs. It was confirmed that the hydrolyzates of chalazae proteins suppress fibrosis of HEWL. The hydrolyzates also reduced the effects of divalent metal ions that promote the formation of HEWL amyloid fibrils. Furthermore, the hydrolyzate was found to suppress fibrosis against human lysozyme and amyloid β1-42. This is thought to not only contribute to the protein stability of the developing egg, but also have functions of suppressing aggregation and fibrosis of protein widely. I conclude that the hen-egg-protein hydrolysates (in particular those from the chalazae) are a treasure house of therapeutic factors for the prevention of amyloid-related degenerative diseases.