

学位論文抄録

Functional analyses of Equarin during chick lens development
(ニワトリレンズ発生時における Equarin の機能解析)

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Abstract of the Thesis

Background and Purpose: Lens growth involves the proliferation of epithelial cells, followed by their migration to the equator region and differentiation into secondary fiber cells. To better understand lens development, investigatory and functional analyses of novel molecules are required. In this study, we tried to identify the function of Equarin during chick lens development.

Methods: To examine its expression pattern, we performed in situ hybridization to determine its spatial and temporal distribution during lens development. To analyze the function of Equarin, we achieved gain-of-function assay by in ovo electroporation and loss of function assay by zinc finger nucleases (ZFNs). We also performed primary lens epithelial cell culture.

Results: Equarin was expressed exclusively in the lens equator region during chick lens development. Overexpression of Equarin into chick lens upregulated the expression of fiber markers. In the primary lens cell culture, Equarin promoted biochemical and morphological changes of lens epithelial-to-fiber differentiation. Lens cell differentiation was markedly inhibited while the endogenous Equarin was blocked. Furthermore, Equarin directly binds to FGFs and heparan sulfate proteoglycan, thereby upregulated the expression of phospho-ERK1/2 (ERK-P) proteins, downstream of the FGF signaling pathway, in vivo and in vitro. Conversely, absence of endogenous Equarin obviously diminished FGF-induced fiber differentiation. Therefore, our results suggest that Equarin is involved as an FGF modulator in chick lens differentiation. In addition, Equarin protein was found to be expressed in the extracellular region of lens epithelial cells and able to promote lens epithelial cell adhesion through heparan sulfate proteoglycan. Therefore, Equarin is also involved in cell adhesion and migration during chick lens development.

Conclusions: Equarin plays as an essential FGF modulator in chick lens fiber differentiation. Equarin is also involved in lens cell migration during chick lens development.