

Molecular Mechanisms of Vertebrate Photoperiodism

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【Outline of survey】

The photoperiodic control of physiological phenomena (known as photoperiodism), such as flowering in plants and reproductive activity in animals is observed in a wide variety of species. Flowering control of the chrysanthemum by lighting during autumn evening and egg production by changing day length in chicken farms are the examples of the application of features of photoperiodism to productivity of agriculture. Although the molecular mechanism of photoperiodism is not well understood in any organism studies so far, we have recently found the gene (*Dio2*) critically important in the control of photoperiodic response in Japanese quail. Photoperiodic information is transformed into pineal melatonin rhythms in mammals, while in birds the information is directly received by photoreceptors located deep in the hypothalamus region of the brain. In birds, light exposure induces *Dio2* gene expression, whereas in mammals melatonin but not light affects *Dio2* expression, indicating that *Dio2* plays a central role in the regulation of vertebrate photoperiodism in spite of different mode of transmission of photoperiodic message. Thus in the present study we are concerned with molecular mechanisms of photoperiodism, focusing on the regulation and function of *Dio2* gene using fish, birds and mammals.

【Expected results】

Although a large number of studies have been made on photoperiodism in animals, little is known about its molecular mechanisms. However, the studies focusing on *Dio2* gene may lead to molecular understanding of photoperiodism and also technological innovation for animal production unaffected by seasonal changes or photoperiods.

【References by the principal researcher】

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【Term of project】 FY 2005 - 2009

【Budget allocation】 86,000,000 yen

【Homepage address】 <http://www.agr.nagoya-u.ac.jp/%7erhythm/>