【Grant-in-Aid for Scientific Research(S)】
Biological Sciences (Agricultural sciences)

Title of Project : Royal Epigenetics: Molecular basis of the extended longevity of reproductives in social insects

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Research Area : Boundary agriculture: Insect Science
Keyword : Social insects, Insect ecology, Insect molecular biology

【Purpose and Background of the Research】

The molecular basis of longevity is the subject of much research in various fields of biology. While studies on the classic model organisms yeast, nematode *Caenorhabditis elegans*, fruitfly *Drosophila melanogaster* and mouse have formed the backbone of our current knowledge on aging and longevity, they might not be telling us the whole story of long lifespan. Eusocial insects, such as ants, bees, wasps, and termites, are characterized by a system of caste division (reproductive vs. non-reproductive individuals), where the lifespan of queens (and kings in termites) can reach nearly 30 years in some ants and termites. This is over 100 times the average lifespan of solitary insects.

Because of their caste-specific life-histories and extreme lifespan differences derived from epigenetic changes, social insects provide ideal opportunity to identify candidate genes involved in the extended lifespan of reproductive individuals. We will identify the molecular mechanism by which the royals of social insects live much longer than other insects.

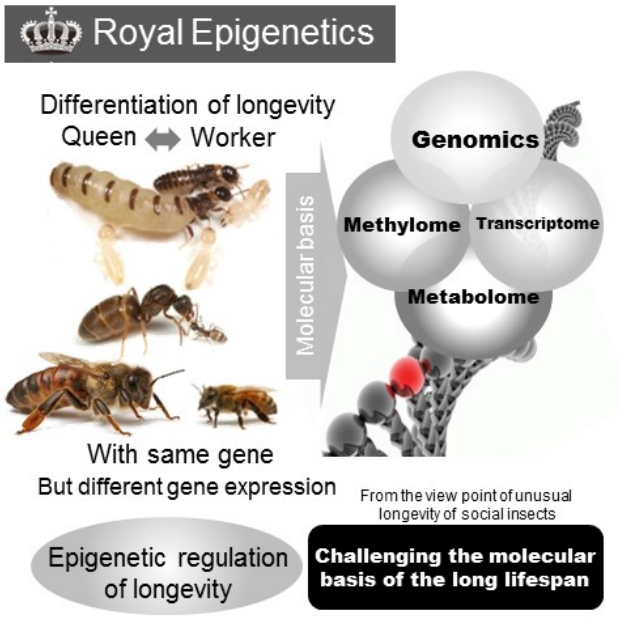

Figure 1. Research strategy

【Research Methods】

There is a tremendous variation in lifespan among castes, where reproductive individuals and workers exhibit up to a 100-fold difference in lifespan. We developed novel technology to control caste differentiation in a termite and a honeybee using queen pheromone (Matsuura et al. 2010) and royalactin (Kamakura 2011), respectively. To identify the genes involved in the extremely long lifespan of royals in termites and honeybees, we compare the gene-expression profiles between sexes, among castes, and between the species with different lifespan.

【Expected Research Achievements and Scientific Significance】

Identification of novel molecular mechanism underlying the extremely long lifespan of social insect royals would have a high interdisciplinary impact in biology.

【Publications Relevant to the Project】

・Matsuura K.et al. (2010) Identification of a pheromone regulating caste differentiation in termites. Proc. Natl. Acad. Sci. USA 107: 12963-12968.
・Matsuura, K. et al. (2009) Queen succession through asexual reproduction in termites. Science 323:1687.
・Matsuura, K.: Sexual and Asexual reproduction in termites. In: Biology of Termites: A Modern Synthesis. eds. D.E. Bignell, Y. Roisin, N. Lo, (Springer), pp255-277 (2010).

【Term of Project】FY2013-2017

【Budget Allocation】163, 800 Thousand Yen

【Homepage Address and Other Contact Information】

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