P090

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Developments of termite neotenics regulated by high Juvenile hormone titers

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Background

Termite : eusocial insects

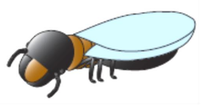
▶Termite societies are maintained by division of labor

▶Reproductive castes

primary reproductives (found new colony)

neotenic reproductives (take over reproduction)

Primary

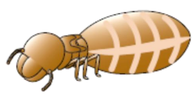


▶Morphological characteristics

Primary reproductives develop imaginal organs

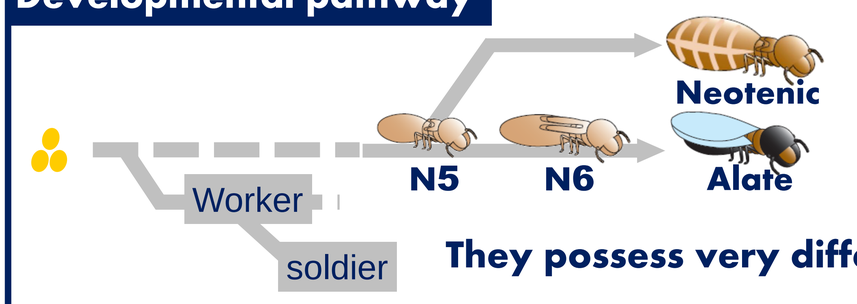
Neotenic reproductives develop only gonads

Neotenic



▶They are derived from the same immature instar

Developmental pathway



They possess very different phenotypes

Juvenile hormone (JH)

▶JH retains juvenile characteristics

▶JH stimulates gonad development generally in insects[1]

▶JH plays central role in termite caste differentiation [2]

▶The role of JH during neotenic differentiation is unclear

Objectives & Contents

Clarify the effects of JH on organ development during neotenic differentiation

Ex.1 Measurement of JH titer and *Vitellogenin* gene expression

Ex.2 Exprexssion analysis of JH signaling genes

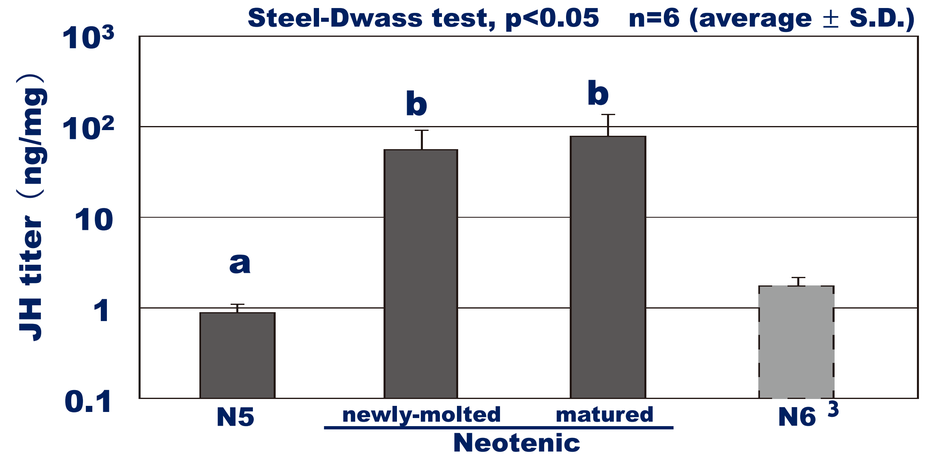
Ex.3 Functional analysis of JH receptor gene

Experiment 1

Measurement of JH titer and *Vitellogenin* gene expression

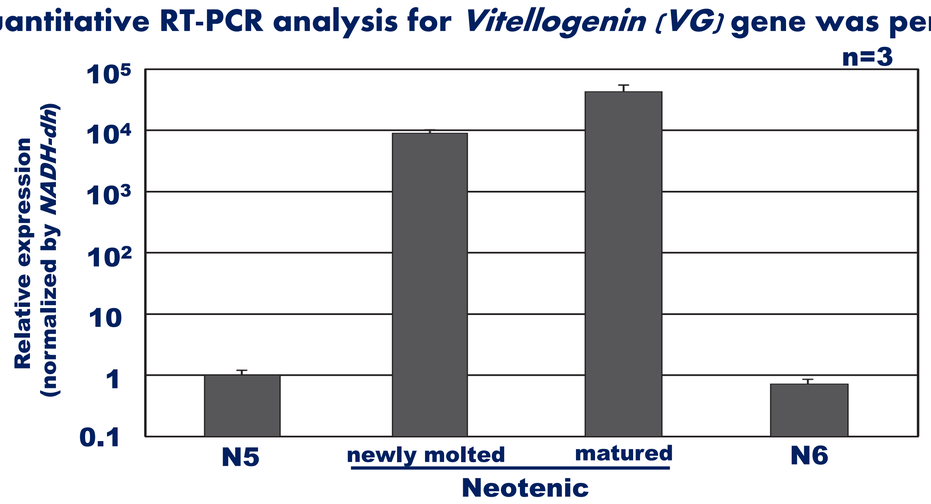
▶JH titer levels of each developmental stage were quantified using HPLC-MS

Steel-Dwass test, p<0.05 n=6 (average ± S.D.)



▶Quantitative RT-PCR analysis for *Vitellogenin (VG)* gene was performed.[4]

n=3



High JH titer in neotenics might be involved in the promotion of VG synthesis

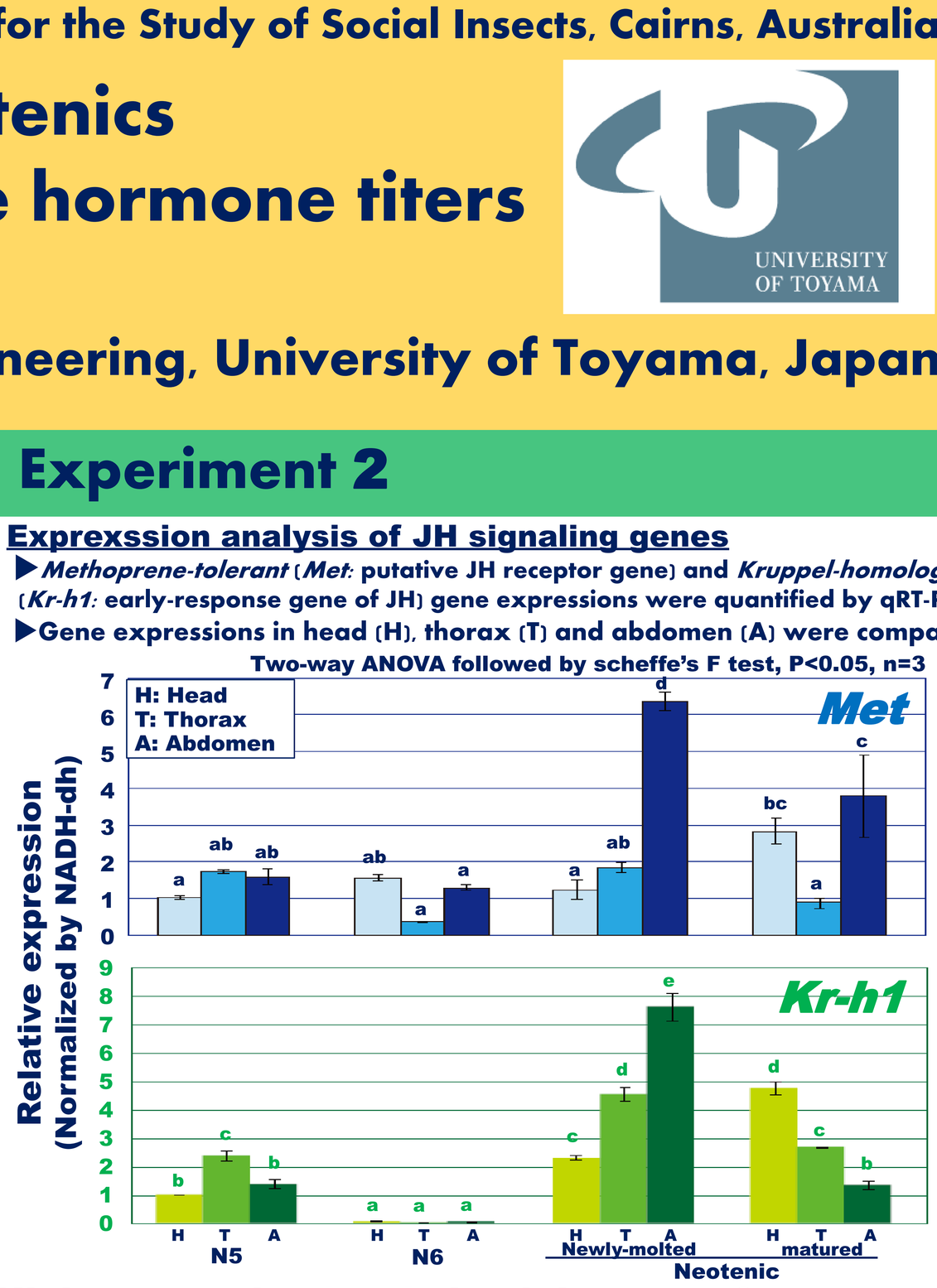
Experiment 2

Exprexssion analysis of JH signaling genes

▶*Methoprene-tolerant* (*Met*: putative JH receptor gene) and *Kruppel-homolog 1* (*Kr-h1*: early-response gene of JH) gene expressions were quantified by qRT-PCR.

▶Gene expressions in head (H), thorax (T) and abdomen (A) were compared.

Two-way ANOVA followed by scheffe's F test, P<0.05, n=3



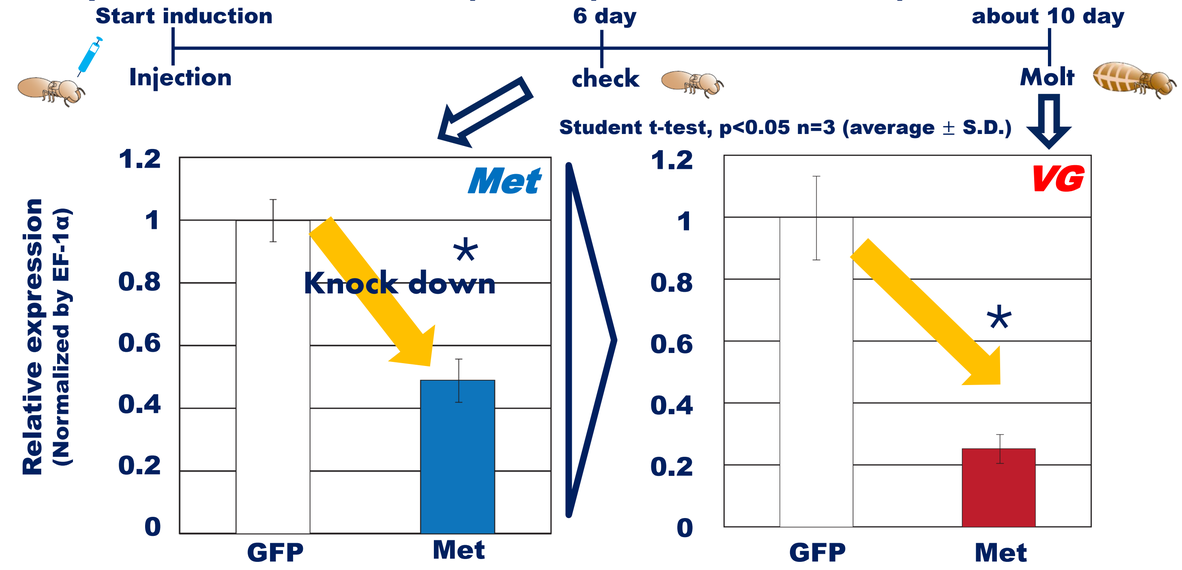
High expression levels in abdomens of neotenics might be involved in ovary development

Experiment 3

Functional analysis of JH receptor gene

▶ Met or GFP dsRNA (2μg) were injected into N5 nymphs before induction of nymphoid differentiation.

▶Newly molted individuals were picked up and checked *VG* expression



JH stimulates VG synthesis probably via Met and accelerates ovary development

Conclusion

Specific ovary development in neotenic might be caused by the following process

1. JH titer is rapidly increased and transported to the fat body in abdomen
2. JH signaling pathway is activated at the fat body
3. Activated signaling pathway stimulates VG synthesis and promotes ovarian development

Process 1

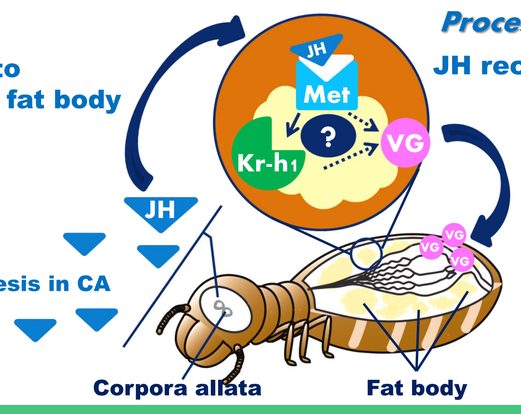
JH is transported to the abdominal fat body

Process 2

JH reception and JH signaling pathway are activated

Process 3

VG synthesis and ovarian development are promoted



References

[1] Gilbert et al. 2000, *Insect Biochemistory and Molecular Biology*

[2] Henderson 1998, *Pheromone communication in social insects*

[3] Maekawa et al. 2010, *Physiological Entomology*

[4] Saiki & Maekawa 2011, *Sociobiology*