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Sociogenomic studies on soldier differentiation in damp-wood termites

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Termite soldiers are a unique caste among social insects in terms of their morphology and role. Soldier differentiation involves many developmental changes, but proximate mechanisms remain unclear. In the incipient colonies of the damp-wood termite *Zootermopsis nevadensis*, it is revealed that the oldest 3rd instar larva (No. 1 larva) always differentiate into a presoldier. This is the first case showing that a particular individual differentiated into a presoldier before the molt. To elucidate the molecular mechanisms of soldier differentiation, we focused on the presoldier differentiation from No. 1 larva, and compared with the molt into 4th instar from other larva. We performed transcriptome analyses using next-generation sequencing (RNA-seq), and expression and function analyses of the candidate gene during presoldier differentiation. First, RNA-seq analyses showed that there was a significantly highly expressed gene ZnNLaz, the *Drosophila* NLaz homolog, in No. 1 larva. Our *de novo* assembly data and molecular phylogenetic studies indicated that there were at least two ZnNLaz homologs in this species. Next, we performed the RNA interference (RNAi) analysis to clarify the ZnNLaz function in presoldier differentiation. Double-stranded siRNAs or DDW were injected into No. 1 larva, and we observed the resulting molted individual phenotypes. Results showed that ZnNLaz RNAi strongly decreased presoldier differentiation rates, and most individuals molted into 4th instar. In the latter case, proctodeal trophallaxis from reproductives to No. 1 larva was significantly lower than the case for those undergoing presoldier differentiation. Our results suggest that ZnNLaz is the candidate genetic determinant for soldier differentiation in *Z. nevadensis*. Soldier differentiation is known to be regulated by some insect hormones (e.g. juvenile hormone). Based on the gene expression analyses of hormone signalings and the ZnNLaz protein localization in No. 1, we will discuss about the role of ZnNLaz and the proximate mechanisms during soldier differentiation in termites.