Section I: Invasive and Emerging Pests

RNAI APPROACH TO CONTROL INVASIVE PESTS

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RNA interference (RNAi) is the specific downregulation or knockdown of gene expression that is a posttranscriptional gene-silencing mechanism. This action is induced by the introduction of double-stranded RNA (dsRNA) into cells, resulting in degradation of a target messenger RNA (mRNA) and failure of a target protein production. RNAi by dsRNA has been exploited for various applications from investigation of specific gene function to gene knockdown effect in plants and animals including insects.

RNAi is now a valuable tool that has led to the development of new class of insecticides. Successful application of RNAi to pest management major challenges are: 1) selection of a suitable target gene(s), 2) development of a suitable delivery, and 3) cost effective RNAi production. In the selection of RNAi targets, insect neuropeptide hormones and their receptors are a good strategy.

Here, we introduce some examples of RNAi approach using selected genes to address a potential pest management as well as to find biological functions of the specific genes on invasive insect pests (Fig. 1). Also we demonstrate significant phenotypic impacts of RNAi constructed for interfering a neuropeptide gene and housekeeping genes on insect pests. RNAi technology as a next generation pest control will be briefly overviewed for the development and application.
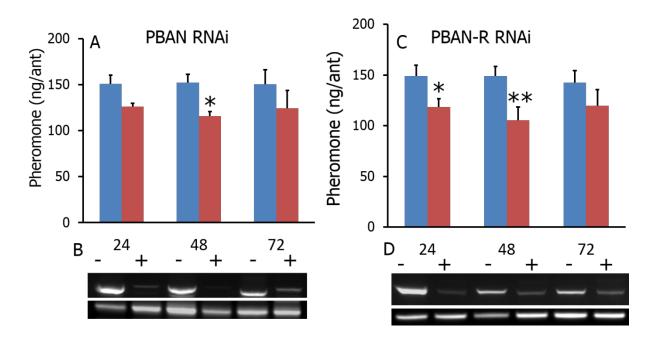

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Figure 4. RNAi effects on pheromone production and PBAN and PBAN-R gene expressions in the invasive ant. (**A**) Suppression of the pheromone production and (**B**) PBAN gene expression from brain-subesophageal ganglion at 24, 48 and 72 h post-injection of nuclease-free water (-) or PBAN dsRNA (+). (**C**) Suppression of pheromone production and (**D**) PBAN-R gene expression at 24, 48 and 72 h post-injection of nuclease-free water (-) or PBAN-R dsRNA (+) (modified Choi et al., 2012).