

Introduction

The crustacean hyperglycemic hormone (CHH) family is a group of neuroendocrine hormones that play important roles in growth, molting and reproduction. *Penaeus vannamei* is the most dominant farmed shrimp and exhibits sexual dimorphism in growth. However, little is known about the function of the CHH family in the formation of sexual dimorphism in shrimp growth.

Materials and Methods

In this study, a novel CHH-like gene was identified using genomic data, and a phylogenetic tree and sequence analysis were constructed. The expression pattern was characterized by RT-PCR and qPCR. In vivo RNAi knockdown and recombinant protein injection were further carried out to analyze the functional roles of this CHH-like gene in male and female *P. vannamei*.

Results

1. Gene identification and sequence analysis

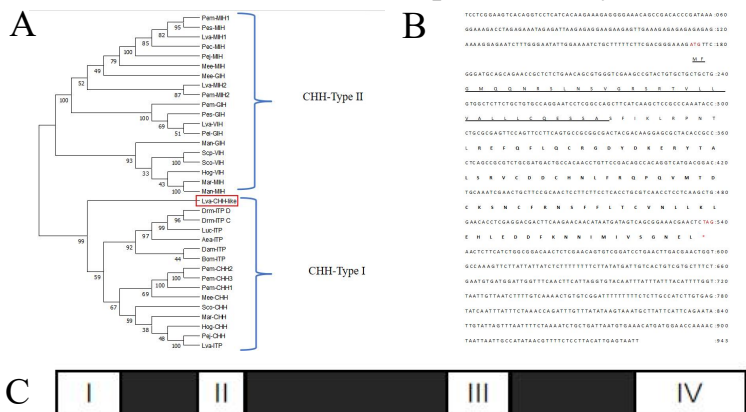


Fig 1 Phylogenetic analysis of CHHs from various crustacean and insect species(A). Nucleotide and deduced amino acid sequence of CHH-like(B). Gene structure of CHH-like, white for exons, black for introns(C).

2. CHH-like is expressed only in eyestalks and is male-biased

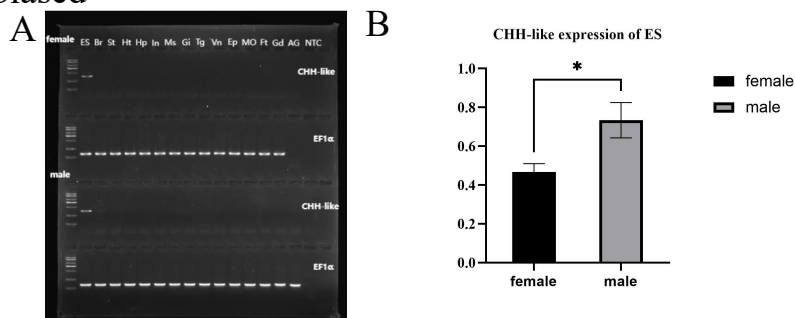


Fig 2 Expression profiles of CHH-like from RT-PCR(A) and qPCR(B).

Results

3. CHH-like expression was significantly decreased after RNAi treatment

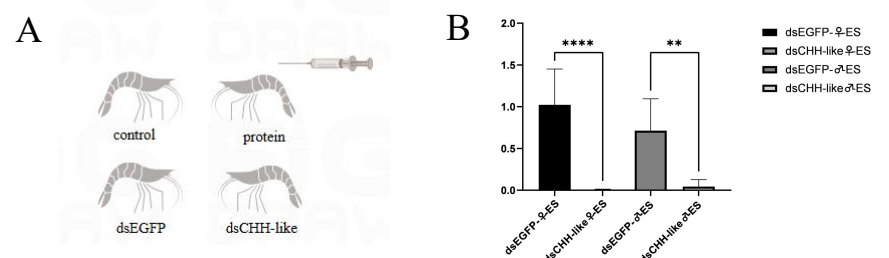


Fig 3 Schematic diagram of the experiment(A). Relative expression of CHH-like after RNAi treatment(B).

4. CHH-like plays opposite roles in the growth of males and females

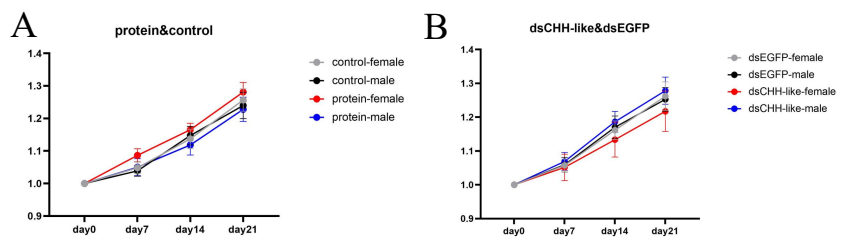


Fig 4 Weight growth rates of shrimps by recombinant protein(A) and RNAi(B) treatment.

5. Differentially expressed genes are mainly enriched in lipid metabolism

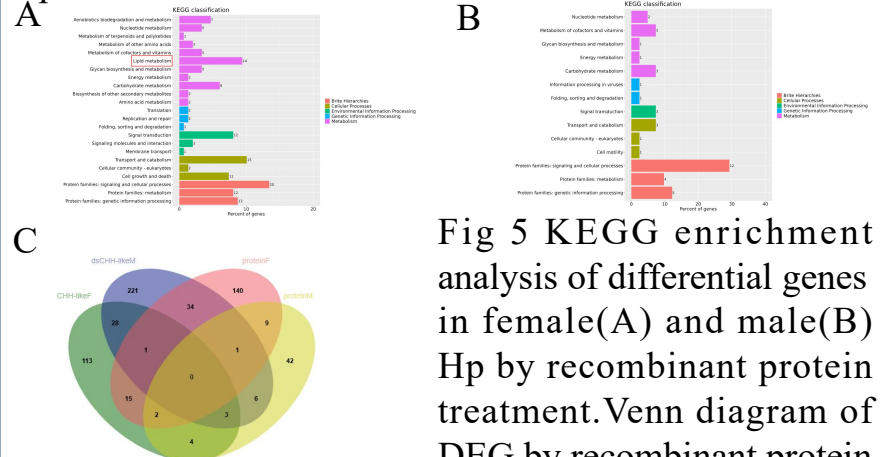


Fig 5 KEGG enrichment analysis of differentially expressed genes in female(A) and male(B) Hp by recombinant protein treatment. Venn diagram of DEG by recombinant protein and RNAi(C).

Conclusion

Our results showed that the CHH-like gene of *P. vannamei* is expressed only in the eyestalk. It is male-biased and plays opposite roles in the growth of males and females, suggesting that CHH-like has a sex-biased regulatory function.

Acknowledgements

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