

Elucidating molecular mechanisms of sex determination in stick insects

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Abstract:

Sex determination is a key process in animal development, triggering the differentiation of primary and secondary sexual traits essential for reproduction. In insects, sex determination is controlled by different cascades of genes that evolved around two genes called *transformer* and *doublesex*. Detailed molecular studies of these two genes in holometabolous insects suggested that insect sex determination is generally controlled via sex specific splicing. However, recent studies of a wider range of insect species challenge this assumption. Here, we investigated sex-specific splicing and expression patterns of the genes *doublesex* and *transformer* in stick insects, a hemimetabolous insect order. Interestingly, we found a duplication of the gene *doublesex* with both copies featuring similar expression patterns between the sexes and across tissues, and no evidence for sex specific splicing. A knockdown experiment targeting one of the two copies via RNAi did not reveal any effect on male or female secondary sexual traits. Furthermore, we also did not find any evidence for sex specific splicing of the gene *transformer*. In combination with new findings in other hemimetabolous insect orders, our data show that sex determination mechanisms in these orders differ strikingly from those in holometabolous insects. Thereupon, the study of non-model organisms reveals how mechanisms believed to be highly conserved feature extensive variation among species.