

GEPHE SUMMARY

	Gephebase Gene	GephelD
Ecdysone oxidase (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^Ecdysone oxidase^#gephebase-summary-title)	GP00001102	Main curator
	Entry Status	Courtier
Published		

PHENOTYPIC CHANGE

	Trait Category
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Physiology^#gephebase-summary-title)	Trait
Developmental time (https://www.gephebase.org/search-criteria?/and+Trait=^Developmental+time^#gephebase-summary-title)	Trait State in Taxon A
food shortage accelerates development	Trait State in Taxon B
food shortage has no effect on developmental time. Synchronization of individuals reared in mass population.	Ancestral State
Taxon A	Taxonomic Status

Taxon A	Latin Name	Taxon B	Latin Name
Bombyx mori (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Bombyx+mori^#gephebase-summary-title)		Bombyx mori (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Bombyx+mori^#gephebase-summary-title)	
domestic silkworm	Common Name	domestic silkworm	Common Name
domestic silkworm; silk moth; silkworm; Bombyx mori Linnaeus, 1758	Synonyms	domestic silkworm; silk moth; silkworm; Bombyx mori Linnaeus, 1758	Synonyms
species	Rank	species	Rank
	Lineage		Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Amphiesmenoptera; Lepidoptera; Glossata; Neolepidoptera; Heteroneura; Ditrysia; Obtectomera; Bombycoidea; Bombycidae; Bombycinae; Bombyx		cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Amphiesmenoptera; Lepidoptera; Glossata; Neolepidoptera; Heteroneura; Ditrysia; Obtectomera; Bombycoidea; Bombycidae; Bombycinae; Bombyx	
Bombyx () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7090)	Parent	Bombyx () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7090)	Parent
7091 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7091)	NCBI Taxonomy ID	7091 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7091)	NCBI Taxonomy ID
No	is Taxon A an Infraspecies?	No	is Taxon B an Infraspecies?

GENOTYPIC CHANGE

Eo	Generic Gene Name	UniProtKB Drosophila melanogaster
CG9504; Dmel\CG9504; DmEO; EO; EObeta1; Eo-RA; Dmel_CG9504	Synonyms	GenebankID or UniProtKB
7227.FBpp0073792 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=7227.FBpp0073792)	String	0
-	Sequence Similarities	
GO:0050660 : flavin adenine dinucleotide binding (https://www.ebi.ac.uk/QuickGO/term/GO:0050660)	GO - Molecular Function	
GO:0047875 : ecdysone oxidase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0047875)	GO - Biological Process	

GO:0008205 : ecdysone metabolic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0008205>)

GO - Cellular Component

GO:0016021 : integral component of membrane
(<https://www.ebi.ac.uk/QuickGO/term/GO:0016021>)

Presumptive Null

No (<https://www.gephebase.org/search-criteria/?and+Presumptive+Null=%No%#gephebase-summary-title>)

Molecular Type

Cis-regulatory (<https://www.gephebase.org/search-criteria/?and+Molecular+Type=%Cis-regulatory%#gephebase-summary-title>)

Aberration Type

Insertion (<https://www.gephebase.org/search-criteria/?and+Aberration+Type=%Insertion%#gephebase-summary-title>)

Insertion Size

100-999 bp

Molecular Details of the Mutation

insertion of a 512bp fragment of a Taguchi transposable element 462 bp upstream of the transcription start site of the EO gene. The TE insertion enhances the transcription of flanking genes after 20-hydroxyecdysone treatment.

Experimental Evidence

Candidate Gene (<https://www.gephebase.org/search-criteria/?and+Experimental+Evidence=%Candidate+Gene%#gephebase-summary-title>)

Main Reference

An adaptive transposable element insertion in the regulatory region of the EO gene in the domesticated silkworm, *Bombyx mori*. (2014) (<https://pubmed.ncbi.nlm.nih.gov/25213334>)

Authors

Sun W; Shen YH; Han MJ; Cao YF; Zhang Z

Abstract

Although there are many studies to show a key role of transposable elements (TEs) in adaptive evolution of higher organisms, little is known about the molecular mechanisms. In this study, we found that a partial TE (Taguchi) inserted in the cis-regulatory region of the silkworm ecdysone oxidase (EO) gene, which encodes a crucial enzyme to reduce the titer of molting hormone (20-hydroxyecdysone, 20E). The TE insertion occurred during domestication of silkworm and the frequency of the TE insertion in the domesticated silkworm (*Bombyx mori*) is high, 54.24%. The linkage disequilibrium in the TE inserted strains of the domesticated silkworm was elevated. Molecular population genetics analyses suggest that this TE insertion is adaptive for the domesticated silkworm. Luminescent reporter assay shows that the TE inserted in the cis-regulatory region of the EO gene functions as a 20E-induced enhancer of the gene expression. Further, phenotypic bioassay indicates that the silkworm with the TE insertion exhibited more stable developmental phenotype than the silkworm without the TE insertion when suffering from food shortage. Thus, the inserted TE in the cis-regulatory region of the EO gene increased developmental uniformity of silkworm individuals through regulating 20E metabolism, partially explaining transformation of a domestication developmental trait in the domesticated silkworm. Our results emphasize the exceptional role of gene expression regulation in developmental transition of domesticated animals.

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Additional References

Green cocoons in silkworm *Bombyx mori* resulting from the quercetin 5-O-glucosyltransferase of UGT86, is an evolved response to dietary toxins. (2013) (<https://pubmed.ncbi.nlm.nih.gov/23271130>)

RELATED GEPHE

No matches found.

Related Genes

No matches found.

Related Haplotypes

EXTERNAL LINKS

COMMENTS

@TE - Food shortage leads to higher levels of ecdysone in both types of individuals. This leads to higher levels of ecdysone oxidase in individuals carrying the TE (Taxon B) compared to the ones without TE insertion (Taxon A); and thus back to normal ecdysone levels and no accelerated development.