

GEPHE SUMMARY

	Gephebase Gene	GephelD
FAR (pheromone gland FAR) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^FAR (pheromone gland FAR)^#gephebase-summary-title)	GP00000304	Main curator
	Entry Status	Martin
Published		

PHENOTYPIC CHANGE

	Trait Category	
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Physiology^#gephebase-summary-title)	Trait	
Pheromone production (isomeric/chirality divergence) (https://www.gephebase.org/search-criteria?/and+Trait=^Pheromone+production+(isomeric/chirality+divergence)^#gephebase-summary-title)		
Ostrinia nubilalis Z	Trait State in Taxon A	
Ostrinia nubilalis E; other Ostrinia spp. In 2013 update	Trait State in Taxon B	
Data not curated	Ancestral State	
Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Intraspecific^#gephebase-summary-title)	Taxonomic Status	
Taxon A		Taxon B
Ostrinia nubilalis (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Ostrinia+nubilalis^#gephebase-summary-title)	Latin Name	Latin Name
European corn borer	Common Name	Common Name
Pyralis nubilalis; Pyrausta nubilalis; European corn borer; Ostrinia nubilalis (Hubner, 1796)	Synonyms	Synonyms
species	Rank	Rank
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; Pyraloidea; Crambidae; Pyraustinae; Ostrinia	Lineage	Lineage
Ostrinia () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 29056)	Parent	Parent
29057 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 29057)	NCBI Taxonomy ID	NCBI Taxonomy ID
Yes	is Taxon A an Infraspecies?	is Taxon B an Infraspecies?
Ostrinia nubilalis Z	Taxon A Description	Taxon B Description
	Ostrinia nubilalis E; other Ostrinia spp. In 2013 update	

GENOTYPIC CHANGE

pgFAR	Generic Gene Name	UniProtKB Ostrinia nubilalis
-	Synonyms	GenebankID or UniProtKB
-	String	
	Sequence Similarities	
Belongs to the fatty acyl-CoA reductase family.	GO - Molecular Function	
GO:0102965 : alcohol-forming fatty acyl-CoA reductase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0102965)		
GO:0080019 : fatty-acyl-CoA reductase (alcohol-forming) activity (https://www.ebi.ac.uk/QuickGO/term/GO:0080019)		
	GO - Biological Process	

GO:0006629 : lipid metabolic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0006629>)

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=%22No%22#gephebase-summary-title>)

Molecular Type

Coding (<https://www.gephebase.org/search-criteria?/and+Molecular+Type=%22Coding%22#gephebase-summary-title>)

Aberration Type

Unknown (<https://www.gephebase.org/search-criteria?/and+Aberration+Type=%22Unknown%22#gephebase-summary-title>)

Molecular Details of the Mutation

Candidate a.a. substitutions with effect validated in vitro

Experimental Evidence

Linkage Mapping (<https://www.gephebase.org/search-criteria?/and+Experimental+Evidence=%22Linkage+Mapping%22#gephebase-summary-title>)

Main Reference

Allelic variation in a fatty-acyl reductase gene causes divergence in moth sex pheromones. (2010) (<https://pubmed.ncbi.nlm.nih.gov/20592730>)

Authors

Lassance JM; Groot AT; Li Ånnard MA; Antony B; Borgwardt C; Andersson F; Hedenstrom E; Heckel DG; Laffstedt C

Abstract

Pheromone-based behaviours are crucial in animals from insects to mammals, and reproductive isolation is often based on pheromone differences. However, the genetic mechanisms by which pheromone signals change during the evolution of new species are largely unknown. In the sexual communication system of moths (Insecta: Lepidoptera), females emit a species-specific pheromone blend that attracts males over long distances. The European corn borer, *Ostrinia nubilalis*, consists of two sex pheromone races, Z and E, that use different ratios of the cis and trans isomers of acetate pheromone components. This subtle difference leads to strong reproductive isolation in the field between the two races, which could represent a first step in speciation. Female sex pheromone production and male behavioural response are under the control of different major genes, but the identity of these genes is unknown. Here we show that allelic variation in a fatty-acyl reductase gene essential for pheromone biosynthesis accounts for the phenotypic variation in female pheromone production, leading to race-specific signals. Both the cis and trans isomers of the pheromone precursors are produced by both races, but the precursors are differentially reduced to yield opposite ratios in the final pheromone blend as a result of the substrate specificity of the enzymes encoded by the Z and E alleles. This is the first functional characterization of a gene contributing to intraspecific behavioural reproductive isolation in moths, highlighting the importance of evolutionary diversification in a lepidopteran-specific family of reductases. Accumulation of substitutions in the coding region of a single biosynthetic enzyme can produce pheromone differences resulting in reproductive isolation, with speciation as a potential end result.

Additional References

Functional consequences of sequence variation in the pheromone biosynthetic gene pgFAR for *Ostrinia* moths. (2013) (<https://pubmed.ncbi.nlm.nih.gov/23407169>)
bric Å brac controls sex pheromone choice by male European corn borer moths. (2021) (<https://pubmed.ncbi.nlm.nih.gov/33990556>)

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

@SexualTrait