GEPHE SUMMARY

Gephebase Gene
CYP6B4 (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^CYP6B4^#gephebase-summary-title)

GepheID
GP00000206

Entry Status
Published

Main curator
Martin

PHENOTYPIC CHANGE

Trait #1

Trait Category
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Physiology^#gephebase-summary-title)

Trait
Xenobiotic resistance (https://www.gephebase.org/search-criteria?/and+Trait=^Xenobiotic resistance^#gephebase-summary-title)

Trait State in Taxon A
Other butterflies

Trait State in Taxon B
Papilio glaucus and Papilio canadensis

Trait #2

Trait Category
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Physiology^#gephebase-summary-title)

Trait
Host plant specialization (https://www.gephebase.org/search-criteria?/and+Trait=^Host plant specialization^#gephebase-summary-title)

Trait State in Taxon A
-

Trait State in Taxon B
-

Ancestral State
Data not curated

Taxonomic Status
Intergeneric or Higher (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Intergeneric or Higher^#gephebase-summary-title)

Taxon A

Latin Name
Nymphalidae (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Nymphalidae^#gephebase-summary-title)

Common Name
brushfoots

Synonyms
brushfoots; brush-footed butterflies

Rank
family

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; Papilionoidea

Parent
Papilionoidea (butterflies) - (Rank: superfamily) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 37572)

NCBI Taxonomy ID
33415 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 33415)

is Taxon A an Infraspecies?
No

Taxon B

Latin Name
Papilio glaucus (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Papilio glaucus^#gephebase-summary-title)

Common Name
eastern tiger swallowtail

Synonyms
Pterourus glaucus; eastern tiger swallowtail; tiger swallowtail; Papilio glaucus Linnaeus, 1758

Rank
species

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; Papilionoidea; Papilionidae; Papilioninae; Papilionini; Papilio

Parent
Papilio () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7145)

NCBI Taxonomy ID
45779 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 45779)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name

CYP6B4

UniProtKB Papilio glaucus

Q27902 (http://www.uniprot.org/uniprot/Q27902)

Synonyms

-

GenebankID or UniProtKB

U65489 (https://www.ncbi.nlm.nih.gov/nuccore/U65489)

String

-

Sequence Similarities

Belongs to the cytochrome P450 family.

GO - Molecular Function

GO:0020037 : heme binding (https://www.ebi.ac.uk/QuickGO/term/GO:0020037)
GO:0005506 : iron ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005506)
GO:0070330 : aromatase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0070330)

GO - Biological Process

-

GO - Cellular Component

GO:0005789 : endoplasmic reticulum membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0005789)
GO:0031090 : organelle membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0031090)

Presumptive Null

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

Molecular Type

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

Aberration Type

SNP (https://www.gephebase.org/search-criteria?/and+Aberration Type=^SNP^#gephebase-summary-title)

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

Lys484Ser and probably other a.a. substitutions

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Lys	Ser	484

Main Reference

Cytochrome P450s in Papilio multicaudatus and the transition from oligophagy to polyphagy in the Papilionidae. (2007) (https://pubmed.ncbi.nlm.nih.gov/17651237)

Authors

Mao W; Schuler MA; Berenbaum MR

Abstract

Although substrate-specific CYP6B1 and CYP6B3 enzymes in Papilio polyxenes contribute to specialization on furanocoumarin-containing host plants, CYP6B4 and CYP6B17 enzymes in the polyphagous Papilio glaucus and Papilio canadensis have a broader range of substrates. Papilio multicaudatus, an oligophage with one furanocoumarin-containing host, is putatively ancestral to polyphagous Papilio species. Furanocoumarin-inducible CYP6B33-CYP6B37 and CYP6AB6 were characterized from this species. Heterologous expression of CYP6B33 revealed furanocoumarin metabolism resembling that of CYP6B4-CYP6B17 enzymes from P. glaucus and P. canadensis. Molecular models of CYP6B33 and CYP6B4 indicate that seven conserved aromatic side chains stabilize their hydrophobic catalytic sites and that a Lys484-Ser484 substitution enlarges the CYP6B4 active site pocket to increase the predicted distance between the substrate and reactive oxygen relative to CYP6B1. Loss of specialization in this lineage may have resulted from relatively few mutational changes, allowing acquisition of broader catalytic activities without loss of ancestral furanocoumarin-metabolizing activities.

Additional References

RELATED GEPHE

Related Genes

2 (CYP6B1, Na/K-ATPase alpha-subunit) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^33415^/and+Trait=Xenobiotic resistance/or+Taxon ID=^33415^/and+Trait=Host plant specialization/or+Taxon ID=^45779^/and+Trait=Xenobiotic resistance/or+Taxon ID=^45779^/and+Trait=Host plant specialization/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS