GEPHE SUMMARY

Gephebase Gene

ABCB4 (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^ABCB4^#gephebase-summary-title)

Entry Status

Published

GepheID

GP00002607

Main curator

Courtier

PHENOTYPIC CHANGE

Trait Category

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

Trait

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

Trait State in Taxon A

Aedes aegypti

Trait State in Taxon B

Aedes aegypti - resistant strain from the Caribbean

Ancestral State

Taxon A

Taxonomic Status

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

Taxon A

Latin Name

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

Common Name

yellow fever mosquito

Synonyms

Stegomyia aegypti; yellow fever mosquito; Aedes aegypti (Linnaeus, 1762)

Rank

species

Lineage

cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Diptera; Nematocera; Culicomorpha; Culicoidea; Culicidae; Culicinae; Aedini; Aedes; Stegomyia

Parent

Stegomyia () - (Rank: subgenus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 53541)

NCBI Taxonomy ID

7159 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7159)

is Taxon A an Infraspecies?

No

Taxon B

Latin Name

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

Common Name

yellow fever mosquito

Synonyms

Stegomyia aegypti; yellow fever mosquito; Aedes aegypti (Linnaeus, 1762)

Rank

species

Lineage

cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Diptera; Nematocera; Culicomorpha; Culicoidea; Culicidae; Culicinae; Aedini; Aedes; Stegomyia

Parent

Stegomyia () - (Rank: subgenus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 53541)

NCBI Taxonomy ID

7159 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7159)

is Taxon B an Infraspecies?

No

GENOTYPIC CHANGE

Generic Gene Name

Abcb4

Synonyms

Mdr2; Pgy2; Pgy-2; mdr-2

String

10090.ENSMUSP00000003717 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier= 10090.ENSMUSP00000003717)

Sequence Similarities

Belongs to the ABC transporter superfamily. ABCB family. Multidrug resistance exporter (TC 3.A.1.201) subfamily.

GO - Molecular Function

GO:0005524 : ATP binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005524)
GO:0042626 : ATPase activity, coupled to transmembrane movement of substances (https://www.ebi.ac.uk/QuickGO/term/GO:0042626)
GO:0008525 : phosphatidylcholine transporter activity (https://www.ebi.ac.uk/QuickGO/term/GO:0008525)
GO:0090554 : phosphatidylcholine-translocating ATPase activity

UniProtKB Mus musculus

P21440 (http://www.uniprot.org/uniprot/P21440)

GenebankID or UniProtKB

()

(https://www.ebi.ac.uk/QuickGO/term/GO:0090554)

GO - Biological Process

GO:0032782 : bile acid secretion (https://www.ebi.ac.uk/QuickGO/term/GO:0032782)
GO:1903413 : cellular response to bile acid
(https://www.ebi.ac.uk/QuickGO/term/GO:1903413)
GO:0055088 : lipid homeostasis (https://www.ebi.ac.uk/QuickGO/term/GO:0055088)
GO:0045332 : phospholipid translocation
(https://www.ebi.ac.uk/QuickGO/term/GO:0045332)
GO:0032376 : positive regulation of cholesterol transport
(https://www.ebi.ac.uk/QuickGO/term/GO:0032376)
GO:0061092 : positive regulation of phospholipid translocation
(https://www.ebi.ac.uk/QuickGO/term/GO:0061092)
GO:2001140 : positive regulation of phospholipid transport
(https://www.ebi.ac.uk/QuickGO/term/GO:2001140)
GO:1901557 : response to fenofibrate (https://www.ebi.ac.uk/QuickGO/term/GO:1901557)

GO - Cellular Component

GO:0016021 : integral component of membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0016021)
GO:0005886 : plasma membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0005886)
GO:0015629 : actin cytoskeleton (https://www.ebi.ac.uk/QuickGO/term/GO:0015629)
GO:0016324 : apical plasma membrane
(https://www.ebi.ac.uk/QuickGO/term/GO:0016324)
GO:0030136 : clathrin-coated vesicle (https://www.ebi.ac.uk/QuickGO/term/GO:0030136)
GO:0005737 : cytoplasm (https://www.ebi.ac.uk/QuickGO/term/GO:0005737)
GO:0005829 : cytosol (https://www.ebi.ac.uk/QuickGO/term/GO:0005829)
GO:0005925 : focal adhesion (https://www.ebi.ac.uk/QuickGO/term/GO:0005925)
GO:0000139 : Golgi membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0000139)
GO:0046581 : intercellular canaliculus
(https://www.ebi.ac.uk/QuickGO/term/GO:0046581)
GO:0016020 : membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0016020)
GO:0045121 : membrane raft (https://www.ebi.ac.uk/QuickGO/term/GO:0045121)
GO:0005654 : nucleoplasm (https://www.ebi.ac.uk/QuickGO/term/GO:0005654)

Presumptive Null

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

Molecular Type

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

Aberration Type

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

Insertion Size

unknown

Molecular Details of the Mutation

ABCB4 gene amplified about 6â€“7 times

Experimental Evidence

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

Main Reference

Gene amplification, ABC transporters and cytochrome P450s: unraveling the molecular basis of pyrethroid resistance in the dengue vector, Aedes aegypti. (2012)
(https://pubmed.ncbi.nlm.nih.gov/22720108)

Authors

Bariami V; Jones CM; Poupardin R; Vontas J; Ranson H

Abstract

Pyrethroid insecticides are widely utilized in dengue control. However, the major vector, Aedes aegypti, is becoming increasingly resistant to these insecticides and this is impacting on the efficacy of control measures. The near complete transcriptome of two pyrethroid resistant populations from the Caribbean was examined to explore the molecular basis of this resistance.

Two previously described target site mutations, 1016I and 1534C were detected in pyrethroid resistant populations from Grand Cayman and Cuba. In addition between two and five per cent of the Ae. aegypti transcriptome was differentially expressed in the resistant populations compared to a laboratory susceptible population. Approximately 20 per cent of the genes over-expressed in resistant mosquitoes were up-regulated in both Caribbean populations (107 genes). Genes with putative monooxygenase activity were significantly over represented in the up-regulated subset, including five CYP9 P450 genes. Quantitative PCR was used to confirm the higher transcript levels of multiple cytochrome P450 genes from the CYP9J family and an ATP binding cassette transporter. Over expression of two genes, CYP9J26 and ABCB4, is due, at least in part, to gene amplification.

These results, and those from other studies, strongly suggest that increases in the amount of the CYP9J cytochrome P450s are an important mechanism of pyrethroid resistance in Ae. aegypti. The genetic redundancy resulting from the expansion of this gene family makes it unlikely that a single gene or mutation responsible for pyrethroid resistance will be identified in this mosquito species. However, the results from this study do pave the way for the development of new pyrethroid synergists and improved resistance diagnostics. The role of copy number polymorphisms in detoxification and transporter genes in providing protection against insecticide exposure requires further investigation.

Additional References

RELATED GEPHE

Related Genes

4 (CYP9J26, CYP9M6, para (kdr), resistance to dieldrin) (https://www.gephebase.org/search-criteria?/or+Taxon ID=^7159^/and+Trait=Xenobiotic resistance/and+groupHaplotypes=true#gephebase-summary-title)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS