GEPHE SUMMARY

Gephebase Gene

PTPN1 (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^PTPN1^#gephebase-summary-title)

GepheID

GP00002668

Entry Status

Published

Main curator

Courtier

PHENOTYPIC CHANGE

Trait Category

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

Trait

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

Trait State in Taxon A

Locusta migratoria

Trait State in Taxon B

Locusta migratoria - Tibetan adapted to high altitude

Ancestral State

Taxon A

Taxonomic Status

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

Taxon A

Latin Name

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

Common Name

migratory locust

Synonyms

migratory locust; Locusta migratoria (Linnaeus, 1758)

Rank

species

Lineage

cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Polyneoptera; Orthoptera; Caelifera; Acrididea; Acridomorpha; Acridoidea; Acrididae; Oedipodinae; Locusta

Parent

Locusta () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7003)

NCBI Taxonomy ID

7004 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7004)

is Taxon A an Infraspecies?

No

Taxon B

Latin Name

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

Common Name

migratory locust

Synonyms

migratory locust; Locusta migratoria (Linnaeus, 1758)

Rank

species

Lineage

cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Polyneoptera; Orthoptera; Caelifera; Acrididea; Acridomorpha; Acridoidea; Acrididae; Oedipodinae; Locusta

Parent

Locusta () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7003)

NCBI Taxonomy ID

7004 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 7004)

is Taxon B an Infraspecies?

No

GENOTYPIC CHANGE

Generic Gene Name

-

Synonyms

-

String

-

Sequence Similarities

-

GO - Molecular Function

-

GO - Biological Process

-

GO - Cellular Component

-

UniProtKB

P18031NULL (http://www.uniprot.org/uniprot/P18031NULL)

GenebankID or UniProtKB

()

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

one nonsynonymous mutation (c.1046A>T) in PTPN1 in Tibetan locusts which encodes the amino acid substitution p.Asn349Ile at the proline (Pro)-rich domain of PTP1B.

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	AAY	ATY	1046
Amino-acid	Asn	Ile	349

Main Reference

Genetic variation in PTPN1 contributes to metabolic adaptation to high-altitude hypoxia in Tibetan migratory locusts. (2018) (https://pubmed.ncbi.nlm.nih.gov/30478313)

Authors

Ding D; Liu G; Hou L; Gui W; Chen B; Kang L

Abstract

Animal and human highlanders have evolved distinct traits to enhance tissue oxygen delivery and utilization. Unlike vertebrates, insects use their tracheal system for efficient oxygen delivery. However, the genetic basis of insect adaptation to high-altitude hypoxia remains unexplored. Here, we report a potential mechanism of metabolic adaptation of migratory locusts in the Tibetan Plateau, through whole-genome resequencing and functional investigation. A genome-wide scan revealed that the positively selected genes in Tibetan locusts are predominantly involved in carbon and energy metabolism. We observed a notable signal of natural selection in the gene PTPN1, which encodes PTP1B, an inhibitor of insulin signaling pathway. We show that a PTPN1 coding mutation regulates the metabolism of Tibetan locusts by mediating insulin signaling activity in response to hypoxia. Overall, our findings provide evidence for the high-altitude hypoxia adaptation of insects at the genomic level and explore a potential regulatory mechanism underlying the evolved metabolic homeostasis.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

@SelectiveSweep UniProtID=P18031