

GEPHE SUMMARY

PTPN1 (https://www.gephebase.org/search-criteria?/and+Gene Gephebase="PTPN1"#gephebase-summary-title)	Gephebase Gene	GP00002668	GepheID
Published	Entry Status	Courtier	Main curator

PHENOTYPIC CHANGE

Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category="Physiology"#gephebase-summary-title)	Trait Category		
High-altitude adaptation (<a adaptation"#gephebase-summary-title"="" high-altitude="" href="https://www.gephebase.org/search-criteria?/and+Trait=">https://www.gephebase.org/search-criteria?/and+Trait="High-altitude adaptation"#gephebase-summary-title)	Trait		
Locusta migratoria	Trait State in Taxon A		
Locusta migratoria - Tibetan adapted to high altitude	Trait State in Taxon B		
Taxon A	Ancestral State		
Intraspecific (https://www.gephebase.org/search-criteria?/and+Taxonomic Status="Intraspecific"#gephebase-summary-title)	Taxonomic Status		
	Taxon A	Taxon B	
Locusta migratoria (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="Locusta migratoria"#gephebase-summary-title)	Latin Name	Locusta migratoria (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms="Locusta migratoria"#gephebase-summary-title)	Latin Name
migratory locust	Common Name	migratory locust	Common Name
migratory locust; Locusta migratoria (Linnaeus, 1758)	Synonyms	migratory locust; Locusta migratoria (Linnaeus, 1758)	Synonyms
species	Rank	species	Rank
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	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	Lineage
Locusta () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7003)	Parent	Locusta () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7003)	Parent
7004 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7004)	NCBI Taxonomy ID	7004 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=7004)	NCBI Taxonomy ID
No	is Taxon A an Intraspecies?	No	is Taxon B an Intraspecies?

GENOTYPIC CHANGE

-	Generic Gene Name	P18031NULL (http://www.uniprot.org/uniprot/P18031NULL)	UniProtKB
-	Synonyms		GenebankID or UniProtKB
-	String	()	
-	Sequence Similarities		
-	GO - Molecular Function		
-	GO - Biological Process		
-	GO - Cellular Component		
-			Presumptive Null
No (https://www.gephebase.org/search-criteria?/and+Presumptive Null="No"#gephebase-summary-title)			Molecular Type
Coding (<a coding"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Molecular Type=">https://www.gephebase.org/search-criteria?/and+Molecular Type="Coding"#gephebase-summary-title)			

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

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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