

GEPHE SUMMARY

Aquaporin (https://www.gephebase.org/search-criteria?/and+GeneGephebase=^Aquaporin^#gephebase-summary-title)	Gephebase Gene	GP00001421	GepheID
	Entry Status	Prigent	Main curator
	Published		

PHENOTYPIC CHANGE

Physiology (https://www.gephebase.org/search-criteria?/and+TraitCategory=^Physiology^#gephebase-summary-title)		Trait Category	
Water transport (selective accumulation of water or glycerol) (https://www.gephebase.org/search-criteria?/and+Trait=^Water transport (selective accumulation of water or glycerol)^#gephebase-summary-title)		Trait	
BgAqp Aquaporin water selective channel		Trait State in Taxon A	
PvAqp2 aquaglyceroporin glycerol transporter		Trait State in Taxon B	
Unknown		Ancestral State	
Interspecific (https://www.gephebase.org/search-criteria?/and+TaxonomicStatus=^Interspecific^#gephebase-summary-title)		Taxonomic Status	
Taxon A		Taxon B	
Blattella germanica (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Blattella germanica^#gephebase-summary-title)		Polypedilum vanderplanki (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Polypedilum vanderplanki^#gephebase-summary-title)	
German cockroach		sleeping chironomid	
German cockroach; Blattella germanica (Linnaeus, 1767); Blatella germanica species		sleeping chironomid; Polypedilum vanderplanki Hinton, 1951; Polypedilum vanderplankei species	
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Polyneoptera; Dictyoptera; Blattodea; Blaberoidea; Ectobiidae; Blattellinae; Blattella		cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Diptera; Nematocera; Culicomorpha; Chironomoidea; Chironomidae; Chironominae; Chironomini; Polypedilum; Polypedilum	
Blattella () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 6973)		Polypedilum () - (Rank: subgenus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 2056899)	
6973 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 6973)		319348 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 319348)	
is Taxon A an Intraspecies?		is Taxon B an Intraspecies?	
No		No	

GENOTYPIC CHANGE

AQP1	Generic Gene Name	UniProtKB Homo sapiens
	Synonyms	P29972 (http://www.uniprot.org/uniprot/P29972)
	String	AB281620 (https://www.ncbi.nlm.nih.gov/nucleotide/AB281620)
9606.ENSPP00000311165 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=9606.ENSPP00000311165)		
Belongs to the MIP/aquaporin (TC 1.A.8) family.		Sequence Similarities
GO:0042802 : identical protein binding (https://www.ebi.ac.uk/QuickGO/term/GO:0042802)		GO - Molecular Function
GO:0015079 : potassium ion transmembrane transporter activity (https://www.ebi.ac.uk/QuickGO/term/GO:0015079)		
GO:0015250 : water channel activity (https://www.ebi.ac.uk/QuickGO/term/GO:0015250)		
GO:0008519 : ammonium transmembrane transporter activity		

(<https://www.ebi.ac.uk/QuickGO/term/GO:0008519>)
GO:0022857 : transmembrane transporter activity
(<https://www.ebi.ac.uk/QuickGO/term/GO:0022857>)
GO:0035379 : carbon dioxide transmembrane transporter activity
(<https://www.ebi.ac.uk/QuickGO/term/GO:0035379>)
GO:0015168 : glycerol transmembrane transporter activity
(<https://www.ebi.ac.uk/QuickGO/term/GO:0015168>)
GO:0005223 : intracellular cGMP-activated cation channel activity
(<https://www.ebi.ac.uk/QuickGO/term/GO:0005223>)
GO:0030184 : nitric oxide transmembrane transporter activity
(<https://www.ebi.ac.uk/QuickGO/term/GO:0030184>)
GO:0005267 : potassium channel activity
(<https://www.ebi.ac.uk/QuickGO/term/GO:0005267>)
GO:0005372 : water transmembrane transporter activity
(<https://www.ebi.ac.uk/QuickGO/term/GO:0005372>)

GO - Biological Process

GO:0043066 : negative regulation of apoptotic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0043066>)
GO:0019934 : cGMP-mediated signaling
(<https://www.ebi.ac.uk/QuickGO/term/GO:0019934>)
GO:0006813 : potassium ion transport
(<https://www.ebi.ac.uk/QuickGO/term/GO:0006813>)
GO:0071260 : cellular response to mechanical stimulus
(<https://www.ebi.ac.uk/QuickGO/term/GO:0071260>)
GO:0042493 : response to drug (<https://www.ebi.ac.uk/QuickGO/term/GO:0042493>)
GO:0071280 : cellular response to copper ion
(<https://www.ebi.ac.uk/QuickGO/term/GO:0071280>)
GO:0003091 : renal water homeostasis
(<https://www.ebi.ac.uk/QuickGO/term/GO:0003091>)
GO:0071456 : cellular response to hypoxia
(<https://www.ebi.ac.uk/QuickGO/term/GO:0071456>)
GO:0006833 : water transport (<https://www.ebi.ac.uk/QuickGO/term/GO:0006833>)
GO:0006972 : hyperosmotic response
(<https://www.ebi.ac.uk/QuickGO/term/GO:0006972>)
GO:0071300 : cellular response to retinoic acid
(<https://www.ebi.ac.uk/QuickGO/term/GO:0071300>)
GO:0042476 : odontogenesis (<https://www.ebi.ac.uk/QuickGO/term/GO:0042476>)
GO:0070301 : cellular response to hydrogen peroxide
(<https://www.ebi.ac.uk/QuickGO/term/GO:0070301>)
GO:0071732 : cellular response to nitric oxide
(<https://www.ebi.ac.uk/QuickGO/term/GO:0071732>)
GO:0015701 : bicarbonate transport (<https://www.ebi.ac.uk/QuickGO/term/GO:0015701>)
GO:0030185 : nitric oxide transport (<https://www.ebi.ac.uk/QuickGO/term/GO:0030185>)
GO:0045766 : positive regulation of angiogenesis
(<https://www.ebi.ac.uk/QuickGO/term/GO:0045766>)
GO:0043154 : negative regulation of cysteine-type endopeptidase activity involved in apoptotic process (<https://www.ebi.ac.uk/QuickGO/term/GO:0043154>)
GO:0048146 : positive regulation of fibroblast proliferation
(<https://www.ebi.ac.uk/QuickGO/term/GO:0048146>)
GO:0071320 : cellular response to cAMP
(<https://www.ebi.ac.uk/QuickGO/term/GO:0071320>)
GO:0015696 : ammonium transport (<https://www.ebi.ac.uk/QuickGO/term/GO:0015696>)
GO:0071549 : cellular response to dexamethasone stimulus
(<https://www.ebi.ac.uk/QuickGO/term/GO:0071549>)
GO:0030950 : establishment or maintenance of actin cytoskeleton polarity
(<https://www.ebi.ac.uk/QuickGO/term/GO:0030950>)
GO:0034644 : cellular response to UV
(<https://www.ebi.ac.uk/QuickGO/term/GO:0034644>)
GO:0030157 : pancreatic juice secretion
(<https://www.ebi.ac.uk/QuickGO/term/GO:0030157>)
GO:0035378 : carbon dioxide transmembrane transport
(<https://www.ebi.ac.uk/QuickGO/term/GO:0035378>)
GO:0015670 : carbon dioxide transport
(<https://www.ebi.ac.uk/QuickGO/term/GO:0015670>)
GO:0006884 : cell volume homeostasis
(<https://www.ebi.ac.uk/QuickGO/term/GO:0006884>)
GO:0019725 : cellular homeostasis (<https://www.ebi.ac.uk/QuickGO/term/GO:0019725>)
GO:0071474 : cellular hyperosmotic response
(<https://www.ebi.ac.uk/QuickGO/term/GO:0071474>)
GO:0071241 : cellular response to inorganic substance
(<https://www.ebi.ac.uk/QuickGO/term/GO:0071241>)
GO:0071288 : cellular response to mercury ion
(<https://www.ebi.ac.uk/QuickGO/term/GO:0071288>)
GO:0071472 : cellular response to salt stress
(<https://www.ebi.ac.uk/QuickGO/term/GO:0071472>)
GO:0033326 : cerebrospinal fluid secretion
(<https://www.ebi.ac.uk/QuickGO/term/GO:0033326>)
GO:0015793 : glycerol transport (<https://www.ebi.ac.uk/QuickGO/term/GO:0015793>)

GO:0021670 : lateral ventricle development
(<https://www.ebi.ac.uk/QuickGO/term/GO:0021670>)
GO:0085018 : maintenance of symbiont-containing vacuole by host
(<https://www.ebi.ac.uk/QuickGO/term/GO:0085018>)
GO:0050891 : multicellular organismal water homeostasis
(<https://www.ebi.ac.uk/QuickGO/term/GO:0050891>)
GO:0046878 : positive regulation of saliva secretion
(<https://www.ebi.ac.uk/QuickGO/term/GO:0046878>)
GO:0003097 : renal water transport (<https://www.ebi.ac.uk/QuickGO/term/GO:0003097>)
GO:0035377 : transepithelial water transport
(<https://www.ebi.ac.uk/QuickGO/term/GO:0035377>)

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:0016324 : apical plasma membrane
(<https://www.ebi.ac.uk/QuickGO/term/GO:0016324>)
GO:0005737 : cytoplasm (<https://www.ebi.ac.uk/QuickGO/term/GO:0005737>)
GO:0070062 : extracellular exosome (<https://www.ebi.ac.uk/QuickGO/term/GO:0070062>)
GO:0005887 : integral component of plasma membrane
(<https://www.ebi.ac.uk/QuickGO/term/GO:0005887>)
GO:0005634 : nucleus (<https://www.ebi.ac.uk/QuickGO/term/GO:0005634>)
GO:0016323 : basolateral plasma membrane
(<https://www.ebi.ac.uk/QuickGO/term/GO:0016323>)
GO:0031965 : nuclear membrane (<https://www.ebi.ac.uk/QuickGO/term/GO:0031965>)
GO:0045177 : apical part of cell (<https://www.ebi.ac.uk/QuickGO/term/GO:0045177>)
GO:0009925 : basal plasma membrane
(<https://www.ebi.ac.uk/QuickGO/term/GO:0009925>)
GO:0005903 : brush border (<https://www.ebi.ac.uk/QuickGO/term/GO:0005903>)
GO:0042383 : sarcolemma (<https://www.ebi.ac.uk/QuickGO/term/GO:0042383>)
GO:0031526 : brush border membrane
(<https://www.ebi.ac.uk/QuickGO/term/GO:0031526>)
GO:0020003 : symbiont-containing vacuole
(<https://www.ebi.ac.uk/QuickGO/term/GO:0020003>)

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

p.His174Ala

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	-	-	-

Main Reference

Insect glycerol transporters evolved by functional co-option and gene replacement. (2015) (<https://pubmed.ncbi.nlm.nih.gov/26183829>)

Authors

Finn RN; ChauvignÃ© F; Stavang JA; Belles X; CerdÃ J

Abstract

Transmembrane glycerol transport is typically facilitated by aquaglyceroporins in Prokaryota and Eukaryota. In holometabolan insects however, aquaglyceroporins are absent, yet several species possess polyol permeable aquaporins. It thus remains unknown how glycerol transport evolved in the Holometabola. By combining phylogenetic and functional studies, here we show that a more efficient form of glycerol transporter related to the water-selective channel AQP4 specifically evolved and multiplied in the insect lineage, resulting in the replacement of the ancestral branch of aquaglyceroporins in holometabolan insects. To recapitulate this evolutionary process, we generate specific mutants in distantly related insect aquaporins and human AQP4 and show that a single mutation in the selectivity filter converted a water-selective channel into a glycerol transporter at the root of the crown clade of hexapod insects. Integration of phanerozoic climate models suggests that these events were associated with the emergence of complete metamorphosis and the unparalleled radiation of insects.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

ancestry is difficult to understand because phylogenetic tree seems to show the opposite of the article's conclusion