

GEPHE SUMMARY

Gephebase Gene		GepheID
Prolactin receptor (https://www.gephebase.org/search-criteria?/and+GeneGephebase=Prolactin+receptor^#gephebase-summary-title)		GP00002284
Entry Status		Main curator
Published		Martin

PHENOTYPIC CHANGE

Trait #1	Trait Category
Morphology (https://www.gephebase.org/search-criteria?/and+TraitCategory=Morphology^#gephebase-summary-title)	
Trait	
Hair (slick ; short) (https://www.gephebase.org/search-criteria?/and+Trait=Hair(slick+;+short)^#gephebase-summary-title)	
Trait State in Taxon A	
WT hair	
Trait State in Taxon B	
Slick hair (dominant) - Carora ; Limonero	

Trait #2	Trait Category
Physiology (https://www.gephebase.org/search-criteria?/and+TraitCategory=Physiology^#gephebase-summary-title)	
Trait	
Thermoregulation (tolerance to warm climate) (https://www.gephebase.org/search-criteria?/and+Trait=Thermoregulation+(tolerance+to+warm+climate)^#gephebase-summary-title)	
Trait State in Taxon A	
Non-thermotolerant	
Trait State in Taxon B	
Thermotolerant breed	

Ancestral State	
Taxon A	
Taxonomic Status	
Domesticated (https://www.gephebase.org/search-criteria?/and+TaxonomicStatus=Domesticated^#gephebase-summary-title)	

Taxon A	Latin Name
Bos taurus (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Bos+taurus^#gephebase-summary-title)	
Common Name	
cattle	
Synonyms	
Bos bovis; Bos primigenius taurus; cattle; bovine; cow; dairy cow; domestic cattle; domestic cow; Bos taurus Linnaeus, 1758; Bos Taurus	
Rank	
species	
Lineage	
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Eutheria; Boreoeutheria; Laurasiatheria; Artiodactyla; Ruminantia; Pecora; Bovidae; Bovinae; Bos	
Parent	
Bos (oxen, cattle) - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9903)	
NCBI Taxonomy ID	
9913 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9913)	
is Taxon A an Intraspecies?	
No	

Taxon B	Latin Name
Bos taurus (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Bos+taurus^#gephebase-summary-title)	
Common Name	
cattle	
Synonyms	
Bos bovis; Bos primigenius taurus; cattle; bovine; cow; dairy cow; domestic cattle; domestic cow; Bos taurus Linnaeus, 1758; Bos Taurus	
Rank	
species	
Lineage	
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Eutheria; Boreoeutheria; Laurasiatheria; Artiodactyla; Ruminantia; Pecora; Bovidae; Bovinae; Bos	
Parent	
Bos (oxen, cattle) - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9903)	
NCBI Taxonomy ID	
9913 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9913)	
is Taxon B an Intraspecies?	
No	

GENOTYPIC CHANGE

PRLR HPRL; MFAB; hPRLrl; RI-PRLR 9606.ENSPO0000371432 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=9606.ENSPO0000371432)	Generic Gene Name	P16471 (http://www.uniprot.org/uniprot/P16471)	UniProtKB Homo sapiens
	Synonyms	AAA51417 (https://www.ncbi.nlm.nih.gov/nuccore/AAA51417)	GenebankID or UniProtKB
	String		
Sequence Similarities			
Belongs to the type I cytokine receptor family. Type 1 subfamily.			
GO - Molecular Function			
GO:0042803 : protein homodimerization activity (https://www.ebi.ac.uk/QuickGO/term/GO:0042803)			
GO:0046872 : metal ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0046872)			
GO:0017046 : peptide hormone binding (https://www.ebi.ac.uk/QuickGO/term/GO:0017046)			
GO:0019955 : cytokine binding (https://www.ebi.ac.uk/QuickGO/term/GO:0019955)			
GO:0004896 : cytokine receptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004896)			
GO:0042978 : ornithine decarboxylase activator activity (https://www.ebi.ac.uk/QuickGO/term/GO:0042978)			
GO:0004925 : prolactin receptor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004925)			
GO - Biological Process			
GO:0043066 : negative regulation of apoptotic process (https://www.ebi.ac.uk/QuickGO/term/GO:0043066)			
GO:0007171 : activation of transmembrane receptor protein tyrosine kinase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0007171)			
GO:0007166 : cell surface receptor signaling pathway (https://www.ebi.ac.uk/QuickGO/term/GO:0007166)			
GO:0120162 : positive regulation of cold-induced thermogenesis (https://www.ebi.ac.uk/QuickGO/term/GO:0120162)			
GO:0042976 : activation of Janus kinase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0042976)			
GO:0060397 : JAK-STAT cascade involved in growth hormone signaling pathway (https://www.ebi.ac.uk/QuickGO/term/GO:0060397)			
GO:0042110 : T cell activation (https://www.ebi.ac.uk/QuickGO/term/GO:0042110)			
GO:0007566 : embryo implantation (https://www.ebi.ac.uk/QuickGO/term/GO:0007566)			
GO:0007595 : lactation (https://www.ebi.ac.uk/QuickGO/term/GO:0007595)			
GO:0006694 : steroid biosynthetic process (https://www.ebi.ac.uk/QuickGO/term/GO:0006694)			
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:0043235 : receptor complex (https://www.ebi.ac.uk/QuickGO/term/GO:0043235)			
GO:0005576 : extracellular region (https://www.ebi.ac.uk/QuickGO/term/GO:0005576)			
GO:0009986 : cell surface (https://www.ebi.ac.uk/QuickGO/term/GO:0009986)			
GO:0009897 : external side of plasma membrane (https://www.ebi.ac.uk/QuickGO/term/GO:0009897)			
GO:0031904 : endosome lumen (https://www.ebi.ac.uk/QuickGO/term/GO:0031904)			
Yes (https://www.gephebase.org/search-criteria?/and+Presumptive+Null=~Yes^#gephebase-summary-title)			Presumptive Null
Coding (https://www.gephebase.org/search-criteria?/and+Molecular+Type=~Coding^#gephebase-summary-title)			Molecular Type
SNP (https://www.gephebase.org/search-criteria?/and+Aberration+Type=~SNP^#gephebase-summary-title)			Aberration Type
Nonsense			SNP Coding Change
g.39136666C>T p.Arg497*			Molecular Details of the Mutation
-			Experimental Evidence

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Arg	STP	497

Convergent Evolution of Slick Coat in Cattle through Truncation Mutations in the Prolactin Receptor. (2018) (https://pubmed.ncbi.nlm.nih.gov/29527221)	Main Reference
Porto-Neto LR; Bickhart DM; Landaeta-Hernandez AJ; Utsunomiya YT; Pagan M; Jimenez E; Hansen PJ; Dikmen S; Schroeder SG; Kim ES; Sun J; Crespo E; Amati N; Cole JB; Null DJ; Garcia JF; Reverter A; Barendse W; Sonstegard TS	Authors

Evolutionary adaptations are occasionally convergent solutions to the same problem. A mutation contributing to a heat tolerance adaptation in Senepol cattle, a New World breed of mostly European descent, results in the distinct phenotype known as slick, where an animal has shorter hair and lower follicle density across its coat than wild type animals. The causal variant, located in the 11 exon of prolactin receptor, produces a frameshift that results in a truncated protein. However, this mutation does not explain all cases of slick coats found in criollo breeds. Here, we obtained genome sequences from slick cattle of a geographically distinct criollo breed, namely Limonero, whose ancestors were originally brought to the Americas by the Spanish. These data were used to identify new causal alleles in the 11 exon of the prolactin receptor, two of which also encode shortened proteins that remove a highly conserved tyrosine residue. These new mutations explained almost 90% of investigated cases of animals that had slick coats, but which also did not carry the Senepol slick allele. These results demonstrate convergent evolution at the molecular level in a trait important to the adaptation of an animal to its environment.

Additional References

RELATED GEPHE

Related Genes

3 (KRT27, KRT71, Prolactin) ([https://www.gephebase.org/search-criteria?/or+Taxon ID=^9913^/and+Trait=Hair/or+Taxon ID=^9913^/and+Trait=Thermoregulation/and+groupHaplotypes=true#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Taxon+ID=^9913^/and+Trait=Hair/or+Taxon+ID=^9913^/and+Trait=Thermoregulation/and+groupHaplotypes=true#gephebase-summary-title))

Related Haplotypes

3 ([https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^Prolactin receptor^/and+Taxon ID=^9913^/or+Gene Gephebase=^Prolactin receptor^/and+Taxon ID=^9913^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=^Prolactin+receptor^/and+Taxon+ID=^9913^/or+Gene+Gephebase=^Prolactin+receptor^/and+Taxon+ID=^9913^#gephebase-summary-title))

EXTERNAL LINKS

COMMENTS

<https://omia.org/OMIA001372/9913/> @AllelicSeries @Pleiotropy