

GEPHE SUMMARY

aggrecan (https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=^aggrecan^#gephebase-summary-title)	Gephebase Gene	GP00002143	GepheID
Published	Entry Status	Martin	Main curator

PHENOTYPIC CHANGE

Morphology (https://www.gephebase.org/search-criteria?/and+Trait+Category=^Morphology^#gephebase-summary-title)	Trait Category		
Body size (dwarfism) (https://www.gephebase.org/search-criteria?/and+Trait=^Body size (dwarfism)^#gephebase-summary-title)	Trait		
Miniature horses	Trait State in Taxon A		
Miniature horses with dwarf phenotype (chondrodysplasia) including the Miniature Shetland pony	Trait State in Taxon B		
Taxon A	Ancestral State		
Domesticated (https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=^Domesticated^#gephebase-summary-title)	Taxonomic Status		
	Taxon A	Taxon B	
Equus caballus (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Equus caballus^#gephebase-summary-title)	Latin Name	Equus caballus (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Equus caballus^#gephebase-summary-title)	Latin Name
horse	Common Name	horse	Common Name
Equus przewalskii f. caballus; Equus przewalskii forma caballus; horse; domestic horse; equine; Equus caballus Linnaeus, 1758	Synonyms	Equus przewalskii f. caballus; Equus przewalskii forma caballus; horse; domestic horse; equine; Equus caballus Linnaeus, 1758	Synonyms
species	Rank	species	Rank
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Eutheria; Boreoeutheria; Laurasiatheria; Perissodactyla; Equidae; Equus; Equus	Lineage	cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Eutheria; Boreoeutheria; Laurasiatheria; Perissodactyla; Equidae; Equus; Equus	Lineage
Equus () - (Rank: subgenus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=35510)	Parent	Equus () - (Rank: subgenus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=35510)	Parent
9796 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9796)	NCBI Taxonomy ID	9796 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9796)	NCBI Taxonomy ID
No	is Taxon A an Intraspecies?	No	is Taxon B an Intraspecies?

GENOTYPIC CHANGE

ACAN	Generic Gene Name	P16112 (http://www.uniprot.org/uniprot/P16112)	UniProtKB Homo sapiens
AGC1; SEDK; AGCAN; CSPG1; MSK16; CSPGCP; SSOAOD	Synonyms	()	GenebankID or UniProtKB
9606.ENSP00000387356 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=9606.ENSP00000387356)	String		
Belongs to the aggrecan/versican proteoglycan family.	Sequence Similarities		
GO:0046872 : metal ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0046872)	GO - Molecular Function		
GO:0030246 : carbohydrate binding (https://www.ebi.ac.uk/QuickGO/term/GO:0030246)			
GO:0005201 : extracellular matrix structural constituent (https://www.ebi.ac.uk/QuickGO/term/GO:0005201)			
GO:0030021 : extracellular matrix structural constituent conferring compression resistance			

(<https://www.ebi.ac.uk/QuickGO/term/GO:0030021>)
 GO:0005540 : hyaluronic acid binding
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0005540>)

GO - Biological Process

GO:0007155 : cell adhesion (<https://www.ebi.ac.uk/QuickGO/term/GO:0007155>)
 GO:0007417 : central nervous system development
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0007417>)
 GO:0001502 : cartilage condensation
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0001502>)
 GO:0002063 : chondrocyte development
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0002063>)
 GO:0030199 : collagen fibril organization
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0030199>)
 GO:0030198 : extracellular matrix organization
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0030198>)
 GO:0007507 : heart development (<https://www.ebi.ac.uk/QuickGO/term/GO:0007507>)
 GO:0018146 : keratan sulfate biosynthetic process
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0018146>)
 GO:0042340 : keratan sulfate catabolic process
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0042340>)
 GO:0030166 : proteoglycan biosynthetic process
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0030166>)
 GO:0006508 : proteolysis (<https://www.ebi.ac.uk/QuickGO/term/GO:0006508>)
 GO:0001501 : skeletal system development
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0001501>)

GO - Cellular Component

GO:0005576 : extracellular region (<https://www.ebi.ac.uk/QuickGO/term/GO:0005576>)
 GO:0062023 : collagen-containing extracellular matrix
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0062023>)
 GO:0005604 : basement membrane (<https://www.ebi.ac.uk/QuickGO/term/GO:0005604>)
 GO:0031012 : extracellular matrix (<https://www.ebi.ac.uk/QuickGO/term/GO:0031012>)
 GO:0098982 : GABA-ergic synapse (<https://www.ebi.ac.uk/QuickGO/term/GO:0098982>)
 GO:0098978 : glutamatergic synapse
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0098978>)
 GO:0005796 : Golgi lumen (<https://www.ebi.ac.uk/QuickGO/term/GO:0005796>)
 GO:0043202 : lysosomal lumen (<https://www.ebi.ac.uk/QuickGO/term/GO:0043202>)
 GO:0098966 : perisynaptic extracellular matrix
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0098966>)

Presumptive Null

No ([https://www.gephebase.org/search-criteria?/and+Presumptive Null+No+gpebase-summary-title](https://www.gephebase.org/search-criteria?/and+Presumptive+Null+No+gpebase-summary-title))

Molecular Type

Coding ([https://www.gephebase.org/search-criteria?/and+Molecular Type+Coding+gpebase-summary-title](https://www.gephebase.org/search-criteria?/and+Molecular+Type+Coding+gpebase-summary-title))

Aberration Type

SNP ([https://www.gephebase.org/search-criteria?/and+Aberration Type+SNP+gpebase-summary-title](https://www.gephebase.org/search-criteria?/and+Aberration+Type+SNP+gpebase-summary-title))

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

g.95282140C>G ; p.Ala505Pro

Experimental Evidence

Candidate Gene ([https://www.gephebase.org/search-criteria?/and+Experimental Evidence+Candidate Gene+gpebase-summary-title](https://www.gephebase.org/search-criteria?/and+Experimental+Evidence+Candidate+Gene+gpebase-summary-title))

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Ala	Pro	505

Main Reference

Whole-genome sequencing reveals a potential causal mutation for dwarfism in the Miniature Shetland pony. (2017) (<https://pubmed.ncbi.nlm.nih.gov/27942904>)

Authors

Metzger J; Gast AC; Schrimpf R; Rau J; Eikelberg D; Beineke A; Hellige M; Distl O

Abstract

The Miniature Shetland pony represents a horse breed with an extremely small body size. Clinical examination of a dwarf Miniature Shetland pony revealed a lowered size at the withers, malformed skull and brachygnathia superior. Computed tomography (CT) showed a shortened maxilla and a cleft of the hard and soft palate which protruded into the nasal passage leading to breathing difficulties. Pathological examination confirmed these findings but did not reveal histopathological signs of premature ossification in limbs or cranial sutures. Whole-genome sequencing of this dwarf Miniature Shetland pony and comparative sequence analysis using 26 reference equids from NCBI Sequence Read Archive revealed three probably damaging missense variants which could be exclusively found in the affected foal. Validation of these three missense mutations in 159 control horses from different horse breeds and five donkeys revealed only the aggrecan (ACAN)-associated g.94370258G>C variant as homozygous wild-type in all control samples. The dwarf Miniature Shetland pony had the homozygous mutant genotype C/C of the ACAN:g.94370258G>C variant and the normal parents were heterozygous G/C. An unaffected full sib and 3/5 unaffected half-sibs were heterozygous G/C for the ACAN:g.94370258G>C variant. In summary, we could demonstrate a dwarf phenotype in a miniature pony breed perfectly associated with a missense mutation within the ACAN gene.

Additional References

Multiple alleles of ACAN associated with chondrodysplastic dwarfism in Miniature horses. (2018) (<https://pubmed.ncbi.nlm.nih.gov/30058072>)

3 (B4GALT7, HMGA2, LCORL) (<https://www.gephebase.org/search-criteria?/or+Taxon ID=^9796^/and+Trait=Body size/and+groupHaplotypes=true#gephebase-summary-title>)

3 (<https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^aggreca^/and+Taxon ID=^9796^/or+Gene Gephebase=^aggreca^/and+Taxon ID=^9796^#gephebase-summary-title>)

EXTERNAL LINKS

COMMENTS

<https://omia.org/OMIA001271/9796/> @AllelicSeries