

GEPHE SUMMARY

	Gephebase Gene	GephelD
GDF9 (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^GDF9^#gephebase-summary-title)	GP00002187	Main curator
Published	Entry Status	Martin

PHENOTYPIC CHANGE

	Trait Category
Physiology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Physiology^#gephebase-summary-title)	Trait
Fertility (increased ovulation rate) (https://www.gephebase.org/search-criteria?/and+Trait=^Fertility+(increased+ovulation+rate)^#gephebase-summary-title)	Trait State in Taxon A
Ovis aries	Trait State in Taxon B
Ovis aries - High fertility, FecG(H) - Increased ovulation rate; Heterozygote shows phenotype; homozygote results in ovarian failure	Ancestral State
Taxon A	Taxonomic Status
Domesticated (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Domesticated^#gephebase-summary-title)	

Taxon A		Taxon B	
Latin Name		Latin Name	
Ovis aries (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Ovis+aries^#gephebase-summary-title)		Ovis aries (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=^Ovis+aries^#gephebase-summary-title)	
sheep	Common Name	sheep	Common Name
Ovis ammon aries; Ovis orientalis aries; Ovis ovis; sheep; domestic sheep; lambs; wild sheep; Ovis aries Linnaeus, 1758	Synonyms	Ovis ammon aries; Ovis orientalis aries; Ovis ovis; sheep; domestic sheep; lambs; wild sheep; Ovis aries 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; Artiodactyla; Ruminantia; Pecora; Bovidae; Caprinae; Ovis	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; Caprinae; Ovis	Lineage
Ovis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 9935)	Parent	Ovis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 9935)	Parent
9940 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 9940)	NCBI Taxonomy ID	9940 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 9940)	NCBI Taxonomy ID
is Taxon A an Infraspecies?		is Taxon B an Infraspecies?	
No		No	

GENOTYPIC CHANGE

GDF9	Generic Gene Name	UniProtKB Homo sapiens
POF14	Synonyms	GenebankID or UniProtKB
9606.ENSP00000296875 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=9606.ENSP00000296875)	String	CCl87994 (https://www.ncbi.nlm.nih.gov/nucore/CCl87994)
Belongs to the TGF-beta family.	Sequence Similarities	
GO:0005125 : cytokine activity (https://www.ebi.ac.uk/QuickGO/term/GO:0005125) GO:0008083 : growth factor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0008083) GO:0005160 : transforming growth factor beta receptor binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005160)	GO - Molecular Function	GO - Biological Process

GO:0008284 : positive regulation of cell proliferation
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0008284>)
 GO:0030509 : BMP signaling pathway
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0030509>)
 GO:0048468 : cell development (<https://www.ebi.ac.uk/QuickGO/term/GO:0048468>)
 GO:0010862 : positive regulation of pathway-restricted SMAD protein phosphorylation
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0010862>)
 GO:0042981 : regulation of apoptotic process
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0042981>)
 GO:0043408 : regulation of MAPK cascade
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0043408>)
 GO:0060395 : SMAD protein signal transduction
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0060395>)
 GO:0030308 : negative regulation of cell growth
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0030308>)
 GO:0007179 : transforming growth factor beta receptor signaling pathway
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0007179>)
 GO:0007292 : female gamete generation
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0007292>)
 GO:0001555 : oocyte growth (<https://www.ebi.ac.uk/QuickGO/term/GO:0001555>)
 GO:2000870 : regulation of progesterone secretion
 (<https://www.ebi.ac.uk/QuickGO/term/GO:2000870>)

GO - Cellular Component

GO:0005737 : cytoplasm (<https://www.ebi.ac.uk/QuickGO/term/GO:0005737>)
 GO:0005615 : extracellular space (<https://www.ebi.ac.uk/QuickGO/term/GO:0005615>)

Presumptive Null

No (<https://www.gephebase.org/search-criteria/?and+Presumptive+Null=%22No%22#gephebase-summary-title>)

Molecular Type

Coding (<https://www.gephebase.org/search-criteria/?and+Molecular+Type=%22Coding%22#gephebase-summary-title>)

Aberration Type

SNP (<https://www.gephebase.org/search-criteria/?and+Aberration+Type=%22SNP%22#gephebase-summary-title>)

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

g.41841212C>T c.1184C>T p.S395F

Experimental Evidence

Linkage Mapping (<https://www.gephebase.org/search-criteria/?and+Experimental+Evidence=%22Linkage+Mapping%22#gephebase-summary-title>)

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Ser	Phe	395

Main Reference

Mutations in the genes for oocyte-derived growth factors GDF9 and BMP15 are associated with both increased ovulation rate and sterility in Cambridge and Belclare sheep (*Ovis aries*).
 (2004) (<https://pubmed.ncbi.nlm.nih.gov/14627550>)

Authors

Hanrahan JP; Gregan SM; Mulsant P; Mullen M; Davis GH; Powell R; Galloway SM

Abstract

Belclare and Cambridge are prolific sheep breeds, the origins of which involved selecting ewes with exceptionally high litter size records from commercial flocks. The variation in ovulation rate in both breeds is consistent with segregation of a gene (or genes) with a large effect on this trait. Sterile ewes, due to a failure of normal ovarian follicle development, occur in both breeds. New naturally occurring mutations in genes for the oocyte-derived growth factors growth differentiation factor 9 (GDF9) and bone morphogenetic protein 15 (BMP15) are described. These mutations are associated with increased ovulation rate in heterozygous carriers and sterility in homozygous carriers in both breeds. This is the first time that a mutation in the gene for GDF9 has been found that causes increased ovulation rate and infertility in a manner similar to inactivating mutations in BMP15, and shows that GDF9 is essential for normal folliculogenesis in sheep. Furthermore, it is shown, for the first time in any species, that individuals with mutations in both GDF9 and BMP15 have a greater ovulation rate than sheep with either of the mutations separately.

Additional References

RELATED GEPHE

Related Genes

3 (B4GALNT2, BMP receptor IB (BMPRIB), BMP15) (<https://www.gephebase.org/search-criteria/?or+Taxon+ID=%229940%22+and+Trait=Fertility+and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

4 (<https://www.gephebase.org/search-criteria/?or+Gene+Gephebase=%22GDF9%22+and+Taxon+ID=%229940%22+or+Gene+Gephebase=%22GDF9%22+and+Taxon+ID=%229940%22#gephebase-summary-title>)

EXTERNAL LINKS

COMMENTS

@HeterozygoteAdvantage ; <https://omia.org/OMIA001801/9940/>