

GEPHE SUMMARY

GCLM (https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=GCLM^#gephebase-summary-title)	Gephebase Gene	GP00001664	GepheID
Published	Entry Status	Prigent	Main curator

PHENOTYPIC CHANGE

Physiology (https://www.gephebase.org/search-criteria?/and+Trait+Category=Physiology^#gephebase-summary-title)	Trait Category		
Recombination rate (https://www.gephebase.org/search-criteria?/and+Trait=Recombination+rate^#gephebase-summary-title)	Trait		
Holstein cattle	Trait State in Taxon A		
Holstein cattle	Trait State in Taxon B		
Unknown	Ancestral State		
Domesticated (https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=Domesticated^#gephebase-summary-title)	Taxonomic Status		
	Taxon A		Taxon B
	Latin Name		Latin Name
Bos taurus (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Bos+taurus^#gephebase-summary-title)	Bos taurus	Bos taurus (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=Bos+taurus^#gephebase-summary-title)	Bos taurus
	Common Name		Common Name
cattle	cattle	cattle	cattle
	Synonyms		Synonyms
Bos bovis; Bos primigenius taurus; cattle; bovine; cow; dairy cow; domestic cattle; domestic cow; Bos taurus Linnaeus, 1758; Bos Taurus	Bos bovis; Bos primigenius taurus; cattle; bovine; cow; dairy cow; domestic cattle; domestic cow; Bos taurus Linnaeus, 1758; Bos Taurus	Bos bovis; Bos primigenius taurus; cattle; bovine; cow; dairy cow; domestic cattle; domestic cow; Bos taurus Linnaeus, 1758; Bos Taurus	Bos bovis; Bos primigenius taurus; cattle; bovine; cow; dairy cow; domestic cattle; domestic cow; Bos taurus Linnaeus, 1758; Bos Taurus
	Rank		Rank
species	species	species	species
	Lineage		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	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	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	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		Parent
Bos (oxen, cattle) - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9903)	Bos (oxen, cattle) - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9903)	Bos (oxen, cattle) - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9903)	Bos (oxen, cattle) - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9903)
	NCBI Taxonomy ID		NCBI Taxonomy ID
9913 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9913)	9913 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9913)	9913 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9913)	9913 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9913)
	is Taxon A an Intraspecies?		is Taxon B an Intraspecies?
Yes	Yes	Yes	Yes
	Taxon A Description		Taxon B Description
Holstein cattle	Holstein cattle	Holstein cattle	Holstein cattle

GENOTYPIC CHANGE

GCLM	Generic Gene Name	Q2T9Y6 (http://www.uniprot.org/uniprot/Q2T9Y6)	UniProtKB Bos taurus
-	Synonyms	0	GenebankID or UniProtKB
	String		
9913.ENSBTAP00000026855 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=9913.ENSBTAP00000026855)	Sequence Similarities		
Belongs to the aldo/keto reductase family. Glutamate--cysteine ligase light chain subfamily.	GO - Molecular Function		
GO:0046982 : protein heterodimerization activity (https://www.ebi.ac.uk/QuickGO/term/GO:0046982)			
GO:0030234 : enzyme regulator activity (https://www.ebi.ac.uk/QuickGO/term/GO:0030234)			

GO:0004357 : glutamate-cysteine ligase activity
(<https://www.ebi.ac.uk/QuickGO/term/GO:0004357>)
GO:0035226 : glutamate-cysteine ligase catalytic subunit binding
(<https://www.ebi.ac.uk/QuickGO/term/GO:0035226>)

GO - Biological Process

GO:2001237 : negative regulation of extrinsic apoptotic signaling pathway
(<https://www.ebi.ac.uk/QuickGO/term/GO:2001237>)
GO:0042493 : response to drug (<https://www.ebi.ac.uk/QuickGO/term/GO:0042493>)
GO:1990830 : cellular response to leukemia inhibitory factor
(<https://www.ebi.ac.uk/QuickGO/term/GO:1990830>)
GO:0006536 : glutamate metabolic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0006536>)
GO:0006979 : response to oxidative stress
(<https://www.ebi.ac.uk/QuickGO/term/GO:0006979>)
GO:0050880 : regulation of blood vessel size
(<https://www.ebi.ac.uk/QuickGO/term/GO:0050880>)
GO:0006750 : glutathione biosynthetic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0006750>)
GO:0008637 : apoptotic mitochondrial changes
(<https://www.ebi.ac.uk/QuickGO/term/GO:0008637>)
GO:0006534 : cysteine metabolic process
(<https://www.ebi.ac.uk/QuickGO/term/GO:0006534>)
GO:0035229 : positive regulation of glutamate-cysteine ligase activity
(<https://www.ebi.ac.uk/QuickGO/term/GO:0035229>)
GO:0051900 : regulation of mitochondrial depolarization
(<https://www.ebi.ac.uk/QuickGO/term/GO:0051900>)

GO - Cellular Component

GO:0017109 : glutamate-cysteine ligase complex
(<https://www.ebi.ac.uk/QuickGO/term/GO:0017109>)

Presumptive Null

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

Molecular Type

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

Aberration Type

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

Molecular Details of the Mutation

On chromosome 3. Associated SNP upstream of the gene

Experimental Evidence

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

Main Reference

Cattle Sex-Specific Recombination and Genetic Control from a Large Pedigree Analysis. (2015) (<https://pubmed.ncbi.nlm.nih.gov/26540184>)

Authors

Ma L; O'Connell JR; VanRaden PM; Shen B; Padhi A; Sun C; Bickhart DM; Cole JB; Null DJ; Liu GE; Da Y; Wiggans GR

Abstract

Meiotic recombination is an essential biological process that generates genetic diversity and ensures proper segregation of chromosomes during meiosis. From a large USDA dairy cattle pedigree with over half a million genotyped animals, we extracted 186,927 three-generation families, identified over 8.5 million maternal and paternal recombination events, and constructed sex-specific recombination maps for 59,309 autosomal SNPs. The recombination map spans for 25.5 Morgans in males and 23.2 Morgans in females, for a total studied region of 2,516 Mb (986 kb/cM in males and 1,085 kb/cM in females). The male map is 10% longer than the female map and the sex difference is most pronounced in the subtelomeric regions. We identified 1,792 male and 1,885 female putative recombination hotspots, with 720 hotspots shared between sexes. These hotspots encompass 3% of the genome but account for 25% of the genome-wide recombination events in both sexes. During the past forty years, males showed a decreasing trend in recombination rate that coincided with the artificial selection for milk production. Sex-specific GWAS analyses identified PRDM9 and CPLX1 to have significant effects on genome-wide recombination rate in both sexes. Two novel loci, NEK9 and REC114, were associated with recombination rate in both sexes, whereas three loci, MSH4, SMC3 and CEP55, affected recombination rate in females only. Among the multiple PRDM9 paralogues on the bovine genome, our GWAS of recombination hotspot usage together with linkage analysis identified the PRDM9 paralogue on chromosome 1 to be associated in the U.S. Holstein data. Given the largest sample size ever reported for such studies, our results reveal new insights into the understanding of cattle and mammalian recombination.

Additional References

RELATED GEPHE

Related Genes

11 (CEP55, CPLX1, FMN1, MSH4, NEK9, PABPN1, PRDM9, REC114, REC8, RNF212, SMC3) (<https://www.gephebase.org/search-criteria?/or+Taxon ID=~9913~/and+Trait=Recombination rate/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

