

GEPHE SUMMARY

Gephebase Gene		GepheID
growth hormone receptor (GHR) (https://www.gephebase.org/search-criteria?/and+Gene Gephebase="growth hormone receptor (GHR)"#gephebase-summary-title)		GP00001475
Entry Status		Prigent
Published		Main curator

PHENOTYPIC CHANGE

Trait Category			
Morphology (https://www.gephebase.org/search-criteria?/and+Trait Category="Morphology"#gephebase-summary-title)		Trait	
Body size (weight) (<a +body+size"="" href="https://www.gephebase.org/search-criteria?/and+Trait=">https://www.gephebase.org/search-criteria?/and+Trait="+Body+size (weight)"#gephebase-summary-title)		Trait State in Taxon A	
Gray wolf of 38 to 66 kg		Trait State in Taxon B	
Dog of 6.6 kg on average		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	
Canis lupus (<a +canis+lupus"="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms="+Canis+lupus lupus"#gephebase-summary-title)		Canis lupus familiaris (<a +canis+lupus+familiaris"="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms="+Canis+lupus+familiaris familiaris"#gephebase-summary-title)	
Common Name		Common Name	
gray wolf		dog	
Synonyms		Synonyms	
gray wolf; grey wolf; Canis lupus Linnaeus, 1758		Canis canis; Canis domesticus; Canis familiaris; dog; dogs; Canis familiaris Linnaeus, 1758; Canis lupus familiaris Linnaeus, 1758	
Rank		Rank	
species		subspecies	
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; Carnivora; Caniformia; Canidae; Canis		cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Eutheria; Boreoeutheria; Laurasiatheria; Carnivora; Caniformia; Canidae; Canis; Canis lupus	
Parent		Parent	
Canis () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9611)		Canis lupus (gray wolf) - (Rank: species) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9612)	
NCBI Taxonomy ID		NCBI Taxonomy ID	
9612 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9612)		9615 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9615)	
is Taxon A an Intraspecies?		is Taxon B an Intraspecies?	
No		No	

GENOTYPIC CHANGE

Generic Gene Name		UniProtKB Canis lupus familiaris	
GHR		Q9TU69 (http://www.uniprot.org/uniprot/Q9TU69)	
Synonyms		GenebankID or UniProtKB	
-		AF133835 (https://www.ncbi.nlm.nih.gov/nucore/AF133835)	
String			
9615.ENSACFP00000037936 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=9615.ENSACFP00000037936)			
Sequence Similarities			
Belongs to the type I cytokine receptor family. Type 1 subfamily.			
GO - Molecular Function			
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:0019838 : growth factor binding (https://www.ebi.ac.uk/QuickGO/term/GO:0019838)			

GO:0004903 : growth hormone receptor activity
(<https://www.ebi.ac.uk/QuickGO/term/GO:0004903>)

GO - Biological Process

GO:0050731 : positive regulation of peptidyl-tyrosine phosphorylation
(<https://www.ebi.ac.uk/QuickGO/term/GO:0050731>)
GO:0006897 : endocytosis (<https://www.ebi.ac.uk/QuickGO/term/GO:0006897>)
GO:0060396 : growth hormone receptor signaling pathway
(<https://www.ebi.ac.uk/QuickGO/term/GO:0060396>)
GO:0046427 : positive regulation of JAK-STAT cascade
(<https://www.ebi.ac.uk/QuickGO/term/GO:0046427>)

GO - Cellular Component

GO:0016021 : integral component of membrane
(<https://www.ebi.ac.uk/QuickGO/term/GO:0016021>)
GO:0005829 : cytosol (<https://www.ebi.ac.uk/QuickGO/term/GO:0005829>)
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:0009897 : external side of plasma membrane
(<https://www.ebi.ac.uk/QuickGO/term/GO:0009897>)
GO:0070195 : growth hormone receptor complex
(<https://www.ebi.ac.uk/QuickGO/term/GO:0070195>)

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

G>A in exon 5 p.E191K in extracellular domain

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Glu	Lys	191

Main Reference

Derived variants at six genes explain nearly half of size reduction in dog breeds. (2013) (<https://pubmed.ncbi.nlm.nih.gov/24026177>)

Authors

Rimbault M; Beale HC; Schoenebeck JJ; Hoopes BC; Allen JJ; Kilroy-Glynn P; Wayne RK; Sutter NB; Ostrander EA

Abstract

Selective breeding of dogs by humans has generated extraordinary diversity in body size. A number of multibreed analyses have been undertaken to identify the genetic basis of this diversity. We analyzed four loci discovered in a previous genome-wide association study that used 60,968 SNPs to identify size-associated genomic intervals, which were too large to assign causative roles to genes. First, we performed fine-mapping to define critical intervals that included the candidate genes GHR, HMGA2, SMAD2, and STC2, identifying five highly associated markers at the four loci. We hypothesize that three of the variants are likely to be causative. We then genotyped each marker, together with previously reported size-associated variants in the IGF1 and IGF1R genes, on a panel of 500 domestic dogs from 93 breeds, and identified the ancestral allele by genotyping the same markers on 30 wild canids. We observed that the derived alleles at all markers correlated with reduced body size, and smaller dogs are more likely to carry derived alleles at multiple markers. However, breeds are not generally fixed at all markers; multiple combinations of genotypes are found within most breeds. Finally, we show that 46%-52.5% of the variance in body size of dog breeds can be explained by seven markers in proximity to exceptional candidate genes. Among breeds with standard weights <41 kg (90 lb), the genotypes accounted for 64.3% of variance in weight. This work advances our understanding of mammalian growth by describing genetic contributions to canine size determination in non-giant dog breeds.

Additional References

RELATED GEPHE

Related Genes

5 (HMGA2, Insulin-like growth factor 1 (IGF1), Insulin-like growth factor receptor 1 (IGF1R), SMAD family member 2 (SMAD2), stanniocalcin 2 (STC2))
(<https://www.gephebase.org/search-criteria?/or+Taxon ID=~9612~/and+Trait=Body size/or+Taxon ID=~9615~/and+Trait=Body size/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

1 ([https://www.gephebase.org/search-criteria?/or+Gene Gephebase=~growth hormone receptor \(GHR\)~/and+Taxon ID=~9612~/or+Gene Gephebase=~growth hormone receptor \(GHR\)~/and+Taxon ID=~9615~#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene Gephebase=~growth hormone receptor (GHR)~/and+Taxon ID=~9612~/or+Gene Gephebase=~growth hormone receptor (GHR)~/and+Taxon ID=~9615~#gephebase-summary-title))

EXTERNAL LINKS

COMMENTS

each variant is potentially causal