

GEPHE SUMMARY

slc2a1b (#gephebase-summary-title)	Gephebase Gene	GP00002367	GepheID
Published	Entry Status	Santos	Main curator

PHENOTYPIC CHANGE

	Trait Category		
Morphology (#gephebase-summary-title)	Trait		
Coloration (eyes) (<a ?and+taxonomic+status='^Domesticated"' href="https://www.gephebase.org/search-criteria/?and+Trait=^Coloration+(eyes)#gephebase-summary-title)</td><td>Trait State in Taxon A</td><td></td><td></td></tr> <tr> <td>Orange iris color</td><td>Trait State in Taxon B</td><td></td><td></td></tr> <tr> <td>Pearl (white) iris color</td><td>Ancestral State</td><td></td><td></td></tr> <tr> <td>Taxon A</td><td>Taxonomic Status</td><td></td><td></td></tr> <tr> <td>Domesticated (#gephebase-summary-title)			
Taxon A	Latin Name	Taxon B	Latin Name
Columba livia (#gephebase-summary-title)	Columba livia (#gephebase-summary-title)	Columba livia (#gephebase-summary-title)	Columba livia (#gephebase-summary-title)
rock pigeon	Common Name	rock pigeon	Common Name
Columba livia domestica; rock pigeon; carrier pigeon; domestic pigeon; rock dove; Columba livia Gmelin, JF, 1789	Synonyms	Columba livia domestica; rock pigeon; carrier pigeon; domestic pigeon; rock dove; Columba livia Gmelin, JF, 1789	Synonyms
species	Rank	species	Rank
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Sauropsida; Sauria; Archelosauria; Archosauria; Dinosauria; Saurischia; Theropoda; Coelurosauria; Aves; Neognathae; Columbiformes; Columbidae; Columba	Lineage	cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Sauropsida; Sauria; Archelosauria; Archosauria; Dinosauria; Saurischia; Theropoda; Coelurosauria; Aves; Neognathae; Columbiformes; Columbidae; Columba	Lineage
Columba () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8931)	Parent	Columba () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8931)	Parent
8932 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8932)	NCBI Taxonomy ID	8932 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8932)	NCBI Taxonomy ID
Yes	is Taxon A an Infraspecies?	Yes	is Taxon B an Infraspecies?
orange-eyed Archangel domestic pigeon	Taxon A Description	pearl-eyed Old Dutch Capuchin domestic pigeon	Taxon B Description

GENOTYPIC CHANGE

slc2a1b	Generic Gene Name	F6P601 (http://www.uniprot.org/uniprot/F6P601)	UniProtKB Danio rerio
slc2a1b; SO:0001217	Synonyms	0	GenebankID or UniProtKB
-	String		
-	Sequence Similarities		
GO:0015149 : hexose transmembrane transporter activity (https://www.ebi.ac.uk/QuickGO/term/GO:0015149)	GO - Molecular Function		
GO:0015749 : monosaccharide transmembrane transport (https://www.ebi.ac.uk/QuickGO/term/GO:0015749)	GO - Biological Process		

GO - Cellular Component

GO:0016020 : membrane (<https://www.ebi.ac.uk/QuickGO/term/GO:0016020>)

GO:0005887 : integral component of plasma membrane

(<https://www.ebi.ac.uk/QuickGO/term/GO:0005887>)

Presumptive Null

Yes (<https://www.gephebase.org/search-criteria?/and+Presumptive+Null=%Yes%#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

Nonsense

Molecular Details of the Mutation

"The premature stop codon in pearl-eyed pigeons falls in exon 3 of SLC2A11B, and is predicted to severely truncate the resulting protein from 504 to 57 amino acids."

"Based on genotypes at the two coding SNPs in the pearl eye haplotype, we found that gene expression in embryo head samples only shows changes associated with the pearl eye haplotype in SLC2A11B, and not in any other genes within 15kb of the pearl eye haplotype, further supporting SLC2A11B as the primary candidate for the pearl eye phenotype (supplementary fig. S3A, Supplementary Material online). Embryo heads homozygous for the pearl allele show a significant reduction in SLC2A11B expression ($P = 3.94 \times 10^{-6}$, two-tailed t-test; supplementary fig. S3B, Supplementary Material online). Analysis of read distribution within the SLC2A11B gene shows a decrease in spliced reads specifically within the first three annotated exons, suggesting that alternative splicing or nonsense-mediated decay may be occurring (supplementary fig. S3D, Supplementary Material online)."

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	TGG	TGA	-
Amino-acid	Trp	STP	-

Main Reference

Two Genomic Loci Control Three Eye Colors in the Domestic Pigeon (*Columba livia*). (2021) (<https://pubmed.ncbi.nlm.nih.gov/34459920>)

Authors

Maclay ET; Phillips B; Wauer R; Boer EF; Bruders R; Gilvarry T; Holt C; Yandell M; Shapiro MD

Abstract

The iris of the eye shows striking color variation across vertebrate species, and may play important roles in crypsis and communication. The domestic pigeon (*Columba livia*) has three common iris colors, orange, pearl (white), and bull (dark brown), segregating in a single species, thereby providing a unique opportunity to identify the genetic basis of iris coloration. We used comparative genomics and genetic mapping in laboratory crosses to identify two candidate genes that control variation in iris color in domestic pigeons. We identified a nonsense mutation in the solute carrier SLC2A11B that is shared among all pigeons with pearl eye color, and a locus associated with bull eye color that includes EDNRB2, a gene involved in neural crest migration and pigment development. However, bull eye is likely controlled by a heterogeneous collection of alleles across pigeon breeds. We also found that the EDNRB2 region is associated with regionalized plumage depigmentation (piebalding). Our study identifies two candidate genes for eye colors variation, and establishes a genetic link between iris and plumage color, two traits that vary widely in the evolution of birds and other vertebrates.

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Additional References

The genetics and evolution of eye color in domestic pigeons (*Columba livia*). (2021) (<https://pubmed.ncbi.nlm.nih.gov/34460822>)Molecular parallels between pigmentation in the avian iris and the integument of ectothermic vertebrates. (2021) (<https://pubmed.ncbi.nlm.nih.gov/33621224>)

RELATED GEPHE

Related Genes

6 (MC1R, Mlana, ndp (norrin), SLC45A2=MATP, SOX10, tyrosinase-related protein 1 (TYRP1)) (<https://www.gephebase.org/search-criteria?/or+Taxon+ID=%8932%/and+Trait=Coloration/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

