

GEPHE SUMMARY

Gephebase Gene		GepheID
ndp (norrin) (https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=~ndp+(norrin)^#gephebase-summary-title)	GP00002250	
Entry Status		Main curator
Published		

PHENOTYPIC CHANGE

Trait Category			
Morphology (https://www.gephebase.org/search-criteria?/and+Trait+Category=~Morphology^#gephebase-summary-title)			
Trait			
Coloration (plumage) (https://www.gephebase.org/search-criteria?/and+Trait=~Coloration+(plumage)^#gephebase-summary-title)			
Trait State in Taxon A			
Domestic pigeon with bar plumage			
Trait State in Taxon B			
Barless ; autosomal recessive ; homozygotes have a high incidence of vision defects			
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	
Columba livia (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=~Columba+livia^#gephebase-summary-title)		Columba livia (https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=~Columba+livia^#gephebase-summary-title)	
Common Name		Common Name	
rock pigeon		rock pigeon	
Synonyms		Synonyms	
Columba livia domestica; rock pigeon; carrier pigeon; domestic pigeon; rock dove; Columba livia Gmelin, JF, 1789		Columba livia domestica; rock pigeon; carrier pigeon; domestic pigeon; rock dove; Columba livia Gmelin, JF, 1789	
Rank		Rank	
species		species	
Lineage		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		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	
Parent		Parent	
Columba () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8931)		Columba () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8931)	
NCBI Taxonomy ID		NCBI Taxonomy ID	
8932 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8932)		8932 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 8932)	
is Taxon A an Intraspecies?		is Taxon B an Intraspecies?	
No		No	

GENOTYPIC CHANGE

Generic Gene Name		UniProtKB Mus musculus
Ndp		P48744 (http://www.uniprot.org/uniprot/P48744)
Synonyms		GenebankID or UniProtKB
ND; Ndp		0
String		
10090.ENSMUSP00000046692 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=10090.ENSMUSP00000046692)		
Sequence Similarities		
-		
GO - Molecular Function		
GO:0042803 : protein homodimerization activity (https://www.ebi.ac.uk/QuickGO/term/GO:0042803)		
GO:0005125 : cytokine activity (https://www.ebi.ac.uk/QuickGO/term/GO:0005125)		
GO:0005109 : frizzled binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005109)		
GO - Biological Process		

GO:0045893 : positive regulation of transcription, DNA-templated
(<https://www.ebi.ac.uk/QuickGO/term/GO:0045893>)
GO:0051091 : positive regulation of DNA-binding transcription factor activity
(<https://www.ebi.ac.uk/QuickGO/term/GO:0051091>)
GO:0016055 : Wnt signaling pathway
(<https://www.ebi.ac.uk/QuickGO/term/GO:0016055>)
GO:0001890 : placenta development
(<https://www.ebi.ac.uk/QuickGO/term/GO:0001890>)
GO:0035426 : extracellular matrix-cell signaling
(<https://www.ebi.ac.uk/QuickGO/term/GO:0035426>)
GO:0110135 : Norrin signaling pathway
(<https://www.ebi.ac.uk/QuickGO/term/GO:0110135>)
GO:0061299 : retina vasculature morphogenesis in camera-type eye
(<https://www.ebi.ac.uk/QuickGO/term/GO:0061299>)

GO - Cellular Component

GO:0062023 : collagen-containing extracellular matrix
(<https://www.ebi.ac.uk/QuickGO/term/GO:0062023>)
GO:0031012 : extracellular matrix (<https://www.ebi.ac.uk/QuickGO/term/GO:0031012>)
GO:0005615 : extracellular space (<https://www.ebi.ac.uk/QuickGO/term/GO:0005615>)
GO:0009986 : cell surface (<https://www.ebi.ac.uk/QuickGO/term/GO:0009986>)

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

Start-codon change predicted to truncate the amino terminus of the NDP protein by 11 amino acids thereby disrupting the 24-amino acid signal peptide sequence

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	Met	Thr	1

Main Reference

Introgression of regulatory alleles and a missense coding mutation drive plumage pattern diversity in the rock pigeon. (2018) (<https://pubmed.ncbi.nlm.nih.gov/30014848>)

Authors

Vickrey AI; Bruders R; Kronenberg Z; Mackey E; Bohlender RJ; Maclary ET; Maynez R; Osborne EJ; Johnson KP; Huff CD; Yandell M; Shapiro MD

Abstract

Birds and other vertebrates display stunning variation in pigmentation patterning, yet the genes controlling this diversity remain largely unknown. Rock pigeons (*Columba livia*) are fundamentally one of four color pattern phenotypes, in decreasing order of melanism: T-check, checker, bar (ancestral), or barless. Using whole-genome scans, we identified NDP as a candidate gene for this variation. Allele-specific expression differences in NDP indicate cis-regulatory divergence between ancestral and melanistic alleles. Sequence comparisons suggest that derived alleles originated in the speckled pigeon (*Columba guinea*), providing a striking example of introgression. In contrast, barless rock pigeons have an increased incidence of vision defects and, like human families with hereditary blindness, carry start-codon mutations in NDP. In summary, we find that both coding and regulatory variation in the same gene drives wing pattern diversity, and post-domestication introgression supplied potentially advantageous melanistic alleles to feral populations of this ubiquitous urban bird.

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Additional References

RELATED GEPHE

Related Genes

6 (MC1R, Mlana, slc2a11b, 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

1 ([https://www.gephebase.org/search-criteria?/or+Gene Gephebase=~ndp \(norrin\)^/and+Taxon ID=~8932^/or+Gene Gephebase=~ndp \(norrin\)^/and+Taxon ID=~8932^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene Gephebase=~ndp (norrin)^/and+Taxon ID=~8932^/or+Gene Gephebase=~ndp (norrin)^/and+Taxon ID=~8932^#gephebase-summary-title))

EXTERNAL LINKS

COMMENTS

