

GEPHE SUMMARY

| | Gephebase Gene | GephelD |
|---|----------------|--------------|
| BCMO1 (https://www.gephebase.org/search-criteria/?and+Gene+Gephebase=^BCMO1#gephebase-summary-title) | GP00000137 | |
| | Entry Status | Main curator |
| Published | Courtier | |

PHENOTYPIC CHANGE

| | Trait Category |
|--|------------------------|
| Morphology, Physiology (https://www.gephebase.org/search-criteria/?and+Trait+Category=^Morphology^/and+Trait+Category=^Physiology#gephebase-summary-title) | |
| Carotenoid content (https://www.gephebase.org/search-criteria/?and+Trait=^Carotenoid+content^#gephebase-summary-title) | |
| Gallus gallus | Trait State in Taxon A |
| Gallus gallus | Trait State in Taxon B |
| Data not curated | Ancestral State |
| Domesticated (https://www.gephebase.org/search-criteria/?and+Taxonomic+Status=^Domesticated^#gephebase-summary-title) | Taxonomic Status |

| Taxon A | Latin Name | Taxon B | Latin Name |
|--|---|--|---|
| Gallus gallus (https://www.gephebase.org/search-criteria/?and+Taxon+and+Synonyms=^Gallus+gallus^#gephebase-summary-title) | Common Name | Gallus gallus (https://www.gephebase.org/search-criteria/?and+Taxon+and+Synonyms=^Gallus+gallus^#gephebase-summary-title) | Common Name |
| chicken | Synonyms | chicken | Synonyms |
| Gallus gallus domesticus; chicken; bantam; chickens | Rank | Gallus gallus domesticus; chicken; bantam; chickens | Rank |
| species | Lineage | species | 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; Galloanserae; Galliformes; Phasianidae; Phasianinae; Gallus | Parent | 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; Galloanserae; Galliformes; Phasianidae; Phasianinae; Gallus | Parent |
| Gallus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 9030) | NCBI Taxonomy ID 9031 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 9031) | Gallus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 9030) | NCBI Taxonomy ID 9031 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 9031) |
| No | is Taxon A an Infraspecies? | No | is Taxon B an Infraspecies? |

GENOTYPIC CHANGE

| | Generic Gene Name | UniProtKB Homo sapiens |
|---|-------------------------|--|
| BCO1 | | |
| BCO; BCDO; BCMO; BCDO1; BCMO1 | Synonyms | GenebankID or UniProtKB |
| 9606.ENSP00000258168 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=9606.ENSP00000258168) | String | XP_015148006 (https://www.ncbi.nlm.nih.gov/nuccore/XP_015148006) |
| Belongs to the carotenoid oxygenase family. | Sequence Similarities | |
| GO:0046872 : metal ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0046872) | GO - Molecular Function | |
| GO:0003834 : beta-carotene 15,15'-monoxygenase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0003834) | | |
| GO:0010436 : carotenoid dioxygenase activity (https://www.ebi.ac.uk/QuickGO/term/GO:0010436) | | |
| GO:0004744 : retinal isomerase activity | | |

GO:0001523 : retinoid metabolic process

(https://www.ebi.ac.uk/QuickGO/term/GO:0001523)

GO:1901810 : beta-carotene metabolic process

(https://www.ebi.ac.uk/QuickGO/term/GO:1901810)

GO:0016121 : carotene catabolic process

(https://www.ebi.ac.uk/QuickGO/term/GO:0016121)

GO:0042574 : retinal metabolic process

(https://www.ebi.ac.uk/QuickGO/term/GO:0042574)

GO:0042572 : retinol metabolic process

(https://www.ebi.ac.uk/QuickGO/term/GO:0042572)

GO:0035238 : vitamin A biosynthetic process

(https://www.ebi.ac.uk/QuickGO/term/GO:0035238)

GO:0005829 : cytosol (https://www.ebi.ac.uk/QuickGO/term/GO:0005829)

Mutation #1

Presumptive Null

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

Molecular Type

Cis-regulatory (https://www.gephebase.org/search-criteria?/and+Molecular Type=^Cis-regulatory^#gephebase-summary-title)

Aberration Type

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

Molecular Details of the Mutation

A to G at SNP1 (â'~678 bp upstream of ATG)

Experimental Evidence

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

Main Reference

Detection of a Cis [corrected] eQTL controlling BCMO1 gene expression leads to the identification of a QTG for chicken breast meat color. (2011)

(https://pubmed.ncbi.nlm.nih.gov/21750696)

Authors

Le Bihan-Duval E; Nadaf J; Berri C; Pitel F; Graulet B; Godet E; Leroux SY; Demeure O; Lagarrigue S; Duby C; Cogburn LA; Beaumont CM; Duclos MJ

Abstract

Classical quantitative trait loci (QTL) analysis and gene expression QTL (eQTL) were combined to identify the causal gene (or QTG) underlying a highly significant QTL controlling the variation of breast meat color in a F2 cross between divergent high-growth (HG) and low-growth (LG) chicken lines. Within this meat quality QTL, BCMO1 (Accession number GenBank: AJ271386), encoding the β -carotene 15, 15'-monoxygenase, a key enzyme in the conversion of β -carotene into colorless retinal, was a good functional candidate. Analysis of the abundance of BCMO1 mRNA in breast muscle of the HG x LG F2 population allowed for the identification of a strong cis eQTL. Moreover, reevaluation of the color QTL taking BCMO1 mRNA levels as a covariate indicated that BCMO1 mRNA levels entirely explained the variations in meat color. Two fully-linked single nucleotide polymorphisms (SNP) located within the proximal promoter of BCMO1 gene were identified. Haplotype substitution resulted in a marked difference in BCMO1 promoter activity in vitro. The association study in the F2 population revealed a three-fold difference in BCMO1 expression leading to a difference of 1 standard deviation in yellow color between the homozygous birds at this haplotype. This difference in meat yellow color was fully consistent with the difference in carotenoid content (i.e. lutein and zeaxanthin) evidenced between the two alternative haplotypes. A significant association between the haplotype, the level of BCMO1 expression and the yellow color of the meat was also recovered in an unrelated commercial broiler population. The mutation could be of economic importance for poultry production by making possible a gene-assisted selection for color, a determining aspect of meat quality. Moreover, this natural genetic diversity constitutes a new model for the study of β -carotene metabolism which may act upon diverse biological processes as precursor of the vitamin A.

Additional References

Mutation #2

Presumptive Null

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

Molecular Type

Cis-regulatory (https://www.gephebase.org/search-criteria?/and+Molecular Type=^Cis-regulatory^#gephebase-summary-title)

Aberration Type

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

Molecular Details of the Mutation

A to G at SNP2 (â'~621 bp upstream of ATG)

Experimental Evidence

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

Main Reference

Detection of a Cis [corrected] eQTL controlling BCMO1 gene expression leads to the identification of a QTG for chicken breast meat color. (2011)

(https://pubmed.ncbi.nlm.nih.gov/21750696)

Authors

Le Bihan-Duval E; Nadaf J; Berri C; Pitel F; Graulet B; Godet E; Leroux SY; Demeure O; Lagarrigue S; Duby C; Cogburn LA; Beaumont CM; Duclos MJ

Abstract

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Additional References

RELATED GEPHE

1 (BCO2 = beta-carotene oxygenase 2) (<https://www.gephebase.org/search-criteria?/or+Taxon ID=%9031%/and+Trait=Carotenoid content/and+groupHaplotypes=true#gephebase-summary-title>)

Related Genes

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS