

GEPHE SUMMARY

<p>FGF20 (<a +fgf20+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=">https://www.gephebase.org/search-criteria?/and+Gene+Gephebase="+FGF20+"#gephebase-summary-title)</p> <p>Published</p>	<p>Gephebase Gene</p> <p>Entry Status</p>	<p>GP00002171</p> <p>Martin</p>	<p>GepheID</p> <p>Main curator</p>
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PHENOTYPIC CHANGE

<p>Morphology (<a +morphology+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Trait+Category=">https://www.gephebase.org/search-criteria?/and+Trait+Category="+Morphology+"#gephebase-summary-title)</p> <p>Organ loss (feathers ; scales) (<a +organ+loss+(feathers+;+scales)+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Trait=">https://www.gephebase.org/search-criteria?/and+Trait="+Organ+loss+(feathers+;+scales)+"#gephebase-summary-title)</p> <p>WT</p> <p>almost complete absence of feathers and scales (recessive sc mutation)</p> <p>Taxon A</p> <p>Domesticated (<a +domesticated+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=">https://www.gephebase.org/search-criteria?/and+Taxonomic+Status="+Domesticated+"#gephebase-summary-title)</p>	<p>Trait Category</p> <p>Trait</p> <p>Trait State in Taxon A</p> <p>Trait State in Taxon B</p> <p>Ancestral State</p> <p>Taxonomic Status</p>	<p>Taxon A</p> <p>Latin Name</p> <p>Gallus gallus (<a +gallus+gallus+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms="+Gallus+gallus+"#gephebase-summary-title)</p> <p>Common Name</p> <p>chicken</p> <p>Synonyms</p> <p>Gallus gallus domesticus; chicken; bantam; chickens</p> <p>Rank</p> <p>species</p> <p>Lineage</p> <p>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</p> <p>Parent</p> <p>Gallus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9030)</p> <p>NCBI Taxonomy ID</p> <p>9031 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9031)</p> <p>is Taxon A an Intraspecies?</p> <p>No</p>	<p>Taxon B</p> <p>Latin Name</p> <p>Gallus gallus (<a +gallus+gallus+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms="+Gallus+gallus+"#gephebase-summary-title)</p> <p>Common Name</p> <p>chicken</p> <p>Synonyms</p> <p>Gallus gallus domesticus; chicken; bantam; chickens</p> <p>Rank</p> <p>species</p> <p>Lineage</p> <p>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</p> <p>Parent</p> <p>Gallus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9030)</p> <p>NCBI Taxonomy ID</p> <p>9031 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9031)</p> <p>is Taxon B an Intraspecies?</p> <p>Yes</p> <p>Taxon B Description</p> <p>Israeli experimental line ; Storrs Connecticut (low line) ; UC Davis lines</p>
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GENOTYPIC CHANGE

<p>FGF20</p> <p>RHDA2; FGF-20</p> <p>9606.ENSP00000180166 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=9606.ENSP00000180166)</p>	<p>Generic Gene Name</p> <p>Synonyms</p> <p>String</p> <p>Sequence Similarities</p> <p>GO - Molecular Function</p>	<p>Q9NP95 (http://www.uniprot.org/uniprot/Q9NP95)</p> <p>0</p>	<p>UniProtKB Homo sapiens</p> <p>GenebankID or UniProtKB</p>
<p>Belongs to the heparin-binding growth factors family.</p> <p>GO:0008083 : growth factor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0008083)</p> <p>GO:0005102 : signaling receptor binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005102)</p> <p>GO:0005104 : fibroblast growth factor receptor binding</p>			

(<https://www.ebi.ac.uk/QuickGO/term/GO:0005104>)
 GO:0043395 : heparan sulfate proteoglycan binding
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0043395>)
 GO:0090722 : receptor-receptor interaction
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0090722>)

GO - Biological Process

GO:0007165 : signal transduction (<https://www.ebi.ac.uk/QuickGO/term/GO:0007165>)
 GO:0043524 : negative regulation of neuron apoptotic process
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0043524>)
 GO:0070374 : positive regulation of ERK1 and ERK2 cascade
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0070374>)
 GO:0000165 : MAPK cascade (<https://www.ebi.ac.uk/QuickGO/term/GO:0000165>)
 GO:0008284 : positive regulation of cell proliferation
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0008284>)
 GO:0051897 : positive regulation of protein kinase B signaling
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0051897>)
 GO:0007267 : cell-cell signaling (<https://www.ebi.ac.uk/QuickGO/term/GO:0007267>)
 GO:0008543 : fibroblast growth factor receptor signaling pathway
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0008543>)
 GO:0060113 : inner ear receptor cell differentiation
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0060113>)
 GO:1904340 : positive regulation of dopaminergic neuron differentiation
 (<https://www.ebi.ac.uk/QuickGO/term/GO:1904340>)
 GO:0060043 : regulation of cardiac muscle cell proliferation
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0060043>)
 GO:0014059 : regulation of dopamine secretion
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0014059>)

GO - Cellular Component

GO:0005576 : extracellular region (<https://www.ebi.ac.uk/QuickGO/term/GO:0005576>)

Presumptive Null

Yes ([https://www.gephebase.org/search-criteria?/and+Presumptive Null=~Yes^#gephebase-summary-title](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](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](https://www.gephebase.org/search-criteria?/and+Aberration+Type=~SNP^#gephebase-summary-title))

SNP Coding Change

Nonsense

Molecular Details of the Mutation

g.62878803A>T c.535A>T p.R179*

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Arg	STP	179

Main Reference

Genome-wide SNP scan of pooled DNA reveals nonsense mutation in FGF20 in the scaleless line of featherless chickens. (2012) (<https://pubmed.ncbi.nlm.nih.gov/22712610>)

Authors

Wells KL; Hadad Y; Ben-Avraham D; Hillel J; Cahaner A; Headon DJ

Abstract

Scaleless (*sc/sc*) chickens carry a single recessive mutation that causes a lack of almost all body feathers, as well as foot scales and spurs, due to a failure of skin patterning during embryogenesis. This spontaneous mutant line, first described in the 1950s, has been used extensively to explore the tissue interactions involved in ectodermal appendage formation in embryonic skin. Moreover, the trait is potentially useful in tropical agriculture due to the ability of featherless chickens to tolerate heat, which is at present a major constraint to efficient poultry meat production in hot climates. In the interests of enhancing our understanding of feather placode development, and to provide the poultry industry with a strategy to breed heat-tolerant meat-type chickens (broilers), we mapped and identified the *sc* mutation.

Through a cost-effective and labour-efficient SNP array mapping approach using DNA from *sc/sc* and *sc/+* blood sample pools, we map the *sc* trait to chromosome 4 and show that a nonsense mutation in FGF20 is completely associated with the *sc/sc* phenotype. This mutation, common to all *sc/sc* individuals and absent from wild type, is predicted to lead to loss of a highly conserved region of the FGF20 protein important for FGF signalling. In situ hybridisation and quantitative RT-PCR studies reveal that FGF20 is epidermally expressed during the early stages of feather placode patterning. In addition, we describe a dCAPS genotyping assay based on the mutation, developed to facilitate discrimination between wild type and *sc* alleles.

This work represents the first loss of function genetic evidence supporting a role for FGF ligand signalling in feather development, and suggests FGF20 as a novel central player in the development of vertebrate skin appendages, including hair follicles and exocrine glands. In addition, this is to our knowledge the first report describing the use of the chicken SNP array to map genes based on genotyping of DNA samples from pooled whole blood. The identification of the *sc* mutation has important implications for the future breeding of this potentially useful trait for the poultry industry, and our genotyping assay can facilitate its rapid introgression into production lines.

Additional References

RELATED GEPHE

Related Genes

No matches found.

No matches found.

EXTERNAL LINKS

COMMENTS

<https://omia.org/OMIA000889/9031/>