

	Gephebase Gene	GepheID
amelogenin (AMEL) (https://www.gephebase.org/search-criteria?/and+Gene+Gephebase+=^amelogenin+(AMEL)^#gephebase-summary-title)	GP00001933	
	Entry Status	Courtier
Published		Main curator

Trait Category		Trait	
Physiology (#https://www.gephebase.org/search-criteria?/and+Trait+Category=~Physiology)			
Tooth absence (no enamel production) (https://www.gephebase.org/search-criteria?/and+Trait=~Tooth absence (no enamel production))			
	Trait State in Taxon A		
presence of teeth			
	Trait State in Taxon B		
absence of teeth			
	Ancestral State		
Taxon A			
	Taxonomic Status		
Intergeneric or Higher (#https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=~Intergeneric or Higher)			
Taxon A		Taxon B	
Paleosuchus palpebrosus (#https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=~Paleosuchus palpebrosus)	Latin Name	Gallus gallus (#https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=~Gallus gallus)	Latin Name
Cuvier's dwarf caiman	Common Name	chicken	Common Name
Cuvier's dwarf caiman; MNHN 7530; MNHN:7530	Synonyms	Gallus gallus domesticus; chicken; bantam; chickens	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; Crocodylia; Alligatoridae; Caimaninae; Paleosuchus	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	Lineage
Paleosuchus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=38657)	Parent	Gallus () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9030)	Parent
84099 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=84099)	NCBI Taxonomy ID	9031 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9031)	NCBI Taxonomy ID
No	is Taxon A an Intraspecies?	No	is Taxon B an Intraspecies?

Amelx	Generic Gene Name	P63277 (http://www.uniprot.org/uniprot/P63277)	UniProtKB Mus musculus
	Synonyms		GenebankID or UniProtKB
Amg; ALGN; AMGL; AMGX; Amel; LRAP; Rgsc888		0	
	String		
10090.ENSMUSP00000065966 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=10090.ENSMUSP00000065966)			
	Sequence Similarities		
Belongs to the amelogenin family.			
	GO - Molecular Function		
GO:0042802 : identical protein binding (https://www.ebi.ac.uk/QuickGO/term/GO:0042802)			
GO:0042803 : protein homodimerization activity (https://www.ebi.ac.uk/QuickGO/term/GO:0042803)			
GO:0008083 : growth factor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0008083)			
GO:0005509 : calcium ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005509)			

GO:0031402 : sodium ion binding (<https://www.ebi.ac.uk/QuickGO/term/GO:0031402>)
GO:0046848 : hydroxyapatite binding (<https://www.ebi.ac.uk/QuickGO/term/GO:0046848>)
GO:0030345 : structural constituent of tooth enamel (<https://www.ebi.ac.uk/QuickGO/term/GO:0030345>)

GO - Biological Process

GO:0007155 : cell adhesion (<https://www.ebi.ac.uk/QuickGO/term/GO:0007155>)
GO:0007165 : signal transduction (<https://www.ebi.ac.uk/QuickGO/term/GO:0007165>)
GO:0042475 : odontogenesis of dentin-containing tooth (<https://www.ebi.ac.uk/QuickGO/term/GO:0042475>)
GO:0051260 : protein homooligomerization (<https://www.ebi.ac.uk/QuickGO/term/GO:0051260>)
GO:0042127 : regulation of cell proliferation (<https://www.ebi.ac.uk/QuickGO/term/GO:0042127>)
GO:0034505 : tooth mineralization (<https://www.ebi.ac.uk/QuickGO/term/GO:0034505>)

GO - Cellular Component

GO:0005604 : basement membrane (<https://www.ebi.ac.uk/QuickGO/term/GO:0005604>)
GO:0032991 : protein-containing complex (<https://www.ebi.ac.uk/QuickGO/term/GO:0032991>)
GO:0009986 : cell surface (<https://www.ebi.ac.uk/QuickGO/term/GO:0009986>)
GO:0099080 : supramolecular complex (<https://www.ebi.ac.uk/QuickGO/term/GO:0099080>)

Mutation #1	
Yes (https://www.gephebase.org/search-criteria?/and+Presumptive Null=~Yes~#gephebase-summary-title)	Presumptive Null
Coding (https://www.gephebase.org/search-criteria?/and+Molecular Type=~Coding~#gephebase-summary-title)	Molecular Type
Insertion (https://www.gephebase.org/search-criteria?/and+Aberration Type=~Insertion~#gephebase-summary-title)	Aberration Type
1-9 bp	Insertion Size
synteny of the corresponding region - two 2-bp insertions in exon 2 leading to a reading frameshift which changes the amino acids in the N-terminal region and results in a premature stop codon in exon 6	Molecular Details of the Mutation
Candidate Gene (https://www.gephebase.org/search-criteria?/and+Experimental Evidence=~Candidate Gene~#gephebase-summary-title)	Experimental Evidence
Hen’s teeth with enamel cap: from dream to impossibility. (2008) (https://pubmed.ncbi.nlm.nih.gov/18775069)	Main Reference
Sire JY; Delgado SC; Giron-dot M	Authors
The ability to form teeth was lost in an ancestor of all modern birds, approximately 100-80 million years ago. However, experiments in chicken have revealed that the oral epithelium can respond to inductive signals from mouse mesenchyme, leading to reactivation of the odontogenic pathway. Recently, tooth germs similar to crocodile rudimentary teeth were found in a chicken mutant. These “chicken teeth” did not develop further, but the question remains whether functional teeth with enamel cap would have been obtained if the experiments had been carried out over a longer time period or if the chicken mutants had survived. The next odontogenetic step would have been tooth differentiation, involving deposition of dental proteins.	Abstract
Using bioinformatics, we assessed the fate of the four dental proteins thought to be specific to enamel (amelogenin, AMEL; ameloblastin, AMBN; enamelin, ENAM) and to dentin (dentin sialophosphoprotein, DSPP) in the chicken genome. Conservation of gene synteny in amniotes allowed definition of target DNA regions in which we searched for sequence similarity. We found the full-length chicken AMEL and the only N-terminal region of DSPP, and both are invalidated genes. AMBN and ENAM disappeared after chromosomal rearrangements occurred in the candidate region in a bird ancestor.	
These findings not only imply that functional teeth with enamel covering, as present in ancestral Aves, will never be obtained in birds, but they also indicate that these four protein genes were dental specific, at least in the last toothed ancestor of modern birds, a specificity which has been questioned in recent years.	Additional References

Mutation #2	
Yes (https://www.gephebase.org/search-criteria?/and+Presumptive Null=~Yes~#gephebase-summary-title)	Presumptive Null
Coding (https://www.gephebase.org/search-criteria?/and+Molecular Type=~Coding~#gephebase-summary-title)	Molecular Type
Insertion (https://www.gephebase.org/search-criteria?/and+Aberration Type=~Insertion~#gephebase-summary-title)	Aberration Type
1-9 bp	Insertion Size
synteny of the corresponding region - two 2-bp insertions in exon 2 leading to a reading frameshift which changes the amino acids in the N-terminal region and results in a premature stop codon in exon 6	Molecular Details of the Mutation
Candidate Gene (https://www.gephebase.org/search-criteria?/and+Experimental Evidence=~Candidate Gene~#gephebase-summary-title)	Experimental Evidence
Hen’s teeth with enamel cap: from dream to impossibility. (2008) (https://pubmed.ncbi.nlm.nih.gov/18775069)	Main Reference
Sire JY; Delgado SC; Giron-dot M	Authors
	Abstract

The ability to form teeth was lost in an ancestor of all modern birds, approximately 100-80 million years ago. However, experiments in chicken have revealed that the oral epithelium can respond to inductive signals from mouse mesenchyme, leading to reactivation of the odontogenic pathway. Recently, tooth germs similar to crocodile rudimentary teeth were found in a chicken mutant. These “chicken teeth” did not develop further, but the question remains whether functional teeth with enamel cap would have been obtained if the experiments had been carried out over a longer time period or if the chicken mutants had survived. The next odontogenetic step would have been tooth differentiation, involving deposition of dental proteins.

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Additional References

Mutation #3

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

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

Indel Size

-

Molecular Details of the Mutation

also numerous indels in exon 6

Experimental Evidence

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

Main Reference

Hen’s teeth with enamel cap: from dream to impossibility. (2008) (<https://pubmed.ncbi.nlm.nih.gov/18775069>)

Authors

Sire JY; Delgado SC; Giron-dot M

Abstract

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Additional References

RELATED GEPHE

Related Genes

3 (ameloblastin (AMBN), dentin sialophosphoprotein (DSPP), enamelin (ENAM)) (<https://www.gephebase.org/search-criteria?/or+Taxon ID=~84099^/and+Trait=Tooth absence/or+Taxon ID=~9031^/and+Trait=Tooth absence/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

In zebrafinch AMEL exon 2 there is a deletion of 12 bases and a base substitution leading to a premature stop codon. The AMEL gene mutations in these two bird species indicate that this crucial gene for enamel formation has lost its functional constraints long before the split between Passeriformes and Galliformes (Sire et al unpublished data).

