

GEPHE SUMMARY

	Gephebase Gene		GepheID
dentin sialophosphoprotein (DSPP) (https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=dentin+sialophosphoprotein+(DSPP)^#gephebase-summary-title)		GP00001936	
Published	Entry Status	Courtier	Main curator

PHENOTYPIC CHANGE

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

GENOTYPIC CHANGE

	Generic Gene Name		UniProtKB Homo sapiens
DSPP		Q9NZW4 (http://www.uniprot.org/uniprot/Q9NZW4)	
	Synonyms		GenebankID or UniProtKB
DPP; DSP; DGI1; DMP3; DFNA39		()	
	String		
9606.ENSP00000382213 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=9606.ENSP00000382213)			
	Sequence Similarities		
-			
	GO - Molecular Function		
GO:0005201 : extracellular matrix structural constituent (https://www.ebi.ac.uk/QuickGO/term/GO:0005201)			
GO:0005509 : calcium ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005509)			
GO:0005518 : collagen binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005518)			
	GO - Biological Process		
GO:0007275 : multicellular organism development			

(<https://www.ebi.ac.uk/QuickGO/term/GO:0007275>)
 GO:0030198 : extracellular matrix organization
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0030198>)
 GO:0001501 : skeletal system development
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0001501>)
 GO:0001503 : ossification (<https://www.ebi.ac.uk/QuickGO/term/GO:0001503>)
 GO:0031214 : biomineral tissue development
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0031214>)
 GO:0097187 : dentinogenesis (<https://www.ebi.ac.uk/QuickGO/term/GO:0097187>)
 GO:0071895 : odontoblast differentiation
 (<https://www.ebi.ac.uk/QuickGO/term/GO:0071895>)
 GO:1901329 : regulation of odontoblast differentiation
 (<https://www.ebi.ac.uk/QuickGO/term/GO:1901329>)

GO - Cellular Component

GO:0005737 : cytoplasm (<https://www.ebi.ac.uk/QuickGO/term/GO:0005737>)
 GO:0005634 : nucleus (<https://www.ebi.ac.uk/QuickGO/term/GO:0005634>)
 GO:0005576 : extracellular region (<https://www.ebi.ac.uk/QuickGO/term/GO:0005576>)
 GO:0031012 : extracellular matrix (<https://www.ebi.ac.uk/QuickGO/term/GO:0031012>)

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

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

Deletion Size

1-9 bp

Molecular Details of the Mutation

synteny of the corresponding region - only the N-terminal region of DSPP is present in the genome - 1-bp deletion in exon one leading to a reading frame shift were this sequence to be translated

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; Girondot M

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.

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

RELATED GEPHE

Related Genes

3 (ameloblastin (AMBN), amelogenin (AMEL), 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

