

GEPHE SUMMARY

		Gephebase Gene		GepheID
enamelin (ENAM) (<a +enamelin+(enam)+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=">https://www.gephebase.org/search-criteria?/and+Gene+Gephebase="+enamelin+(ENAM)+"#gephebase-summary-title)			GP00001935	
Published		Entry Status	Courtier	Main curator

PHENOTYPIC CHANGE

		Trait Category	
Physiology (<a +physiology+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Trait+Category=">https://www.gephebase.org/search-criteria?/and+Trait+Category="+Physiology+"#gephebase-summary-title)			
		Trait	
Tooth absence (no enamel production) (<a +tooth+absence+(no+enamel+production)+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Trait=">https://www.gephebase.org/search-criteria?/and+Trait="+Tooth+absence+(no+enamel+production)+"#gephebase-summary-title)			
presence of teeth		Trait State in Taxon A	
absence of teeth		Trait State in Taxon B	
		Ancestral State	
Taxon A			
		Taxonomic Status	
Intergenic or Higher (<a +intergenic+or+higher+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=">https://www.gephebase.org/search-criteria?/and+Taxonomic+Status="+Intergenic+or+Higher+"#gephebase-summary-title)			

Taxon A	Latin Name	Taxon B	Latin Name
Paleosuchus palpebrosus (<a +paleosuchus+palpebrosus+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms="+Paleosuchus+palpebrosus+"#gephebase-summary-title)		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)	
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
ENAM			Q9NRM1 (http://www.uniprot.org/uniprot/Q9NRM1)	
		Synonyms		GenebankID or UniProtKB
ADA1; AI1C; AIH2			()	
		String		
9606.ENSP00000379383 (http://string-db.org/newstring.cgi/show_network_section.pl?identifier=9606.ENSP00000379383)				
		Sequence Similarities		
-				
		GO - Molecular Function		
GO:0030345 : structural constituent of tooth enamel (https://www.ebi.ac.uk/QuickGO/term/GO:0030345)				
		GO - Biological Process		
GO:0044267 : cellular protein metabolic process (https://www.ebi.ac.uk/QuickGO/term/GO:0044267)				
GO:0043687 : post-translational protein modification				

(<https://www.ebi.ac.uk/QuickGO/term/GO:0043687>)
GO:0031214 : biomineral tissue development
(<https://www.ebi.ac.uk/QuickGO/term/GO:0031214>)
GO:0036305 : ameloblast differentiation
(<https://www.ebi.ac.uk/QuickGO/term/GO:0036305>)
GO:0097186 : amelogenesis (<https://www.ebi.ac.uk/QuickGO/term/GO:0097186>)
GO:0070175 : positive regulation of enamel mineralization
(<https://www.ebi.ac.uk/QuickGO/term/GO:0070175>)
GO:0022604 : regulation of cell morphogenesis
(<https://www.ebi.ac.uk/QuickGO/term/GO:0022604>)

GO - Cellular Component

GO:0031012 : extracellular matrix (<https://www.ebi.ac.uk/QuickGO/term/GO:0031012>)
GO:0005788 : endoplasmic reticulum lumen
(<https://www.ebi.ac.uk/QuickGO/term/GO:0005788>)

Presumptive Null

Yes (<https://www.gephebase.org/search-criteria?/and+Presumptive Null=~Yes^#gephebase-summary-title>)

Molecular Type

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

Aberration Type

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

Deletion Size

10-100 kb

Molecular Details of the Mutation

synteny of the corresponding region - the gene has been likely deleted from the chicken genome as a consequence of intrachromosomal rearrangements which have probably occurred in the lineage that led to the last common ancestor of modern birds

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), dentin sialophosphoprotein (DSPP)) (<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