

## GEPHE SUMMARY

**Gephebase Gene**  
enamelin (ENAM)

**Entry Status**  
Published

**GepheID**  
GP00001935

**Main curator**  
Courtier

## PHENOTYPIC CHANGE

**Trait Category**  
Physiology

**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

### Taxon A

**Latin Name**

*Paleosuchus palpebrosus*

**Common Name**

Cuvier's dwarf caiman

**Synonyms**

Cuvier's dwarf caiman; MNHN 7530; MNHN:7530

**Rank**

species

**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

**Parent**

*Paleosuchus* () - (Rank: genus)

**NCBI Taxonomy ID**

84099

**is Taxon A an Intraspecies?**

No

### Taxon B

**Latin Name**

*Gallus gallus*

**Common Name**

chicken

**Synonyms**

*Gallus gallus domesticus*; chicken; bantam; chickens

**Rank**

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**

*Gallus* () - (Rank: genus)

**NCBI Taxonomy ID**

9031

**is Taxon B an Intraspecies?**

No

## GENOTYPIC CHANGE

**Generic Gene Name**  
ENAM

**Synonyms**

ADA1; AI1C; AIH2

**String**

9606.ENSP00000379383

**Sequence Similarities**

-

**GO - Molecular Function**

GO:0030345 : structural constituent of tooth enamel

**GO - Biological Process**

GO:0044267 : cellular protein metabolic process

GO:0043687 : post-translational protein modification

GO:0031214 : biomineral tissue development

GO:0036305 : ameloblast differentiation

GO:0097186 : amelogenesis

GO:0070175 : positive regulation of enamel mineralization

GO:0022604 : regulation of cell morphogenesis

**UniProtKB Homo sapiens**  
Q9NRM1

**GenebankID or UniProtKB**

GO - Cellular Component  
GO:0031012 : extracellular matrix  
GO:0005788 : endoplasmic reticulum lumen

#### Presumptive Null

Yes

#### Molecular Type

Gene Loss

#### Aberration Type

Deletion

#### 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

##### Main Reference

Hen's teeth with enamel cap: from dream to impossibility. (2008)

##### 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))

##### Related Haplotypes

No matches found.

## COMMENTS