

# GEPHE SUMMARY

neurogenin 3 ( <a href="https://www.gephebase.org/search-criteria/?and+GeneGephebase=%neurogenin 3^#gephebase-summary-title">https://www.gephebase.org/search-criteria/?and+GeneGephebase=%neurogenin 3^#gephebase-summary-title</a> )	Gephebase Gene	GP00001915	GepheID
	Entry Status	Courtier	Main curator
Published			

## PHENOTYPIC CHANGE

	Trait Category
Physiology ( <a href="https://www.gephebase.org/search-criteria/?and+TraitCategory=%Physiology^#gephebase-summary-title">https://www.gephebase.org/search-criteria/?and+TraitCategory=%Physiology^#gephebase-summary-title</a> )	Trait
Digestion (absence of stomach) ( <a href="https://www.gephebase.org/search-criteria/?and+Trait=%Digestion+(absence+of+stomach)^#gephebase-summary-title">https://www.gephebase.org/search-criteria/?and+Trait=%Digestion+(absence+of+stomach)^#gephebase-summary-title</a> )	Trait State in Taxon A
presence of stomach and gastric acid production	Trait State in Taxon B
loss of stomach and no gastric acid production	Ancestral State
Taxon A	Taxonomic Status

Taxon A	Latin Name	Taxon B	Latin Name
Monodelphis domestica ( <a href="https://www.gephebase.org/search-criteria/?and+Taxon+and+Synonyms=%Monodelphis+domestica^#gephebase-summary-title">https://www.gephebase.org/search-criteria/?and+Taxon+and+Synonyms=%Monodelphis+domestica^#gephebase-summary-title</a> )		Ornithorhynchus anatinus ( <a href="https://www.gephebase.org/search-criteria/?and+Taxon+and+Synonyms=%Ornithorhynchus+anatinus^#gephebase-summary-title">https://www.gephebase.org/search-criteria/?and+Taxon+and+Synonyms=%Ornithorhynchus+anatinus^#gephebase-summary-title</a> )	
gray short-tailed opossum	Common Name	platypus	Common Name
gray short-tailed opossum; Monodelphis domesticus	Synonyms	platypus; duck-billed platypus; duckbill platypus; Ornithorhynchus anatinus	Synonyms
species	Rank	species	Rank
	Lineage		Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Metatheria; Didelphimorpha; Didelphidae; Didelphinae; Monodelphis		cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Prototheria; Monotremata; Ornithorhynchidae; Ornithorhynchus	
Monodelphis (short-tailed opossums) - (Rank: genus) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=13615">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=13615</a> )	Parent	Ornithorhynchus () - (Rank: genus) ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9257">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9257</a> )	Parent
13616 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=13616">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=13616</a> )	NCBI Taxonomy ID	9258 ( <a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9258">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=9258</a> )	NCBI Taxonomy ID
No	is Taxon A an Infraspecies?	No	is Taxon B an Infraspecies?

## GENOTYPIC CHANGE

NEUROG3	Generic Gene Name	UniProtKB Homo sapiens
ngn3; Atoh5; NGN-3; Math4B; bHLHa7; ATOH5; BHLHA7; NGN3	Synonyms	GenebankID or UniProtKB
9606.ENSP00000242462 ( <a href="http://string-db.org/newstring_cgi/show_network_section.pl?identifier=9606.ENSP00000242462">http://string-db.org/newstring_cgi/show_network_section.pl?identifier=9606.ENSP00000242462</a> )	String	0
-	Sequence Similarities	
GO:0046983 : protein dimerization activity ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0046983">https://www.ebi.ac.uk/QuickGO/term/GO:0046983</a> )	GO - Molecular Function	
GO:0001228 : DNA-binding transcription activator activity, RNA polymerase II-specific ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0001228">https://www.ebi.ac.uk/QuickGO/term/GO:0001228</a> )		
GO:0000981 : DNA-binding transcription factor activity, RNA polymerase II-specific ( <a href="https://www.ebi.ac.uk/QuickGO/term/GO:0000981">https://www.ebi.ac.uk/QuickGO/term/GO:0000981</a> )		
GO:0000978 : RNA polymerase II proximal promoter sequence-specific DNA binding		

(<https://www.ebi.ac.uk/QuickGO/term/GO:0000978>)  
GO:0001227 : DNA-binding transcription repressor activity, RNA polymerase II-specific  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0001227>)  
GO:0003713 : transcription coactivator activity  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0003713>)  
GO:0031490 : chromatin DNA binding  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0031490>)

#### GO - Biological Process

GO:0007417 : central nervous system development  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0007417>)  
GO:0007399 : nervous system development  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0007399>)  
GO:0007422 : peripheral nervous system development  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0007422>)  
GO:0045944 : positive regulation of transcription by RNA polymerase II  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0045944>)  
GO:0000122 : negative regulation of transcription by RNA polymerase II  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0000122>)  
GO:0045666 : positive regulation of neuron differentiation  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0045666>)  
GO:0048814 : regulation of dendrite morphogenesis  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0048814>)  
GO:0031018 : endocrine pancreas development  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0031018>)  
GO:0030900 : forebrain development  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0030900>)  
GO:0030855 : epithelial cell differentiation  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0030855>)  
GO:0051091 : positive regulation of DNA-binding transcription factor activity  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0051091>)  
GO:0030902 : hindbrain development  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0030902>)  
GO:0021510 : spinal cord development  
(<https://www.ebi.ac.uk/QuickGO/term/GO:0021510>)  
GO:0060290 : transdifferentiation (<https://www.ebi.ac.uk/QuickGO/term/GO:0060290>)

#### 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>)

Presumptive Null

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

Molecular Type

Gene Loss ([#gepheebase-summary-title](https://www.gepheebase.org/search-criteria/?and+Molecular+Type=^Gene+Loss))

Aberration Type

Deletion ([#gepheebase-summary-title](https://www.gepheebase.org/search-criteria/?and+Aberration+Type=^Deletion))

Deletion Size

-

#### Molecular Details of the Mutation

Absence of the gene in the genome sequence - Neurogenin-3 is a transcription factor whose activity is required for the specification of gastric epithelial cell identity - Deficiency of this factor results in considerably smaller stomachs and absence of gastrin-secreting G cells: somatostatin-secreting D cells and glucagon-secreting A cells

Experimental Evidence

Candidate Gene ([#gepheebase-summary-title](https://www.gepheebase.org/search-criteria/?and+Experimental+Evidence=^Candidate+Gene))

Main Reference

Loss of genes implicated in gastric function during platypus evolution. (2008) (<https://pubmed.ncbi.nlm.nih.gov/18482448>)

Authors

Ordoñez GR; Hillier LW; Warren WC; Grutzner F; López-Otón C; Puente XS

Abstract

The duck-billed platypus (*Ornithorhynchus anatinus*) belongs to the mammalian subclass *Prototheria*, which diverged from the *Theria* line early in mammalian evolution. The platypus genome sequence provides a unique opportunity to illuminate some aspects of the biology and evolution of these animals.

We show that several genes implicated in food digestion in the stomach have been deleted or inactivated in platypus. Comparison with other vertebrate genomes revealed that the main genes implicated in the formation and activity of gastric juice have been lost in platypus. These include the aspartyl proteases pepsinogen A and pepsinogens B/C, the hydrochloric acid secretion stimulatory hormone gastrin, and the α subunit of the gastric H+/K+-ATPase. Other genes implicated in gastric functions, such as the β subunit of the H+/K+-ATPase and the aspartyl protease cathepsin E, have been inactivated because of the acquisition of loss-of-function mutations. All of these genes are highly conserved in vertebrates, reflecting a unique pattern of evolution in the platypus genome not previously seen in other mammalian genomes.

The observed loss of genes involved in gastric functions might be responsible for the anatomical and physiological differences in gastrointestinal tract between monotremes and other vertebrates, including small size, lack of glands, and high pH of the monotreme stomach. This study contributes to a better understanding of the mechanisms that underlie the evolution of the platypus genome, might extend the less-is-more evolutionary model to monotremes, and provides novel insights into the importance of gene loss events during mammalian evolution.

Additional References

## RELATED GEPHE

#### Related Genes

7 (ATP4A, gastrin, pepsinogen A, pepsinogen B, pepsinogen C, ATP4B, cathepsin E) ([#gepheebase-summary-title](https://www.gepheebase.org/search-criteria/?or+TaxonID=^13616^/and+Trait=Digestion/or+Taxon+ID=^9258^/and+Trait=Digestion/and+groupHaplotypes=true))

Related Haplotypes

No matches found.

## EXTERNAL LINKS

## COMMENTS

lack of acid secretion in the platypus stomach - this is a characteristic feature of monotremes whose gastric juice is above pH 6