

GEPHE SUMMARY

	Gephebase Gene	GepheID
ribonuclease 1B (RNase1B) (https://www.gepibase.org/search-criteria?/and+Gene+Gepibase=%5B%5Cribonuclease+1B+%5C%28RNase1B%29%5D%5C%23gepibase-summary-title%5C%29)	GP00000988	Main curator
Published	Entry Status	Courtier

PHENOTYPIC CHANGE

Physiology (https://www.gephebase.org/search-criteria?/and+Trait+Category=^Physiology^#gephebase-summary-title)		Trait Category	
Optimal enzymatic pH (https://www.gephebase.org/search-criteria?/and+Trait=^Optimal enzymatic pH^#gephebase-summary-title)		Trait	
Primate ancestor		Trait State in Taxon A	
Colobus guereza		Trait State in Taxon B	
Data not curated		Ancestral State	
Intergeneric or Higher (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Intergeneric or Higher^#gephebase-summary-title)		Taxonomic Status	
Taxon A		Taxon B	
Primates	Latin Name	Colobus guereza	Latin Name
(https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Primates^#gephebase-summary-title)		(https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Colobus guereza^#gephebase-summary-title)	
-	Common Name		Common Name
		mantled guereza	
Primata; Primates Linnaeus, 1758	Synonyms		Synonyms
		Colobus abyssinicus; mantled guereza; eastern black-and -white colobus; guereza; Colobus abyssinicus (Oken, 1816); Colobus guereza Rueppell, 1835	
order	Rank		Rank
		species	
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Eutheria; Boreoeutheria; Euarchontoglires	Lineage		Lineage
		cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota; Mammalia; Theria; Eutheria; Boreoeutheria; Euarchontoglires; Primates; Haplorrhini; Simiiformes; Catarrhini; Cercopithecoidea; Cercopithecidae; Colobinae; Colobus	
Euarchontoglires () - (Rank: superorder)	Parent		Parent
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 314146)			
9443	NCBI Taxonomy ID	Colobus (black-and-white colobus monkeys) - (Rank: genus)	
(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 9443)		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 9570)	
			NCBI Taxonomy ID
	is Taxon A an Intraspecies?	33548	
No		(https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 33548)	
			is Taxon B an Intraspecies?
		No	

GENOTYPIC CHANGE

Gene Name	UniProtKB Pygathrix nemaeus
RNASE1B	Q8SPN3 (http://www.uniprot.org/uniprot/Q8SPN3)
Synonyms	GenebankID or UniProtKB
-	0
String	
-	
Sequence Similarities	
Belongs to the pancreatic ribonuclease family.	
GO - Molecular Function	
GO:0003676 : nucleic acid binding (https://www.ebi.ac.uk/QuickGO/term/GO:0003676)	
GO:0004522 : ribonuclease A activity (https://www.ebi.ac.uk/QuickGO/term/GO:0004522)	
GO - Biological Process	
-	
GO - Cellular Component	
GO:0005576 : extracellular region (https://www.ebi.ac.uk/QuickGO/term/GO:0005576)	

Mutation #1

Presumptive Null

No ([https://www.gephebase.org/search-criteria?/and+Presumptive Null=`No`#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Presumptive+Null=))

Molecular Type

Coding ([https://www.gephebase.org/search-criteria?/and+Molecular Type=`Coding`#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Molecular+Type=))

Aberration Type

SNP ([https://www.gephebase.org/search-criteria?/and+Aberration Type=`SNP`#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Aberration+Type=))

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

The three amino acid changes R4Q K6E R39W have a phenotypic effect in combination - the effect of a single amino acid change has not been tested - the fact that they evolved independently in another lineage suggests that they all have a phenotypic effect

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Arg	Gln	4

Main Reference

Parallel adaptive origins of digestive RNases in Asian and African leaf monkeys. (2006) (<https://pubmed.ncbi.nlm.nih.gov/16767103>)

Authors

Zhang J

Abstract

Similar morphological or physiological changes occurring in multiple evolutionary lineages are not uncommon. Such parallel changes are believed to be adaptive, because a complex character is unlikely to originate more than once by chance. However, the occurrence of adaptive parallel amino acid substitutions is debated. Here I propose four requirements for establishing adaptive parallel evolution at the protein sequence level and use these criteria to demonstrate such a case. I report that the gene encoding pancreatic ribonuclease was duplicated independently in Asian and African leaf-eating monkeys. Statistical analyses of DNA sequences, functional assays of reconstructed ancestral proteins and site-directed mutagenesis show that the new genes acquired enhanced digestive efficiencies through parallel amino acid replacements driven by darwinian selection. They also lost a non-digestive function independently, under a relaxed selective constraint. These results demonstrate that despite the overall stochasticity, even molecular evolution has a certain degree of repeatability and predictability under the pressures of natural selection.

Additional References

Mutation #2

Presumptive Null

No ([https://www.gephebase.org/search-criteria?/and+Presumptive Null=`No`#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Presumptive+Null=))

Molecular Type

Coding ([https://www.gephebase.org/search-criteria?/and+Molecular Type=`Coding`#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Molecular+Type=))

Aberration Type

SNP ([https://www.gephebase.org/search-criteria?/and+Aberration Type=`SNP`#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Aberration+Type=))

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

The three amino acid changes R4Q K6E R39W have a phenotypic effect in combination - the effect of a single amino acid change has not been tested - the fact that they evolved independently in another lineage suggests that they all have a phenotypic effect

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Lys	Glu	6

Main Reference

Parallel adaptive origins of digestive RNases in Asian and African leaf monkeys. (2006) (<https://pubmed.ncbi.nlm.nih.gov/16767103>)

Authors

Zhang J

Abstract

Similar morphological or physiological changes occurring in multiple evolutionary lineages are not uncommon. Such parallel changes are believed to be adaptive, because a complex character is unlikely to originate more than once by chance. However, the occurrence of adaptive parallel amino acid substitutions is debated. Here I propose four requirements for establishing adaptive parallel evolution at the protein sequence level and use these criteria to demonstrate such a case. I report that the gene encoding pancreatic ribonuclease was duplicated independently in Asian and African leaf-eating monkeys. Statistical analyses of DNA sequences, functional assays of reconstructed ancestral proteins and site-directed mutagenesis show that the new genes acquired enhanced digestive efficiencies through parallel amino acid replacements driven by darwinian selection. They also lost a non-digestive function independently, under a relaxed selective constraint. These results demonstrate that despite the overall stochasticity, even molecular evolution has a certain degree of repeatability and predictability under the pressures of natural selection.

Additional References

Mutation #3

Presumptive Null

No (<https://www.gephebase.org/search-criteria?/and+Presumptive Null=^No^#gephebase-summary-title>)

Molecular Type

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

Aberration Type

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

SNP Coding Change

Nonsynonymous

Molecular Details of the Mutation

The three amino acid changes R4Q K6E R39W have a phenotypic effect in combination - the effect of a single amino acid change has not been tested - the fact that they evolved independently in another lineage suggests that they all have a phenotypic effect

Experimental Evidence

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

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Arg	Trp	39

Main Reference

Parallel adaptive origins of digestive RNases in Asian and African leaf monkeys. (2006) (<https://pubmed.ncbi.nlm.nih.gov/16767103>)

Authors

Zhang J

Abstract

Similar morphological or physiological changes occurring in multiple evolutionary lineages are not uncommon. Such parallel changes are believed to be adaptive, because a complex character is unlikely to originate more than once by chance. However, the occurrence of adaptive parallel amino acid substitutions is debated. Here I propose four requirements for establishing adaptive parallel evolution at the protein sequence level and use these criteria to demonstrate such a case. I report that the gene encoding pancreatic ribonuclease was duplicated independently in Asian and African leaf-eating monkeys. Statistical analyses of DNA sequences, functional assays of reconstructed ancestral proteins and site-directed mutagenesis show that the new genes acquired enhanced digestive efficiencies through parallel amino acid replacements driven by darwinian selection. They also lost a non-digestive function independently, under a relaxed selective constraint. These results demonstrate that despite the overall stochasticity, even molecular evolution has a certain degree of repeatability and predictability under the pressures of natural selection.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

1 ([https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^ribonuclease 1B \(RNase1B\)^/and+Taxon ID=^9443^/or+Gene Gephebase=^ribonuclease 1B \(RNase1B\)^/and+Taxon ID=^33548^#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene Gephebase=^ribonuclease 1B (RNase1B)^/and+Taxon ID=^9443^/or+Gene Gephebase=^ribonuclease 1B (RNase1B)^/and+Taxon ID=^33548^#gephebase-summary-title))

EXTERNAL LINKS

COMMENTS