GEPHE SUMMARY

Gephebase Gene
Fezf2 (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^Fezf2^#gephebase-summary-title)

GepheID
GP00000307

Entry Status
Published

Main curator
Courtier

PHENOTYPIC CHANGE

Trait Category
Morphology (https://www.gephebase.org/search-criteria?/and+Trait Category=^Morphology^#gephebase-summary-title)

Trait
Cerebral cortex layered organization (https://www.gephebase.org/search-criteria?/and+Trait=^Cerebral cortex layered organization^#gephebase-summary-title)

Trait State in Taxon A
Other amniotes

Trait State in Taxon B
Mammals

Ancestral State
Taxon A

Taxonomic Status
Intergeneric or Higher (https://www.gephebase.org/search-criteria?/and+Taxonomic Status=^Intergeneric or Higher^#gephebase-summary-title)

Taxon A

Latin Name
Amniota (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Amniota^#gephebase-summary-title)

Common Name
amniotes

Synonyms
amniotes

Rank
no rank

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda

Parent
Tetrapoda (tetrapods) - (Rank: no rank) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 32523)

NCBI Taxonomy ID
32524 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 32524)

is Taxon A an Infraspecies?
No

Taxon B

Latin Name
Mammalia (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Mammalia^#gephebase-summary-title)

Common Name
mammals

Synonyms
mammals

Rank
class

Lineage
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Deuterostomia; Chordata; Craniata; Vertebrata; Gnathostomata; Teleostomi; Euteleostomi; Sarcopterygii; Dipnotetrapodomorpha; Tetrapoda; Amniota

Parent
Amniota (amniotes) - (Rank: no rank) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 32524)

NCBI Taxonomy ID
40674 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 40674)

is Taxon B an Infraspecies?
No

GENOTYPIC CHANGE

Generic Gene Name
Fezf2

Synonyms
Fez; Fezl; Zfp312; AI451466; AI852056

String
10090.ENSMUSP00000022262 (http://string-db.org/newstring_cgi/show_network_section.pl?identifier=10090.ENSMUSP00000022262)

Sequence Similarities
Belongs to the krueppel C2H2-type zinc-finger protein family.

GO - Molecular Function
GO:0001228 : DNA-binding transcription activator activity, RNA polymerase II-specific (https://www.ebi.ac.uk/QuickGO/term/GO:0001228)
GO:0003700 : DNA-binding transcription factor activity (https://www.ebi.ac.uk/QuickGO/term/GO:0003700)
GO:0043565 : sequence-specific DNA binding (https://www.ebi.ac.uk/QuickGO/term/GO:0043565)
GO:0046872 : metal ion binding (https://www.ebi.ac.uk/QuickGO/term/GO:0046872)
GO:0044212 : transcription regulatory region DNA binding

UniProtKB Mus musculus
Q9ESP5 (http://www.uniprot.org/uniprot/Q9ESP5)

GenebankID or UniProtKB
AAH55718 (https://www.ncbi.nlm.nih.gov/nuccore/AAH55718)

(https://www.ebi.ac.uk/QuickGO/term/GO:0044212)
GO:0003677 : DNA binding (https://www.ebi.ac.uk/QuickGO/term/GO:0003677)
GO:0003682 : chromatin binding (https://www.ebi.ac.uk/QuickGO/term/GO:0003682)
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 - Biological Process

GO:0050767 : regulation of neurogenesis
(https://www.ebi.ac.uk/QuickGO/term/GO:0050767)
GO:0006355 : regulation of transcription, DNA-templated
(https://www.ebi.ac.uk/QuickGO/term/GO:0006355)
GO:0000122 : negative regulation of transcription by RNA polymerase II
(https://www.ebi.ac.uk/QuickGO/term/GO:0000122)
GO:0045893 : positive regulation of transcription, DNA-templated
(https://www.ebi.ac.uk/QuickGO/term/GO:0045893)
GO:0008285 : negative regulation of cell proliferation
(https://www.ebi.ac.uk/QuickGO/term/GO:0008285)
GO:0021537 : telencephalon development
(https://www.ebi.ac.uk/QuickGO/term/GO:0021537)
GO:0045666 : positive regulation of neuron differentiation
(https://www.ebi.ac.uk/QuickGO/term/GO:0045666)
GO:0007626 : locomotory behavior (https://www.ebi.ac.uk/QuickGO/term/GO:0007626)
GO:0021895 : cerebral cortex neuron differentiation
(https://www.ebi.ac.uk/QuickGO/term/GO:0021895)
GO:0007411 : axon guidance (https://www.ebi.ac.uk/QuickGO/term/GO:0007411)
GO:0007413 : axonal fasciculation (https://www.ebi.ac.uk/QuickGO/term/GO:0007413)
GO:0043697 : cell dedifferentiation (https://www.ebi.ac.uk/QuickGO/term/GO:0043697)
GO:0021853 : cerebral cortex GABAergic interneuron migration
(https://www.ebi.ac.uk/QuickGO/term/GO:0021853)
GO:0021902 : commitment of neuronal cell to specific neuron type in forebrain
(https://www.ebi.ac.uk/QuickGO/term/GO:0021902)
GO:0016358 : dendrite development (https://www.ebi.ac.uk/QuickGO/term/GO:0016358)
GO:0021542 : dentate gyrus development
(https://www.ebi.ac.uk/QuickGO/term/GO:0021542)
GO:0021797 : forebrain anterior/posterior pattern specification
(https://www.ebi.ac.uk/QuickGO/term/GO:0021797)
GO:0030900 : forebrain development
(https://www.ebi.ac.uk/QuickGO/term/GO:0030900)
GO:0045665 : negative regulation of neuron differentiation
(https://www.ebi.ac.uk/QuickGO/term/GO:0045665)
GO:0048664 : neuron fate determination
(https://www.ebi.ac.uk/QuickGO/term/GO:0048664)
GO:1902667 : regulation of axon guidance
(https://www.ebi.ac.uk/QuickGO/term/GO:1902667)

GO - Cellular Component

GO:0005634 : nucleus (https://www.ebi.ac.uk/QuickGO/term/GO:0005634)

Presumptive Null

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

Molecular Type

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

Aberration Type

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

Molecular Details of the Mutation

Acquisition of SOX binding sites in enhancer E4

Experimental Evidence

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

Main Reference

Cis-regulatory control of corticospinal system development and evolution. (2012) (https://pubmed.ncbi.nlm.nih.gov/22678282)

Authors

Shim S; Kwan KY; Li M; Lefebvre V; Sestan N

Abstract

The co-emergence of a six-layered cerebral neocortex and its corticospinal output system is one of the evolutionary hallmarks of mammals. However, the genetic programs that underlie their development and evolution remain poorly understood. Here we identify a conserved non-exonic element (E4) that acts as a cortex-specific enhancer for the nearby gene Fezf2 (also known as Fezl and Zfp312), which is required for the specification of corticospinal neuron identity and connectivity. We find that SOX4 and SOX11 functionally compete with the repressor SOX5 in the transactivation of E4. Cortex-specific double deletion of Sox4 and Sox11 leads to the loss of Fezf2 expression, failed specification of corticospinal neurons and, independent of Fezf2, a reeler-like inversion of layers. We show evidence supporting the emergence of functional SOX-binding sites in E4 during tetrapod evolution, and their subsequent stabilization in mammals and possibly amniotes. These findings reveal that SOX transcription factors converge onto a cis-acting element of Fezf2 and form critical components of a regulatory network controlling the identity and connectivity of corticospinal neurons.

Additional References

RELATED GEPHE

Related Genes

No matches found.

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS

@SexualTrait