

# WORKSHOP:

## Finding Addiction Resources



Short Course on the Genetics of Addiction  
Aug 25, 2015  
Joanne Berghout, PhD

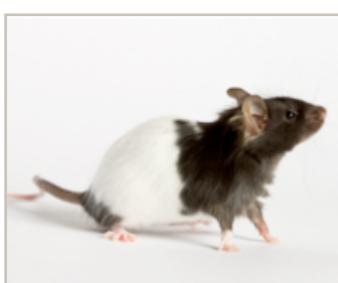
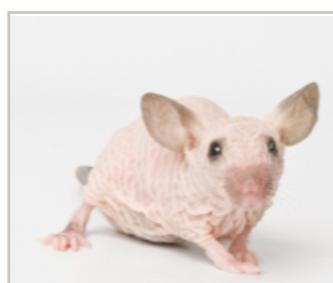
# Database resources

- Mouse Genome Informatics (MGI) & International Mouse Strain Resource  
[www.informatics.jax.org](http://www.informatics.jax.org)
  - integrated gene, allele, phenotype & expression resources with mutant alleles generated by the entire research community.
  - Structured vocabularies are used by curators to describe data
  - IMSR indexes commercial availability of mutant strains
- International Mouse Phenotyping Consortium (IMPC)  
[www.mousephenotype.org](http://www.mousephenotype.org)
  - high-throughput targeted allele production and standardized phenotyping
  - Structured vocabularies are used by investigators to describe data
- Mouse Phenotype Database (MPD)  
<http://phenome.jax.org/>
  - standardized phenotype assessments across panels of inbred strains, genotyping information for inbred strains

# Database resources

- Rat Genome Database  
<http://rgd.mcw.edu/>
  - Genetic, genomic, phenotype, and disease data generated from rat research
  - Structured vocabularies are used by curators to describe data
- Neuroscience Information Framework  
<http://www.neuinfo.org/>
  - Inventory and index of data relevant to neuroscience research from across the “hidden web” (databases & repositories), linking to primary data and providing analysis tools
- Allen Brain Atlas  
<http://www.brain-map.org/>
  - Structural anatomy and gene expression data within the brain

# Mouse genotypes



Laboratory mice are typically fully inbred  
Individuals within a strain are genetically identical  
Experimental consistency and reproducibility

Differences between strains  
comparing strains allows study of genetically influenced traits

Individual genes can be studied using spontaneous or targeted alleles on a predictable controlled background

# How to organize biology



# Organization: structured vocabularies

- Provides unique, stable and well-defined identifiers
  - Can be read by a computer
  - Allows comparisons
- Hierarchical relationships between terms
  - Variable levels of precision for data annotation and retrieval

**Mammalian Phenotype Browser**  
Term Detail

MP term: **abnormal behavioral response to addictive substance**  
MP id: **MP:0009748**  
Definition: **any anomaly in the behavioral response induced by an addictive substance, such as induced hyperactivity or stereotypic behavior**  
Number of paths to term: **1**

**I** denotes an 'is-a' relationship  
**P** denotes a 'part-of' relationship

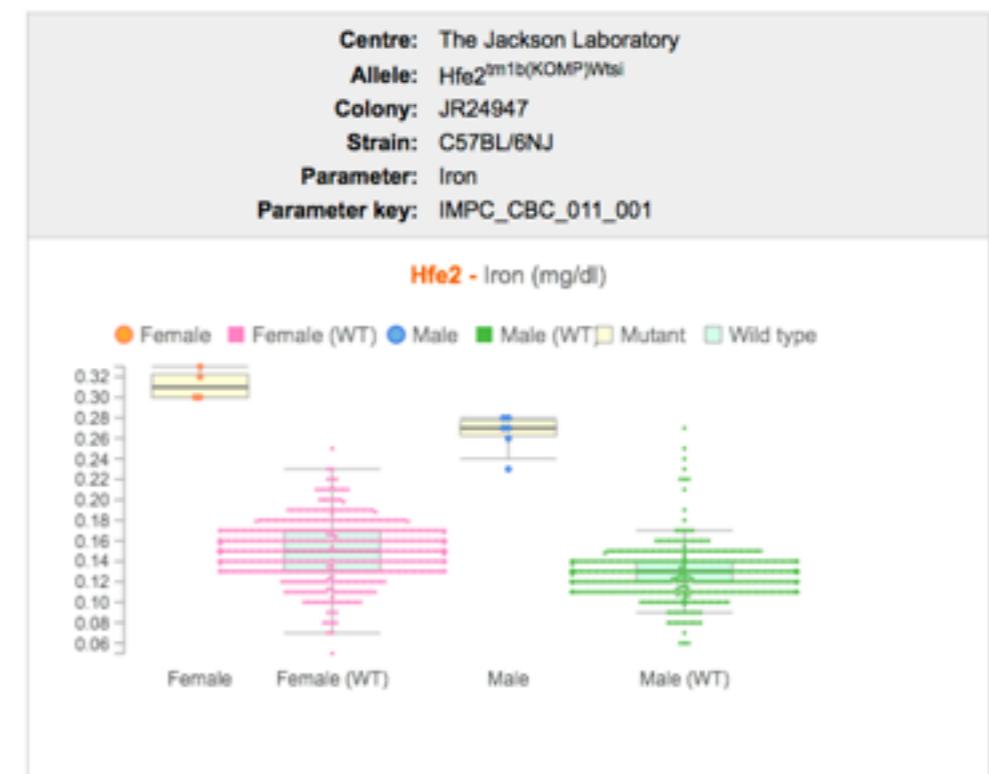
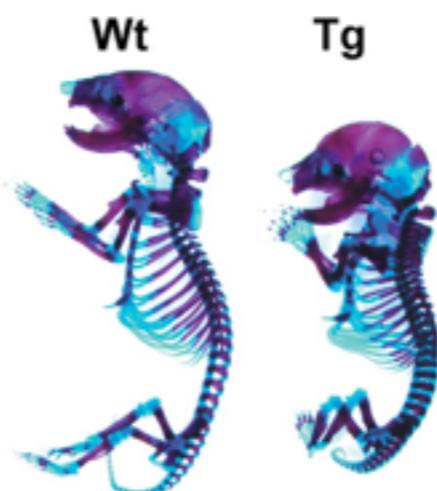
mammalian phenotype

- I** [behavior/neurological phenotype](#)
- I** [abnormal behavior](#)
- I** [abnormal behavioral response to xenobiotic](#)
  - I** [abnormal alcohol consumption +](#)
  - I** [abnormal behavioral response to addictive substance \[MP:0009748\] \(239 genotypes, 277 annotations\)](#)
    - I** [abnormal behavioral response to alcohol +](#)
    - I** [abnormal behavioral response to cocaine +](#)
    - I** [abnormal behavioral response to methamphetamine](#)
    - I** [abnormal behavioral response to morphine +](#)
    - I** [abnormal behavioral response to nicotine +](#)
    - I** [abnormal behavioral withdrawal response +](#)
    - I** [enhanced behavioral response to addictive substance +](#)
    - I** [impaired behavioral response to addictive substance +](#)
  - I** [abnormal behavioral response to anesthetic +](#)
  - I** [abnormal cocaine consumption +](#)
  - I** [abnormal habituation to xenobiotic](#)
  - I** [abnormal seizure response to pharmacological agent +](#)
  - I** [abnormal sensitization to xenobiotic](#)
  - I** [aversion to addictive substance +](#)
  - I** [enhanced behavioral response to xenobiotic +](#)
  - I** [impaired behavioral response to xenobiotic +](#)
  - I** [preference for addictive substance +](#)

[Back to entry page](#)

# Organization: structured vocabularies

- **Mammalian Phenotype (MP) ontology**
  - Describes abnormal observations in mutant animals
  - Used by MGI, IMPC, RGD



# Organization: structured vocabularies

- **Mammalian Phenotype (MP) ontology**
- **Gene Ontology (GO)**
  - Describes normal behavior of a gene or gene product within its cellular context (species neutral).
  - Subdivided into *Biological Process*, *Molecular Function* and *Cellular Component*

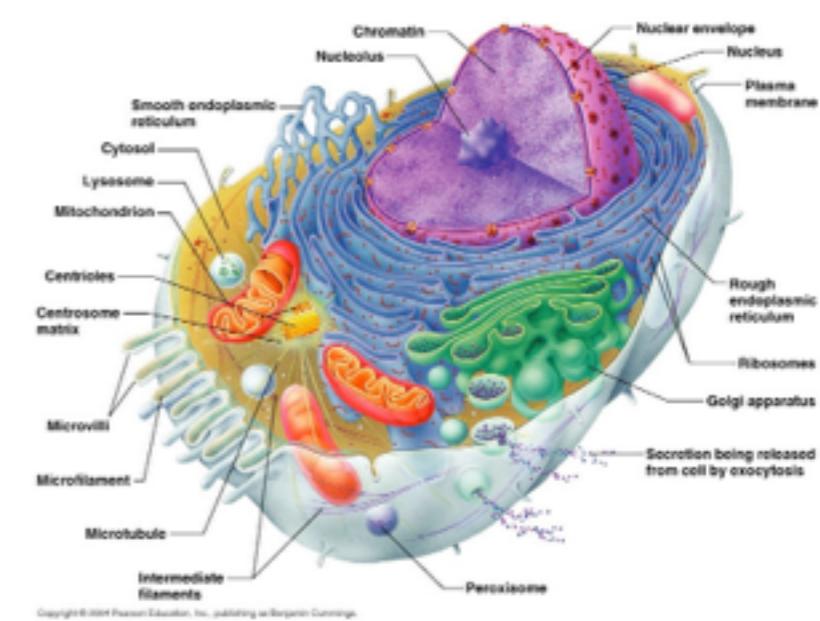
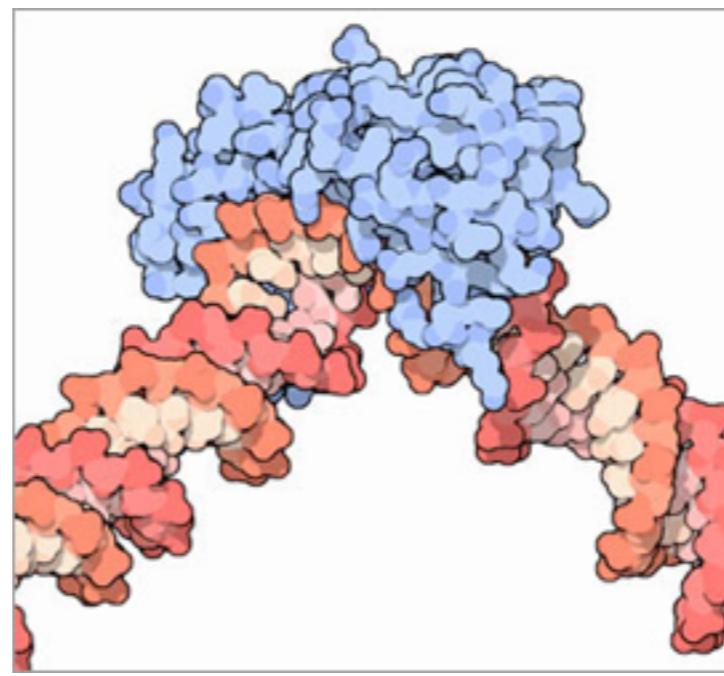
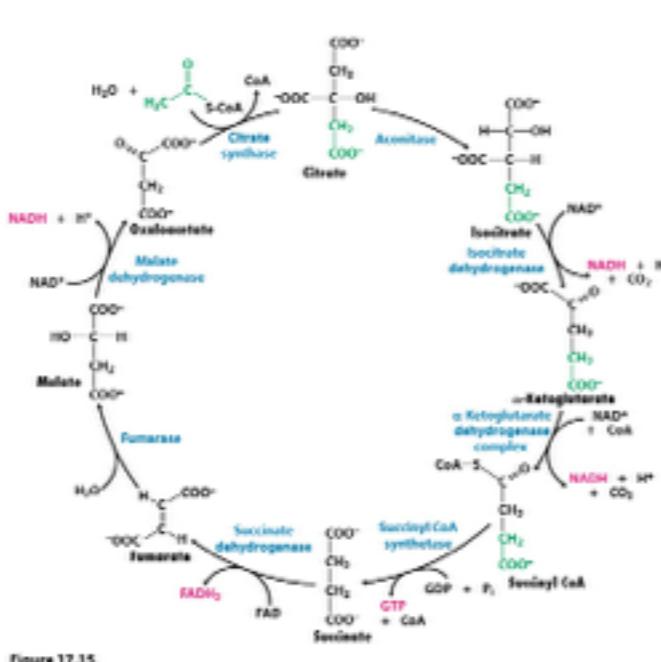
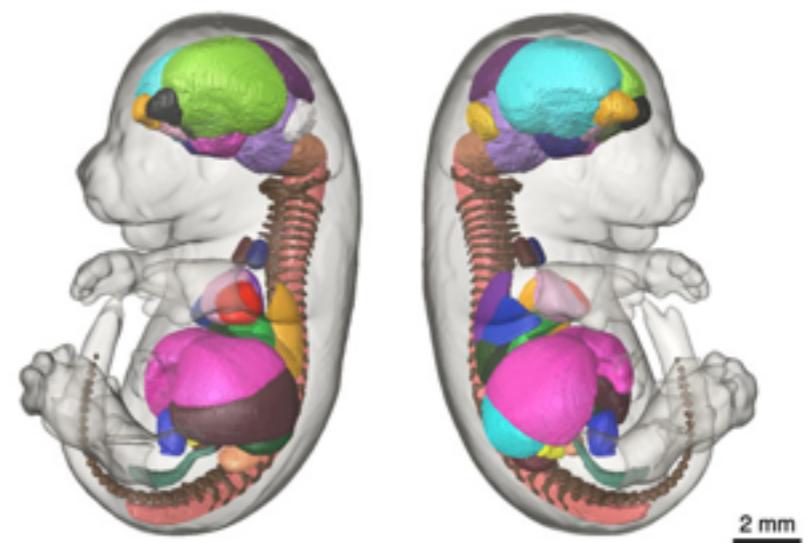


Figure 17.15  
Biochemistry, Seventh Edition  
© 2012 W.H. Freeman and Company

# Organization: structured vocabularies

- **Mammalian Phenotype** (MP) ontology
- **Gene Ontology** (GO)
- Mouse **Developmental Anatomy** ontology
  - Describes organs and tissues throughout development
  - Uses Theiler stages where TS1-26 are embryonic, TS27 is perinatal and TS28 is post-natal adult
  - Used by MGI/GXD and e-Mouse Atlas





# Mouse Genome Informatics

<http://www.informatics.jax.org/>

- Curate information
- Integrate and organize data
- Provide tools for data retrieval and analysis

Search by **gene, phenotype, gene function, disease, publication**, etc

The screenshot shows the MGI homepage with a navigation bar at the top. The main content area features a search bar, a sidebar with various links like 'Genes', 'Phenotypes & Mutant Alleles', and 'Gene Expression Database (GXD)', and a 'Community Interest' section with links to 'MGI Workshops' and 'Research Highlights'. A prominent box on the right announces the 'MGI has an iPhone app!'.

**MGI Mouse Genome Informatics**

Search ▾ Download ▾ More Resources ▾ Submit Data Find Nice (IMSR) Analysis Tools Contact Us Browsers

Keywords, Symbols, or IDs Quick Search

Or use topic specific search and analysis tools:

- Genes
- Phenotypes & Mutant Alleles
- Human-Mouse: Disease Connection
- Gene Expression Database (GXD)
- Recombinase (cre)
- Function
- Strains, SNPs & Polymorphisms
- Vertebrate Homology
- Mouse Models of Human Cancer
- Pathways
- Batch Data and Analysis Tools
- Nomenclature

Getting Started:

- Introduction to mouse genetics
- How to use MGI
- The mouse as a model of human disease

Community Interest

MGI Workshops

- If you would like to host an MGI workshop at your institution, contact User Support to discuss the details.
- A typical MGI workshop includes a brief presentation ([sample](#)) and a hands-on, interactive tutorial ([sample](#)).
- If you would like to schedule a remote interactive session to learn to use MGI, contact User Support to discuss the details.

Research Highlights

- Nature Mouse ENCODE issue. [Nature](#). 2014 Nov 19;515.
- Mouse ENCODE project [website](#).

Other Resources

MGI is the international database resource for the laboratory mouse, providing integrated genetic, genomic, and biological data to facilitate the study of human health and disease.

About Us MGI Publications

**Now MGI has an iPhone app!**

Save favorites and receive updates when new data are available for genes, diseases, or other phenotypes with MGI GenomeCompass.

Available on the iPhone App Store

Current release requires iOS8  
Other versions and Android coming soon.

What's new at MGI updated May 28, 2015

- Links to expression data at GEISHA, Xenbase and ZFIN are now available. [Read more...](#)
- HOPP human homology predictions are now integrated in MGI. [Read more...](#)
- MGI is pleased to announce the release of its first mobile app for iOS. [Read more...](#)
- MGI now incorporates weekly updates of IHPC high-throughput phenotyping data. [Read more...](#)
- New features for the Human-Mouse: Disease Connection. [Read more...](#)

MGI Statistics More MGI news

# MGI advantages



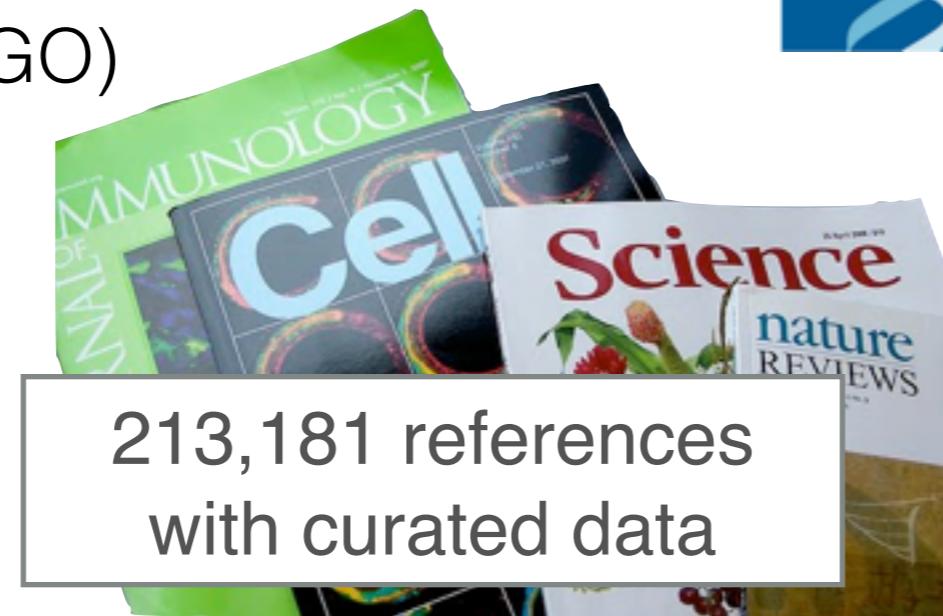
- Authoritative resource on the mouse
- All information in the database relies on peer-reviewed sources and is curated by scientists
- Curation and interpretation of data into metadata using well-defined, structured terminology
- One-stop integration of genes, alleles and biology making it flexible for a variety of research questions
- Fully supported for user questions and under active development to respond to the changing landscape of mouse genetics

# MGI data content

- Genes 59,000 entries with 22,599 protein-coding genes
  - Homology 17,103 mouse genes in a homology class with human
  - Sequences
- Alleles & transgenes 44,217 mutant alleles in mice covering 11,093 genes
  - phenotypes & diseases 55,176 genotypes with 283,566 phenotype annotations; 4,638 modeling 1,374 human diseases
- Gene functions (GO) 24,184 genes with 308,554 GO annotations
- Expression 13,983 genes with 1,487,555 expression assay results
- SNPs/variation 16,000,000 SNPs annotated to inbred strains (dbSNP)

# MGI data sources

- Genes
  - Homology
  - Sequences
- Alleles & transgenes
  - phenotypes & diseases
- Gene functions (GO)
- Expression
- SNPs/variation



**GENEONTOLOGY**  
Unifying Biology



**sanger**  
institute



Search by **gene, phenotype, gene function, disease, publication**, etc

Build queries

Locate introductory tutorials

Contact us

The screenshot shows the homepage of the Mouse Genome Informatics (MGI) website. At the top, there is a navigation bar with links for About, Help, FAQ, Search, Download, More Resources, Submit Data, Find Mice (IMSR), Analysis Tools, Contact Us, and Browsers. A search bar at the top left allows users to enter keywords, symbols, or IDs, with a "Quick Search" button. Below the search bar is a list of topic-specific search and analysis tools, each with an icon: Genes, Phenotypes & Mutant Alleles, Human-Mouse: Disease Connection, Gene Expression Database (GXD), Recombinase (cre), Function, Strains, SNPs & Polymorphisms, Vertebrate Homology, Mouse Models of Human Cancer, Pathways, Batch Data and Analysis Tools, and Nomenclature. A "Getting Started" section provides links to Introduction to mouse genetics, How to use MGI, and The mouse as a model of human disease, accompanied by a cartoon mouse icon. To the right of the main content area, there is a sidebar with a brief description of MGI's mission, links to About Us and MGI Publications, and social media icons for Facebook and Twitter. A large callout box highlights the release of the MGI iPhone app, showing its logo and availability on the App Store. Another callout box in the bottom right corner lists recent news items. The footer contains sections for MGI Workshops, Research Highlights, and Other Resources, along with a note about the International Mouse Phenotyping Consortium.

**Keywords, Symbols, or IDs** **Quick Search**

Or use topic specific search and analysis tools:

- Genes
- Phenotypes & Mutant Alleles
- Human-Mouse: Disease Connection
- Gene Expression Database (GXD)
- Recombinase (cre)
- Function
- Strains, SNPs & Polymorphisms
- Vertebrate Homology
- Mouse Models of Human Cancer
- Pathways
- Batch Data and Analysis Tools
- Nomenclature

**Getting Started:**

- Introduction to mouse genetics
- How to use MGI
- The mouse as a model of human disease

**Community Interest**

**MGI Workshops**

- If you would like to host an MGI workshop at your institution, contact User Support to discuss the details.
- A typical MGI workshop includes a brief presentation ([sample](#)) and a hands-on, interactive tutorial ([sample](#)).
- If you would like to schedule a remote interactive session to learn to use MGI, contact User Support to discuss the details.

**Research Highlights**

- Nature Mouse ENCODE issue. [Nature. 2014 Nov 19;515](#).
- Mouse ENCODE project [website](#).

**Other Resources**

The [International Mouse Phenotyping Consortium](#) project is systematically phenotyping knockout mice from the mutant ES cells produced by the International Mouse Knockout Consortium. Data will be integrated into MGI as available.

MGI is the international database resource for the laboratory mouse, providing integrated genetic, genomic, and biological data to facilitate the study of human health and disease.

About Us [MGI Publications](#)

[f](#) [t](#)

**New MGI has an iPhone app!**

Save favorites and receive updates when new data are available for genes, diseases, or other phenotypes with MGI GenomeCompass.

Available on the iPhone [App Store](#)

Current release requires iOS8  
Other versions and Android coming soon.

**What's new at MGI** updated May 28, 2015

- Links to expression data at GEISHA, Xenbase and ZFIN are now available. [Read more...](#)
- HCOP human homology predictions are now integrated in MGI. [Read more...](#)
- MGI is pleased to announce the release of its first mobile app for iOS. [Read more...](#)
- MGI now incorporates weekly updates of IMPC high-throughput phenotyping data. [Read more...](#)
- New features for the Human–Mouse: Disease Connection. [Read more...](#)

[MGI Statistics](#) [More MGI news](#)

# IDs and synonyms

## Positional information

## Homology

## Alleles & phenotypes

## GO functions

## Expression data

## Sequences

## References

<b>Symbol</b>	<b>Chrna4</b>
<b>Name ID</b>	cholinergic receptor, nicotinic, alpha polypeptide 4 MGI:87888
<b>Synonyms</b>	α4 nicotinic receptor, Acra4, Acrα4, α4 nAChR, α4-nAChR
<b>Feature Type</b>	protein coding gene
<b>Genetic Map</b>	Chromosome 2 103.54 cM <a href="#">Detailed Genetic Map + 1 cM</a>
	<a href="#">Mapping data</a> (12)
<b>Sequence Map</b>	Chr2:181018380-181043546 bp, - strand From VEGA annotation of GRCh38 <a href="#">Get FASTA</a> 25167 bp ± 0 kb flank <a href="#">VEGA Genome Browser</a>   <a href="#">Ensembl Genome Browser</a>   <a href="#">UCSC Browser</a>   <a href="#">NCBI Map Viewer</a>
<b>Vertebrate homology</b>	HomoloGene:592 <a href="#">Vertebrate Homology Class</a> 1 human; 1 mouse; 1 rat; 1 chimpanzee; 1 rhesus macaque; 1 cattle; 1 dog; 1 chicken; 1 western clawed frog; 2 zebrafish HGDP human homology predictions: <a href="#">CHRNA4</a> Gene Tree: <a href="#">Chrna4</a>
<b>Human homologs</b>	CHRNA4, cholinergic receptor, nicotinic, alpha 4 (neuronal) Orthology source: HomoloGene ID: <a href="#">HGNC:1958</a> NCBI Gene ID: <a href="#">1137</a> nextProt AC: <a href="#">NX_P43681</a> Human Synonyms: BFNC, EBN, EBN1, NACHR, NACHRA4, NACRA4 Human Chr (Location): 20q13.33; chr20:63343310-63361396 (-) GRCh38.p2 Disease Associations: (2) Diseases Associated with Human CHRNA4
<b>Mutations, alleles, and phenotypes</b>	All mutations/alleles(17) : Gene trapped( <a href="#">1</a> ) Spontaneous( <a href="#">1</a> ) Targeted( <a href="#">15</a> ) Genomic Mutations involving Chrna4 ( <a href="#">1</a> ) Incidental mutations (data from <a href="#">Mutagenesis</a> , <a href="#">APF</a> )  Nullizygous mice may show reduced chemically-elicited analgesia, susceptibility to seizures, increased anxiety, and altered behavioral responses to nicotine or a new environment. Homozygotes for any of several knock-in alleles exhibit altered nervous system physiology and/or sensitivity to nicotine.
<b>Interactions</b>	Chrna4 interacts with 250 markers ( <a href="#">Mir7-1</a> , <a href="#">Mir7-2</a> , <a href="#">Mir7b</a> , ...) <a href="#">View All</a>
<b>Gene Ontology (GO) classifications</b>	All GO classifications: (73 annotations) Process <a href="#">action potential</a> , <a href="#">B cell activation</a> , ... Component <a href="#">acetylcholine-gated channel complex</a> , <a href="#">cell junction</a> , ... Function <a href="#">acetylcholine-activated cation-selective channel activity</a> , <a href="#">acetylcholine binding</a> , ... This is a <a href="#">GO Consortium Reference Genome Project</a> gene. External Resources: <a href="#">Funcbase</a>
<b>Expression</b>	Literature Summary: (11) records Data Summary: Results (214) Tissues (122) Images (23) Tissue x Stage Matrix ( <a href="#">view</a> ) Assay Type Results RNA in situ 189 Northern blot 8 RT-PCR 17 cDNA source data(48) Other mouse links: <a href="#">Allen Institute</a> <a href="#">GENSAT</a> <a href="#">GEO Expression Atlas</a> Other vertebrate links: <a href="#">Xenbase</a> <a href="#">chrna4</a> ; <a href="#">ZFIN</a> <a href="#">chrna4b</a> [NEW]
<b>Molecular reagents</b>	All nucleic(54) cDNA(51) Primer pair(2) Other(1) Microarray probesets(5)
<b>Other database links</b>	VEGA Gene Model <a href="#">OTTMUSG00000016395</a> (Evidence) Ensembl Gene Model <a href="#">ENSMUSG000000027577</a> (Evidence) Entrez Gene <a href="#">11438</a> (Evidence) UniGene <a href="#">252369</a> DPCI <a href="#">TC1579281</a> DTS <a href="#">DT_60102934</a> NIA Mouse Gene Index <a href="#">U023772</a> Consensus CDS Project <a href="#">CCDS17192.1</a> International Mouse Phenotyping Consortium Status <a href="#">Chrna4</a>
<b>Sequences</b>	Representative Sequences <input type="checkbox"/> genomic OTTMUSG00000016395 <a href="#">VEGA Gene Model</a>   <a href="#">MGI Sequence Detail</a> 25167 C57BL/6J ± 0 kb <input type="checkbox"/> transcript OTTMUST00000039489 <a href="#">VEGA</a>   <a href="#">MGI Sequence Detail</a> 2183 Not Applicable <input type="checkbox"/> polypeptide OTTMUSP00000017644 <a href="#">VEGA</a>   <a href="#">MGI Sequence Detail</a> 641 Not Applicable  For the selected sequences <a href="#">download in FASTA format</a> <a href="#">Go</a> <a href="#">All sequences</a> (45) RefSeq(4) UniProt(5)
<b>Polymorphisms</b>	RFLP( <a href="#">1</a> ) : SNPs within 2kb( <a href="#">162</a> from dbSNP Build 137)
<b>Protein-related Information</b>	Resource ID Description InterPro <a href="#">IPR006201</a> Neurotransmitter-gated ion-channel InterPro <a href="#">IPR018000</a> Neurotransmitter-gated ion-channel, conserved site InterPro <a href="#">IPR0206202</a> Neurotransmitter-gated ion-channel ligand-binding InterPro <a href="#">IPR0206029</a> Neurotransmitter-gated ion-channel transmembrane domain InterPro <a href="#">IPR027361</a> Nicotinic acetylcholine-gated receptor, transmembrane domain InterPro <a href="#">IPR022394</a> Nicotinic acetylcholine receptor Protein Ontology <a href="#">PO_00000452</a> neuronal acetylcholine receptor subunit alpha-4
<b>References</b>	(Earliest) <a href="#">J10489</a> Bessis A, et al., Chromosomal localization of the mouse genes coding for alpha 2, alpha 3, alpha 4 and beta 2 subunits of neuronal nicotinic acetylcholine receptor. FEBS Lett. 1990 May 7;264(1):48-52 (Latest) <a href="#">J212011</a> Garcia P, et al., Subsynaptic localization of nicotinic acetylcholine receptor subunits: a comparative study in the mouse and rat striatum. Neurosci Lett. 2014 Apr 30;566:106-10

# IDs and synonyms

## Positional information

## Homology

## Alleles & phenotypes

## GO functions

## Expression data

## Sequences

## References

<b>Symbol</b>	<b>Chrna4</b>
<b>Name ID</b>	cholinergic receptor, nicotinic, alpha polypeptide 4 MGI:87888
<b>Synonyms</b>	α4 nicotinic receptor, Acra4, Acrα4, α4 nAChR, α4-nAChR
<b>Feature Type</b>	protein coding gene
<b>Genetic Map</b>	Chromosome 2 103.54 cM <a href="#">Detailed Genetic Map + 1 cM</a>
	<a href="#">Mapping data</a> (12)
<b>Sequence Map</b>	Chr2:181018380-181043546 bp, - strand From VEGA annotation of GRCh38
	<a href="#">Get FASTA</a> 25167 bp <input type="button" value="+"/> 0 kb flank
	<a href="#">VEGA Genome Browser</a>   <a href="#">Ensembl Genome Browser</a>   <a href="#">UCSC Browser</a>   <a href="#">NCBI Map Viewer</a>
<b>Vertebrate homology</b>	HomoloGene:592 <a href="#">Vertebrate Homology Class</a> 1 human; 1 mouse; 1 rat; 1 chimpanzee; 1 rhesus macaque; 1 cattle; 1 dog; 1 chicken; 1 western clawed frog; 2 zebrafish HGDP human homology predictions: <a href="#">CHRNA4</a> Gene Tree: <a href="#">Chrna4</a>
<b>Human homologs</b>	CHRNA4, cholinergic receptor, nicotinic, alpha 4 (neuronal) Orthology source: HomoloGene ID: <a href="#">HGNC:1958</a> NCBI Gene ID: <a href="#">1137</a> nextProt AC: <a href="#">NX_P43681</a> Human Synonyms: BFNC, EBN, EBN1, NACHR, NACHRA4, NACRA4 Human Chr (Location): 20q13.33; chr20:63343310-63361396 (-) GRCh38.p2 Disease Associations: (2) Diseases Associated with Human CHRNA4
<b>Mutations, alleles, and phenotypes</b>	All mutations/alleles(17) : Gene trapped(1) Spontaneous(1) Targeted(15) Genomic Mutations involving Chrna4 (1) Incidental mutations (data from <a href="#">Mutagenex</a> , <a href="#">APF</a> )  Nullizygous mice may show reduced chemically-elicited analgesia, susceptibility to seizures, increased anxiety, and altered behavioral responses to nicotine or a new environment. Homozygotes for any of several knock-in alleles exhibit altered nervous system physiology and/or sensitivity to nicotine.
<b>Interactions</b>	Chrna4 interacts with 250 markers ( <a href="#">Mir7-1</a> , <a href="#">Mir7-2</a> , <a href="#">Mir7b</a> , ...) <a href="#">View All</a>
<b>Gene Ontology (GO) classifications</b>	All GO classifications: (73 annotations) Process <a href="#">action potential</a> , <a href="#">B cell activation</a> , ... Component <a href="#">acetylcholine-gated channel complex</a> , <a href="#">cell junction</a> , ... Function <a href="#">acetylcholine-activated cation-selective channel activity</a> , <a href="#">acetylcholine binding</a> , ... This is a <a href="#">GO Consortium Reference Genome Project</a> gene. External Resources: <a href="#">Funcbase</a>
<b>Expression</b>	Literature Summary: (11) records Data Summary: Results (214) Tissues (122) Images (23) Tissue x Stage Matrix ( <a href="#">view</a> ) Assay Type Results RNA in situ 189 Northern blot 8 RT-PCR 17 cDNA source data(48) Other mouse links: <a href="#">Allen Institute</a> <a href="#">GENSAT</a> <a href="#">GEO Expression Atlas</a> Other vertebrate links: <a href="#">Xenbase</a> <a href="#">chrna4</a> ; <a href="#">ZFIN</a> <a href="#">chrna4b</a> [NEW]
<b>Molecular reagents</b>	All nucleic(54) cDNA(51) Primer pair(2) Other(1) Microarray probesets(5)
<b>Other database links</b>	VEGA Gene Model <a href="#">OTTMUSG00000016395</a> (Evidence) Ensembl Gene Model <a href="#">ENSMUSG000000027577</a> (Evidence) Entrez Gene <a href="#">11438</a> (Evidence) UniGene <a href="#">252369</a> DPCI <a href="#">TC1579281</a> DBTSS <a href="#">DT_60102934</a> NIA Mouse Gene Index <a href="#">U023772</a> Consensus CDS Project <a href="#">CCDS17192.1</a> International Mouse Phenotyping Consortium Status <a href="#">Chrna4</a>
<b>Sequences</b>	Representative Sequences <input type="checkbox"/> genomic OTTMUSG00000016395 <a href="#">VEGA Gene Model</a>   <a href="#">MGI Sequence Detail</a> 25167 C57BL/6J <input type="button" value="+"/> 0 kb <input type="checkbox"/> transcript OTTMUST00000039489 <a href="#">VEGA</a>   <a href="#">MGI Sequence Detail</a> 2183 Not Applicable <input type="checkbox"/> polypeptide OTTMUSP00000017644 <a href="#">VEGA</a>   <a href="#">MGI Sequence Detail</a> 641 Not Applicable  For the selected sequences <input type="button" value="download in FASTA format"/> <input type="button" value="Go"/> <a href="#">All sequences</a> (45) <a href="#">RefSeq</a> (4) <a href="#">UniProt</a> (5)
<b>Polymorphisms</b>	RFLP(1) : SNPs within 2kb(162) from dbSNP Build 137)
<b>Protein-related Information</b>	Resource ID Description InterPro <a href="#">IPR006201</a> Neurotransmitter-gated ion-channel InterPro <a href="#">IPR018000</a> Neurotransmitter-gated ion-channel, conserved site InterPro <a href="#">IPR0206202</a> Neurotransmitter-gated ion-channel ligand-binding InterPro <a href="#">IPR0206029</a> Neurotransmitter-gated ion-channel transmembrane domain InterPro <a href="#">IPR027361</a> Nicotinic acetylcholine-gated receptor, transmembrane domain InterPro <a href="#">IPR022394</a> Nicotinic acetylcholine receptor Protein Ontology <a href="#">PO_00000457</a> neuronal acetylcholine receptor subunit alpha-4
<b>References</b>	(Earliest) <a href="#">J10489</a> Bessis A, et al., Chromosomal localization of the mouse genes coding for alpha 2, alpha 3, alpha 4 and beta 2 subunits of neuronal nicotinic acetylcholine receptor. FEBS Lett. 1990 May 7;264(1):48-52 (Latest) <a href="#">J212011</a> Garcia P, et al., Subsynaptic localization of nicotinic acetylcholine receptor subunits: a comparative study in the mouse and rat striatum. Neurosci Lett. 2014 Apr 30;566:106-10

# Mutations, alleles and phenotypes ribbon

Links to list of mutant alleles

<b>Mutations, alleles, and phenotypes</b>	All mutations/alleles(17) : Gene trapped(1) Spontaneous(1) Targeted(15) Genomic Mutations involving Chrna4 (1) Incidental mutations (data from <a href="#">Mutagenetix</a> , <a href="#">APF</a> )  Nullizygous mice may show reduced chemically-elicited analgesia, susceptibility to seizures, increased anxiety, and altered behavioral responses to nicotine or a new environment. Homozygotes for any of several knock-in alleles exhibit altered nervous system physiology and/or sensitivity to nicotine.
---	--

Free text description of some salient features found in mutants

# Alleles summary table

Allele Symbol Gene; Allele Name	Chr	Synonyms	Category	Abnormal Phenotypes Reported in these Systems	Human Disease Models
<a href="#">Chrna4<sup>tm1.1Sbt</sup></a> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 1.1, Jerry A Stitzel	2	Chrna4 T529A	Targeted	behavior, homeostasis	
<a href="#">Chrna4<sup>tm1.1Tmcg</sup></a> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 1.1, Tresa M McGranahan	2	alpha4 lox	Targeted (Conditional ready, No functional change)	behavior, nervous system	
<a href="#">Chrna4<sup>tm1.2Tmcg</sup></a> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 1.2, Tresa M McGranahan	2	alpha4 -	Targeted (Null/knockout)	behavior, nervous system	
<a href="#">Chrna4<sup>tm1Dra</sup></a> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 1, John Drago	2		Targeted (Null/knockout)	behavior, nervous system	
<a href="#">Chrna4<sup>tm1Jbou</sup></a> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 1, Jim Boulter	2	Chrna4 <sup>S252F</sup>	Targeted	behavior, nervous system	
<a href="#">Chrna4<sup>tm1Jpc</sup></a> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 1, Jean-Pierre Changeux	2	alpha4 -	Targeted (Null/knockout)	behavior, hematopoietic, immune, integument, nervous system	
<a href="#">Chrna4<sup>tm1Lst</sup></a> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 1, Henry A Lester	2	L9'S, Leu-9'Ser, neo-intact line	Targeted	behavior, mortality/aging, nervous system	
<a href="#">Chrna4<sup>tm2.1Dra</sup></a> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 2.1, John Drago	2	S248F	Targeted	behavior	
<a href="#">Chrna4<sup>tm2Dra</sup></a> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 2.1, John Drago					

# Alleles summary table

Allele Symbol Gene: Allele Name	Chr	Synonyms	Category	Abnormal Phenotypes Reported in these Systems	Human Disease Models
<a href="#">Chrna4<sup>tm1.1Stit</sup></a> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 1, Jerry A Stitzel	2	Chrna4 T529A	Targeted	behavior, homeostasis	
<a href="#">Chrna4<sup>tm1</sup></a> cholinergic polypeptide 4; targeted mutation 1, M McGrath				stem	
<a href="#">Chrna4<sup>tm1</sup></a> cholinergic polypeptide 4; targeted mutation 1, M McGrath				stem	
<a href="#">Chrna4<sup>tm1</sup></a> cholinergic polypeptide 4; targeted mutation 1, Drago				stem	
<a href="#">Chrna4<sup>tm1</sup></a> cholinergic polypeptide 4; targeted mutation 1, Boulter				stem	
<a href="#">Chrna4<sup>tm1</sup></a> cholinergic polypeptide 4; targeted mutation 1, Jean-Pierre Changeux			(NULL KNOCKOUT)	ectic, immune, integument,	
<a href="#">Chrna4<sup>tm1Lst</sup></a> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 1, Henry A Lester	2	L9'S, Leu-9'Ser, neo-intact line	Targeted	behavior, mortality/aging, nervous system	
<a href="#">Chrna4<sup>tm2.1Dra</sup></a> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 2.1, John Drago	2	S248F	Targeted	behavior	
<a href="#">Chrna4<sup>tm2Dra</sup></a> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 2.1, John Drago					

Chrna4<sup>tm1.1Stit</sup>

Gene Symbol

tm = targeted mutation

Serial number

lab code: Stit = generated by Jerry A Stitzel

<http://www.informatics.jax.org/mgihome/nomen/index.shtml>

# Alleles summary table

Allele Symbol Gene; Allele Name	Chr	Synonyms	Category	Abnormal Phenotypes Reported in these Systems	Human Disease Models
<a href="#">Chrna4<sup>tm1.1Sbt</sup></a> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 1.1, Jerry A Stitzel	2	Chrna4 T529A	Targeted	behavior, homeostasis	
<a href="#">Chrna4<sup>tm1.1Tmcg</sup></a> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 1.1, Tresa M McGranahan	2	alpha4 lox	Targeted (Conditional ready, No functional change)	behavior, nervous system	
<a href="#">Chrna4<sup>tm1.2Tmcg</sup></a> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 1.2, Tresa M McGranahan	2	alpha4 -	Targeted (Null/knockout)	behavior, nervous system	
<a href="#">Chrna4<sup>tm1Dra</sup></a> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 1, John Drago	2		Targeted (Null/knockout)	behavior, nervous system	
<a href="#">Chrna4<sup>tm1Jbou</sup></a> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 1, Jim Boulter	2	Chrna4 <sup>S252F</sup>	Targeted	behavior, nervous system	
<a href="#">Chrna4<sup>tm1Jpc</sup></a> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 1, Jean-Pierre Changeux	2	alpha4 -	Targeted (Null/knockout)	behavior, hematopoietic, immune, integument, nervous system	
<a href="#">Chrna4<sup>tm1Lst</sup></a> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 1, Henry A Lester	2	L9'S, Leu-9'Ser, neo-intact line	Targeted	behavior, mortality/aging, nervous system	
<a href="#">Chrna4<sup>tm2.1Dra</sup></a> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 2.1, John Drago	2	S248F	Targeted	behavior	
<a href="#">Chrna4<sup>tm2Dra</sup></a> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 2.1, John Drago					

# Allele detail page

?

**Chrna4<sup>tm1Jbou</sup>**

Targeted Allele Detail

Nomenclature | Mutation origin | Mutation description | Phenotypes | Find Mice (IMSR) | References

<b>Nomenclature</b>	Symbol: <b>Chrna4<sup>tm1Jbou</sup></b> Name: cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 1, Jim Boulter MGI ID: MGI:3700204 Synonyms: Chrna4 <sup>S252F</sup> Gene: <a href="#">Chrna4</a> Location: Chr2:181018380-181043546 bp, - strand Genetic Position: Chr2, 103.54 cM																																					
<b>Mutation origin</b>	Germline Transmission: Earliest citation of germline transmission: <a href="#">J:118273</a> Parent Cell Line: GSI-1 (ES Cell) Strain of Origin: 129X1/SvJ																																					
<b>Mutation description</b>	Allele Type: Targeted Mutation: Nucleotide substitutions ▼ Mutation details: The S252F mutation was introduced. A floxed neo was removed from the locus via cre mediated recombination. ( <a href="#">J:118273</a> )																																					
<b>Phenotypes</b>	Key: <table border="1"><tr><td>hm</td><td>homozygous</td><td>ht</td><td>heterozygous</td><td>tg</td><td>involves transgenes</td><td>✓</td><td>phenotype observed</td></tr><tr><td>cn</td><td>conditional genotype</td><td>cx</td><td>complex: &gt; 1 genome feature</td><td>ot</td><td>other: hemizygous, indeterminate,...</td><td>N</td><td>normal phenotype</td></tr></table> Genotypes: <table border="1"><thead><tr><th>Genotype</th><th>Allelic Composition</th><th>Genetic Background</th><th>Cell Line(s)</th></tr></thead><tbody><tr><td>hm1</td><td>Chrna4<sup>tm1Jbou</sup>/Chrna4<sup>tm1Jbou</sup></td><td>either: (involves: 129S4/SvJae * 129X1/SvJ * C57BL/6J) or (involves: 129X1/SvJ * C57BL/6J)</td><td></td></tr><tr><td>ht2</td><td>Chrna4<sup>tm1Jbou</sup>/Chrna4<sup>+</sup></td><td>either: (involves: 129S4/SvJae * 129X1/SvJ * C57BL/6J) or (involves: 129X1/SvJ * C57BL/6J)</td><td></td></tr></tbody></table> Phenotypes: <table border="1"><thead><tr><th>Affected Systems</th><th>hm1</th><th>ht2</th></tr></thead><tbody><tr><td>behavior/neurological</td><td>▶</td><td>✓</td></tr><tr><td>nervous system</td><td>▶</td><td>✓</td></tr></tbody></table> <p><a href="#">View phenotypes for all genotypes (concatenated display).</a></p>	hm	homozygous	ht	heterozygous	tg	involves transgenes	✓	phenotype observed	cn	conditional genotype	cx	complex: > 1 genome feature	ot	other: hemizygous, indeterminate,...	N	normal phenotype	Genotype	Allelic Composition	Genetic Background	Cell Line(s)	hm1	Chrna4 <sup>tm1Jbou</sup> /Chrna4 <sup>tm1Jbou</sup>	either: (involves: 129S4/SvJae * 129X1/SvJ * C57BL/6J) or (involves: 129X1/SvJ * C57BL/6J)		ht2	Chrna4 <sup>tm1Jbou</sup> /Chrna4 <sup>+</sup>	either: (involves: 129S4/SvJae * 129X1/SvJ * C57BL/6J) or (involves: 129X1/SvJ * C57BL/6J)		Affected Systems	hm1	ht2	behavior/neurological	▶	✓	nervous system	▶	✓
hm	homozygous	ht	heterozygous	tg	involves transgenes	✓	phenotype observed																															
cn	conditional genotype	cx	complex: > 1 genome feature	ot	other: hemizygous, indeterminate,...	N	normal phenotype																															
Genotype	Allelic Composition	Genetic Background	Cell Line(s)																																			
hm1	Chrna4 <sup>tm1Jbou</sup> /Chrna4 <sup>tm1Jbou</sup>	either: (involves: 129S4/SvJae * 129X1/SvJ * C57BL/6J) or (involves: 129X1/SvJ * C57BL/6J)																																				
ht2	Chrna4 <sup>tm1Jbou</sup> /Chrna4 <sup>+</sup>	either: (involves: 129S4/SvJae * 129X1/SvJ * C57BL/6J) or (involves: 129X1/SvJ * C57BL/6J)																																				
Affected Systems	hm1	ht2																																				
behavior/neurological	▶	✓																																				
nervous system	▶	✓																																				
<b>Find Mice (IMSR)</b>	Mouse strains and cell lines available from the International Mouse Strain Resource ( <a href="#">IMSR</a> ) Carrying this Mutation: Mouse Strains: <a href="#">1 strain available</a> Cell Lines: 0 lines available Carrying any Chrna4 Mutation: <a href="#">9 strains or lines available</a>																																					
<b>References</b>	Original: <a href="#">J:118273</a> Klaassen A, et al., Seizures and enhanced cortical GABAergic inhibition in two mouse models of human autosomal dominant nocturnal frontal lobe epilepsy. Proc Natl Acad Sci U S A. 2006 Dec 12;103(50):19152-7 All: <a href="#">1 reference(s)</a>																																					

# Allele detail page

Chrna4 <sup>tm1Jbou</sup>																						
Targeted Allele Detail																						
<a href="#">Nomenclature</a>   <a href="#">Mutation origin</a>   <a href="#">Mutation description</a>   <a href="#">Phenotypes</a>   <a href="#">Find</a>																						
<b>Nomenclature</b>	<b>Symbol:</b> Chrna4 <sup>tm1Jbou</sup> <b>Name:</b> cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 1, Jim Boulton <b>MGI ID:</b> MGI:3700204 <b>Synonyms:</b> Chrna4 <sup>S252F</sup> <b>Gene:</b> Chrna4 <b>Location:</b> Chr2:181018380-181043546 bp, - strand <b>Genetic Position:</b> Chr2:181018380-181043546 bp, - strand																					
<b>Mutation origin</b>	<b>Germline Transmission:</b> Earliest citation of germline transmission: J:118273 <b>Parent Cell Line:</b> GSI-1 (ES Cell) <b>Strain of Origin:</b> 129X1/SvJ																					
<b>Mutation description</b>	<b>Allele Type:</b> Targeted <b>Mutation:</b> Nucleotide substitutions ▼ <b>Mutation details:</b> The S252F mutation was introduced. A floxed neo was removed from the locus.																					
<b>Phenotypes</b>	<b>Key:</b> hm homozygous ht heterozygous tg involves transgenes cn conditional genotype cx complex: > 1 genome feature ot other: hemizygous, indeterminate <b>Genotypes:</b> <table border="1"><thead><tr><th>Genotype</th><th>Allelic Composition</th><th>Genetic Background</th></tr></thead><tbody><tr><td>hm1</td><td>Chrna4<sup>tm1Jbou</sup>/Chrna4<sup>tm1Jbou</sup></td><td>either: (involves: 129S4/SvJae * 129X1/SvJ) * C57BL/6J</td></tr><tr><td>ht2</td><td>Chrna4<sup>tm1Jbou</sup>/Chrna4<sup>+</sup></td><td>either: (involves: 129S4/SvJae * 129X1/SvJ) * C57BL/6J</td></tr></tbody></table> <b>Phenotypes:</b> <table border="1"><thead><tr><th>Affected Systems</th><th>hm1</th><th>ht2</th></tr></thead><tbody><tr><td>show or hide all annotated terms</td><td></td><td></td></tr><tr><td><b>behavior/neurological</b></td><td>▶</td><td>✓</td></tr><tr><td><b>nervous system</b></td><td>▶</td><td>✓</td></tr></tbody></table> <a href="#">View phenotypes for all genotypes (concatenated display).</a>	Genotype	Allelic Composition	Genetic Background	hm1	Chrna4 <sup>tm1Jbou</sup> /Chrna4 <sup>tm1Jbou</sup>	either: (involves: 129S4/SvJae * 129X1/SvJ) * C57BL/6J	ht2	Chrna4 <sup>tm1Jbou</sup> /Chrna4 <sup>+</sup>	either: (involves: 129S4/SvJae * 129X1/SvJ) * C57BL/6J	Affected Systems	hm1	ht2	show or hide all annotated terms			<b>behavior/neurological</b>	▶	✓	<b>nervous system</b>	▶	✓
Genotype	Allelic Composition	Genetic Background																				
hm1	Chrna4 <sup>tm1Jbou</sup> /Chrna4 <sup>tm1Jbou</sup>	either: (involves: 129S4/SvJae * 129X1/SvJ) * C57BL/6J																				
ht2	Chrna4 <sup>tm1Jbou</sup> /Chrna4 <sup>+</sup>	either: (involves: 129S4/SvJae * 129X1/SvJ) * C57BL/6J																				
Affected Systems	hm1	ht2																				
show or hide all annotated terms																						
<b>behavior/neurological</b>	▶	✓																				
<b>nervous system</b>	▶	✓																				
<b>Find Mice (IMSR)</b>	Mouse strains and cell lines available from the International Mouse Strain Resource ( <a href="#">IMSR</a> ) <b>Carrying this Mutation:</b> Mouse Strains: <a href="#">1 strain available</a> Cell Lines: 0 lines available <b>Carrying any Chrna4 Mutation:</b> <a href="#">9 strains or lines available</a>																					
<b>References</b>	<b>Original:</b> <a href="#">J:118273</a> Klaassen A, et al., Seizures and enhanced cortical GABAergic inhibition in two lobe epilepsy. Proc Natl Acad Sci U S A. 2006 Dec 12;103(50):19152-7 <b>All:</b> <a href="#">1 reference(s)</a>																					

IDs and synonyms

Mutation description with original reference

Genotypes

Phenotypes

Availability (IMSR)

References

# Genotypes and phenotypes

Key:	hm	homozygous	ht	heterozygous	tg	involves transgenes	✓	phenotype observed
	cn	conditional genotype	complex: > 1 genome feature	ot	other: hemizygous, indeterminate,...	N	normal phenotype	
Genotypes:	Genotype	Allelic Composition	Genetic Background					Cell Line(s)
	hm1	Chrna4 <sup>tm1Jbou</sup> /Chrna4 <sup>tm1Jbou</sup>	either: (involves: 129S4/SvJae * 129X1/SvJ * C57BL/6J) or (involves: 129X1/SvJ * C57BL/6J)					
	ht2	Chrna4 <sup>tm1Jbou</sup> /Chrna4 <sup>+</sup>	either: (involves: 129S4/SvJae * 129X1/SvJ * C57BL/6J) or (involves: 129X1/SvJ * C57BL/6J)					
Phenotypes:	Affected Systems	hm1	ht2					
	show or hide all annotated terms							
	<b>behavior/neurological</b>	✓	✓					
	behavioral arrest	✓	✓					
	seizures	✓	✓					
	clonic seizures	✓	✓					
	<b>nervous system</b>	✓	✓					
	abnormal nervous system physiology	✓	✓					
	seizures	✓	✓					
	clonic seizures	✓	✓					
	abnormal brain wave pattern	✓	✓					
	abnormal inhibitory postsynaptic currents	✓						

# Genotypes and phenotypes

Key:	hm	homozygous	ht	heterozygous	tg	involves transgenes	✓	phenotype observed	
	cn	conditional genotype	cx	complex: > 1 genome feature	ot	other: hemizygous, indeterminate,...	N	normal phenotype	
<b>Genotypes:</b>	<b>Genotype</b>	<b>Allelic Composition</b>				<b>Genetic Background</b>			<b>Cell Line(s)</b>
	hm1	Chrna4 <sup>tm1Jbou</sup> /Chrna4 <sup>tm1Jbou</sup>	either: (involves: 129S4/SvJae * 129X1/SvJ * C57BL/6J) or (involves: 129X1/SvJ * C57BL/6J)						
	ht2	Chrna4 <sup>tm1Jbou</sup> /Chrna4 <sup>+</sup>	either: (involves: 129S4/SvJae * 129X1/SvJ * C57BL/6J) or (involves: 129X1/SvJ * C57BL/6J)						
<b>Phenotypes:</b>	<b>Affected Systems</b>			hm1	ht2				
	show or hide all annotated terms			▼	✓	✓			
	<b>behavior/neurological</b>								
	behavioral arrest								
	seizures								
	clonic seizures								
	<b>nervous system</b>								
	abnormal nervous system physiology								
	seizures								
	clonic seizures								
	abnormal brain wave pattern								
	abnormal inhibitory post-synaptic potential								
<a href="#">View phenotypes for all genotypes (concatenated)</a>									

**MGI** Chrna4<sup>tm1Jbou</sup>/Chrna4<sup>tm1Jbou</sup>  
 hm1 either: (involves: 129S4/SvJae \* 129X1/SvJ \* C57BL/6J) or (involves: 129X1/SvJ \* C57BL/6J)

**Print**

**Key:**

- ♀ phenotype observed in females
- ♂ phenotype observed in males
- N normal phenotype

**behavior/neurological**

**behavioral arrest ( J:118273 )**

- observed during seizures

**seizures ( J:118273 )**

- mice exhibit spontaneous recurrent seizures, ranging from 1-5s of behavioral arrest to extended (2-60 seconds) of rhythmic jerking movements of extremities, with loss of balance and falling over

**clonic seizures ( J:118273 )**

**nervous system**

**abnormal nervous system physiology ( J:118273 )**

- mutants show abnormal EEG activity during seizure episodes, such as repetitive discharges with paroxysmal onset and sudden termination with asymmetric rhythm patterns; this is observed for 21.5% of a 4-hour recording period

**seizures ( J:118273 )**

- mice exhibit spontaneous recurrent seizures, ranging from 1-5s of behavioral arrest to extended (2-60 seconds) of rhythmic jerking movements of extremities, with loss of balance and falling over

**clonic seizures ( J:118273 )**

**abnormal brain wave pattern ( J:118273 )**

- mutants show abnormal EEG activity during seizure episodes, such as repetitive discharges with paroxysmal onset and sudden termination with asymmetric rhythm patterns; this is observed for 21.5% of a 4-hour recording period

# Allele detail page

?

**Chrna4<sup>tm1Jbou</sup>**

Targeted Allele Detail

Nomenclature | Mutation origin | Mutation description | Phenotypes | Find Mice (IMSR) | References

<b>Nomenclature</b>	Symbol: <b>Chrna4<sup>tm1Jbou</sup></b> Name: cholinergic receptor, nicotinic, alpha polypeptide 4; targeted mutation 1, Jim Boulter MGI ID: MGI:3700204 Synonyms: Chrna4 <sup>S252F</sup> Gene: <a href="#">Chrna4</a> Location: Chr2:181018380-181043546 bp, - strand Genetic Position: Chr2, 103.54 cM																																					
<b>Mutation origin</b>	Germline Transmission: Earliest citation of germline transmission: <a href="#">J:118273</a> Parent Cell Line: GSI-1 (ES Cell) Strain of Origin: 129X1/SvJ																																					
<b>Mutation description</b>	Allele Type: Targeted Mutation: Nucleotide substitutions ▼ Mutation details: The S252F mutation was introduced. A floxed neo was removed from the locus via cre mediated recombination. ( <a href="#">J:118273</a> )																																					
<b>Phenotypes</b>	Key: <table border="1"><tr><td>hm</td><td>homozygous</td><td>ht</td><td>heterozygous</td><td>tg</td><td>involves transgenes</td><td>✓</td><td>phenotype observed</td></tr><tr><td>cn</td><td>conditional genotype</td><td>cx</td><td>complex: &gt; 1 genome feature</td><td>ot</td><td>other: hemizygous, indeterminate,...</td><td>N</td><td>normal phenotype</td></tr></table> Genotypes: <table border="1"><thead><tr><th>Genotype</th><th>Allelic Composition</th><th>Genetic Background</th><th>Cell Line(s)</th></tr></thead><tbody><tr><td>hm1</td><td>Chrna4<sup>tm1Jbou</sup>/Chrna4<sup>tm1Jbou</sup></td><td>either: (involves: 129S4/SvJae * 129X1/SvJ * C57BL/6J) or (involves: 129X1/SvJ * C57BL/6J)</td><td></td></tr><tr><td>ht2</td><td>Chrna4<sup>tm1Jbou</sup>/Chrna4<sup>+</sup></td><td>either: (involves: 129S4/SvJae * 129X1/SvJ * C57BL/6J) or (involves: 129X1/SvJ * C57BL/6J)</td><td></td></tr></tbody></table> Phenotypes: <table border="1"><thead><tr><th>Affected Systems</th><th>hm1</th><th>ht2</th></tr></thead><tbody><tr><td>behavior/neurological</td><td>▶</td><td>✓</td></tr><tr><td>nervous system</td><td>▶</td><td>✓</td></tr></tbody></table> <p><a href="#">View phenotypes for all genotypes (concatenated display).</a></p>	hm	homozygous	ht	heterozygous	tg	involves transgenes	✓	phenotype observed	cn	conditional genotype	cx	complex: > 1 genome feature	ot	other: hemizygous, indeterminate,...	N	normal phenotype	Genotype	Allelic Composition	Genetic Background	Cell Line(s)	hm1	Chrna4 <sup>tm1Jbou</sup> /Chrna4 <sup>tm1Jbou</sup>	either: (involves: 129S4/SvJae * 129X1/SvJ * C57BL/6J) or (involves: 129X1/SvJ * C57BL/6J)		ht2	Chrna4 <sup>tm1Jbou</sup> /Chrna4 <sup>+</sup>	either: (involves: 129S4/SvJae * 129X1/SvJ * C57BL/6J) or (involves: 129X1/SvJ * C57BL/6J)		Affected Systems	hm1	ht2	behavior/neurological	▶	✓	nervous system	▶	✓
hm	homozygous	ht	heterozygous	tg	involves transgenes	✓	phenotype observed																															
cn	conditional genotype	cx	complex: > 1 genome feature	ot	other: hemizygous, indeterminate,...	N	normal phenotype																															
Genotype	Allelic Composition	Genetic Background	Cell Line(s)																																			
hm1	Chrna4 <sup>tm1Jbou</sup> /Chrna4 <sup>tm1Jbou</sup>	either: (involves: 129S4/SvJae * 129X1/SvJ * C57BL/6J) or (involves: 129X1/SvJ * C57BL/6J)																																				
ht2	Chrna4 <sup>tm1Jbou</sup> /Chrna4 <sup>+</sup>	either: (involves: 129S4/SvJae * 129X1/SvJ * C57BL/6J) or (involves: 129X1/SvJ * C57BL/6J)																																				
Affected Systems	hm1	ht2																																				
behavior/neurological	▶	✓																																				
nervous system	▶	✓																																				
<b>Find Mice (IMSR)</b>	Mouse strains and cell lines available from the International Mouse Strain Resource ( <a href="#">IMSR</a> ) Carrying this Mutation: Mouse Strains: <a href="#">1 strain available</a> Cell Lines: 0 lines available Carrying any Chrna4 Mutation: <a href="#">9 strains or lines available</a>																																					
<b>References</b>	Original: <a href="#">J:118273</a> Klaassen A, et al., Seizures and enhanced cortical GABAergic inhibition in two mouse models of human autosomal dominant nocturnal frontal lobe epilepsy. Proc Natl Acad Sci U S A. 2006 Dec 12;103(50):19152-7 All: <a href="#">1 reference(s)</a>																																					

# Strain availability

<b>Find Mice (IMSR)</b>	Mouse strains and cell lines available from the International Mouse Strain Resource ( <a href="#">IMSR</a> )
<b>Carrying this Mutation:</b>	Mouse Strains: <a href="#">1 strain available</a> Cell Lines: 0 lines available
<b>Carrying any Chrna4 Mutation:</b>	<a href="#">9 strains or lines available</a>

# Strain availability

<b>Find Mice (IMSR)</b>	Mouse strains and cell lines available from the International Mouse Strain Resource ( <a href="#">IMSR</a> )	
<b>Carrying this Mutation:</b>	<b>Mouse Strains: 1 strain available</b>	Cell Lines: 0 lines available
<b>Carrying any Chrna4 Mutation:</b>	<b>9 strains or lines available</b>	

# Strain availability

**Find Mice (IMSR)** Mouse strains and cell lines available from the International Mouse Strain Resource (IMSR)

**Carrying this Mutation:** **Mouse Strains: 1 strain available** **Cell Lines: 0 lines available**

**Carrying any Chrna4 Mutation:** **9 strains or lines available**

**International Mouse Strain Resource (IMSR)**



Search Repositories Participate Glossary Contact Us About Us Deposit Strains

**Summary**

Search for:  Search Reset [Show Options](#)

**You searched for:**

Strain States: [embryo, live, ovaries, sperm] << first < prev 1 next > last >> 25

1 strains(s) match your unfiltered search. Showing items 1 - 1 of 1

Export: [CSV](#) Filter by: State Type Provider Mutation

N	Strain Name	Synonyms	States	Repository	Mutation Types	Alleles	Genes	Strain Types
+	B6.129X1- Chrna4 <sup>tm1Jbou</sup> /Mmucl	B6.129- Chrna4 <sup>tm1Jbou</sup> /Mmcd, B6.129X1- Chrna4 <sup>tm1Jbou</sup> /Mmcd	sperm embryo	MMRRC <a href="#">Order</a>	targeted mutation	Chrna4 <sup>tm1Jbou</sup> targeted mutation 1, Jim Boulter	Chrna4 cholinergic receptor, nicotinic, alpha polypeptide 4 Chrna4 cholinergic receptor, nicotinic, alpha polypeptide 4	unclassified

# Strain availability

**Find Mice (IMSR)** Mouse strains and cell lines available from the International Mouse Strain Resource (IMSR)

**Carrying this Mutation:** **Mouse Strains: 1 strain available** **Cell Lines: 0 lines available**

**Carrying any Chrna4 Mutation:** **9 strains or lines available**

**International Mouse Strain Resource (IMSR)**

The screenshot shows the IMSR homepage with a navigation bar at the top. Below the navigation, a summary section includes a search bar and a table of search results. The table has columns for N, Strain Name, Synonyms, States, Repository, Mutation Types, Alleles, Genes, and Strain Types. One row is highlighted with a red box, showing details for the strain B6.129X1-Chrna4<sup>tm1Jbou</sup>/Mmucl. A red arrow points from the '1 strain available' link in the 'Find Mice (IMSR)' box down to this highlighted row.

N	Strain Name	Synonyms	States	Repository	Mutation Types	Alleles	Genes	Strain Types
+	B6.129X1-Chrna4 <sup>tm1Jbou</sup> /Mmucl	B6.129-Chrna4 <sup>tm1Jbou</sup> /Mmcd, B6.129X1-Chrna4 <sup>tm1Jbou</sup> /Mmcd	sperm embryo	MMRRC Order	targeted mutation	Chrna4 <sup>tm1Jbou</sup> targeted mutation 1, Jim Boulter	Chrna4 cholinergic receptor, nicotinic, alpha polypeptide 4 Chrna4 cholinergic receptor, nicotinic, alpha polypeptide 4	unclassified

# The International Mouse Strain Resource (IMSR): <http://www.findmice.org>

## International Mouse Strain Resource (IMSR)



Search    Repositories    Participate    Glossary    Contact Us    About Us    Deposit Strains

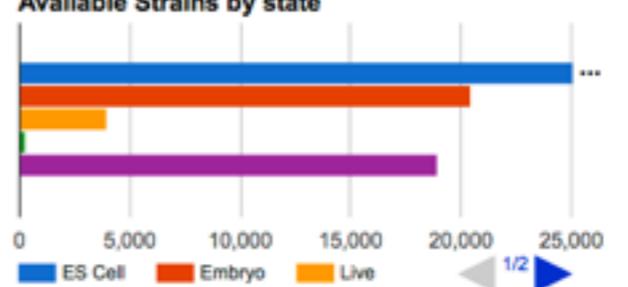
### Welcome to the IMSR

The IMSR is a searchable online database of mouse strains, stocks, and mutant ES cell lines available worldwide, including inbred, mutant, and genetically engineered strains. The goal of the IMSR is to assist the international scientific community in locating and obtaining mouse resources for research. Note that the data content found in the IMSR is as supplied by strain repository holders.

For each strain or cell line listed in the IMSR, users can obtain information about:

- Where that resource is available (Repository Site)
- What state(s) the resource is available as (e.g. live, cryopreserved embryo or germplasm, ES cells)
- Links to descriptive information about a strain or ES cell line
- Links to mutant alleles carried by a strain or ES cell line
- Links for ordering a strain or ES cell line from a Repository
- Links for contacting the Repository to send a query

**Available Strains by state**



State	Count
ES Cell	~25,000
Embryo	~20,000
Live	~4,000

Search for:    [- Hide Options](#)

Strain State: Any  
ES Cell  
embryo  
live  
ovaries

Strain Type: Any  
closed colony  
coisogenic strain  
congenic strain  
consomic or chromosome substitution strain

Repository: Any  
APB (Australian Phenome Bank) Australia  
CARD (Center for Animal Resources and Development) Japan  
CMMR (Canadian Mouse Mutant Repository) Canada  
EMMA (European Mouse Mutant Archive) Germany  
EMS (Dr. Elizabeth M. Simpson, Ph.D.) Canada  
HAR (MRC Harwell) UK

[View Repository Reports.](#)



# The International Mouse Strain Resource (IMSR): <http://www.findmice.org>

**International Mouse Strain Resource (IMSR)**



Search    **Repositories**    Participate    Glossary    Contact Us    About Us    Deposit Strains

**Contributing Repositories**

A summary of Institutions, organizations, and individuals contributing mouse resource information to the IMSR database. If you or your institution hold mice, cryopreserved gametes or embryos, or ES cell lines that you distribute to other researchers, please consider listing them in the IMSR catalog to make them more widely known. Learn more about participating in the IMSR [here](#).

Repository	Holdings	Downloadable Reports	Last Update
<b>Australian Phenome Bank (APB)</b> Building 117 Garran Road The Australian National University , Acton ACT 0200 Australia <a href="#">✉</a>	Strains: 170 ES Cell lines: 0 Total: 170	<a href="#">DOC</a> <a href="#">XLS</a>	Feb 6, 2014
<b>Center for Animal Resources and Development (CARD)</b> Kumamoto University 2-2-1 Honjo Kumamoto, 860-0811 Japan <a href="#">✉</a>	Strains: 1,292 ES Cell lines: 31 Total: 1,292	<a href="#">DOC</a> <a href="#">XLS</a>	May 18, 2015
<b>Canadian Mouse Mutant Repository (CMMR)</b> 25 Orde Street Toronto, Ontario M5T 3H7 Canada <a href="#">✉</a>	Strains: 167 ES Cell lines: 13,653 Total: 13,820	<a href="#">DOC</a> <a href="#">XLS</a>	Jun 24, 2009
<b>European Mouse Mutant Archive (EMMA)</b> Helmholtz Zentrum München - German Research Center for Environmental Health, GmbH Institute of Experimental Genetics Ingolstädter Landstraße 1 Neuherberg / München, 85764 Germany <a href="#">✉</a>	Strains: 4,492 ES Cell lines: 0 Total: 4,492	<a href="#">DOC</a> <a href="#">XLS</a>	Aug 17, 2015
<b>Dr. Elizabeth M. Simpson, Ph.D. (EMS)</b> Centre for Molecular Medicine and Therapeutics University of British Columbia 950 West 28th Avenue Vancouver, B.C. V5Z 4H4 Canada <a href="#">✉</a>	Strains: 4 ES Cell lines: 0 Total: 4	<a href="#">DOC</a> <a href="#">XLS</a>	Feb 1, 2007
<b>MRC Harwell (HAR)</b> Harwell Science and Innovation Campus , Oxfordshire OX11 0RD UK <a href="#">✉</a>	Strains: 2,326 ES Cell lines: 0 Total: 2,326	<a href="#">DOC</a> <a href="#">XLS</a>	Apr 9, 2015

# Database resources

- Mouse Genome Informatics (MGI) & International Mouse Strain Repository (IMSR)  
[www.informatics.jax.org](http://www.informatics.jax.org)
  - integrated gene, allele, phenotype & expression resources with mutant alleles generated by the entire research community.
  - Structured vocabularies are used by curators to describe data
  - IMSR indexes commercial availability of mutant strains
- International Mouse Phenotyping Consortium (IMPC)  
[www.mousephenotype.org](http://www.mousephenotype.org)
  - high-throughput targeted allele production and standardized phenotyping
  - Structured vocabularies are used by investigators to describe data
- Mouse Phenotype Database (MPD)  
<http://phenome.jax.org/>
  - standardized phenotype assessments across panels of inbred strains, genotyping information for inbred strains



# International Mouse Phenotyping Consortium



<https://www.mousephenotype.org/>

The screenshot shows the IMPC website homepage. At the top, there is a navigation bar with links for Login, Register, SEARCH, ABOUT IMPC, NEWS & EVENTS, CONTACT, and MY IMPC. Below the navigation bar, a banner states: "We are building the first truly comprehensive, functional catalogue of a mammalian genome." On the left side, there are three main categories: Genes (with links to Find genes, 1855 Genes analysed, and Stay Connected), Phenotypes (with links to Find phenotypes, Lethal or Subviable, and Gene interactions), and Human Disease (with links to Find Human Disease, Mouse Models, and Rare diseases links). On the right side, there is a search bar titled "Search IMPC database" with a "Search" button and a placeholder text: "Enter your favorite gene, phenotype, anatomy or protocol to find IMPC data important to your research." Below the search bar, there is a "Or browse" section with a button labeled "new gene-phenotype associations". Further down, there is a "Tweets by @impc" section and a "Phenoview" section with a description: "An interactive web application with integrated media viewer for comparative visualisation of genotypes and phenotypes." A "Visit Phenoview" button is located at the bottom of the Phenoview section.

- Present mouse phenotypes annotated by the investigators of the IMPC
  - includes primary data & analyzed results
- Phenotype each mutant line according to a whole-mouse pipeline that includes all major organ systems
  - all protocols are described online

# IMPC advantages



- Systematic, comprehensive, large-scale phenotyping
- Annotation of “normal” phenotypes

# IMPC data content

- 9,955 genes with IMPC ES cells produced
- 4,805 genes with IMPC mice produced
- 2,451 genes with IMPC phenotyping data
- 1,144 phenotypic terms used to describe data (MP ontology)



# Search for “Aim1”

Home > Search    Batch query     i

**Filter your search** ?

**Genes** 3

- IMPC Phenotyping Status**
  - Approved 1
  - Started 0
  - Attempt Registered 0
  - Legacy 0
- IMPC Mouse Production Status**
- IMPC Mouse Production Center**
- IMPC Mouse Phenotype Center**
- Subtype**
- Embryo Image Viewer**

**Phenotypes** 2

**Diseases** 53

**Anatomy** 0

**IMPC Images** 41

**Images** 0

Found 3 genes Download

Gene	Production Status	Phenotype Status	
<b>Aim1</b> name: absent in melanoma 1 human ortholog: AIM1	<span style="background-color: #0070C0; color: white; padding: 2px 5px;">ES Cells</span> <span style="background-color: #F0F0F0; padding: 2px 5px;">Mice</span>	<span style="background-color: #0070C0; color: white; padding: 2px 5px;">phenotype data available</span>	<span style="color: blue;">↗ Interest</span>
<b>Aim1l</b>	<span style="background-color: #0070C0; color: white; padding: 2px 5px;">ES Cells</span> <span style="background-color: #F0F0F0; padding: 2px 5px;">Mice</span>		<span style="color: blue;">↗ Interest</span>
<b>Slc45a2</b>	<span style="background-color: #0070C0; color: white; padding: 2px 5px;">ES Cells</span> <span style="background-color: #F0F0F0; padding: 2px 5px;">Mice</span>		<span style="color: blue;">↗ Interest</span>

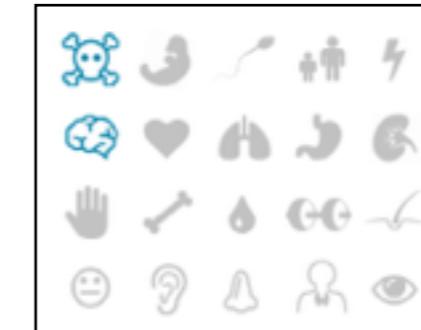
Showing 1 to 3 of 3 entries

← First 1 Last →

# Gene and status information

Post-QC **significant** phenotype associations with statistics

*Aim1:*



All available phenotype data

- light blue = not significant
- dark blue = significant
- grey = no data

Images



Predicted potential disease models

Order mice

# Database resources

- Mouse Genome Informatics (MGI) & International Mouse Strain Repository (IMSR)  
[www.informatics.jax.org](http://www.informatics.jax.org)
  - integrated gene, allele, phenotype & expression resources with mutant alleles generated by the entire research community.
  - Structured vocabularies are used by curators to describe data
  - IMSR indexes commercial availability of mutant strains
- International Mouse Phenotyping Consortium (IMPC)  
[www.mousephenotype.org](http://www.mousephenotype.org)
  - high-throughput targeted allele production and standardized phenotyping
  - Structured vocabularies are used by investigators to describe data
- Mouse Phenotype Database (MPD)  
<http://phenome.jax.org/>
  - standardized phenotype assessments across panels of inbred strains, genotyping information for inbred strains



# MPD advantages



- Characterizing inbred strains rather than gene mutants
  - baseline and under experimental conditions
- All raw data and protocol are available
  - multiple drug and alcohol administration studies
- Analysis, display and download tools for raw & analyzed data
- Genotyping data sets associated with all strains
  - online QTL mapping (EMMA)

# Mouse Phenome Database

<http://phenome.jax.org/>

- standardized collection of measured data on mouse strains
- Includes baseline phenotype data sets, studies of drug, diet, disease and aging effects

The screenshot shows the homepage of the Mouse Phenome Database (MPD) at The Jackson Laboratory. The top navigation bar includes the MPD logo, a search bar, and links for "About MPD", "Approaches", "What's new", "Contributing data", "Investigators", "Larger initiatives", "Publications", "Pheno tools demo", "Tutorial videos", "Your collection", "Download data", "Also at JAX", "Suggestion box", and "Help desk". A "Did you know?" section explains that users can navigate MPD in the context of a specific strain panel or set. The main content area features eight large buttons: "Phenotype" (bar chart), "Genotype" (grid of DNA sequence), "Expression" (line graph), "QTL Archive" (line graph), "Strains" (image of four mice), "Genes" (chromosome map), "Interventions" (blue box listing "Drugs", "Alcohol", "Diets", "Challenges"), and "Methodologies" (black notebook icon). The bottom footer includes links for "Hosted by The Jackson Laboratory", "Contact us", "About MPD", "Also at JAX", "Units", "Changelog", "Downloads", "Citing", "Funding", and "Terms of Use". A small image of a mouse is located in the bottom right corner.



Strains &gt;

## Mouse strain: C57BL/6J

Vendor: JAX:000664    inbred    MPD Priority Tier 1    Availability: Level1

Available phenotype strain survey data for C57BL/6J:

- By topic / anatomy / system
  - appearance and coat color
  - behavior
  - blood—clinical chemistry
  - blood—hematology
  - blood—lipids
  - blood—xenobiotics
  - body composition
  - body fat pads
  - body weight size and growth
  - bone
  - brain
  - cancer
  - cardiovascular
  - cell and tissue damage
  - ear
  - endocrine and exocrine
  - exercise and endurance
  - eye
  - gallbladder
  - immune system
  - ingestive preference
  - integumentary
  - kidney
  - liver
  - longevity
  - metabolism
  - muscle
  - nervous system
  - neurosensory
  - reproduction
  - respiratory
  - spleen
  - wound healing
- By detailed phenotype category
  - By methodology / procedure
  - By intervention study  
(drugs, alcohol, diets, challenges)
  - In aging-related studies
  - By misc. grouping:
    - images
    - organ metrics
  - As outlier / exceptional
  - By project / data set
  - All pheno measurements (csv)
  - Sex differences
  - Compare vs. another strain
- By detailed phenotype category
  - By detailed phenotype category
  - By methodology / procedure
  - By intervention study  
(drugs, alcohol, diets, challenges)
  - In aging-related studies
  - By misc. grouping:
    - images
    - organ metrics
  - As outlier / exceptional
  - By project / data set
  - All pheno measurements (csv)
  - Sex differences
  - Compare vs. another strain

Also available for this strain:

- Appearance: black
- View pup appearance by age
- SNP / genotype variation data for C57BL/6J and comparisons vs. other strains
- C57BL/6J vs. C57BL/6NJ, all differences: • SNPs and indels
- SNP data for allelic or gender genotype variants of this strain
- List genes where C57BL/6J is polymorphic vs. other selected strains across entire genome, based on Sanger1 SNP data
- Genes / probesets where C57BL/6J is an outlier in gene expression strain survey data.
- QTL Archive studies where C57BL/6J is a progenitor

Additional misc studies/archives involving C57BL/6J:

- [Brayton1](#) – spontaneous diseases in commonly used strains (pdf)
- [CGDpheno2](#) – B6 variation over time, multi-system survey
- [Esposito1](#) – pathology review, frequency rates of various disorders
- [Jax6](#) – exome data for 16 strains (FASTQ, Illumina)
- [Jaxwest10](#) – inflammatory bowel disease study, olatiramer

# Strain detail page



Strains &gt;

## Mouse strain: C57BL/6J

Vendor: JAX:000664 inbred MPD Priority Tier 1 Availability: Level1

Available phenotype strain survey data for C57BL/6J:

- By topic / anatomy / system
- appearance and coat color
- behavior
- blood—clinical chemistry
- **blood—hematology**
- blood—ipius
- blood—xenobiotics
- body composition
- body fat pads
- body weight size and growth
- bone
- brain
- cancer
- cardiovascular
- cell and tissue damage
- ear
- endocrine and exocrine
- exercise and endurance
- eye
- gallbladder
- immune system
- ingestive preference
- integumentary
- kidney
- liver
- longevity
- metabolism
- muscle
- nervous system
- neurosensory
- reproduction
- respiratory
- spleen
- wound healing

- By detailed phenotype category
- By methodology / procedure
- By intervention study  
(drugs, alcohol, diets, challenges)
- In aging-related studies
- By misc. grouping:
  - images
  - organ metrics

Also available for this strain:



- Appearance: black
- View pup appearance by age

## Phenotype strain survey data:

## blood — hematology — cell counts — RBC CBC

Displaying C57BL/6J averages  
♀ ♂  
[More info](#)

[Apply tools](#)

CGDpheno1		red blood cell count (RBC; per volume x 10 <sup>6</sup> ) [n/µL] .....	10.2	10.3	72 strains age 11wks Inbred
Eumorphia1		red blood cell count (RBC; per volume x 10 <sup>6</sup> ) [n/µL] .....	9.76	9.98	6 strains age 12wks Inbred
Jaxpheno4		red blood cell count (RBC) [n/µL] • age 8wks ..... 10.8 10.6 • age 16wks ..... 10.9 10.6 ▪ age comparison			11 strains 8wks, 16wks Inbred
Justice2		red blood cell count (RBC; per volume x 10 <sup>6</sup> ) [n/µL] .....	10.2	9.63	16 strains age 12-16wks Inbred
Peters1		red blood cell count (RBC; per volume x 10 <sup>6</sup> ) [n/µL] .....	9.19	9.34	43 strains age 10wks Inbred
Peters4		red blood cell count (RBC) [n/µL] • 6mo ..... 10.7 10.8 • 12mo ..... 10.5 10.6 • 18mo ..... 10.5 10.1 • 24mo ..... 9.25 9.80 ▪ age comparison			31 strains aging study Inbred
Lake1		red blood cell count (RBC; per volume x 10 <sup>6</sup> ) [n/µL] .....	9.04 ▼	9.35	23 strains age 7wks B6.A consomic

## Additional misc studies/archive:

- Brayton1 – spontaneous disease
- CGDpheno2 – B6 variation of
- Esposito1 – pathology review

disorders

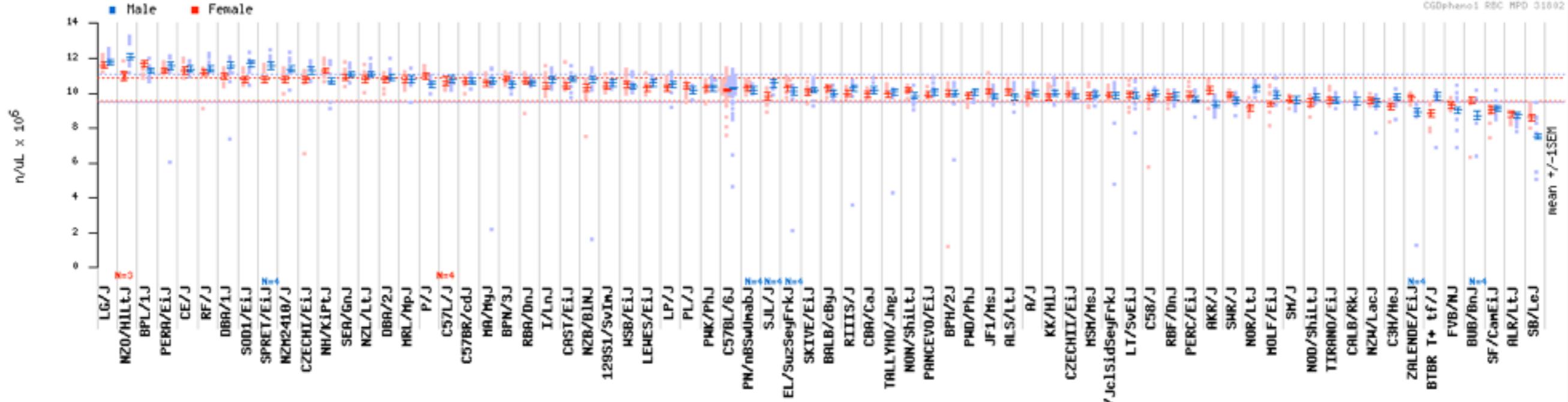
• Jax6 – exome data for 16 strains (FASTQ, Illumina)

• Jaxwest10 – inflammatory bowel disease study, olatiramer

C57BL/6J is a progenitor:

- obesity mutants
- DO population

## Strain detail page



- brain
- cancer
- cardiovascular
- cell and tissue damage
- ear
- endocrine and exocrine
- exercise and endurance
- eye
- gallbladder
- immune system
- ingestive preference
- integumentary
- kidney
- liver
- longevity
- metabolism
- muscle
- nervous system
- neurosensory
- reproduction
- respiratory
- spleen
- wound healing

#### Additional misc studies/archive:

- Brayton1 – spontaneous disease
- CGDpheno2 – B6 variation analysis
- Esposito1 – pathology review

disorders

- Jax6 – exome data for 16 strains (FASTQ, Illumina)
- Jaxwest10 – inflammatory bowel disease study, olatiramer

#### Phenotype strain survey data:

##### blood — hematology — cell counts — RBC      CBC

CGDpheno1	red blood cell count (RBC; per volume x 10 <sup>6</sup> ) [n/µL] ..... 10.2 10.3	72 strains age 11wks Inbred
Eumorphia1	red blood cell count (RBC; per volume x 10 <sup>6</sup> ) [n/µL] ..... 9.76 9.98	6 strains age 12wks Inbred
Jaxpheno4	red blood cell count (RBC) [n/µL] • age 8wks ..... 10.8 10.6 • age 16wks ..... 10.9 10.6 ▪ age comparison	11 strains 8wks, 16wks Inbred
Justice2	red blood cell count (RBC; per volume x 10 <sup>6</sup> ) [n/µL] ..... 10.2 9.63	16 strains age 12-16wks Inbred
Peters1	red blood cell count (RBC; per volume x 10 <sup>6</sup> ) [n/µL] ..... 9.19 9.34	43 strains age 10wks Inbred
Peters4	red blood cell count (RBC) [n/µL] • 6mo ..... 10.7 10.8 • 12mo ..... 10.5 10.6 • 18mo ..... 10.5 10.1 • 24mo ..... 9.25 9.80 ▪ age comparison	31 strains aging study Inbred
Lake1	red blood cell count (RBC; per volume x 10 <sup>6</sup> ) [n/µL] ..... 9.04 ▼ 9.35	23 strains age 7wks B6.A consomic

#### Apply tools

C57BL/6J is a progenitor:  
• obesity mutants  
• DO population

# Database resources

- 
- Rat Genome Database  
<http://rgd.mcw.edu/>
    - Genetic, genomic, phenotype, and disease data generated from rat research
    - Structured vocabularies are used by curators to describe data
  - Neuroscience Information Framework  
<http://www.neuinfo.org/>
    - Inventory and index of data relevant to neuroscience research from across the “hidden web” (databases & repositories), linking to primary data and providing analysis tools
  - Allen Brain Atlas  
<http://www.brain-map.org/>
    - Structural anatomy and gene expression data within the brain

# RGD advantages



- Authoritative resource on the laboratory rat
- All information in the database relies on peer-reviewed sources and is curated by scientists
- Curation and interpretation of data into metadata using well-defined, structured terminology
- One-stop integration of genes, alleles, strains, experiments and biology making it flexible for a variety of research questions

# Rat Genome Database

<http://rgd.mcw.edu/>

The screenshot shows the homepage of the Rat Genome Database (RGD). At the top, there's a navigation bar with links for HOME, DATA, GENOME TOOLS, DISEASES, PHENOTYPES & MODELS, CUSTOM RATS, PATHWAYS, and COMMUNITY. Below the navigation bar is a search bar labeled "Keyword" with a magnifying glass icon. To the right of the search bar is a "Find us on Facebook" button. The main content area features several boxes for quick access:

- Genes:** Map positions, functions and more.
- Strains:** Search Strains.
- QTL:** Phenotypes & Traits linked to the genome.
- Function:** Gene Ontology, Phenotype, Pathway info.
- Diseases:** Genes, QTL & Strains related to Disease.
- Phenotypes & Models:** Phenotype data, Assays, Husbandry and more.
- Rat JBrowse:** Rat GBrowse.
- Genome Tools:** Data mining, analysis and visualization.
- Pathways:** Pathway reports and diagrams.

Below these boxes, there's a section titled "Featured RGD Video Tutorials". It includes a video thumbnail for "PhenoGen Informatics Genome/Transcriptome Data and Browser" and another for "Introduction to the Variant Visualizer". There's also a section for "The Gene Annotator" with a video thumbnail. At the bottom, there's a "Recent NEWS" section listing recent updates from RGD.

Quick search

Explore topics with specific tools

Tutorials

# Rat Genome Database

<http://rgd.mcw.edu/>

RGD Gene Editing Rat Resource Center PhysGen Knock Out Keyword

HOME DATA GENOME TOOLS DISEASES PHENOTYPES & MODELS CUSTOM RATS PATHWAYS COMMUNITY

Search RGD | Grant Resources | Citing RGD | About Us | Contact Us

[Find us on Facebook](#)

**Genes** Map positions, functions and more

**Strains** Search Strains

**QTL** Phenotypes & Traits linked to the genome

**Function** Gene Ontology, Phenotype, Pathway info

**Diseases** Genes, QTL & Strains related to Disease

**Phenotypes & Models** Phenotype data, Assays, Husbandry and more

**Rat JBrowse**

**Rat GBrowse**

**Genome Tools** Data mining, analysis and visualization

**Pathways** Pathway reports and diagrams

**Featured RGD Video Tutorials**

**PhenoGen Informatics Genome/Transcriptome Data and Browser**

RGD has been providing links from our gene pages to the **PhenoGen Informatics Genome/Transcriptome Data Browser**, but there's a good chance you don't know all there is to know about the tool. Want more information about how to use it so you can get the most out of its data and functionality? This informative hands-on workshop video is just the tutorial to help you with that!

**Introduction to the Variant Visualizer**

The examination of SNPs has undergone a recent change, and in response to this change, RGD has released the new **Variant Visualizer** tool (VarVis), taking the place of the old SNPtyper tool. VarVis is a visualization and analysis tool for sequence variation. The data currently contains 22 rat strains sequenced by 4 independent labs.

**The Gene Annotator**

The **Gene Annotator** takes a list of gene symbols, RGD IDs, GenBank accession numbers, Ensembl identifiers, and/or a chromosomal region, and retrieves annotation data from RGD. This tool will retrieve annotations from any or all ontologies used at RGD for genes and their orthologs, as well as links to additional information at other databases.

[Click here](#) to access RGD's Rat Community Videos page. This page includes all of the tutorial videos that RGD has produced, plus other videos of interest to rat researchers.

**Latest News**

08/10 - RGD releases the DNA Damage Response pathway suite  
07/30 - RGD publishes the S-adenosylmethionine Homeostasis Pathway Suite Network  
07/27 - RGD releases a comprehensive update of the insulin responsive facilitative sugar transporter mediated glucose transport pathway  
07/10 - Announcing the Workshop on Genome Resources for the Rat Community  
06/15 - RGD releases an updated pathway suite network for gene expression and regulation  
06/11 - RGD provides new files comparing genes between genome assemblies m3.4, m5 and m6  
06/09 - RGD releases an interactive diagram page for the translation pathway  
05/06 - Paper describing analysis of variation data for 40+ rat strains published in BMC Genomics  
04/27 - RGD publishes an interactive diagram page for the ribosome biogenesis pathway  
04/08 - Registration is now open for the Rat Genetics and Genomics for Psychiatric Disorders and Addiction Workshop  
03/30 - RGD releases an updated version of the microRNA pathway

Quick search  
“heroin dependence”



## RGD Search Result

6 records found for search term **heroin dependence**

### GENES

4 Found [View Genes for All Species](#)

Rattus norvegicus	1	<a href="#">View Rat Genes Report</a>
Mus musculus	2	<a href="#">View Mouse Genes Report</a>
Homo sapiens	1	<a href="#">View Human Genes Report</a>

	Result Matrix		
	Rat	Mouse	Human
Genes:	1	2	1
QTLs:	0	0	0
Strains:	0	0	0
SSLPs:	0	0	0
References:	0	0	0
Promoters:	0	0	0
Cell Lines:	0	0	0
Variants:	0	0	0

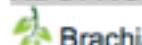
## Ontologies

Curators at RGD make annotations to genes, QTLs and strains using standardized vocabularies/ontologies. Your search returned annotations to the terms below.

### CHEBI: Chebi Ontology

[heroin](#)

### RDO: RGD Disease Ontology

[Brachial Plexus Neuritis](#)[Heroin Dependence](#)



## RGD Search Result

6 records found for search term heroin dependence

### GENES

4 Found [View Genes for All Species](#)

Rattus norvegicus	1	<a href="#">View Rat Genes Report</a>
Mus musculus	2	<a href="#">View Mouse Genes Report</a>
Homo sapiens	1	<a href="#">View Human Genes Report</a>

## Ontologies

Curators at RGD make annotations to genes, QTLs and strains using standardized vocab below.

### CHEBI: Chebi Ontology

[heroin](#)

### RDO: RGD Disease Ontology

[Brachial Plexus Neuritis](#)

[Heroin Dependence](#)

## ONTOLOGY REPORT - ANNOTATIONS

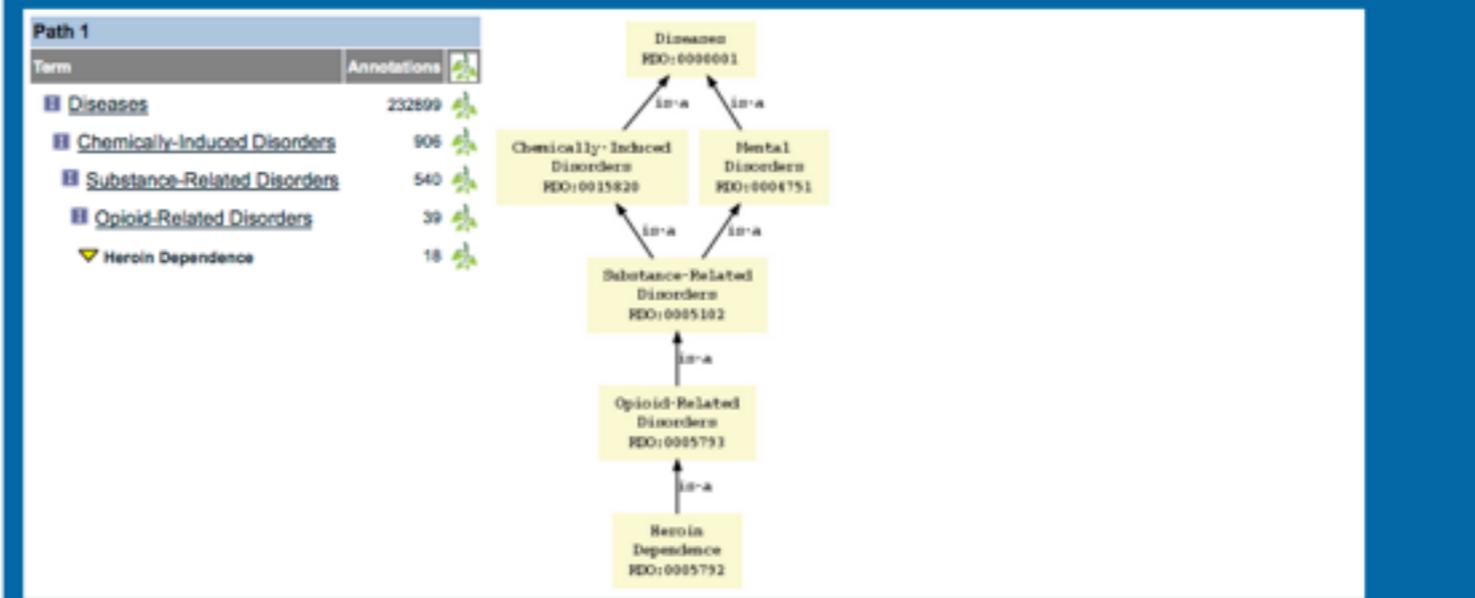
Term: Heroin Dependence  [go back to main search page](#)  
 Accession: RDO:0005792 [browse the term](#)  
 Definition: Strong dependence, both physiological and emotional, upon heroin.  
 Synonyms: exact\_synonym: Heroin Abuse; Heroin Addiction  
 primary\_id: MESH:D006558

Please select species to view GViewer data.

Rat Mouse Human All  show annotations for term's descendants Sort by: symbol  T asc  download  view all columns

Heroin Dependence								
Symbol	Object Name	GBrowse	Chr	Start	Stop	Reference		
R <i>Abat</i>	4-aminobutyrate aminotransferase	<a href="#">GBrowse</a>	10	5,894,187	6,002,068	<a href="#">RGD:10046064</a>		
M <i>Abat</i>	4-aminobutyrate aminotransferase	<a href="#">GBrowse</a>	16	8,513,522	8,621,661	<a href="#">RGD:10046064</a>		
H <i>ABAT</i>	4-aminobutyrate aminotransferase	<a href="#">GBrowse</a>	16	8,768,444	8,878,432	<a href="#">RGD:10046064</a>		
R <i>Chrm2</i>	cholinergic receptor, muscarinic 2	<a href="#">GBrowse</a>	4	63,799,489	63,801,551	<a href="#">RGD:5509583</a>		
M <i>Chrm2</i>	cholinergic receptor, muscarinic 2, cardiac	<a href="#">GBrowse</a>	6	36,473,170	36,474,774	<a href="#">RGD:5509583</a>		
H <i>CHRM2</i>	cholinergic receptor, muscarinic 2	<a href="#">GBrowse</a>	7	136,553,399	136,703,720	<a href="#">RGD:5509583</a>		
R <i>Fas</i>	Fas cell surface death receptor	<a href="#">GBrowse</a>	1	259,812,248	259,846,107	<a href="#">RGD:8686423</a>		
M <i>Eas</i>	Fas (TNF receptor superfamily member 6)	<a href="#">GBrowse</a>	19	34,365,149	34,402,260	<a href="#">RGD:8686423</a>		
H <i>FAS</i>	Fas cell surface death receptor	<a href="#">GBrowse</a>	10	90,750,288	90,775,542	<a href="#">RGD:8686423</a>		
R <i>Kcnj6</i>	potassium channel, inwardly rectifying subfamily J, member 6	<a href="#">GBrowse</a>	11	38,602,645	38,692,971	<a href="#">RGD:6483055</a>		
M <i>Kcnj6</i>	potassium inwardly-rectifying channel, subfamily J, member 6	<a href="#">GBrowse</a>	16	94,970,290	95,219,303	<a href="#">RGD:6483055</a>		
H <i>KCNJ6</i>	potassium channel, inwardly rectifying subfamily J, member 6	<a href="#">GBrowse</a>	21	38,996,778	39,288,741	<a href="#">RGD:6483055</a>		
R <i>Oprk1</i>	opioid receptor, kappa 1	<a href="#">GBrowse</a>	5	18,519,763	18,534,188	<a href="#">RGD:9831447</a>		
M <i>Oprk1</i>	opioid receptor, kappa 1	<a href="#">GBrowse</a>	1	5,578,574	5,592,947	<a href="#">RGD:9831447</a>		
H <i>OPRK1</i>	opioid receptor, kappa 1	<a href="#">GBrowse</a>	8	54,138,276	54,164,257	<a href="#">RGD:9831447</a>		
R <i>Penk</i>	proenkephalin	<a href="#">GBrowse</a>	5	21,834,409	21,839,759	<a href="#">RGD:10003025</a>		
M <i>Penk</i>	preproenkephalin	<a href="#">GBrowse</a>	4	4,060,683	4,065,592	<a href="#">RGD:10003025</a>		
H <i>PENK</i>	proenkephalin	<a href="#">GBrowse</a>	8	57,353,513	57,359,282	<a href="#">RGD:10003025</a>		

Term paths to the root one shortest and longest



# PhenoMiner tool

Phenotypes & Models at RGD

Welcome to the Phenotypes & Models Portal within RGD. This portal contains data related to rat strains and phenotypes, as well as essential information for conducting physiological research, identifying disease models, and community forums for gathering feedback from the scientific community.

Please feel free to [contact us](#) with suggestions for additional data or tools that would help advance your research.

Go to Phenotypes | Go to Strains & Models

Strains & Models

Meet Joe Rat

## PhenoMiner Database

To begin, select a starting point

**Rat Strains**  
Search for data related to one or more rat strains.  
Examples: congenic strain, ACl, BN

**Experimental Conditions**  
Find data based on a list of conditions.  
Examples: diet, atmosphere composition, activity level

**Clinical Measurements**  
Query the database by clinical measurements.  
Examples: heart rate, blood cell count

**Measurement Methods**  
Base your query on a list of Measurement methods.  
Examples: fluid filled catheter, blood chemistry panel

\* If you would like to show your own data in PhenoMiner, please submit your data [here](#).

## PhenoMiner Database

Search: alcohol

Experiment

- Rat
- Each
- Click
- To

Search: alcohol

- activity(1734)
- chemical(9303)
- chemical time series(2223)
- chemical with specified function(1933)
- chemical with specified structure(4473)
- alcohol(449)
- amino acid(547)
- carbohydrate(691)
- hydrocarbon(116)
- ion/salt(1421)
- labeled chemical(0)
- nitrogenous(93)
- nucleic acid(25)
- nucleotide/nucleoside(2)
- peptide/amino(783)
- phenolic/phenol derivative(378)
- quinone(18)
- steroid(140)
- sulfonamide(498)
- control condition(12789)
- controlled atmosphere composition(12467)
- controlled in situ organ condition(23)
- controlled visible light condition(157)
- diet(17932)
- disease inducing agent(316)
- housing condition(38)
- in utero condition(82)
- radiation exposure(91)
- reproduction condition(82)

## PhenoMiner Database

Select values from categories of interest and select "Generate Report" to build report Matching Records 69

### Experimental Conditions

Find data based on a list of conditions.

Examples: diet, atmosphere composition

[Edit Conditions](#)

controlled ethanol content drinking water (61)  
ethanol (69)

Additional Options...

[Limit By Rat Strains](#)

[Limit By Clinical Measurements](#)

[Limit By Measurement Methods](#)

I'm Done..

[Generate Report](#)

You are limiting by: Experimental Conditions (69 records)

# PhenoMiner tool

**Phenotypes & Models at RGD**

Welcome to the Phenotypes & Models Portal within RGD. This portal contains data related to rat strains and phenotypes, as well as essential information for conducting physiological research, identifying disease models, and community forums for gathering feedback from the scientific community.

Please feel free to [contact us](#) with suggestions for additional data or tools that would help advance your research.

[Go to Phenotypes](#)    [Go to Strains & Models](#)

**PhenoMiner Tool**

[Rat Strains](#)    [Experimental Conditions](#)    [Phenotypes](#)    [Measurement Methods](#)

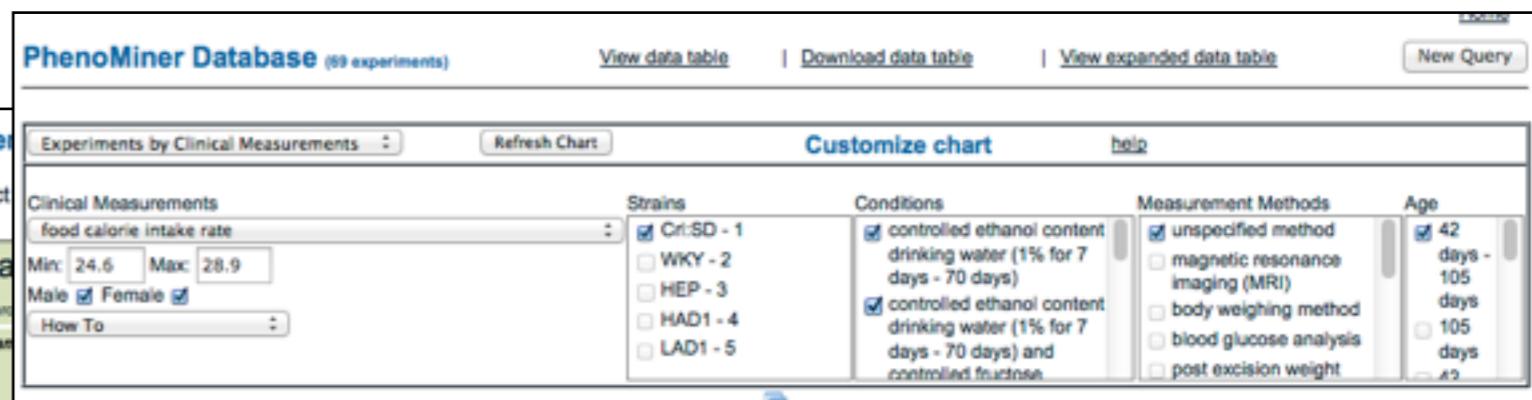
[Meet Joe Rat](#)

**PhenoMiner**

To begin, select:

- Rat Strains
- Clinical Measurements
- Strains
- Conditions
- Measurement Methods
- Age

\* If you would like to...



**PhenoMiner Database**

Select values from categories of interest and select "Generate Report" to build report    Matching Records: 69

**Experimental Conditions**

Find data based on a list of conditions.

Examples: diet, atmosphere composition

[Edit Conditions](#)

controlled ethanol content drinking water (61)  
ethanol (89)

You are limiting by: Experimental Conditions (89 records)

**Additional Options...**

[Limit By Rat Strains](#)  
[Limit By Clinical Measurements](#)  
[Limit By Measurement Methods](#)

I'm Done.. [Generate Report](#)

**EXPERIMENTS**

Options: [View chart](#) | [Download data table](#) | [View expanded data table](#) | [Which do I want](#)

# of Animals (Click to Sort)	Clinical Measurement (Click to Sort)	Strain (Click to Sort)	Sex (Click to Sort)	Value (Click to Sort)	Units (Click to Sort)	Condition 1 (Click to Sort)	Condition 2 (Click to Sort)	Condition 3 (Click to Sort)
12	food calorie intake rate	Cri:SD	female	28.9 kcal/d		controlled ethanol content drinking water (1% for 7 days - 70 days)	-	-
12	food calorie intake rate	Cri:SD	female	24.6 kcal/d		controlled ethanol content drinking water (1% for 7 days - 70 days)	and controlled fructose content drinking water (5% for 7 days - 70 days)	-
12	whole body visceral fat volume	Cri:SD	female	13.9 ml		controlled ethanol content drinking water (1% for 70 days)	-	-
12	whole body visceral fat volume	Cri:SD	female	14.3 ml		controlled ethanol content drinking water (1% for 70 days)	and controlled fructose content drinking water (5% for 70 days)	-
49	whole body subcutaneous fat	Cri:SD	female	44.6 ml		controlled ethanol content drinking water (1% for 70 days)	-	-

# Database resources

- Rat Genome Database  
<http://rgd.mcw.edu/>
  - Genetic, genomic, phenotype, and disease data generated from rat research
  - Structured vocabularies are used by curators to describe data
- Neuroscience Information Framework  
<http://www.neuinfo.org/>
  - Inventory and index of data relevant to neuroscience research from across the “hidden web” (databases & repositories), linking to primary data and providing analysis tools
- Allen Brain Atlas  
<http://www.brain-map.org/>
  - Structural anatomy and gene expression data within the brain



# NIF advantages



- Enormous scale: an aggregate library index for scholarly output (databases, tools, resources), across species, information type, and experimental strategy/focus
- Provides tools for integration of and interoperability between databases
- Access to interpreted (ontology metadata) and raw data
- Single search portal of the hidden web
- Neuroscience focus

**NIF NAVIGATOR**

LITERATURE →

PubMed (24743027)

NIF DATA FEDERATION →

DATA TYPE

Animals (1859249)

Annotation (23562319)

Antibodies (2441818)

Atlas (267689101)

Biospecimen (648)

Brain Activation Foci (25018312)

Cell line (318630)

Clinical Trials (412510)

Connectivity (66199)

Dataset (27756439)

Disease (88418469)

Drugs (47430500)

Expression (583005064)

Gene (1389938)

Grants (2998523)

Images (1361726)

Interactions (7911192)

MRI (20171)

Microarray (578277403)

Models (766502)

Molecule (124)

Multimedia (117867)

Orthology (9924860)

Pathways (843951)

People (367)

Phenotype (2679851)

Plasmids (22800)

Protocols (15147)

Registries (17552)

Software (2095)

Training (678)

NERVOUS SYSTEM LEVELS

Cell (368949)

Function (25980431)

Gene (476489962)

Gross Anatomy (45597)

Molecule (1510286)

NIF REGISTRY (13948) →

# NIF data content

Literature : 24,743,027 (PubMed)

Antibodies: 2,441,818

Clinical trials: 412,510

Drugs: 47,430,500

Gene: 1,389,938 (multiple species)

Interactions: 791,192

Software: 2095

## ▼ ABOUT

[About NIF](#)[People](#)[Publications](#)[Presentations](#)[Tutorials](#)[Brochures](#)[Testimonials](#)[Release Notes 6.0](#)[FAQ](#)

## ► NIF SERVICES

## ► NIF DATA SHARING

## ► NIF SYSTEM

## ► SOCIAL MEDIA



Registered with NIF?  
Place this icon on your site.

[Find out how.](#)

## Search for All Things Neuroscience

[Search NIF](#)[Search NeuroLex](#)

SEARCH TIPS | WHAT IS THIS? (example searches: cerebellum, genetic analysis software, gene:grm1)

## NIF STATISTICS

NIF Version: 6.2

Ontology Version: 2.9

Level 2.5/3.0 Resources: 239

Registry Entries: 12,598

Total Records: 829,679,866

[Home](#) » [About](#) » [About NIF](#)

## About NIF

The Neuroscience Information Framework is a dynamic inventory of Web-based neuroscience resources: data, materials, and tools accessible via any computer connected to the Internet. An initiative of the NIH Blueprint for Neuroscience Research, NIF advances neuroscience research by enabling discovery and access to public research data and tools worldwide through an open source, networked environment.

[View the Introductory Video about NIF.](#)

## NIF OFFERS:

1. A [search portal](#) for researchers, students, or anyone looking for neuroscience information, tools, data or materials.
2. Access to content normally not indexed by search engines, i.e., the "hidden web"
3. Tools for resource providers to make resources more discoverable, e.g., ontologies, data federation tools vocabulary services
4. Tools for promoting interoperability among databases
5. [Standards](#) for data annotation
6. The [NIFSTD ontology](#) covering the major domains of neuroscience, e.g., brain anatomy, cells, organisms, diseases, techniques
7. [Services](#) for accessing the NIF vocabulary and NIF tools
8. Best practices for creating discoverable and [interoperable resources](#)
9. Data annotation services: NIF experts can enhance your resource through semantic tagging ([contact us](#))
10. NIF cards: Easy links to neuroscience information from any web browser (See examples)
11. Ontology services: NIF knowledge engineers can [help create or extend ontologies](#) for neuroscience

The NIF project is designed to serve the biomedical research community. The more participation from the community, the better the NIF. We welcome all [feedback and suggestions](#) and are actively looking for resource providers to make their

## NIF NAVIGATOR



## LITERATURE →

[PubMed \(24743027\)](#)

## NIF DATA FEDERATION →

## DATA TYPE

[Animals \(1859249\)](#)[Annotation \(23562319\)](#)[Antibodies \(2441818\)](#)[Atlas \(267689101\)](#)[Biospecimen \(648\)](#)[Brain Activation Foci \(25018312\)](#)[Cell line \(318630\)](#)[Clinical Trials \(412510\)](#)[Connectivity \(66199\)](#)[Dataset \(27756439\)](#)[Disease \(88418469\)](#)[Drugs \(47430500\)](#)[Expression \(583005064\)](#)[Gene \(1389938\)](#)[Grants \(2998523\)](#)[Images \(1361726\)](#)[Interactions \(791192\)](#)[MRI \(20171\)](#)[Microarray \(578277403\)](#)[Models \(766502\)](#)[Molecule \(124\)](#)[Multimedia \(117867\)](#)[Orthologs \(9924880\)](#)

### ABOUT

[About NIF](#)[People](#)[Publications](#)[Presentations](#)[Tutorials](#)[Brochures](#)[Testimonials](#)[Release Notes 6.0](#)[FAQ](#)

### NIF SERVICES

### NIF DATA SHARING

### NIF SYSTEM

### SOCIAL MEDIA



Registered with NIF?  
Place this icon on your site.

[Find out how.](#)

## Search for All Things Neuroscience

[Search NIF](#)

# heroin

SEARCH... | SEARCH NIF | SEARCH NLOX (example searches: cerebellum, genetic analysis software, gene:grm1)

[Search NeuroLex](#)[Home](#) » [About](#) » [About NIF](#)

### About NIF

The Neuroscience Information Framework is a dynamic inventory of Web-based neuroscience resources: data, materials, and tools accessible via any computer connected to the Internet. An initiative of the NIH Blueprint for Neuroscience Research, NIF advances neuroscience research by enabling discovery and access to public research data and tools worldwide through an open source, networked environment.

[View the Introductory Video about NIF.](#) 

### NIF OFFERS:

1. A [search portal](#) for researchers, students, or anyone looking for neuroscience information, tools, data or materials.
2. Access to content normally not indexed by search engines, i.e., the "hidden web"
3. Tools for resource providers to make resources more discoverable, e.g., ontologies, data federation tools vocabulary services
4. Tools for promoting interoperability among databases
5. [Standards](#) for data annotation
6. The [NIFSTD ontology](#) covering the major domains of neuroscience, e.g., brain anatomy, cells, organisms, diseases, techniques
7. [Services](#) for accessing the NIF vocabulary and NIF tools
8. Best practices for creating discoverable and [interoperable resources](#)
9. Data annotation services: NIF experts can enhance your resource through semantic tagging ([contact us](#))
10. NIF cards: Easy links to neuroscience information from any web browser (See examples)
11. Ontology services: NIF knowledge engineers can [help create or extend ontologies](#) for neuroscience

The NIF project is designed to serve the biomedical research community. The more participation from the community, the better the NIF. We welcome all [feedback and suggestions](#) and are actively looking for resource providers to make their

### NIF STATISTICS

NIF Version: 6.2

Ontology Version: 2.9

Level 2.5/3.0 Resources: 239

Registry Entries: 12,598

Total Records: 829,679,866

### NIF NAVIGATOR



#### LITERATURE →

[PubMed \(24743027\)](#)

#### NIF DATA FEDERATION →

##### DATA TYPE

[Animals \(1859249\)](#)[Annotation \(23562319\)](#)[Antibodies \(2441818\)](#)[Atlas \(267689101\)](#)[Biospecimen \(648\)](#)[Brain Activation Foci \(25018312\)](#)[Cell line \(318630\)](#)[Clinical Trials \(412510\)](#)[Connectivity \(66199\)](#)[Dataset \(27756439\)](#)[Disease \(88418469\)](#)[Drugs \(47430500\)](#)[Expression \(583005064\)](#)[Gene \(1389938\)](#)[Grants \(2998523\)](#)[Images \(1361726\)](#)[Interactions \(791192\)](#)[MRI \(20171\)](#)[Microarray \(578277403\)](#)[Models \(766502\)](#)[Molecule \(124\)](#)[Multimedia \(117867\)](#)[Ontology \(9924880\)](#)

# Results

NIF Home | myNIF | Neurolex | Search | Recommend a Resource      Login | Register | Tutorial | Help

# heroin

search for (e.g., cerebellum, "pulvinar nucleus")

Data (40,086)      Literature (8,688,754)      Registry (4)      Funding (12)      Web (∞)

Displaying 40,086 results

[Clinical Trials Network: Dataset](#)  
CTN contains information on NIDA's Clinical Trials Network.  
Information on Clinical Trials Network    2 Results

[Drug Related Gene Database: DRG](#)  
The DRG provides differential gene expression data relevant to addiction where data types include the effects of a drug, strain, or knockout on a particular gene, in a particular brain region. [Share your data set.](#)  
Information on Drug Related Gene Database    1,301 Results

[HealthData.gov: Registry](#)  
HealthData.gov is a public repository of high-value datasets, tools, and applications using data about health and health care.  
Information on HealthData.gov    11 Results

[Educational Resources in Neuroscience: Materials](#)  
Educational Resources in Neuroscience is a database that lists, reviews, and rates resources for teaching neuroscience at the graduate and undergraduate level.  
Information on Educational Resources in Neuroscience    2 Results

[RePORTER: CurrentNIHGrants](#)  
NIH RePORTER provides a list of funded grants across NIH institutes.  
Information on RePORTER    319 Results

[OneMind: BioBanks](#)  
One Mind Biospecimen Bank Listing is an international registry of biomaterial supply resources - visit [SciCrunch](#) to register your resource.  
Information on OneMind    1 Results

[Integrated: Disease](#)  
Integrated Disease is a virtual database currently indexing authoritative information on disease and treatment options from: [NINDS Disorder List](#) and [PubMed Health](#).  
Information on Integrated    3 Results

[Integrated: Podcasts](#)  
Integrated Podcasts is a virtual database currently indexing multiple podcast resources. A list of the participating resources is provided [here](#).  
Information on Integrated    6 Results

[ClinicalTrials.gov: Trial List](#)  
ClinicalTrials.gov registry of clinical trials conducted primarily within USA.  
Information on ClinicalTrials.gov    178 Results

Semantic Expansion [-]  
17-methyl-7, diacetylmorphine, diacetylmorphine-hcl, 5alpha-epoxymorphinan-3, diacetylmorphine hydrochloride, diacetyl-morphine, 6alpha-dihydro diacetate, 8-didehydro-4

Term Information

**HEROIN**  
View in Neurolex: [CHEBI\\_27808](#)

+ Synonyms  
+ subClassOf

Survey      Feedback

# Results

Relevant resource

The screenshot shows the NIF search interface. In the search bar at the top right, the word "heroin" is typed. Below the search bar, a sidebar on the left lists categories: Data (40,086), Literature (8,688,754), Registry (4), Funding (12), and Web (0). Under "System Level [-]", there are links for Function (15,936), Gene (12,038), and Molecule (5). Under "Type of Data [-]", there are links for Animals (1), Annotation (7,335), Antibodies (6), Biospecimen (1), Brain Activation Foci (15,859), Clinical Trials (362), Dataset (37), Disease (13,072), Drugs (9,592), and Expression (1,329). At the bottom left, there is a link to "Login or create an account to". The main content area displays search results for "heroin". It shows "Displaying 40,086 results". The first result is "Clinical Trials Network: Dataset", which contains information on NIDA's Clinical Trials Network. The second result is "Drug Related Gene Database: DRG", which provides differential gene expression data relevant to addiction. Other results listed include "HealthData.gov: Registry", "Educational Resources in Neuroscience: Materials", "RePORTER: CurrentNIHGrants", "OneMind: BioBanks", "Integrated: Disease", "Integrated: Podcasts", and "ClinicalTrials.gov: Trial List". Each result has a brief description and a link to "Information on [Resource]".

Specify a data type

Relevant data within resource

epoxymorphinan-3, diacetylmorphine hydrochloride, diacetyl-morphine, 6alpha-dihydro-6-acetyl-

## Term Information

### HEROIN

View in Neurolex: [CHEBI\\_27808](#)

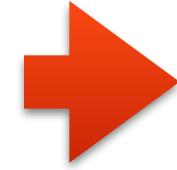
- [Synonyms](#)
- [subClassOf](#)

Survey

Ontologies and term information

# Database resources

- Rat Genome Database  
<http://rgd.mcw.edu/>
  - Genetic, genomic, phenotype, and disease data generated from rat research
  - Structured vocabularies are used by curators to describe data
- Neuroscience Information Framework  
<http://www.neuinfo.org/>
  - Inventory and index of data relevant to neuroscience research from across the “hidden web” (databases & repositories), linking to primary data and providing analysis tools
- Allen Brain Atlas  
<http://www.brain-map.org/>
  - Structural anatomy and gene expression data within the brain



# Allen Brain Atlas advantages



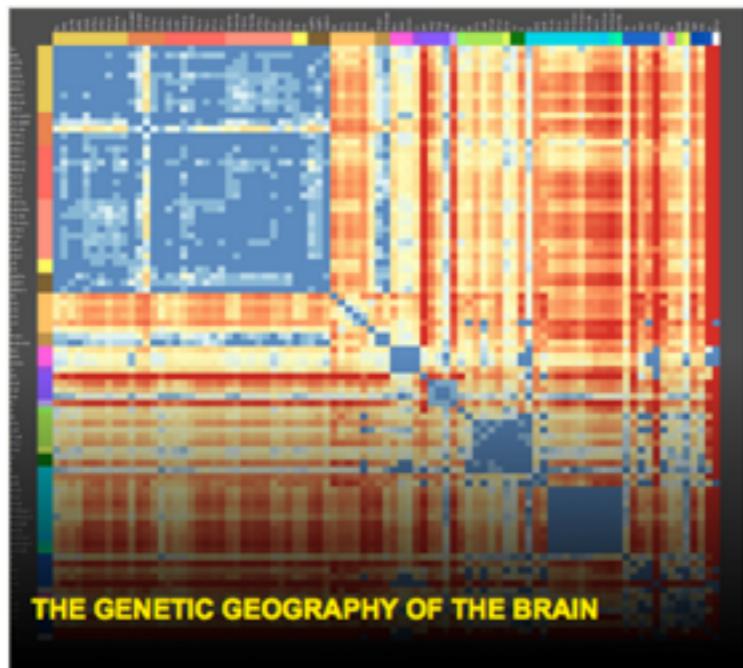
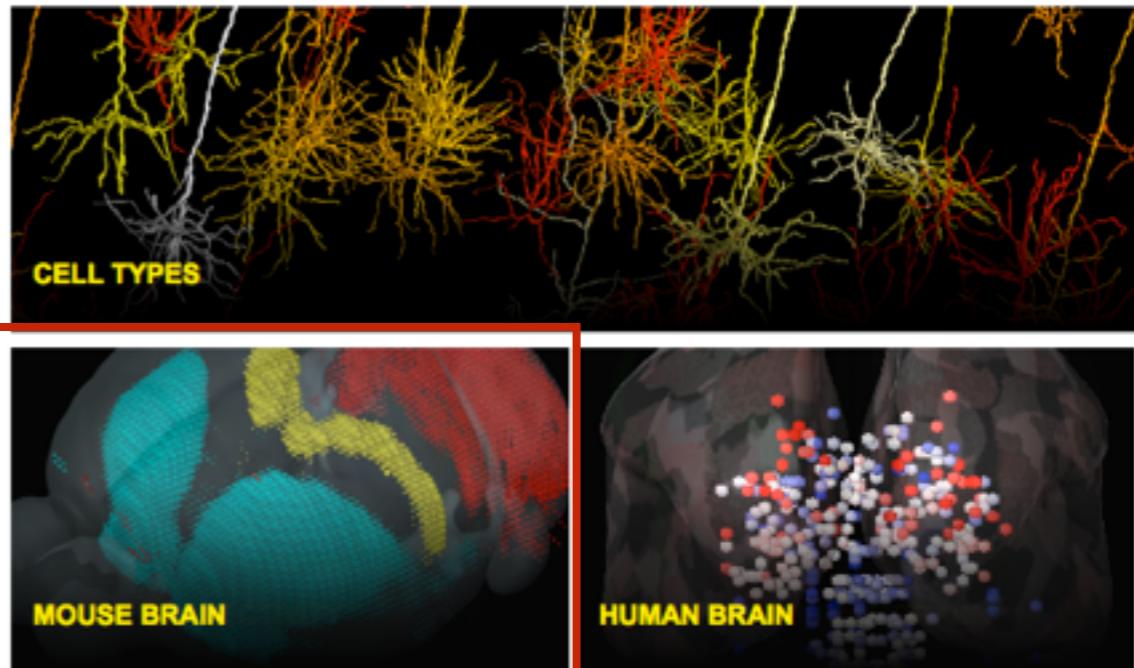
- Comprehensive atlases of brain anatomy (mouse, human, non-human primate) at the structural and cellular level
- Comprehensive mapping of gene expression data within the brain
- Straightforward (and beautiful) imaging of gene expression and connectivity

**ALLEN BRAIN ATLAS**

DATA PORTAL

[HOME](#)[GET STARTED](#)[HELP](#)[DATA & TOOLS ▾](#)

Search...

**SCIENCE VIGNETTES****DATA & TOOLS****WHAT'S NEW**

- Latest Data Release May 14, 2015
- Events & Training

**ALLEN INSTITUTE PUBLICATIONS**

View a full list of publications from the Allen Institute for Brain Science.

**TUTORIALS**

Watch videos to learn how to make the most out of the Allen Brain Atlas resources.

[DEVELOPING MOUSE](#)[NON-HUMAN PRIMATE](#)[MOUSE SPINAL CORD](#)[GLIOBLASTOMA](#)[REFERENCE ATLASES](#)[APPLICATION PROGRAMMING INTERFACE \(API\)](#)[SOFTWARE DEVELOPMENT KIT \(SDK\)](#)

ALLEN BRAIN ATLAS

DATA PORTAL

HOME

**GET STARTED**

HELP

## MOUSE BRAIN ▾

Search... 

ISH DATA

REFERENCE ATLAS

AGEA

BRAIN EXPLORER

## RELATED STUDIES

DOCUMENTATION

HELP

- Gene Search
  - Differential Search
  - Fine Structure Search
  - Bulk Search
  - Human Differential Search

Enter Gene Name, Gene Symbol, NCBI Accession Number or Entrez Gene ID

Drd2

Show exact matches only

## Correlation

Basic cell groups and regions (grey) ▾

### Coronal data only

Search

BrainExplorer

## Related Institute Data

ALLEN BRAIN ATLAS

DATA PORTAL

HOME

## GET STARTED

HELP

ISH DATA

REFERENCE ATLAS

AGEA

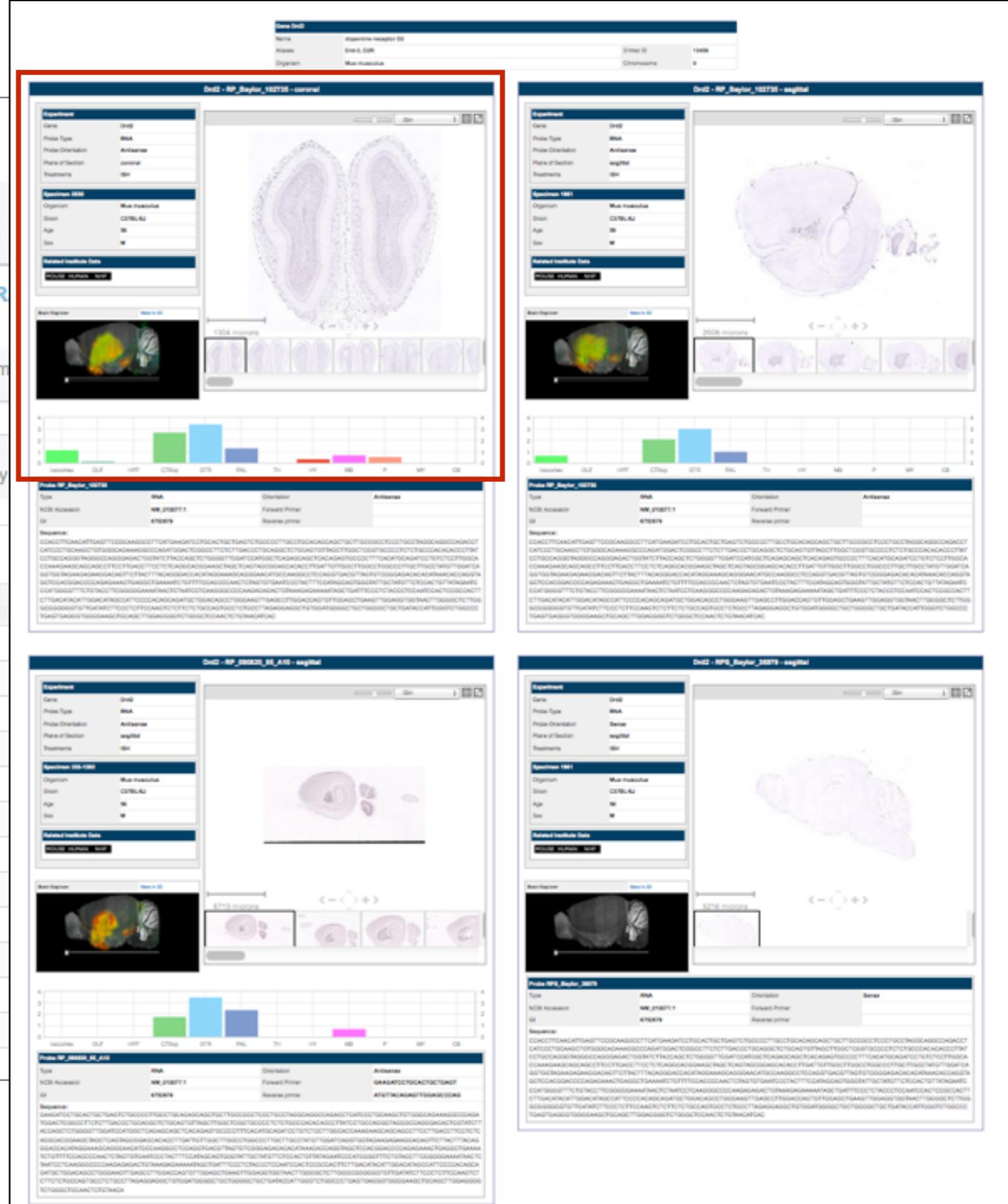
BR

- Gene Search
  - Differential Search
  - Fine Structure Search
  - Bulk Search
  - Human Differential Search

Enter Gene Name, Gene Sym

Drd2

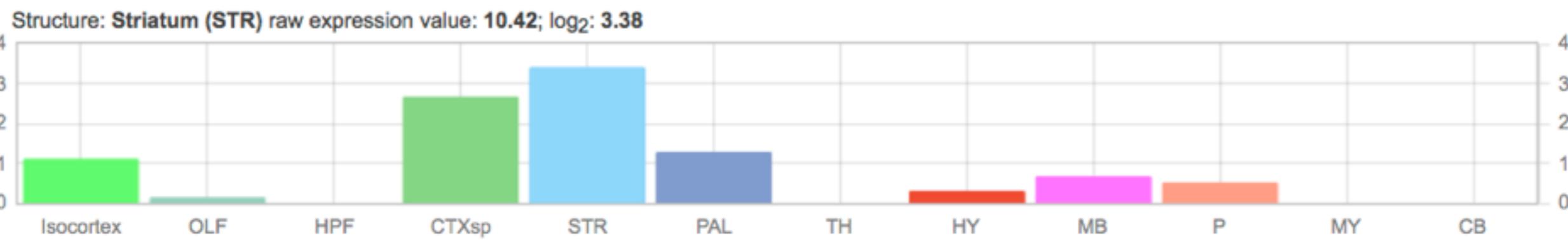
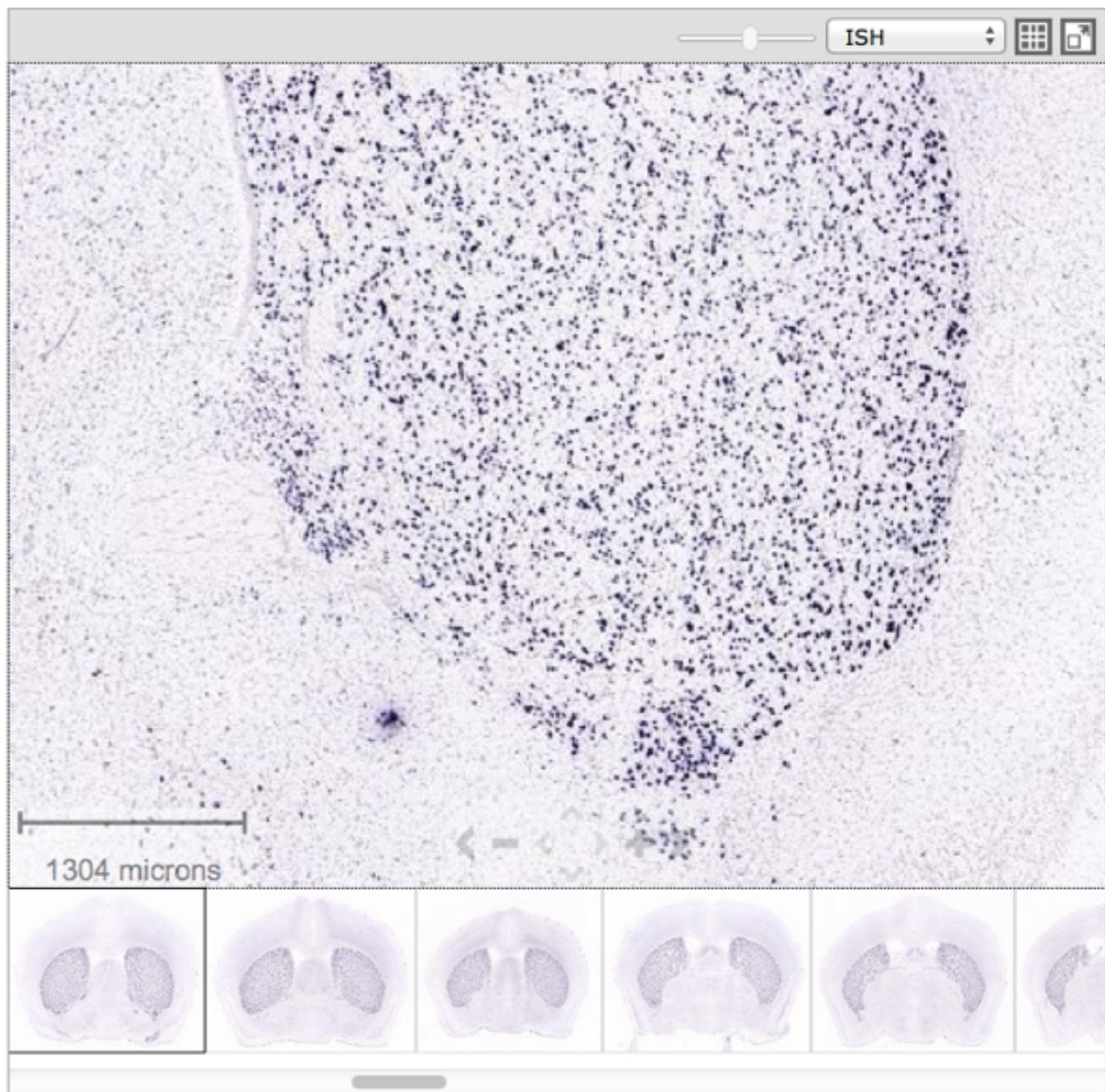
Show exact matches only



Experiment	
Gene	Drd2
Probe Type	RNA
Probe Orientation	Antisense
Plane of Section	coronal
Treatments	ISH

Specimen 2030	
Organism	<b>Mus musculus</b>
Strain	C57BL/6J
Age	56
Sex	M

Related Institute Data		
MOUSE	HUMAN	NHP



### Experiment

Gene	Drd2
Probe Type	RNA
Probe Orientation	Antisense
Plane of Section	coronal
Treatments	ISH

### Specimen 2030

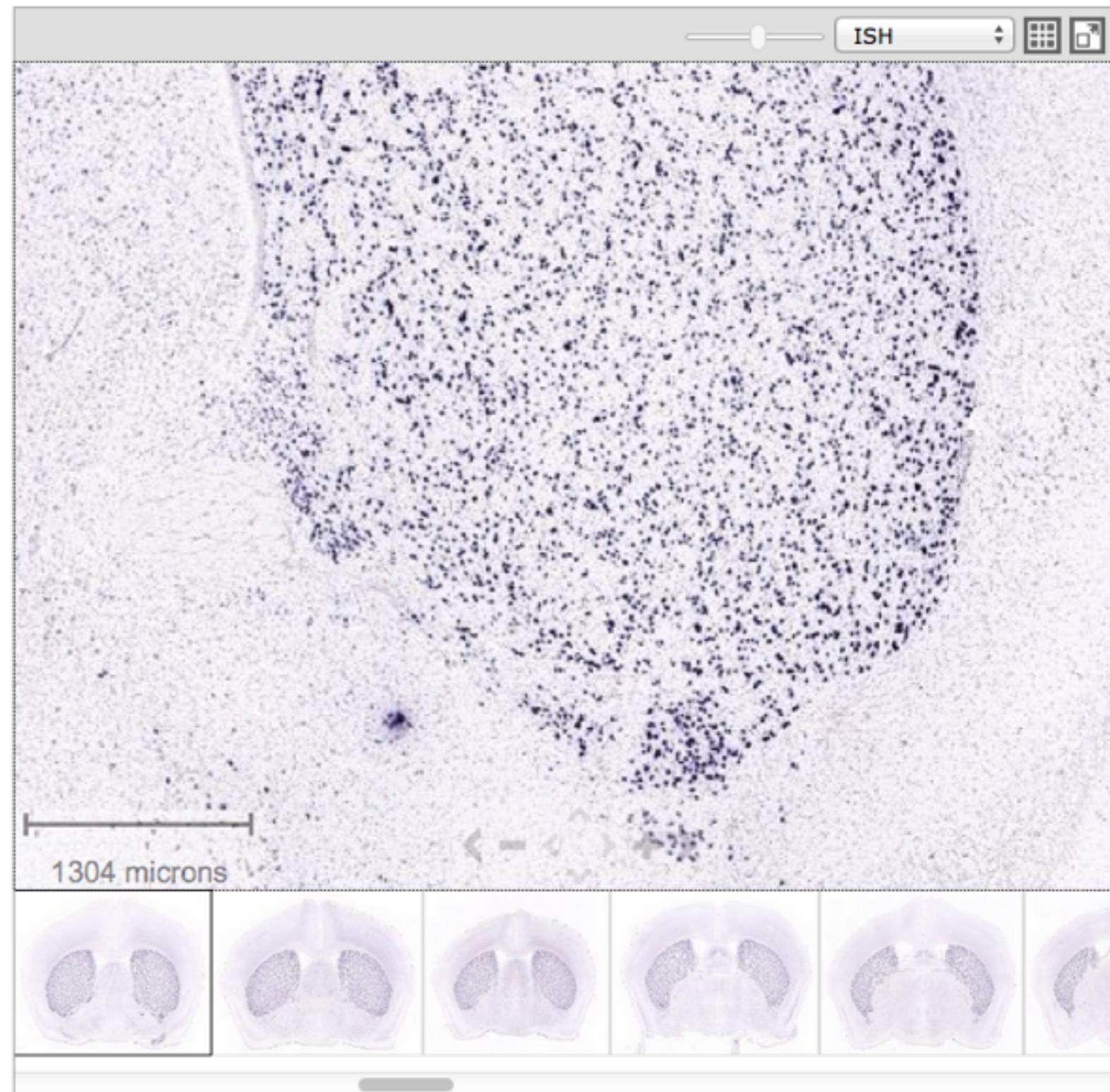
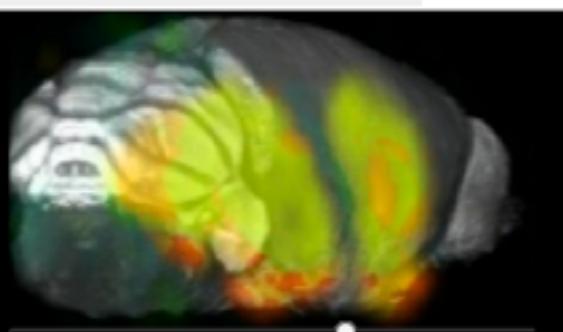
Organism	Mus musculus
Strain	C57BL/6J
Age	56
Sex	M

### Related Institute Data

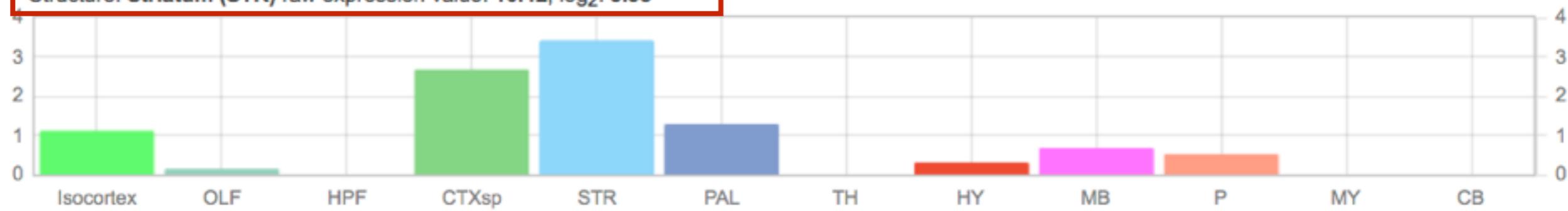
MOUSE HUMAN NHP

### Brain Explorer

[View in 3D](#)



Structure: Striatum (STR) raw expression value: 10.42;  $\log_2$ : 3.38



# Questions?

