www.findmice.org

www.informatics.jax.org

IMSR and MGI:
tools moving research forward

Janan T. Eppig

Infrafrontier/IMPC workshop

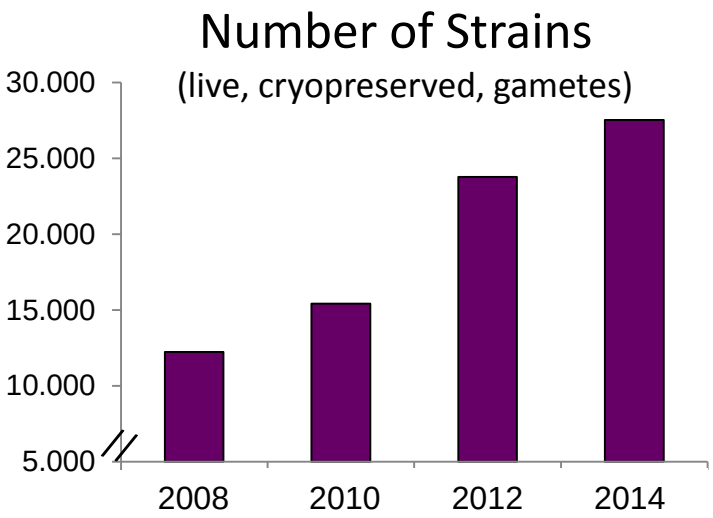
Munich, May 2014

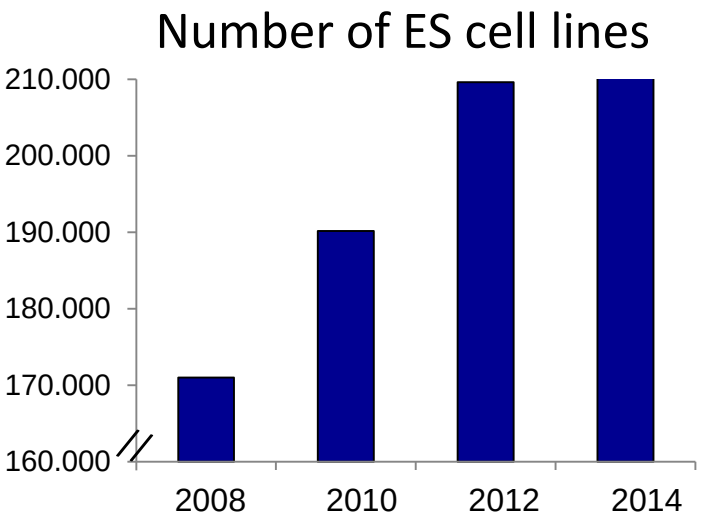
International Mouse Strain Resources (IMSR)

A GLOBAL CATALOG OF MOUSE RESOURCES

- Where are the mouse resources I need?
- In what state are they available
  (live, frozen embryos or Gametes, ES cell lines)?
- How can I find more info about a strain or cell line?
- How can I find more info about the mutations & alleles carried by a strain; and their phenotypes?
- How can I order a mouse resource?
- How can I contact the holding repository with other questions ?
  (e.g. delivery times, cost)

IMSR Content





Users (2013):

- 58,800 unique users visited IMSR
- Page views numbered >350,000 from 102 countries

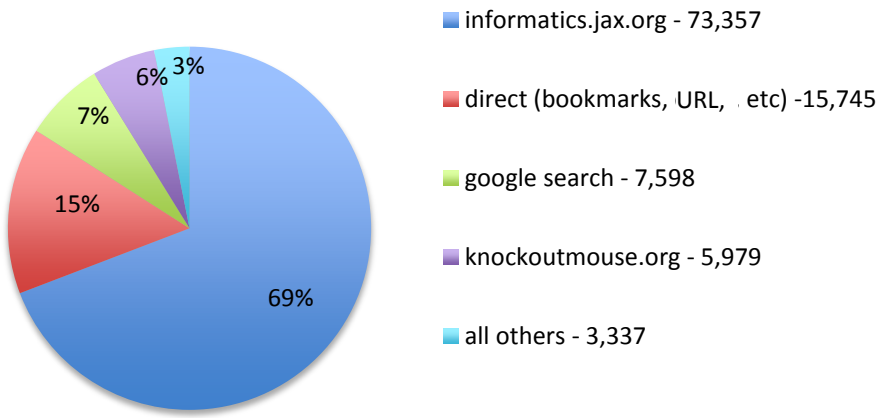
IMSR REPOSITORIES

Repository / Consortium #	Abbreviation	Region
Australian Phenome Bank*	APB	Australia
Center for Animal Resources and Development	CARD	Japan
Canadian Mouse Mutant Repository	CMMR	Canada
European Mouse Mutant Archive*	EMMA	Europe
E.M. Simpson	EMS	Canada
MRC Harwell	HAR	U.K.
JAX Mice	JAX	U.S.A.
Knockout Mouse Project	KOMP	U.S.A.
Mutant Mouse Regional Resource Centers*	MMRRC	U.S.A.
MUGEN Mouse Database	MUGEN	Greece
National Cancer Institute at Frederick	NCIMR	U.S.A.
National Institute of Genetics	NIG	Japan
National Resource Center for Mutant Mice	NRCMM	China
Oriental BioService, Inc.	OBS	Japan
Oak Ridge Collection at JAX	ORNL	U.S.A.
RIKEN BioResource Center	RBRC	Japan
National Applied Research Laboratories	RMRC-NLAC	Taiwan
Taconic	TAC	U.S.A.
Texas A&M Institute for Genomic Medicine	TIGM	U.S.A.
Wellcome Trust Sanger Institute	WTSI	U.K.

* consortiums representing 4-14 individual repository sites (all repositories = 46)

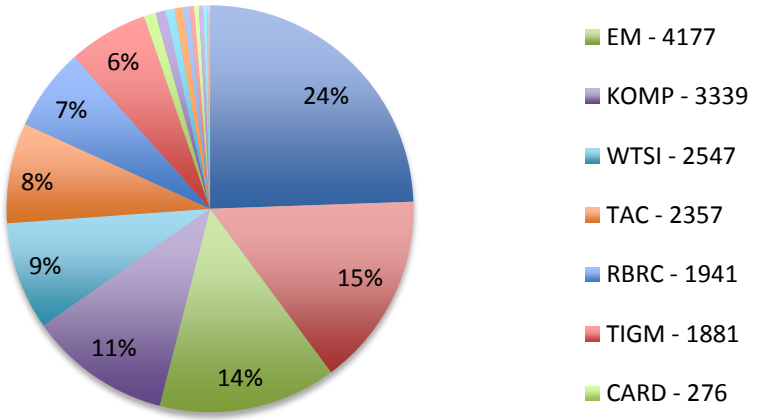
an additional 5 repositories have registered, but not yet submitted data

Referrals to IMSR (2013)



How do users get to IMSR to start with?

Referrals to Repositories From IMSR (2013)



Where do users go once they find the resource they want?

International Mouse Strain Resource (IMSR)

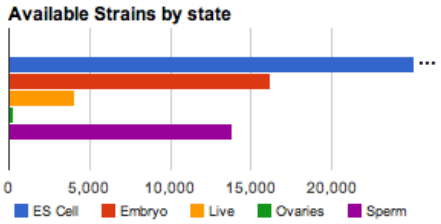
Search | Repositories | Participate | Glossary | Contact Us | About Us | Deposit Strains

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



Search for:

Search | Reset | 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
EM (European Mouse Mutant Archive) Germany
EMS (Dr. Elizabeth M. Simpson, Ph.D.) Canada
HAR (MRC Harwell) UK
JAX (JAX Mice) USA
KOMP (The Knockout Mouse Project) USA

View Repository Reports.

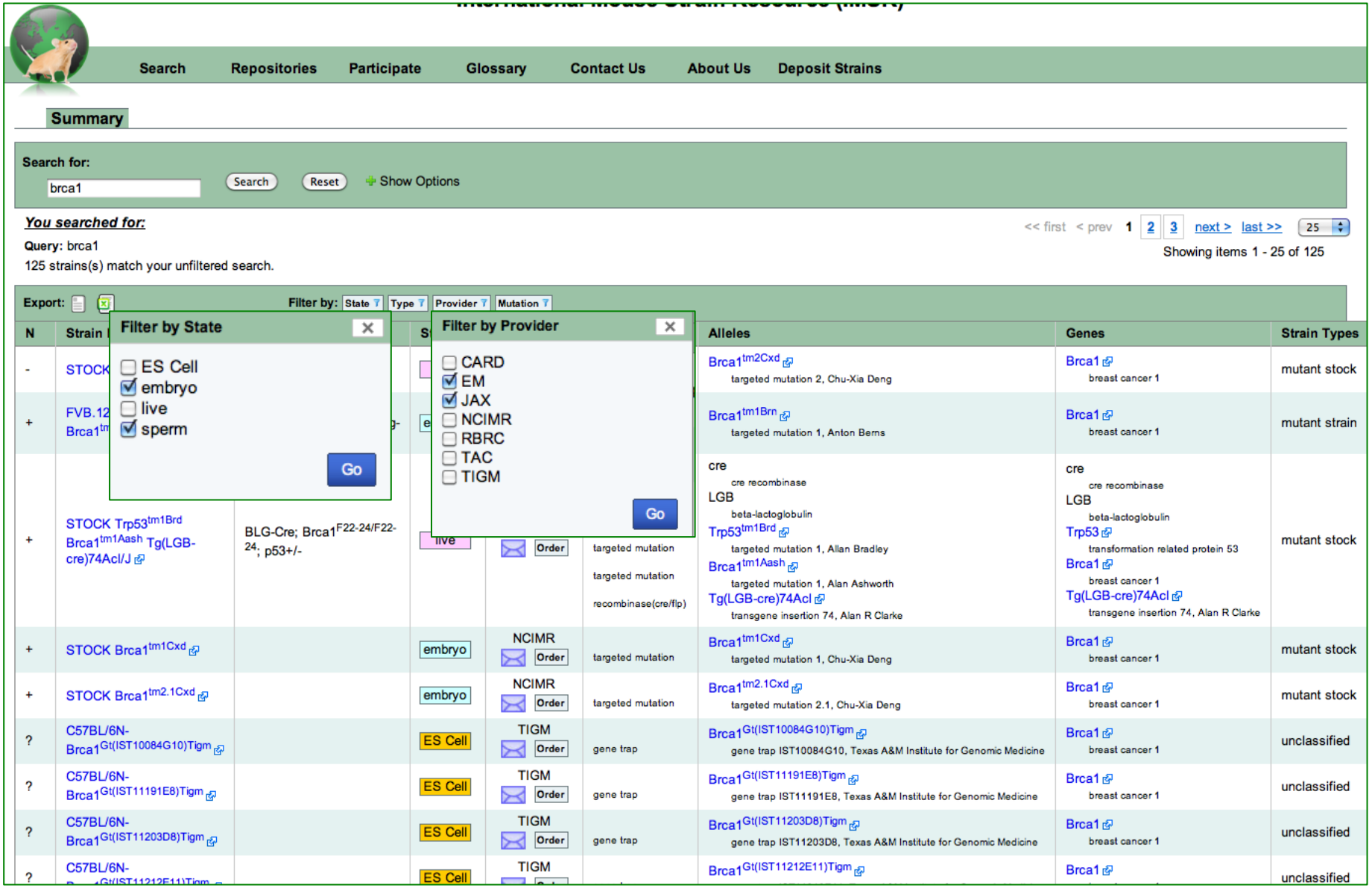
All regions and repositories are selected by default; to limit your search to a specific region, click on the map, or select one or more specific repositories from the select list.

Mutations:

- chemically induced mutation
- chromosomal aberration
- deletion
- duplication
- gene trap
- insertion
- inversion
- other
- radiation induced mutation
- reciprocal translocation
- recombinase(cre/flp)
- robertsonian translocation
- spontaneous mutation
- targeted mutation
- transgenic
- transposition

Quick search

Search other parameters


Search
Repositories
Participate
Glossary
Contact Us
About Us
Deposit Strains
Summary
Search for:
brca1
Search
Reset
Show Options
You searched for:
Query: brca1
125 strains(s) match your unfiltered search.
<< first < prev 1 2 3 next > last >> 25
Showing items 1 - 25 of 125
Export:
Filter by: State Type Provider Mutation
Filter by State
ES Cell
embryo
live
sperm
Go
Filter by Provider
CARD
EM
JAX
NCIMR
RBRC
TAC
TIGM
Go
N
Strain
Alleles
Genes
Strain Types
- STOCK Brca1tm2Cxd targeted mutation 2, Chu-Xia Deng Brca1 breast cancer 1 mutant stock
+ FVB.12 Brca1tm Brca1tm1Brn targeted mutation 1, Anton Berns Brca1 breast cancer 1 mutant strain
+ STOCK Trp53tm1Brd Brca1tm1Aash Tg(LGB-cre)74Acl/J BLG-Cre; Brca1F22-24/F22-24; p53+/- live Order targeted mutation targeted mutation recombinase(cre/flp) cre cre recombinase LGB beta-lactoglobulin Trp53tm1Brd targeted mutation 1, Allan Bradley Brca1tm1Aash targeted mutation 1, Alan Ashworth Tg(LGB-cre)74Acl transgene insertion 74, Alan R Clarke cre cre recombinase LGB beta-lactoglobulin Trp53 transformation related protein 53 Brca1 breast cancer 1 Tg(LGB-cre)74Acl transgene insertion 74, Alan R Clarke mutant stock
+ STOCK Brca1tm1Cxd embryo NCIMR Order targeted mutation Brca1tm1Cxd targeted mutation 1, Chu-Xia Deng Brca1 breast cancer 1 mutant stock
+ STOCK Brca1tm2.1Cxd embryo NCIMR Order targeted mutation Brca1tm2.1Cxd targeted mutation 2.1, Chu-Xia Deng Brca1 breast cancer 1 mutant stock
? C57BL/6N-Brca1Gt(IST10084G10)Tigm ES Cell TIGM Order gene trap Brca1Gt(IST10084G10)Tigm gene trap IST10084G10, Texas A&M Institute for Genomic Medicine Brca1 breast cancer 1 unclassified
? C57BL/6N-Brca1Gt(IST11191E8)Tigm ES Cell TIGM Order gene trap Brca1Gt(IST11191E8)Tigm gene trap IST11191E8, Texas A&M Institute for Genomic Medicine Brca1 breast cancer 1 unclassified
? C57BL/6N-Brca1Gt(IST11203D8)Tigm ES Cell TIGM Order gene trap Brca1Gt(IST11203D8)Tigm gene trap IST11203D8, Texas A&M Institute for Genomic Medicine Brca1 breast cancer 1 unclassified
? C57BL/6N- ES Cell TIGM Brca1Gt(IST11212E11)Tigm Brca1 unclassified

2 item(s) match after applying filter(s).

Summary

Search for: brca1 Search Reset Show Options

You searched for:

Query: brca1

125 strains(s) match your unfiltered search.

Filters: Remove All Filters | State: embryo | State: sperm | Provider: EM | Provider: JAX

2 item(s) match after applying filter(s).

<< first < prev 1 next > last >> 25

Showing items 1 - 2 of 2

N	Strain Name	Synonyms	States	Repository	Mutation Types	Alleles	Genes	Strain Types
+	FVB.129P2-Brca1^{tm1Brn}/Cnrm	FVB.129P2-Brca1^{tm1Brn}/Ibcm,FVB.Cg-Brca1^{tm1Brn}/Ibcm,Br1F	embryo	EM Order	targeted mutation	Brca1^{tm1Brn} targeted mutation 1, Anton Berns	Brca1 breast cancer 1	mutant strain
+	STOCK Brca1^{tm1Aash}/J		embryo	JAX Order	targeted mutation	Brca1^{tm1Aash} targeted mutation 1, Alan Ashworth	Brca1 breast cancer 1	mutant stock

Strain -> repository page

Email + Order link

Allele/phenotype (MGI)

Gene page (MGI)

IMSR – going forward:

- infrastructure upgrade -> re-implement in PostgreSQL
- gene & allele search improvements
- follow-up with registered/not-submitted repositories
- ability to search MGI from within IMSR

Recent features Added to MGI

1. Re-designed phenotype data representation to integrate high-throughput phenotyping & multiple sites; prototype for anticipated IMPC data.

2. New for Cre Portal www.creportal.org
    - Matrix summary for cre tissue activity
    - Migrated to use EMAPA for tissue terms

3. New Human-Mouse Disease Connection (HMDC) Beta
    www.diseasemodels.org

4. Coming (May 22 release)
    - Re-implementation of allele categories
        - Allele generation type
        - Allele effect
        - Allele collections

Integrating high-throughput phenotype data with published and/or individual lab or consortium-submitted data.

MGI has integrated high-throughput phenotype data from the Wellcome Trust Sanger Institute (WTSI) and Europhenome (EuPh) and redesigned its web inteface for Allele detail.

- Allows comparison between different Center's data interpretation, where data are from the same genotypes/mice.

- Model built in anticipation of data being available from the phenotyping centers of the IMPC.

Implemented a Derivative Allele Load to assign 'tm1b' and other derivative alleles from the IMPC project and provide MGI_IDs and nomenclature to iMits

Spns2$^{tm1a(KOMP)Wtsi}$

Targeted Allele Detail

Your Input Welcome

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

Nomenclature

Symbol:	Spns2$^{tm1a(KOMP)Wtsi}$
Name:	spinster homolog 2; targeted mutation 1a, Wellcome Trust Sanger Institute
MGI ID:	MGI:4460276
Gene:	Spns2 *Location:* Chr11:72451638-72489904 bp, - strand *Genetic Position:* Chr11, 44.31 cM

Mutation origin

Mutant Cell Lines:	**EPD0090_5_A05, EPD0090_5_B04, EPD0090_5_C04, EPD0090_5_D06, EPD0090_5_E04, EPD0090_5_E05, EPD0090_5_E06, EPD0090_5_F04, EPD0090_5_F05, EPD0090_5_G04** (Wellcome Trust Sanger Institute)
Germline Transmission:	Earliest citation of germline transmission: J:188933
Parent Cell Line:	JM8.N19 (ES Cell)
Strain of Origin:	C57BL/6N

Mutation description

Allele Type:	Targeted (Floxed/Frt)
Mutation:	Insertion *Vector:* L1L2_Bact_P

▶ Mutation details

Phenotypes

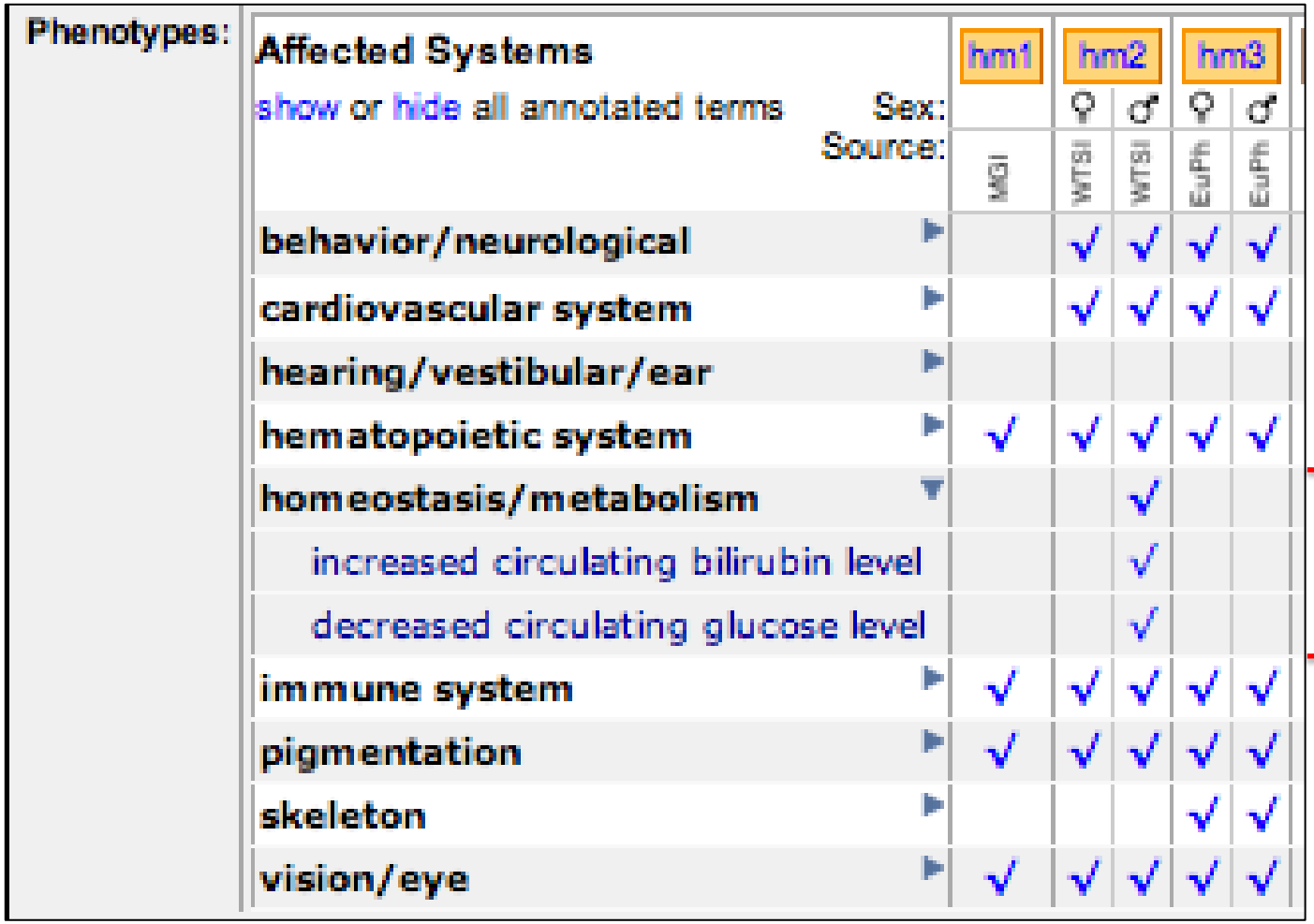
Key:	hm	homozygous	ht	heterozygous	tg	involves transgenes	√	phenotype observed
	cn	conditional genotype	cx	complex: > 1 genome feature	ot	other: hemizygous, indeterminate,...	N	normal phenotype

Genotypes:

Genotype	Allelic Composition	Genetic Background	Cell Line(s)
hm1	Spns2$^{tm1a(KOMP)Wtsi}$/Spns2$^{tm1a(KOMP)Wtsi}$	C57BL/6-Spns2$^{tm1a(KOMP)Wtsi}$	EPD0090_5_B04
hm2	Spns2$^{tm1a(KOMP)Wtsi}$/Spns2$^{tm1a(KOMP)Wtsi}$	Not Specified	EPD0090_5_B04
hm3	Spns2$^{tm1a(KOMP)Wtsi}$/Spns2$^{tm1a(KOMP)Wtsi}$	Not Specified	
ot4	Spns2$^{tm1a(KOMP)Wtsi}$/?	Not Specified	EPD0090_5_B04

Phenotypes:

Affected Systems (show or hide all annotated terms)	hm1	hm2 ♀	hm2 ♂	hm3 ♀	hm3 ♂	ot4
Source:	MGI	WTSI	WTSI	EuPh	EuPh	WTSI
behavior/neurological ▶		√	√	√	√	
cardiovascular system ▶		√	√	√	√	
hearing/vestibular/ear ▶						√
hematopoietic system ▶	√	√	√	√	√	
homeostasis/metabolism ▼			√			
increased circulating bilirubin level			√			
decreased circulating glucose level			√			
immune system ▶	√	√	√	√	√	
pigmentation ▶	√	√	√	√	√	
skeleton ▶				√	√	√
vision/eye ▶	√	√	√	√	√	√



Homeostasis / metabolism phenotypes only scored as significant by Sanger; not Europhenome

Cre Portal Enhancements

www.creportal.org & linked from the MGI homepage

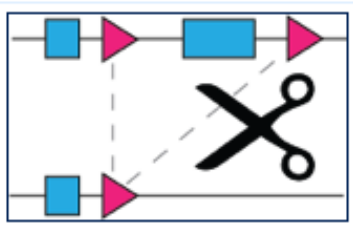
1. Searches for recombinase activity now provide autocomplete function for choosing tissue terms from EMAPA (release May 22)

1. The recombinase allele detail pages show a summary matrix of age and structure where activity was detected/not detected

1. Your Observations Welcome button allows the community to report unexpected findings, e.g. unpublished off-target activity

Recombinase (cre) Activity

MGI collects and annotates expression and activity data for recombinase-containing transgenes and knock-in alleles.



Access Data

FIND RECOMBINASE-CARRYING ALLELES

Search for alleles assayed for specificity/activity in an anatomical structure.

Recombinase activity in:

left atri **Go**

- left atrium
- left atrium auricular region
- left atrium cardiac muscle
- left atrium endocardial lining
- left atrium lumen
- left atrium auricular region cardiac muscle
- left atrium auricular region endocardial lining
- common atrial chamber left part
- common atrial chamber left part cardiac jelly
- common atrial chamber left part cardiac muscle
- common atrial chamber left part endocardial lining

Search for

RETRIEVE

FAQs

How do I...

.. find existing recombinase-expressing transgenes and knock-ins that have a given promoter (driver)?
FAQ

More FAQs
Cre Portal Tuto

Autocomplete terms using EMAPA

Bold emphasis on searched anatomical system

* Release May 22

Recombinase Alleles - Tissue Summary

You searched for:
Activity assayed in **left atrium cardiac muscle** includes synonyms & substructures
System(s) in bold contain matching search terms.
Click column headings to sort table data.

Driver	Allele Symbol Gene; Allele Name	Recombinase Activity Detected	Recombinase Activity Not Detected	Allele Synonym	Inducible	Find Mice (IMSR)	Refs
Myh6	Tg(Myh6-cre)2182Mds transgene insertion 2182, Michael D Schneider	alimentary system, **cardiovascular system**, hemolymphoid system, renal and urinary system, reproductive system, respiratory system	limbs, liver and biliary system	MCH-cre, MHC-Cre, MHCalphaCre, MHCcre, Tg(Myhca-cre)2182Mds, alpha-MHC-Cre+, alphaMhc-Cre, alphaMyHC-Cre		3	170
Wt1	Wt1tm2(cre/ERT2)Wtp Wilms tumor 1 homolog; targeted mutation 2, William T Pu	**cardiovascular system**, cavities and their linings		Wt1CreERT2, Wt1iCre (i represents inducible), Wt1tm2(cre/ESR1)Wtp	Yes	1	16

Cre Transgene Detail showing matrix summary of Acivity in Tissue Systems x Age

Tg(Myh6-cre)2182Mds

Transgene Detail

Your Input Welcome

Nomenclature | Transgene origin | Transgene description | Recombinase activity | Phenotypes | Disease models | Find Mice (IMSR) | Referen

Nomenclature

Symbol:	**Tg(Myh6-cre)2182Mds**
Name:	transgene insertion 2182, Michael D Schneider
MGI ID:	MGI:2386742
Synonyms:	alphaMhc-Cre, alpha-MHC-Cre^{+}, alphaMyHC-Cre, MCH-cre, MHCalphaCre, MHCcre, MHC-Cre, Tg(Myhca-cre)2182Mds
Transgene:	Tg(Myh6-cre)2182Mds *Location:* unknown

Transgene origin

Strain of Origin: FVB/N

Transgene description

Transgene Type: Transgenic (Recombinase)

Mutation: Insertion

▶ Mutation details

Recombinase activity

Activity:

Activity in Systems/Structures (show or hide all structures)	E 0-8.9	E 9.0-13.9	E 14-19.5	P 0-21	Post-weaning P 22-42	Adult >P 43	Images
alimentary system ▶				√		√	√
cardiovascular system ▶	√	√	√	√	√	√	√
hemolymphoid system ▶				√	-		√
limbs ▶					-		√
liver and biliary system ▶					-		√
renal and urinary system ▶				√		√	√
reproductive system ▶						√	√
respiratory system ▶				√	-	√	√

√ Activity Detected - Activity Not Detected

Driver: Myh6 Summary of all recombinase alleles driven by Myh6.

Your Observations Welcome

Tg(Myh6-cre)2182Mds - Cardiovascular System

Recombinase Activity Detail

Allele Information

Allele: **Tg(Myh6-cre)2182Mds**
transgene insertion 2182, Michael D Schneider

Driver: Myh6
Type: Transgenic (Recombinase)

Synonym: alphaMhc-Cre, alpha-MHC-Cre^{+}, alphaMyHC-Cre, MCH-cre, MHCalphaCre, MHCcre, MHC-Cre, Tg(Myhca-cre)2182Mds

Molecular description: The transgenic construct contained the Myh7 3' untranslated region, the Myhca promoter, Myhca noncoding exons 1 and 2 driving the expression of the cre recombinase sequence. The Myhca promoter drives expression in cardiac tissue.

Find mice (IMSR): Mouse Strains: 3 strains available Cell Lines: 0 lines available

Additional Tissues: Tg(Myh6-cre)2182Mds activity also observed in:
alimentary system, hemolymphoid system, renal and urinary system, reproductive system, respiratory

Tissue Information

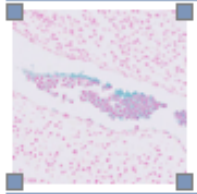
Cardiovascular System

Other recombinase alleles with activity in Cardiovascular System tissues:
▶ 1700009P17Rik$^{tm1.1(icre)Heli}$, Calb2$^{tm1(cre)Zjh}$, Cck$^{tm1.1(cre)Zjh}$, Crh$^{tm1(cre)Zjh}$ ...(more)

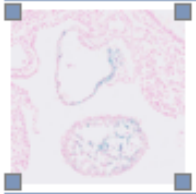
Images

Drag images to compare to others or to data in the table below. Drag corners to resize images for more detail. **Reset Images**

J:193672 Full image
Fig. Myh6 Dorsal Aorta E10.5



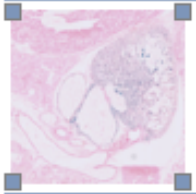
J:193672 Full Image
Fig. Myh6 Heart 1 E10.5



J:193672 Full Image
Fig. Myh6 Heart 1 E15.5

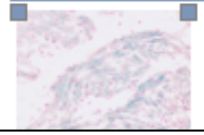
J:193672 Full image
Fig. Myh6 Heart 2 E10.5

J:193672 Full image
Fig. Myh6 Heart 2 E15.5



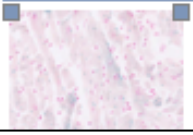
J:193672 Full image
Fig. Myh6 Heart 3 E10.5

J:193672 Full image
Fig. Myh6 Heart Atrium P56

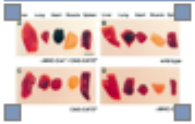


J:193672 Fig. Myh6 Heart P7

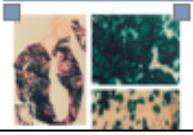
J:193672 Full image
Fig. Myh6 Heart Ventricle P56



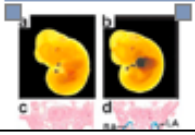
J:67908 Fig. 3



J:67908 Fig. 4



J:75084 Fig. 1



Human-Mouse Disease Connection

www.diseasemodels.org

Beta version released

Search by: human or mouse gene
human or mouse genome location
phenotype or disease term
submitted VCF file

Provide overview of human/mouse data incorporating phenotypes and disease

- Grid overview
- Gene-based Summary
- Disease-based Summary

Drill down to

- Genotypes (allele composition) profile of phenotypes → detailed pheno data
- Links to IMSR

Human ⟷ Mouse: Disease Connection

Relating human diseases and mouse models

Search by genes

Search by genome locations
Human(GRCh38) Mouse(GRCm38)

Search by disease or phenotype terms

Ex: Bmp4, Pax*, NM_013627

Enter symbols, names or IDs.
Use * for wildcard.

Ex: Chr12:3000000-10000000

Need to convert genome build?
Use this converter tool.

Ex: diabetes, 105830

Select from autocomplete or continue typing. Use quotes for exact match.

Upload Genes File (.txt): Choose File no file selected

GO

Reset

Upload a VCF File: Choose File no file selected

Apply filters
Human(GRCh38) Mouse(GRCm38)

BETA

Take a tour of the
Human-Mouse: Disease Connection

Introduction to
Mouse Genetics

Glossary of Terms

Spotlight on mouse models of human disease

Human T-Cell Immunodeficiency, Congenital Alopecia, and Nail Dystrophy (OMIM: 601705)

Humans and mice homozygous for recessive mutations in the FOXN1 (forkhead box N1) gene display common phenotypes:

- congenital alopecia
- absent thymus
- severe T-cell immunodeficiency
- nail dystrophy
- limited lifespan

[Read more...]

Click to modify search

Results

You searched for:

Phenotypes or Diseases matching [**105830(Angelman Syndrome; AS),**]

<< first < prev **1** next > last >> 250

Showing results(s) 1 - 4 of 4

Gene Homologs x Phenotypes/Diseases | Genes (5) | Diseases (1)

Legend: - Terms are annotated to genes in **human**/**mouse**. Darker colors indicate more annotations.

N - No abnormal phenotype observed.

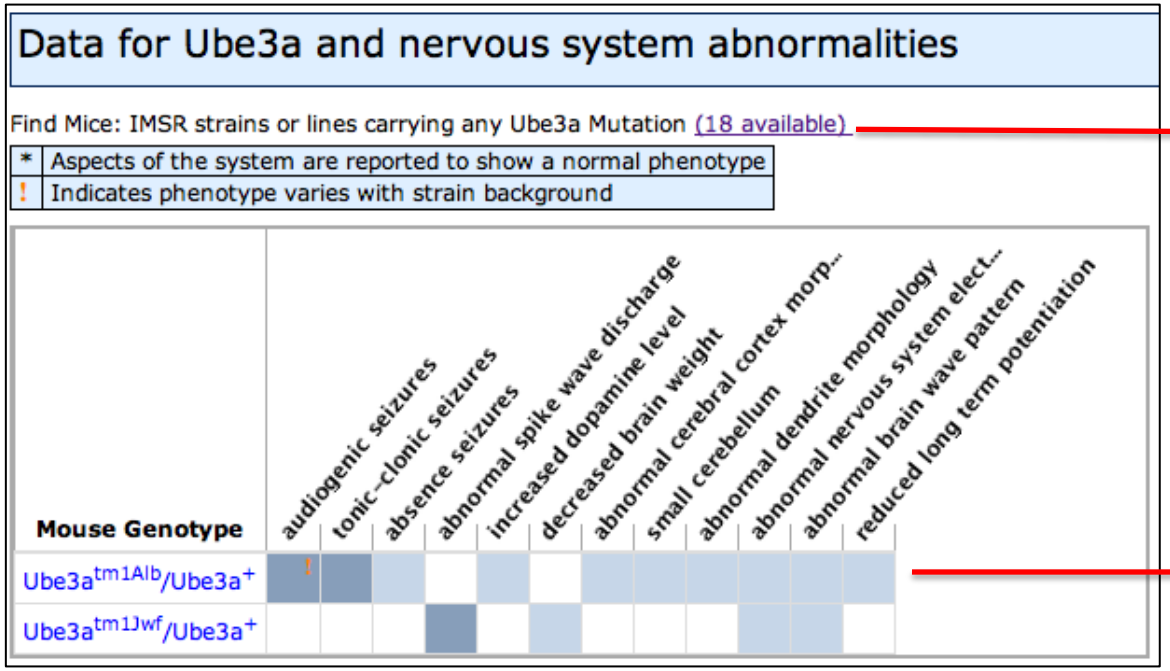
NOTE: Searching by phenotype/disease term restricts the gene results based on the search term. Search by gene or genome location for the complete phenotype profile of gene mutations. More..

Apply Filters: Retain selected col/rows

Human Gene	Mouse Gene	adipose tissue	behavior/neurological	cellular	growth/size	homeostasis/metabolism	mortality/aging	nervous system	reproductive system	Angelman Syndrome; AS	Prader-Willi Syndrome; PWS
SNRPN	Snrpn							N			
UBE3A	Ube3a										
CDKL5	Cdkl5										
MECP2	Mecp2										

<< first < prev **1** next > last >> 250

Showing results(s) 1 - 4 of 4



Link to IMSR page displaying 18 available resources carrying *Ube3a* mutations

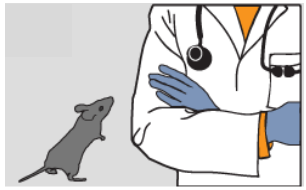
Link to MGI detailed phenotype descriptions for *Ube3a*^{tm1Alb}*/Ube3a+* heterozygotes.

MGI– going forward:

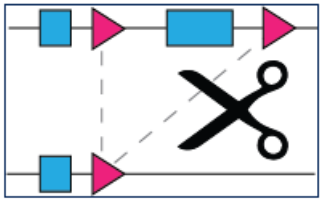
- Further development of the Human-Mouse Disease Connection site
  - human phenotypes from HPO
  - synteny map displays for regions
  - more data filtering options (e.g. types of loci, delete/retain grid columns/rows)
  - accept additional file input formats
  - for VCF files, return file annotated with identified genes+
  - enhance Boolean search capabilities
- Incorporate IMPC data (awaiting IMPC release)
- 'Relationship' project
  - microRNA targets (experimental and predicted)
  - genomic content of cluster regions
  - 'genomic mutation' content

IMSR : International Mouse Strain Resources
www.findmice.org

MGI: Mouse Genome Informatics
www.informatics.jax.org



HMDC: Human-Mouse Disease Connection
www.mousemodels.org



CrePortal:
www.creportal.org