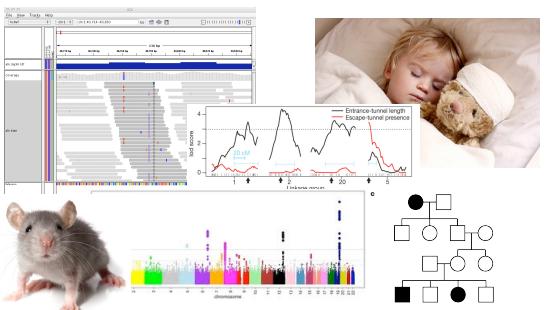




## The Human-Mouse: Disease Connection in MGI

Short Course Bioinformatics Workshops  
July 2014

### Connecting Mouse Models to Human Disease

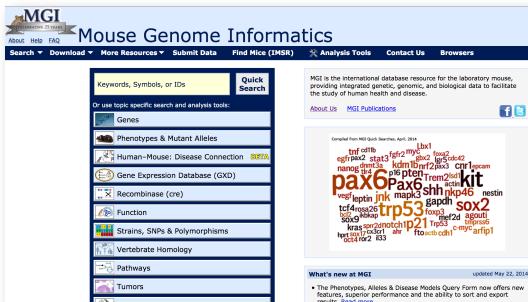


### HMDc in a Nutshell



- Search for mouse models by
  - gene symbol (mouse or human)
  - exome results (VCF file)
  - genome locations
  - key words
- Quick access to phenotype and disease annotations, references, mouse model availability

### Mouse Genome Informatics



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

**Human-Mouse: Disease Connection**

Relating human diseases and mouse models

**Search by genes**

Search by genome locations

Search by disease or phenotype terms

Upload a VCF File

**Spotlight on mouse models of human disease**

Human T-Cell Immunodeficiency, Congenital Alopecia, and Nail dystrophy (OMIM: 601703)

Introduction to Mouse Genetics

Glossary of Terms

## Search by Gene Symbol

**Search by genes**

Gja8  
Mapk10  
Rspn9  
Il20ra  
Jak3  
Frg1

**Search by genome locations**

Ex: Chr12:30000000-100000000

Need to convert genome build? Use this [converter tool](#).

**Search by disease or phenotype terms**

Ex: diabetes, 105830

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

GO  
Reset  
BETA

## View associated gene, phenotype and disease results

Gene Homologs x Phenotypes/Diseases

Genes (21) Diseases (5)

Legend: █ - Terms are annotated to genes in **human**. 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...](#)

|            |            | Mammalian (mouse) Phenotypes |                |          |            |           |        |           |              |              |      | Human disease (OMIM) |       |     |         |           |           |        |           |              |
|------------|------------|------------------------------|----------------|----------|------------|-----------|--------|-----------|--------------|--------------|------|----------------------|-------|-----|---------|-----------|-----------|--------|-----------|--------------|
|            |            | behavioral                   | cardiovascular | cellular | depressive | digestive | immune | metabolic | neurological | reproductive | skin | urinary              | blood | ear | central | digestive | endocrine | immune | metabolic | neurological |
| Human Gene | Mouse Gene | Gja8                         | █              | █        | █          | █         | █      | █         | █            | █            | █    | █                    | █     | █   | █       | █         | █         | █      | █         | █            |
|            |            | Il20ra                       | █              | █        | █          | █         | █      | █         | █            | █            | █    | █                    | █     | █   | █       | █         | █         | █      | █         | █            |
|            |            | Jak3                         | █              | █        | █          | █         | █      | █         | █            | █            | █    | █                    | █     | █   | █       | █         | █         | █      | █         | █            |
|            |            | Mapk10                       | █              | █        | █          | █         | █      | █         | █            | █            | █    | █                    | █     | █   | █       | █         | █         | █      | █         | █            |
|            |            | Frg1                         | █              | █        | █          | █         | █      | █         | █            | █            | █    | █                    | █     | █   | █       | █         | █         | █      | █         | █            |
|            |            | Rspn9                        | █              | █        | █          | █         | █      | █         | █            | █            | █    | █                    | █     | █   | █       | █         | █         | █      | █         | █            |
|            |            | Gja8                         | █              | █        | █          | █         | █      | █         | █            | █            | █    | █                    | █     | █   | █       | █         | █         | █      | █         | █            |
|            |            | Il20ra                       | █              | █        | █          | █         | █      | █         | █            | █            | █    | █                    | █     | █   | █       | █         | █         | █      | █         | █            |
|            |            | Jak3                         | █              | █        | █          | █         | █      | █         | █            | █            | █    | █                    | █     | █   | █       | █         | █         | █      | █         | █            |
|            |            | Mapk10                       | █              | █        | █          | █         | █      | █         | █            | █            | █    | █                    | █     | █   | █       | █         | █         | █      | █         | █            |

Aspects of the system are reported to show a normal phenotype  
Indicates phenotype varies with strain background

|            |            | Mouse Genotype    |                          |                                 |                                 |                                  |                                    |  |                                 |                                  |                         | Human Genotype          |                         |                         |                         |                         |                         |                         |                         |   |
|------------|------------|-------------------|--------------------------|---------------------------------|---------------------------------|----------------------------------|------------------------------------|--|---------------------------------|----------------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|---|
|            |            | abnormal behavior | abnormal cell morphology | decreased leukocyte cell number | increased leukocyte cell number | increased neutrophil cell number | abnormal dendritic cell morphology | increased dendritic cell differentiation | decreased lymphocyte morphology | decreased neutrophil cell number | decreased T cell number |   |
| Human Gene | Mouse Gene | Gja8              | █                        | █                               | █                               | █                                | █                                  | █  | █                               | █                                | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █                       |   |
|            |            | Il20ra            | █                        | █                               | █                               | █                                | █                                  | █  | █                               | █                                | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █ |
|            |            | Jak3              | █                        | █                               | █                               | █                                | █                                  | █  | █                               | █                                | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █ |
|            |            | Mapk10            | █                        | █                               | █                               | █                                | █                                  | █  | █                               | █                                | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █ |
|            |            | Frg1              | █                        | █                               | █                               | █                                | █                                  | █  | █                               | █                                | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █ |
|            |            | Rspn9             | █                        | █                               | █                               | █                                | █                                  | █  | █                               | █                                | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █ |
|            |            | Gja8              | █                        | █                               | █                               | █                                | █                                  | █  | █                               | █                                | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █ |
|            |            | Il20ra            | █                        | █                               | █                               | █                                | █                                  | █  | █                               | █                                | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █ |
|            |            | Jak3              | █                        | █                               | █                               | █                                | █                                  | █  | █                               | █                                | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █ |
|            |            | Mapk10            | █                        | █                               | █                               | █                                | █                                  | █  | █                               | █                                | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █                       | █ |

### Disease associations

**Data for GJA8, Gja8 and Cataract**

| Mouse Genotype                                   | Cataract, Multiple Types, C- |
|--|------------------------------|
| Gja8 <sup>No2</sup> /Gja8 <sup>No2</sup>         |                              |
| Gja8 <sup>R205G</sup> /Gja8 <sup>R205G</sup>     |                              |
| Gja8 <sup>tm1Paul</sup> /Gja8 <sup>tm1Paul</sup> |                              |
| Gja8 <sup>No2</sup> /Gja8 <sup>+</sup>           |                              |
| <b>Human Gene</b>                                |                              |
| <b>GJA8</b>                                      |                              |

**Gene Homologs x Phenotypes/Diseases** [Genes (21) | Diseases (5)]

**Legend:** N - Term is annotated to genes in human/mouse. Darker colors indicate more annotations.

**NOTE:** Searching by phenotype/disease term restricts the gene results based on the search term. Search by gene or genomic location for the complete phenotype profile of gene mutations. [More...](#)

**Apply Filters: Retain selected columns**

| Human Gene | Mouse Gene | Behavior/mentality     | Cardiovascular system | Digestive system | Endocrine system | Genitourinary system | Immune system | Integumentary system | Musculoskeletal system | Neurological system | Respiratory system | Stomach | Urinary system | Cataract | Ciliary Dyskinesia, Primary | Fascioscapulohumeral Muscular Dystrophy | Severe Combined Immunodeficiency |
|------------|------------|------------------------|-----------------------|------------------|------------------|----------------------|---------------|----------------------|------------------------|---------------------|--------------------|---------|----------------|----------|-----------------------------|---|----------------------------------|
| GJA8       | Gja8       | N                      | N                     | N                | N                | N                    | N             | N                    | N                      | N                   | N                  | N       | N              | N        | N                           | N                                       | N                                |
| IL20RA     | I20ra      |                        |                       |                  |                  |                      |               |                      |                        |                     |                    |         |                |          |                             |   |                                  |
| JAK3       | Jak3       |                        |                       |                  |                  |                      |               |                      |                        |                     |                    |         |                |          |                             |   |                                  |
| MAPK10     | Mapk10     | Tg(ACTA1-Frg1)highReto |                       |                  |                  |                      |               |                      |                        |                     |                    |         |                |          |                             |   |                                  |
|            |            | Tg(ACTA1-Frg1)lowReto  |                       |                  |                  |                      |               |                      |                        |                     |                    |         |                |          |                             |   |                                  |
|            |            | Tg(ACTA1-Frg1)medReto  |                       |                  |                  |                      |               |                      |                        |                     |                    |         |                |          |                             |   |                                  |
| FRG1       | Frg1       |                        |                       |                  |                  |                      |               |                      |                        |                     |                    |         |                |          |                             |   |                                  |
| RSPH9      | Rspf9      |                        |                       |                  |                  |                      |               |                      |                        |                     |                    |         |                |          |                             |   |                                  |

### Tabs for Genes & Diseases information

**Click to modify search**

**Results**  
You searched for:  
Genes matching [Gja8 Mapk10 Rspf9 Il20ra Frg1 Jak3]

**Gene Homologs x Phenotypes/Diseases** [Genes (21) | Diseases (5)]

5

6

### IMSR = International Mouse Strain Resource

[International Mouse Strain Resource \(IMSR\)](#)

Search for:  Search Reset Show Options

You searched for: [ES Cell, embryo, live, ovaries, sperm]  
Showing items 1 - 5 of 5

| N | Strain Name           | Synonyms                                 | Status | Repository | Mutation Types    | Alleles            | Genes              | Strain Types  |
|---|-----------------------|--|--------|------------|-------------------|--------------------|--------------------|---------------|
| ? | CTRC1LW <sup>ES</sup> | A-Frg1 <sup>ES</sup> /GJab <sup>ES</sup> | WT1    | ES Cell    | targeted mutation | Frg1 <sup>ES</sup> | Frg1 <sup>ES</sup> | mutant strain |
| ? | CTRC1LW <sup>ES</sup> | A-Frg1 <sup>ES</sup> /GJab <sup>ES</sup> | WT1    | ES Cell    | targeted mutation | Frg1 <sup>ES</sup> | Frg1 <sup>ES</sup> | mutant strain |
| ? | CTRC1LW <sup>ES</sup> | A-Frg1 <sup>ES</sup> /GJab <sup>ES</sup> | TGIM   | ES Cell    | gene trap         | Frg1 <sup>ES</sup> | Frg1 <sup>ES</sup> | unclassified  |
| ? | SGTR ES cell line     | SGTR ES cell line                        | MWRC   | ES Cell    | gene trap         | Frg1 <sup>ES</sup> | Frg1 <sup>ES</sup> | unclassified  |
| ? | SGTR ES cell line     | SGTR ES cell line                        | MWRC   | ES Cell    | gene trap         | Frg1 <sup>ES</sup> | Frg1 <sup>ES</sup> | unclassified  |

[www.findmice.org](http://www.findmice.org)

### Human Disease and Mouse Model Detail

Human Disease: Cataract 1, Multiple Types; CTRCT1  
OMIM ID: 116200

Synonyms: Cataract; Cataract 1, Multiple Types, with or without Microcornea; Cataract, Duffy-Linked; Cataract, Zonular Pulverulent, 1; CZP1; C2P1; CAEL

View all mouse models: View ALL (4) mouse models for this human disease.

Gene and mouse models: Mutations in human and/or mouse homologs are associated with this disease

Gene: Gja8\* is associated with the disease in this species  
 Mouse Homologs | Human Homologs | Mouse Models | Mouse : Human Homology Class

References: Disease References using Mouse Models (1)

In this case both the mouse gene and human ortholog are associated with the Cataract 1 disease.

### Diseases tab: Disease and mouse model details

[Gene Homologs x Phenotypes/Diseases](#) [Genes \(21\)](#) [Diseases \(5\)](#)

Export: Text File

| Disease   | OMIM ID | Mouse Models | Associated Mouse Genes  | Associated Human Genes | References using Mouse Models |
|---|---------|--------------|---|------------------------|-------------------------------|
| Cataract 1, Multiple Types; CTRCT1  | 116200  | 4            | Gja8  | GJA8                   | <a href="#">3</a>             |
| Ciliopathy, Primary, 13   | 612650  |              |   | RSPH9                  |                               |
| Fasciculohumeral Muscular Dystrophy 1; FSHD1  | 158900  | 3            | Large, Tg(ACTA1-Frg1)highRot, Tg(ACTA1-Frg1)medRot, Tg(Dux4)-#Tap | DUX4, FRG1, FSHMD1A    | <a href="#">4</a>             |
| Severe Combined Immunodeficiency, Autosomal Recessive, T Cell-Negative, B Cell-Positive, NK Cell-Negative | 600802  |              |   | JAK3                   |                               |
| Severe Combined Immunodeficiency, Autosomal Recessive, T Cell-Negative, B Cell-Positive, NK Cell-Positive | 608971  | 6            | Coro1a, Jak3  | IL7R, PTPRC            | <a href="#">3</a>             |

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

Showing results(s) 1 - 5 of 5

### Human Disease and Mouse Model Detail

Human Disease: Severe Combined Immunodeficiency, Autosomal Recessive, T Cell-Negative, B Cell-Positive, NK Cell-Positive  
OMIM ID: 608971

Synonyms: SCID, Autosomal Recessive, T Cell-Negative, B Cell-Positive, NK Cell-Positive; Severe Combined Immunodeficiency

View all mouse models: View ALL (6) mouse models for this human disease.

Gene and mouse models: Mutations in human and/or mouse homologs are associated with this disease

Gene: \*Gene is associated with the disease in this species  
 Mouse Homologs | Human Homologs | Mouse Models | Mouse : Human Homology Class

Coro1a\* CORO1A View 4 models 1:1 Homology  
 Jak3\* JAK3 View 2 models 1:1 Homology  
 IL7r\* IL7R View 1 models 1:1 Homology  
 Ptprc PTPRC View 1 models 1:1 Homology

In this case different mouse and human genes are associated with the disease.

### Search by genes in VCF files

**Search by genes**

Ex: Bmp4, Pax\*, NM\_013627

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

Upload Genes File (.txt):  No file selected.

**Search by genome locations**

Human(GRCh38)  Mouse(GRCm38)

**Search by disease or phenotype terms**

 Processing file and caching data matches. Please wait.

complete or continue for exact match.

**GO** **Reset** **BETA**

An example vcf file is available on the github site

**Results**

You searched for: Human locations matching [file=Pfeiffer.vcf]

Gene Homologs x Phenotype/Diseases | Genes (1741) | Diseases (263)

Legend: Terms are annotated to genes in Human Disease colors indicate more annotation.

NOTE: Search by gene or phenotype 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...](#)

| Human Gene | Mouse Gene | Phenotype/Disease |
|------------|------------|-------------------|
| PCDH10     | PCDH10     |                   |
| RETN       | Retrn      | Rare              |
| UBXN4      | Ubxn4      | Ubiquitous        |
| CAZB2      | Cazb2      | Ubiquitous        |
| NBL1       | Nbl1       | NBL1              |
| EPFAC3     | Epfac3     |                   |
| D2Z2A1     | D2z2a1     |                   |

**Search by genes in VCF files**

Ex: Bmp4, Pax\*, NM\_013627

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

Upload Genes File (.txt):  No file selected.

**Search by genome locations**

Human(GRCh38)  Mouse(GRCm38)

**Search by disease or phenotype terms**

VCF file successfully processed.

- 2416 Coordinates Ignored
- 33923 Rows Ignored Due to Non-Empty ID Column
- 0 Rows Ignored Due to FILTER Other Than 'PASS'
- 1634 Genes Matched On Mouse Genome
- 1741 Genes Matched On Human Genome

5830

complete or continue for exact match.

**GO** **Reset** **BETA**

Please verify your organism selection before hitting "GO".

### Search terms can be combined

**Search by genome locations**

Human(GRCh37)  Mouse(GRCm38)

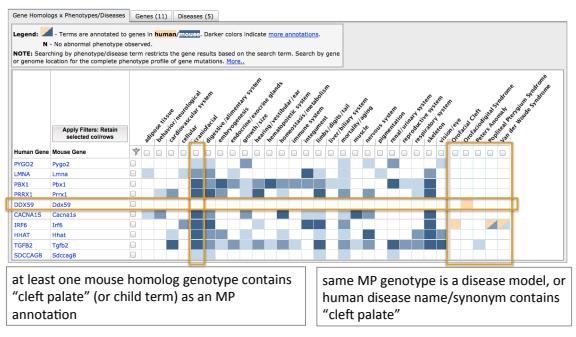
Chr1:150000000-250000000

**Search by disease or phenotype terms**

type "cleft palate" (matches whole)  
or  
type cleft palate (matches as two terms)  
or select  
cleft palate Mammalian phenotype  
or select

Cleft Palate; CP [Cleft palate isolated, CPI] OMIM

## Results for a search by both genome region and key word



## Your Turn !

- Use the HMDC for a disease, gene, or phenotype you are interested in or have heard about at the Short Course
    - There are also example VCF files available on the github site

## Summary

- The Human-Mouse: Disease Connection supports rapid access to disease and phenotype associations
  - The HMDC is in Beta release
    - contact [mgi-help@jax.org](mailto:mgi-help@jax.org) with questions and suggestions