LAMHDI: The Initiative to Link Animal Models to Human Disease

NCRR Resource Directors’ Meeting
May 11, 2010
Phase 1

In Phase I LAMHDi is designed to answer two questions:

- What models might be appropriate for my human disease research?
- Where do I find them?
Elements

One site to search them all

- Single search across all known animal model databases
  - Focus first on zebrafish, mice, rats, yeast, NHP
  - Add fly, worm, rabbits, horses...
- Mimic humans: search related databases to fill in missing data
  - OMIM, NCBI, Homologene, WikiPathways, NIF ontologies and terminologies, PubMed...

Engage research communities

- Define and populate new databases
- Share information
  - Wiki, forum, mailing list, and other collaboration tools
PubMed-Style Searching

LAMHDI

THE SEARCH FOR ANIMAL MODELS STARTS HERE

LAMHDI Database Search  Animal Model Web Search  Featured Resources

Search History

Advanced Search Options

Search for database records that include...

☑ All of these (AND)  ☐ Any of these (OR)

Species
Disease
Model
Gene
Related Genes

You can also...

Select number of results per page: 10
Select maximum hop count: Automatic

Advanced Search
Database Search

Search Results 1 - 10 of 804 for rheumatoid arthritis

<table>
<thead>
<tr>
<th>Hops</th>
<th>Animal</th>
<th>Disease</th>
<th>Model ID</th>
<th>Further Information</th>
<th>Access Animal Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mouse</td>
<td>106300 SPONDYLOARTHROPATHY, SUSCEPTIBILITY TO, 1; SPORA1</td>
<td>Eppos1/Eppos1Ew</td>
<td>Human Disease and Mouse Model Detail</td>
<td>Search for Strains Carrying Eppos1Ew</td>
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<tr>
<td></td>
<td>Mouse</td>
<td>180300 RHEUMATOID ARTHRITIS, RA</td>
<td>Dose2x58/xN0962x58</td>
<td>Human Disease and Mouse Model Detail</td>
<td>Search for Strains Carrying Dose2x58/xN0962x58</td>
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<tr>
<td></td>
<td>Mouse</td>
<td>200409 ACHALASIA, FAMILIAL</td>
<td>Nsp1n1x1/Nsp1n1x1</td>
<td>Human Disease and Mouse Model Detail</td>
<td>Search for Strains Carrying Nsp1n1x1/Nsp1n1x1</td>
</tr>
<tr>
<td></td>
<td>Mouse</td>
<td>270159 SJOGREN SYNDROME</td>
<td>Nsp3x14x1/Nsp3x14x1</td>
<td>Human Disease and Mouse Model Detail</td>
<td>Search for Strains Carrying Nsp3x14x1/Nsp3x14x1</td>
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<tr>
<td></td>
<td>Mouse</td>
<td>270159 SJOGREN SYNDROME</td>
<td>Tg(Tnfα13b)1Fma/6</td>
<td>Human Disease and Mouse Model Detail</td>
<td>Search for Strains Carrying Tg(Tnfα13b)1Fma</td>
</tr>
</tbody>
</table>
Click Through to MGI
## Search Traceability

**LAMHDI**

**The Search for Animal Models Starts Here**

### Search Results 1 - 10 of 107 for mycobacterium

<table>
<thead>
<tr>
<th>Hops</th>
<th>Animal</th>
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<th>Model ID</th>
<th>Further Information</th>
<th>Access Animal Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Mouse</td>
<td>#607948 MYCOBACTERIUM TUBERCULOSIS, SUSCEPTIBILITY TO MYCOBACTERIUM TUBERCULOSIS, PROTECTION AGAINST, INCLUDED</td>
<td>Grp12 Jm1Jm1 Jm1 Jm1 Jm1 Jm1 6.129P2-Gpr12</td>
<td>Human Disease and Mouse Model Detail</td>
<td>Search for Strains Carrying Grp12 Jm1Jm1 Jm1 Jm1 Jm1 Jm1 6.129P2-Gpr12</td>
</tr>
<tr>
<td>3</td>
<td>Rat</td>
<td>#607948 MYCOBACTERIUM TUBERCULOSIS, SUSCEPTIBILITY TO MYCOBACTERIUM TUBERCULOSIS, PROTECTION AGAINST, INCLUDED</td>
<td>Wag/RijCmr</td>
<td>Substrain of WAG/Rij, separated from the Rijswijk colony in about 1975, now maintained at Medical College of Wisconsin</td>
<td>Center for Medical Countermeasures Against Radiological Terrorism, Medical College of Wisconsin</td>
</tr>
</tbody>
</table>

**Disease:**

#607948 MYCOBACTERIUM TUBERCULOSIS, SUSCEPTIBILITY TO MYCOBACTERIUM TUBERCULOSIS, PROTECTION AGAINST, INCLUDED

- **Human Gene:** CCL2
- **Related Genes (Cross-Species):**
  - D011654: Pulmonary Edema
- **Rat Model:** Wag/RijCmr

**Human Disease and Mouse Model Detail**

http://www.infoinfarojax.org/jawad2/services/WIFetch?page=humanDisease&key=851736

**Search for Strains Carrying C011622**

http://www.finwave.org/finch?page=msrSummary&query=C011622%3C%3E&selectedQuery=Genes
Phase 2

Phase 2 LAMHDI will support histology:

- Generating and integrating interaction maps in and across model species
- Enabling scientists to interact with data through visualization instead of schematics and spreadsheets
Whole Zebrafish Catalog
Value Proposition

In Phase III of LAMHDI, researchers will be able to move in and out of the data cloudfield, allowing them to exploit and build on accumulated knowledge as they shortcut the path to discovery.
Working the Value Proposition

- **New features**
  - Linking to publications
  - Visual data for exploration and discovery
    - Disease-related gene-interaction maps
    - Show the same interactions in different models

- **More data**
  - Other animal models
  - Non-animal models (cells, simulations)
  - Reporting research outcomes (tangential, negative)

- **Outreach**
Goals

- **Support replacement, reduction, refinement, reuse**
  - What are the options?
  - What are the relationships?
  - How can we understand the data better?
  - How can we apply what we learned elsewhere?

- **Community control**
  - Find and integrate new and established databases
  - Share information about appropriateness of tools
    - Wiki, forum, mailing list, and other collaboration tools
    - Management through collaboration: what was your experience?
      - Negative results
      - Tangential outcomes
LAMHDII

Linking Animal Models to Human Disease

www.LAMHDI.org
Backup Slides
The Plan

- Base LAMHDI on existing data
  - Jackson Laboratories
  - Zebrafish Information Network
  - Rat Genome Database
  - Saccharomyces Genome Database
  - Primate data
  - Other databases
  - One-off models: hippopotamus, horse
Click Through to ZFIN

Gene Name: putative breast adenocarcinoma marker
Gene Symbol: bo2
Previous Names: wu:fl8h03, fl10d05(1), wu:fl10d05(1), zgc:55361(1)

<table>
<thead>
<tr>
<th>Gene Expression (current status)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directly submitted expression data:</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Wild Type Stages, Structures:
Zygote: 1-cell (0.00h-0.75h) to Hatching-Pec-fin (60.00h-72.00h)
unspecified

Curated microarray expression:
GEO (1), ZF-Espresso (1)

<table>
<thead>
<tr>
<th>MUTANTS AND TARGETED KNOCKDOWNS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mutant line(s): 2 genotypes (1 allele)</td>
</tr>
</tbody>
</table>

Phenotype: (current status)
Data: 1 figure(s) from Phenotype Annotation (1994-2006)

<table>
<thead>
<tr>
<th>Gene Products:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gene Ontology</td>
</tr>
<tr>
<td>Ontology</td>
</tr>
<tr>
<td>Biological Process</td>
</tr>
</tbody>
</table>
Standardize Existing Data

Insufficient information?

- Some databases do not contain human disease names at all
- Some databases do not standardize names of diseases or genes

Use the computer!

- OMIM, JAX, NIF’s NeuroLex, NCBI - disease ontologies
- WikiPathways - biologic pathways
- HomoloGene - homologs
Your search for rheumatoid arthritis returned 43 literature search results.

Search Results 1 - 10 of 43 for rheumatoid arthritis

1. Title  Type II collagen-induced arthritis in cynomolgous monkeys as an experimental model for rheumatoid arthritis in humans.

2. Author  Araki H / Terato K / Ita S / Fujimoto K / et al
   Title  An experimental model for human rheumatoid arthritis in Macaca fascicularis: Induction of arthritis by chick type-II collagen.

3. Author  Bakker NPM / van Erck MGM / Jonker M
   Title  Induction of experimental arthritis in rhesus monkeys: A comparison with human rheumatoid arthritis.

   Title  Inhibition of the development of collagen-induced arthritis in rhesus monkeys by a small molecular weight antagonist of COX.
   PubMed ID  15683002

5. Author  Mackay JMK / Sim AK / McCormick JN / Marmon BP / McCraw AP / Duthie IJR / Gardner DL
   Title  Aetiology of rheumatoid arthritis: An attempt to transmit an infective agent from patients with rheumatoid arthritis to baboons.
   PubMed ID  8892541

6. Author  Bakker NPM / van Erck MG / Zurcher C / Fauber P / Lemmens A / Hazenberg M / Bontrop RE / Jonker M
   Title  Experimental immune mediated arthritis in rhesus monkeys. A model for human rheumatoid arthritis?