# Exercises for Mouse Genome Informatics (MGI)
**(Version 3, 2008)**

# You can choose to do these using the questions as your only guide—or see the following pages for the step-by-step checklist to finding these answers.

**1.** Find receptor genes on mouse chromosome 1 which have been characterized as having a role in the diabetes phenotype.  Examine homologous genes in other mammalian species.  Find a protein sequence for this gene and obtain the FASTA format output.

*Skills:  Genes and Markers search with phenotypes, mammalian homology, obtaining protein sequences*

**2.** Can you find genes in the Patched family, which have SNPs in the coding region, and examine a selected SNP for its occurrence in many strains?

*Skills: Strains and Polymorphisms search, SNP function class selection, SNP details pages*

**3.** Use the Gene Expression Data query to identify genes involved in Notch binding, which have been detected in brain by in situ hybridization.  Find mutant mice which have been examined in this manner, and view the expression data images.

*Skills: Gene expression data query, output option changes, image viewing*

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**Mouse Genome Informatics Exercises, version 3.**
**Correspond to the data available in December 2008.**

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# Step-by-Step checklist/instructions for MGI exercises

**1. Find receptor genes on mouse chromosome 1 which have been characterized as having a role in the diabetes phenotype. Examine homologous genes in other mammalian species. Find a protein sequence for this gene and obtain the FASTA format output.**

| Step | Action | ✓ |
|------|--------|---|
| 1 | From the **MGI HomePage** (http://www.informatics.jax.org/), **click on the top menu labeled "Search".** | |
| 2 | From the Search menu, **click on the "Genes & Markers Query" item in the Genes group.** | |
| 3 | On the Genes and Markers Query Form page, you will make several selections for search options. First, **type "receptor" in the Genes/Marker Symbol/Name text box.** | |
| 4 | **Select chromosome 1** in the Map Position area. | |
| 5 | **Type "diabetes"** in the Mouse phenotypes and mouse models of human disease area. | |
| 6 | **Click the Search button** to run the query. | |
| 7 | From the results page, **click the link for Irs1**, the insulin receptor substrate 1 gene. | |
| 8 | Examine the Irs1 page. **In the Mammalian homology section, click the link for Mammalian Orthology.** You should see a new page with information about related genes in several species. | |
| 9 | **Use the Back button** to return to the Irs1 page. | |
| 10 | In the Sequences section, **click the link for All Sequences (23).** *Note: the number of sequences may change over time.* | |
| 11 | On the Mouse Sequences Summary Report, note that you can access DNA, RNA and protein (polypeptide) sequences. Scroll through the list of sequences and **click the checkbox next to the first polypeptide in the list.** | |
| 12 | At the bottom of the page, **ensure that the pulldown menu selection says "download in FASTA format".** | |
| 13 | **Click the Go button** beneath the menu. | |
| 14 | A new page will present the amino acid sequence for the selected protein. You could copy and paste this sequence into many analysis tools. | |
| 15 | **Use the back button to return to the Irs1 page. Click the MGI logo at the top left to return to the MGI homepage.** | |

**2) Can you find genes in the Patched family, which have SNPs in the coding region, and examine a selected SNP for its occurrence in many strains?**

| Step | Action | ✓ |
|------|--------|---|
| 1 | From the MGI homepage http://www.informatics.jax.org/, use the Search pulldown menu and **highlight the "Strains / SNPs" option.** | |
| 2 | From the Strains/SNPs menu option, **click the SNP Query menu item**. | |
| 3 | On the Mouse SNP Query Form page, we will make several selections in the next steps. Make sure you are following each one carefully to obtain the expected results. | |
| 4 | In the Strains and strain comparisons section, **select these strains** and **use the ADD >> button to move them to the Selected Strains box**:<br>• **C57BL/6J**<br>• **A/J**<br>• **FVB/NJ** | |
| 5 | **In the SNP attributes section select two options** in the dbSNP Function Class box:<br>• **Coding-NonSynonymous**<br>• **Coding-Synonymous** | |
| 6 | **In the Associated genes area, make these choices:**<br>• Pulldown menu: **begins**<br>• Text box: **patched**<br>• Search menu: **current symbols/names** | |
| 7 | Leave all other settings as default. **Click Search to run the query.** | |
| 8 | A new web page will launch that presents the results. How many genes are displayed? _____<br>*At this time, 4 genes are shown: Ptch1, Ptch2, Ptchd2, Ptchd3.* | |
| 9 | From the results list, **find the first SNP listed which shows data for all 3 strains**. *(Currently this is rs13477933 in Ptch2 but that may change over time).* From this row, **click the MGI SNP Detail link in the first column.** | |
| 10 | On the SNP detail page, are there other strains that carry either of these alleles?<br>*Yes, at this time 10 strains carry the T allele, and 38 carry the C allele.* | |
| 11 | **Click the link for MGI Home** at the top left of the MGI page to return to the homepage. | |

**3) Use the Gene Expression Data query to identify genes involved in Notch binding, which have been detected in brain by in situ hybridization.  Find mutant mice which have been examined in this manner, and view the expression data images.**

| Step | Action | ✔ |
|------|--------|---|
| 1 | From the MGI homepage http://www.informatics.jax.org/, **click the image labeled "Expression"** from the "Explore MGI" area. | |
| 2 | **Click the link for Gene Expression Data Query.** | |
| 3 | On the Gene Expression Data Query Form you will make several changes.  Follow the instructions to obtain the expected outcome. | |
| 4 | In the Gene Ontology classification section, **enter this text in the text box:**<br>• **notch binding** | |
| 5 | In the Expression area, **type "brain" in the Anatomical Structures section.** | |
| 6 | In the Assay type(s) area, **select RNA in situ**. | |
| 7 | **Click Search** to run the query. | |
| 8 | On the result page, determine how many genes meet these criteria. *(At this time there are 4 genes: Dll1, Dll3, Jag1 and Jag2).* | |
| 9 | From the results in this format it isn't clear where or when the expression is examined.  **Use the back button to return to the Query Form.** | |
| 10 | In the Sorting and output format area, **change the radio button near Return data type to: Assay Results.** | |
| 11 | **Click Search.** | |
| 12 | What is the earliest expression stage for Dll1?  _____ *(At this time it is embryonic day 8.0)* | |
| 13 | Is Dll1 detected in Presenilin 1 mutant mice (Psen1)? _____ *(Yes, we can see Dll1 detected in some Psen1 mutants.)* | |
| 14 | In the Psen1 mutant mice section ($Psen1^{tm1Shn}/Psen1^{+}$) click the link: **data** (MGI:1859916). | |
| 15 | On the Gene Expression Data Query Results -- Details page, **click the 6Aa link in the column with the camera icon** to view the data for:<br>• TS19: telencephalon; ventricular layer Figure 6Aa | |
| 16 | A new page should open with image data to show the results. | |