

Exercises for the UCSC Genome Browser: Additional Tools

1) Find genes that are predominately expressed in the mouse adrenal gland, determine the expression pattern of the human ortholog of one such gene and obtain the genomic sequence of the human gene.

Skills: basic text search; Gene Sorter menus and options; configure & filtering, connections between browsers, etc.

2) Perform an in silico PCR, to see what happens when more than 1 PCR product may arise. Determine the product sizes, and the melting temperatures of these primers.

Skills: in silico PCR of genomic sequence; finding product size and Tm.

3) Use the VisiGene interface to obtain gene expression data for a gene of interest.

Skills: find gene expression images; link back to the Genome Browser and outside sources.

**UCSC Additional Tools Exercises, version 18c.
Correspond to the data available in November 2010.**

**The materials and slides offered are for non-commercial use only. Reproduction, distribution
and/or use for commercial purposes are strictly prohibited.
Copyright 2010, OpenHelix, LLC.**

Step-by-Step instructions for the UCSC Genome Browser Additional Tools exercises

- 1) Find genes that are predominately expressed in the mouse adrenal gland, determine the expression pattern of one such gene.

Step	Action	✓
1	Go to the UCSC Genome Browser homepage, genome.ucsc.edu .	
2	Enter the Gene Sorter by clicking one of the homepage Gene Sorter links .	
3	Select Mouse as the species. Leave it set on the latest (July 2007) assembly.	
4	Enter a mouse gene (example: hoxa11) in the search box. We just need an arbitrary gene to get started.	
5	Sort by expression (GNF Atlas 2) .	
6	Click the 'configure' button . Choose 'median of all replicas' from the TISSUES pull down menu of Expression (GNF Atlas2) . Leave everything else as default in this section.	
7	Click submit .	
8	Click the 'filter' button and filter for genes highly expressed in the adrenal gland by putting 2.5 in the minimum box for the adrenal gland . (This obtains genes expressed in the adrenal gland to at least this level). Click submit .	
9	The resulting browser page will show genes expressed in the adrenal gland (and other tissues) as shown in red.	
10	To narrow down the field to genes predominately expressed in the adrenal gland, click again on the 'filter' button and add a maximum expression value (0.5 is a good number) for the following tissues: frontal cortex, olfactory bulb, mammary gland, brown fat, and ovary . This will filter out genes which are expressed in multiple tissues. Click submit .	
11	The resulting page gives 13 genes expressed in the adrenal gland. You will notice that at least one of these genes is expressed predominately in the adrenal gland. BC030183 is one strong possibility .	

2) Perform an in silico PCR, to see what happens when more than 1 PCR product may arise. Determine the product sizes, and the melting temperatures of these primers.

Step	Action	✓
1	Go to the UCSC Genome Browser homepage, genome.ucsc.edu	
2	Enter the PCR tool by clicking either of the PCR or In Silico PCR links from the homepage.	
3	Select human as the species, and the current assembly.	
4	Enter this as the FORWARD primer (with or without spaces): TTC AAG GAG GCC TTC TCC CT	
5	Enter this as the REVERSE primer: CTG GGG GAG AAG CTG A	
6	Click 'flip reverse primer' checkbox if it isn't selected.	
7	Click Submit .	
8	The results page will show that these particular primers would amplify 2 different genomic regions —one on chr19 and one on chr10. The product size would vary and be detectible. Product size on chr10: _____ Product size on chr19: _____ <i>This set of primers is clearly not specific for one region, if that is the goal.</i>	
9	What is the melting temperature for the primers? Forward primer: _____ Reverse primer: _____	
<p><i>Note: this primer pair was specifically selected to demonstrate what would be seen if there was more than one match for the primer sequences.</i></p>		

Answers:

Chr10 = 316 bp, Chr19 = 714 bp

Forward TM = 62.5 C, Reverse TM = 55.4 C

3) Use the VisiGene interface to obtain gene expression data for a gene of interest.

Step	Action	✓
1	Go to the UCSC Genome Browser homepage, genome.ucsc.edu	
2	From the blue navigation links on the left side of the page, click the link for VisiGene.	
3	From the VisiGene Image Browser interface, type drd2 in the text box. Click search.	
4	Examine the result. In the left frame, use the scroll bar to move down through all the images.	
5	At the bottom of the left images panel, click the <u>2</u> to move to the next page of results.	
6	On the second page, click the top image. (At the time of this writing, it is a green spotted image). That image should replace the first one in the larger frame on the right.	
7	Move to the large right frame. Click the “zoom in” button to get a better look at the image in the center.	
8	Use the scroll bar on the far right to access the details about this image. Click the link for the gene Drd2 in the information area. This should bring you to the gene details page in the genome browser.	
9	Click other links in the details area to understand the data available. Clone information, reference information, and links to original source databases should be available.	