Reference Datasets

To provide a neuroanatomical framework for gene expression data, the Allen Developing Mouse Brain Reference Atlas was created with the expertise of Professor Luis Puelles, M.D., Ph.D. (University of Murcia, Spain). Sagittal full-color, high resolution web-based digital reference atlases have been created for seven stages of mouse brain development accompanied by a systematic developmental taxonomy of mouse brain structures.

The Allen Developing Mouse Brain Reference Atlases were designed to:

1. Allow users to directly compare gene expression patterns to an annotated developmental atlas;
2. Provide templates for the creation of 3-D computer models of the developing mouse brain;
3. Serve as a neuroanatomical foundation for informatics-based analysis tools.

In 2013, the reference atlas was updated to provide a deeper level of annotation. For more information on the reference atlas update and a description of the ontological levels, please refer to the Reference Atlas whitepaper located under the Documentation tab. Access to the previous reference datasets are available via links on the Reference Atlas landing page.

To access the reference atlas, you can click on one of the links from the landing page or you can select the key icon from the High Resolution Image Viewer to view the atlas in context with a gene expression experiment.

<table>
<thead>
<tr>
<th>Age</th>
<th>Annotation</th>
<th>Plane</th>
<th>Level of Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>E11.5 (TS19)</td>
<td>28 sections (40μm interval)</td>
<td>sagittal</td>
<td>Level 9</td>
</tr>
<tr>
<td>E13.5 (TS21)</td>
<td>15 sections (100μm interval)</td>
<td>sagittal</td>
<td>Level 10</td>
</tr>
<tr>
<td>E15.5 (TS24)</td>
<td>16 sections (120μm interval)</td>
<td>sagittal</td>
<td>Level 10</td>
</tr>
<tr>
<td>E18.5 (TS26)</td>
<td>19 sections (120μm interval)</td>
<td>sagittal</td>
<td>Level 10</td>
</tr>
<tr>
<td>P4</td>
<td>23 sections (160μm interval)</td>
<td>sagittal</td>
<td>Level 13</td>
</tr>
<tr>
<td>P14</td>
<td>39 sections (125μm interval)</td>
<td>sagittal</td>
<td>Level 13</td>
</tr>
<tr>
<td>P56</td>
<td>21 sections (200μm interval)</td>
<td>sagittal</td>
<td>Level 1</td>
</tr>
</tbody>
</table>

From the Reference Atlas landing page, you can also add reference data into your cart to enhance your exploration of gene expression data by clicking the checkboxes next to the desired reference dataset. Clicking "View Experiments" will allow you to view all selected datasets (including experimental data already present in the cart).
Translation Between the Adult and Developing Mouse Ontologies

Given there are two structure ontologies for the mouse brain in the Allen Brain Atlas resources, we have created a way to overlay the Structure Ontology from Adult Mouse Atlas and the Developing Mouse Brain Atlas.
While in the "Developing Mouse Atlas, P56", select "P56 Adult Mouse" atlas from the second drop-down menu and select "Outlines" from the Tools icon drop-down. This will show both Structure Ontologies overlayed together.

Reference Atlas Viewing with Gene Expression Data

Structure Ontology

The Structure Ontology for the Developing Mouse is listed hierarchically in the left-hand panel of the Interactive Atlas Viewer. By default the atlas is opened to level 3. Please see the Reference Atlas whitepaper available from the Documentation tab for more information on the Structure Ontology levels.

Each of the Developing Mouse atlases was drawn to a specific level and only those levels that were drawn will be available to navigate by clicking on the name. Those that are not available will be greyed out. Clicking on a structure name will take you to that drawn structure in the main image viewer.

Ontology Levels

Clicking on the ontology icon ( 

) will open up the Developing Mouse Ontology defaulting at level 3.
The ontology levels in the Developing Mouse Atlas range from Level 00 (Neural Plate) up through higher differentiation levels to Level 13. Please see the Reference Atlas whitepaper available from the Documentation tab for a deeper explanation of the ontology levels. By clicking on the Ontology Levels (numbered squares above the ontology list) you will open the ontology to the level of detail indicated by the highlighted level.

Searching using the text box in the Ontology pane will allow you to browse through the ontology looking for specific regions. Using the “Sync” icon ( ), you can sync either image to its partner to view the gene expression in context with the reference atlas.

Given the difficulty of sectioning and programatically aligning these small specimen, you have the option of viewing a reference dataset with each gene expression specimen that will also outline a small structure of interest. To do this, choose the reference atlas from the Atlas dropdown menu (either Feulgen-HP or Nissl, depending upon the age) and select on the reference data set to outline your desired structure.

In the below image, gene expression is located in a region of the prethalamus.
Reference Atlas Viewing Tools

Interactive Atlas Viewer (IAV)
Zoom-And-Pan (ZAP) Image Viewer
Using The High Resolution Image Viewer