Transgenic Mouse Lines

Transgenic Strategy

The Allen Brain Observatory contains data collected via two-photon calcium imaging to quantify neuron activity in the mouse neocortex in response to visual stimuli. The use of a fluorescent calcium indicator, GCaMP6f, was used to image neural activity in the visual cortex of transgenic mice exposed to various visual stimuli. Calcium influx associated with neural activity results in transient increases in fluorescence of GCaMP6-GFP. These experiments use the transgenic mouse line Ai93, in which GCaMP6f expression is dependent on the activity of both Cre recombinase and the tetracycline-controlled transactivator protein (tTA). Triple transgenic mice (Ai93, tTA, Cre) were generated by first crossing Ai93 mice with Camk2a-tTA mice, which preferentially express tTA in forebrain excitatory neurons. Double transgenic mice were then crossed with a Cre driver line to generate mice in which GCaMP6f expression is induced in the specific populations of neurons that express both Cre and tTA.

Transgenic Mouse Lines

Specific expression is driven by the following Cre driver lines. Clicking on one of the links below will open serial two-photon images of fluorescent GCaMP6-GFP expression in the triple transgenic mouse line in an image viewer.

- Cux2-CreERT2
- Rorb-IRES2-Cre
- Rbp4-Cre_KL100
- Nr5a1-Cre
- Scnn1a-Tg3-Cre
- Emx1-IRES-Cre

In the Transgenic Characterization section of the Allen Brain Observatory, each of the above cell lines is listed with links to view the 2-photon serial tomography as well as a brief description of the brain areas targeted by the transgenic strategy. To view the fluorescence expression in these mouse lines in an image viewer, click on either the transgenic mouse line or the example image.

Viewing Fluorescence Images

Transgenic Mouse Detail Page

Clicking on either the transgenic mouse line name or the example image will open a transgenic mouse detail page with metadata on the mouse line including the line name, age, plane of sectioning, organism, sex and induction method.

<table>
<thead>
<tr>
<th>Transgenic Mouse</th>
<th>Organism</th>
<th>Sex</th>
<th>Induction method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ai93</td>
<td>Mus musculus</td>
<td>Female</td>
<td>Tamoxifen</td>
</tr>
</tbody>
</table>

A panel of images also shows each section (~140 sections) from this series of images. Scrolling down the page will allow you to see images with fluorescence expression. Clicking on one of the individual images will open a high resolution image viewer in a new tab.
Image Viewer

The Image Viewer is a powerful tool to navigate and view the images in this series. The main viewer contains a scale bar, a toolbar and on-screen navigation tools. The main viewer is an interactive window where an image can be repositioned by clicking on the image and dragging with the mouse. Use the scroll wheel, on-screen navigation buttons or the keyboard to zoom in or out. The name of the mouse line and the expressed fluorescent molecule is displayed in the top left-hand corner of the main viewer.

Thumbnails for the entire image series are displayed across the bottom of the main viewer in section order. Click a thumbnail to select that image for viewing, or use the keyboard to navigate through the series.
Scale Bar

Drag the scale bar with your mouse to the desired location. Click the scale bar text with your mouse to toggle between horizontal and vertical scale bars.

3360 microns

3360 microns

Using the Image Viewer Toolbar

Use the toolbar to take actions on the current image. Toolbar controls include:

<table>
<thead>
<tr>
<th>Icon</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Clicking the key icon will open another viewer with the reference atlas.

Once the reference atlas is open, this icon, when clicked, will sync the other viewer to the same location.

Opens the tools menu.

From the reference atlas menu, allows for the atlas images or the nissl images to be displayed.

**Keyboard Commands**

Use the keyboard to navigate through the image series and synchronize the viewers on the page. Keyboard commands include:

<table>
<thead>
<tr>
<th>Key</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Zoom in</td>
</tr>
<tr>
<td>Z</td>
<td>Zoom out</td>
</tr>
<tr>
<td>F</td>
<td>Step forward through the thumbnail images keeping the same location and scale</td>
</tr>
</tbody>
</table>
Step backward through the thumbnail images keeping the same location and scale

Sync all viewers on the page to the zoom level and location of the active viewer

Zoom in. Please note that some keyboards may require the [Shift] key be held down while pressing the [+] key

Zoom out

Tools Menu

The tools menu allows access to downloading both the fluorescence and reference atlas images, as well as to remove the metadata information on the atlas and fluorescence images (to allow for a cleaner screen-shot).