Finding GAL4 drivers and other transgenic tools in FlyBase

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The rich genetic toolkit that is available for Drosophila melanogaster helps to make it an ideal model organism to answer a wide range of biological questions, but also creates a potential problem: how to find the most appropriate fly line for a particular experiment. FlyBase has introduced a number of improvements to help address this question. These include the ‘GAL4 etc’ QuickSearch tab which allows searches for GAL4 and other binary drivers and non-binary reporters by temporal-spatial expression pattern, and dedicated ‘Experimental Tool’ reports for commonly used tools such as GAL4 and EGFP, which gather information on related transgenic constructs in a single webpage. Together with enhancements to hit lists, a specialized Integrated Table view hit list, and the ‘Frequently Used GAL4 Driver’ table, this has improved the access of these important transgenic tools to FlyBase users.

The GAL4 etc QuickSearch tab

The GAL4 etc tab uses the same strategies as the Expression tab, and similarly searches expression statements curated from the literature.

The List view of the GAL4 etc hit-list

The List view hit-list includes four data types: alleles, insertions, transgenic constructs, and stocks. Filtering the hit-list to a single data type allows you to further convert the results to another data type, export to a file or to another FlyBase tool, or analyze the results in a data type specific manner. The filtered list can also be viewed as a standard hit-list; please note that this is not the same as the Integrated Table described below.

The Integrated Table view of the GAL4 etc hit-list

The Integrated Table view is designed to display the relationships between alleles, insertions, transgenic constructs, and stocks. For example, the allele Scer\GAL4(G30) is caused by a specific insertion, P{Swo}H2A, of the enhancer trap construct P{Swo}, and has one stock tet that is associated with stocks available from a public stock center are automatically pre-sorted to the top of the table. The search used to generate the hit-list is displayed at the top.

The expression data has been condensed to emphasize how these drivers are used as experimental tools. Full curated expression patterns can be found on linked allele, insertion or construct reports.

The Frequently Used GAL4 Drivers table

In the Frequently Used GAL4 Drivers table, we have compiled information from more than 200 GAL4 drivers, including the 150 stocks most ordered from the Bloomington Drosophila Stock Center and those drivers that have been curated to more than 20 research publications. This table can be accessed via a link on the GAL4 etc QuickSearch tab, and is also available as a downloadable TSV file. The table can be sorted by column for most columns. Links to publications and stocks are included in this table.

The first two columns list the GAL4 drivers by allele, and by insertion or transgenic construct. We include allele designations to draw attention to relationships between the more user-familiar insertion/construct symbols and their associated alleles. FlyBase uses allele symbols in many contexts, including in text descriptions of expression patterns, phenotypes, and genetic interactions.

We display expression pattern information in several formats: FlyBase Anatomy CV terms, common terms often used in literature, short test description, major developmental stage, and genes for those drivers that reflect a gene expression pattern. Term columns are not always sorted, so drivers with similar expression patterns can be more easily compared.

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New Features of the Frequently Used GAL4 Drivers table

In an upcoming release, we will be enhancing the Frequently Used GAL4 Drivers table with representative images illustrating the expression patterns of the drivers, starting with published images from papers distributed using the Creative Commons Attribution License, or for which we have obtained permission to use.

There are many GAL4 drivers for which we have been unable to find a suitable image to incorporate into the table. We are seeking high-quality unpublished GAL4 images from the FlyBase user community; every image we use will be credited to the person and/or research group that provided it.

We have added a dedicated Contact FlyBase link to the Frequently Used GAL4 Drivers table. This link allows FlyBase users to directly contact the curators responsible for the maintenance of this resource. Please contact us if you have a comment on a driver’s displayed expression pattern, if you’d like to contribute an image, if you think a GAL4 driver should be added to the table, or if you have a suggestion to make this resource more useful.

Experimental Tool Report

‘Experimental Tool Uses’ Term Report

Main branches of Uses tree and examples of Tools

<table>
<thead>
<tr>
<th>Uses term(s)</th>
<th>description of what the tool is used for</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘Click on the term to go to the Uses Term Report’</td>
<td></td>
</tr>
</tbody>
</table>

Related experimental tools section makes it easy to jump to reports for related tools at a finer level of detail than the ‘Uses’ section.

‘Click on the Tool name to go to its Tool Report’

‘Click on the Uses to go to the corresponding Term Report’

Columns list the components that make up the transgenic construct.

Link to relevant Gene (e.g. mCherry) or Tool (e.g. UAS) report

Searching

- Search by name (e.g. GAL4, mCherry) via QuickSearch
- Search by Uses using the Vocabularies tool

Coming soon! QuickSearch GAL4 tab will be expanded to include all types of tools.

‘Experimental tool descriptor’
- binary expression system component
- engineered regulatory region
- gene product activity tag
- gene product location tag
- gene product degradation tag
- gene product detection tool
- gene product transporter
- gene product localization tag
- gene product repressor
- split system component

Main branches of Uses tree and examples of Tools

- binary expression system component
- binary expression system - driver
- GAL4, GAL4::VP16, QF
- binary expression system - regulatory region UAS, QUAS
- binary expression system - repressor
- GAL80, QS
- fluorescent protein
- blue fluorescent protein
- EBFP cyan fluorescent protein
- Cerulean, GFP
- far-red fluorescent protein
- mKaila
- green fluorescent protein
- EGFP, PA-GFP
- infra-red fluorescent protein
- mNP
- modulatable fluorescent protein
- PA-GFP
- orange fluorescent protein
- mKaila
- red fluorescent protein
- mCherry
- yellow fluorescent protein
- EYFP, Venus

‘Coming soon!’ Search directly for a Tool by typing the name into the Tool box.

Alternatively, search directly for a Tool by typing the name into the Tool box.

Coming soon! (target FB2019_02)
- cell ablation tool
- neuron activation tool
- neuron inhibition tool
- split system component
- split driver - DNA-binding fragment
- GAL4(DBD):Zip
- split driver - transcription activation fragment
- VP16(AD):Zip
- split fluorescence protein
- C-Venus, N-Venus
- split reporter enzyme
- Ia2Z:dsi, Ia2Z:dsu

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