

Results – February 2015

Total number of responses – 382

Gene Groups in FlyBase

Many publications describe sets of genes that share a common biology. Comprehensive genome-wide studies and phylogenetic analyses are now commonplace, and the subunit composition of many multi-protein complexes are well characterized. FlyBase has been collating such data for *Drosophila melanogaster* as 'Gene Groups' as we believe that FlyBase users would benefit from being able to easily view and analyse acknowledged gene sets. We are in the process of making Gene Group pages available on the website, and we would appreciate your views on how to implement this resource.

For this current phase, we are limiting Gene Groups to:

- a. **Gene families and/or gene products with shared molecular functions** e.g. Ras GTPases, GPCRs, potassium channels;
- b. **Protein complexes** e.g. ribosomal complexes, 26S proteasome, ATAC complex;
- c. **Gene arrays and gene complexes** e.g. E(spl) complex.

Three databases that already provide gene group-type data are HGNC, TAIR and WormBase. These may be useful for you to look at to get a sense of the different ways such data might be presented.

[HGNC](#)

[TAIR](#) (you or your institution will require a subscription to see content)

[WormBase](#)

Gene Group Report Proposal

The Gene Groups will be organized in a hierarchical structure e.g.

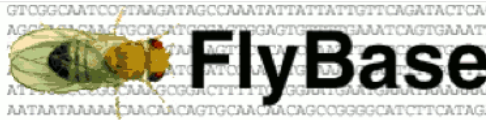
- > **G PROTEIN COUPLED RECEPTORS**
 - > **CLASS A GPCRs**
 - > **AMINE RECEPTORS**
 - > **DOPAMINE RECEPTORS**

Each level of the hierarchy will have its own Gene Group report page. All genes within that group will be displayed on that page.

The report page will include:

- a list of genes within the group;
- a short description, notes and links to source publications to give an over-view of how the group was collated;
- a set of "key" gene ontology terms to indicate what biological properties these genes are likely to share;
- relationships with other groups - place within group hierarchy, links with related groups (e.g. wnt family and frizzled-like receptors) and links to orthologous groups in other databases.

A mock-up of a Gene Group report for Class B GPCRs is shown below.



Gene Group: CLASS B GPCRs

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General Information		
Name	CLASS B GPCRs	Species <i>D. melanogaster</i>
Symbol	GPCR-B	FlyBase ID FBgg0000005
Date Last Reviewed	2014.09.15	Number of members 25
Description		
Description of Gene Group	Class B or secretin-like GPCRs are characterized by long N-terminal domain. Family B GPCRs can be divided into three subfamilies: B1, B2 and B3 (Methuselah-type). (Adapted from Li <i>et al.</i> , 2013).	
Notes on Group membership	stan is also a member of the cadherin family. Harmar (2001) classifies stan as a Family B GPCR. This agrees with the HGNC gene family classification and is the grouping adopted here. Li <i>et al.</i> , (2013) use a slightly different classification system and classes stan as an atypical GPCR.	
Key GO Terms		
Molecular Function	G-protein coupled receptor activity (FlyBase, 2014-)	
Biological Process	G-protein coupled receptor signaling pathway (FlyBase, 2014-)	
Cellular Component	integral component of plasma membrane (FlyBase, 2014-)	
Related Gene Groups		
Parent group(s)	G PROTEIN COUPLED RECEPTORS	
Component group(s)	CLASS B GPCRs, SUBFAMILY B1 CLASS B GPCRs, SUBFAMILY B2 METHUSELAH-TYPE RECEPTORS	
Related group(s)	NEUROPEPTIDES, PEPTIDE AND PROTEIN HORMONES	
[+/-] Members		
For all members:	<input type="button" value="Download and Export buttons"/>	
CLASS B GPCRs, SUBFAMILY B1		
Gene Symbol	Gene Name	Additional Data
Dh31-R	Diuretic hormone 31 Receptor	
Dh44-R1	Diuretic hormone 44 receptor 1	
Dh44-R2	Diuretic hormone 44 receptor 2	
hec	hector	
Pdfr	Pigment-dispersing factor receptor	
CLASS B GPCRs, SUBFAMILY B2		
Gene Symbol	Gene Name	Additional Data
CG11318		
CG15556		
Cirl	Calcium-independent receptor for α -latrotoxin	
stan	starry night	
METHUSELAH-TYPE RECEPTORS		
Gene Symbol	Gene Name	Additional Data
meth	methuselah	
meth1	methuselah-like 1	
meth2	methuselah-like 2	
meth3	methuselah-like 3	
meth4	methuselah-like 4	
meth5	methuselah-like 5	
meth6	methuselah-like 6	
meth7	methuselah-like 7	
meth8	methuselah-like 8	
meth9	methuselah-like 9	
meth10	methuselah-like 10	
meth11	methuselah-like 11	
meth12	methuselah-like 12	
meth13	methuselah-like 13	
meth14	methuselah-like 14	
meth15	methuselah-like 15	
[+/-] External data		
Orthologous Group(s)	HGNC <ul style="list-style-type: none"> Human Class B GPCRs WormBase <ul style="list-style-type: none"> WormBase Secretin Class GPCRs WormBase Methuselah Class GPCRs 	
Other resource(s)	GPCR family database	
[+/-] Synonyms and Secondary IDs		
Synonym(s)	Family B GPCR Family 2 GPCR Secretin receptor family	
[+/-] References		
Research paper	Li <i>et al.</i> , 2013, <i>Gene</i> 519(1): 1–12. Comparative genomic analysis and evolution of family-B G protein-coupled receptors from six model insect species. [FBrf0221117] Patel <i>et al.</i> , 2012, <i>J. Exp. Zool. B Mol. Dev. Evol.</i> 318(5): 368–387. Dramatic expansion and developmental expression diversification of the methuselah gene family during recent Drosophila evolution. [FBrf0218628]	
Review	Hauser <i>et al.</i> , 2006, <i>Prog. Neurobiol.</i> 80(1): 1–19. A review of neurohormone GPCRs present in the fruitfly <i>Drosophila melanogaster</i> and the honey bee <i>Apis mellifera</i> . [FBrf0193587] Hauser <i>et al.</i> , 2006, <i>Brief. Funct. Genomic. Proteomic.</i> 4(4): 321–330. Identifying neuropeptide and protein hormone receptors in <i>Drosophila melanogaster</i> by exploiting genomic data. [FBrf0195077] Harmar <i>et al.</i> , 2001, <i>Genome Biol.</i> 2(12): REVIEWS3013. Family-B G-protein-coupled receptors. [FBrf0147071] Brody and Cravchik, 2000, <i>J. Cell Biol.</i> 150(2): F83–F88. <i>Drosophila melanogaster</i> G Protein-coupled Receptors. [FBrf0129744]	
FlyBase Analysis	FlyBase, 2014-. FlyBase Gene Group information. [FBrf0225556]	

Question 1: Attribution of Gene Group members

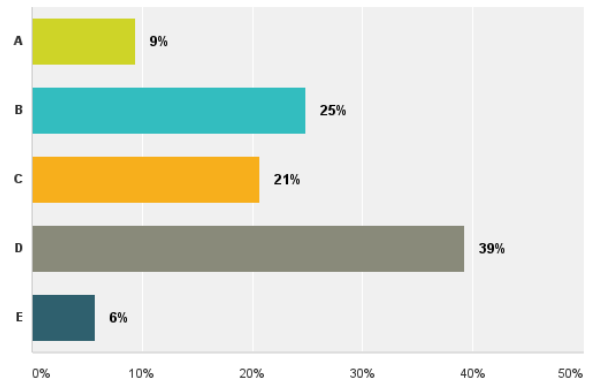
FlyBase Gene Groups are intended to reflect the current consensus within the research literature. Referenced notes are provided in the "Notes on Group membership" section to explain the criteria for membership where necessary.

Gene Groups are often compiled from multiple publications. Each publication may not list the exact same set of genes owing to their year of publication or focus, for example.

In addition to displaying all references in full at the bottom of the page and the "Notes on Group membership", we would like to know whether more detailed attribution should be displayed.

Choose your preferred option (illustration below).

- No further attribution is necessary
- Add a "Source Material" summary in Description section
- Add a "Source Material for Gene Membership" column to the Members table to show the source(s) of each gene
- Add a "Source Material" summary in Description section AND a "Source Material for Gene Membership" column to the Members table (i.e. B and C)
- Don't know



FlyBase Gene Group: CLASS B GPCRs

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General Information

Name: CLASS B GPCRs

Description: Class B or secretin-like GPCRs have long N-terminal domains and form a group structurally and functionally divergent from other GPCR classes. Family B GPCRs can be divided into three subfamilies: B1, B2 and B3 (Methuselah-type). (Adapted from Li et al., 2013).

Notes on Group membership: stan is also a member of the secretin family. Harmar (2001) classifies stan as a Family B GPCR. This agrees with the HGNC gene family classification and is the grouping adopted here. Li et al., (2013) use a slightly different classification system and classes stan as an atypical GPCR.

Notes on Group membership: stan is also a member of the secretin family. Harmar (2001) classifies stan as a Family B GPCR. This agrees with the HGNC gene family classification and is the grouping adopted here. Li et al., (2013) use a slightly different classification system and classes stan as an atypical GPCR.

Molecular Function

Description: Class B or secretin-like GPCRs have long N-terminal domains and form a group structurally and functionally divergent from other GPCR classes. Family B GPCRs can be divided into three subfamilies: B1, B2 and B3 (Methuselah-type). (Adapted from Li et al., 2013).

Notes on Group membership: stan is also a member of the secretin family. Harmar (2001) classifies stan as a Family B GPCR. This agrees with the HGNC gene family classification and is the grouping adopted here. Li et al., (2013) use a slightly different classification system and classes stan as an atypical GPCR.

Source Material

CLASS B GPCRs member genes have been compiled by FlyBase curators using publications from Brody and Cravchik (2000), Harmar et al., (2001), Hauser et al., (2006), Hauser et al., (2008), Li et al., (2013), and Patel et al., (2012).

Parent group(s): 3 PROTEIN COUPLED RECEPTORS

Component group(s): CLASS B GPCRs, SUBFAMILY B1
CLASS B GPCRs, SUBFAMILY B2
METHUSELAH-TYPE RECEPTORS
NEUROPEPTIDES, PEPTIDE AND PROTEIN HORMONES

Related group(s):

Members

For all members: Download and Export buttons

Gene Symbol	Gene Name	Source Material for Gene Membership
CG1314	Diuretic hormone 31 Receptor	Hauser et al., (2006), Hauser et al., (2008), Harmar et al., (2001), Li et al., (2013)
Dh44-R1	Diuretic hormone 44 receptor 1	Hauser et al., (2006), Hauser et al., (2008), Harmar et al., (2001), Li et al., (2013)
Dh44-R2	Diuretic hormone 44 receptor 2	Hauser et al., (2006), Hauser et al., (2008), Harmar et al., (2001), Li et al., (2013)
hec	hector	Hauser et al., (2006), Hauser et al., (2008), Harmar et al., (2001), Li et al., (2013)
Pdfr	Pigment-dispersing factor receptor	Hauser et al., (2006), Hauser et al., (2008), Harmar et al., (2001), Li et al., (2013)

CLASS B GPCRs, SUBFAMILY B2

Gene Symbol	Gene Name	Source Material for Gene Membership
CG11318	Calcium-independent receptor for α -latrotoxin	Harmar et al., (2001), Li et al., (2013)
CG15656	stan	Harmar et al., (2001), Li et al., (2013)

METHUSELAH-TYPE RECEPTORS

Gene Symbol	Gene Name	Source Material for Gene Membership
meth	methuselah	Harmar et al., (2001), Li et al., (2013)
meth1	methuselah-like 1	Harmar et al., (2001), Li et al., (2013)
meth2	methuselah-like 2	Harmar et al., (2001), Li et al., (2013)
meth3	methuselah-like 3	Harmar et al., (2001), Li et al., (2013)
meth4	methuselah-like 4	Harmar et al., (2001), Li et al., (2013)
meth5	methuselah-like 5	Harmar et al., (2001), Li et al., (2013)
meth6	methuselah-like 6	Harmar et al., (2001), Li et al., (2013)
meth7	methuselah-like 7	Harmar et al., (2001), Li et al., (2013)
meth8	methuselah-like 8	Harmar et al., (2001), Li et al., (2013)
meth9	methuselah-like 9	Harmar et al., (2001), Li et al., (2013)
meth10	methuselah-like 10	Harmar et al., (2001), Li et al., (2013)
meth11	methuselah-like 11	Harmar et al., (2001), Li et al., (2013)
meth12	methuselah-like 12	Harmar et al., (2001), Li et al., (2013)
meth13	methuselah-like 13	Harmar et al., (2001), Li et al., (2013)
meth14	methuselah-like 14	Harmar et al., (2001), Li et al., (2013)
meth15	methuselah-like 15	Harmar et al., (2001), Li et al., (2013)

External data

Orthologous Group(s): HGNC: Human Class B GPCR; WormBase: WormBase Secretin Class; GPCR family database

Other resource(s)

Synonyms and Secondary IDs

Synonym(s): Family B GPCR; Family 2 GPCR; Secretin receptor family

References

Research paper: Li et al., 2013, Gene 519(1): 1–12. Comparative genomic analysis and evolution of family-B G protein-coupled receptors from six model insect species. [FB:022117]
Patel et al., 2012, J. Exp. Zool. B Mol. Dev. Evol. 316(5): 368–387. Dramatic expansion and developmental expression diversification of the methuselah gene family during recent Drosophila evolution. [FB:0218628]
Hauser et al., 2006, Prog. Neurobiol. 80(1): 1–19. A review of neurohormone GPCRs present in the fruitfly Drosophila melanogaster and the honey bee Apis mellifera. [FB:0193587]
Hauser et al., 2006, Brief. Funct. Genomic. Proteomic. 4(4): 321–330. Identifying neuropeptide and protein hormone receptors in Drosophila melanogaster by exploiting genomic data. [FB:0195077]
Harmar et al., 2001, Genome Biol. 2(12): REVIEWS3013. Family-B G-protein-coupled receptors. [FB:0147071]

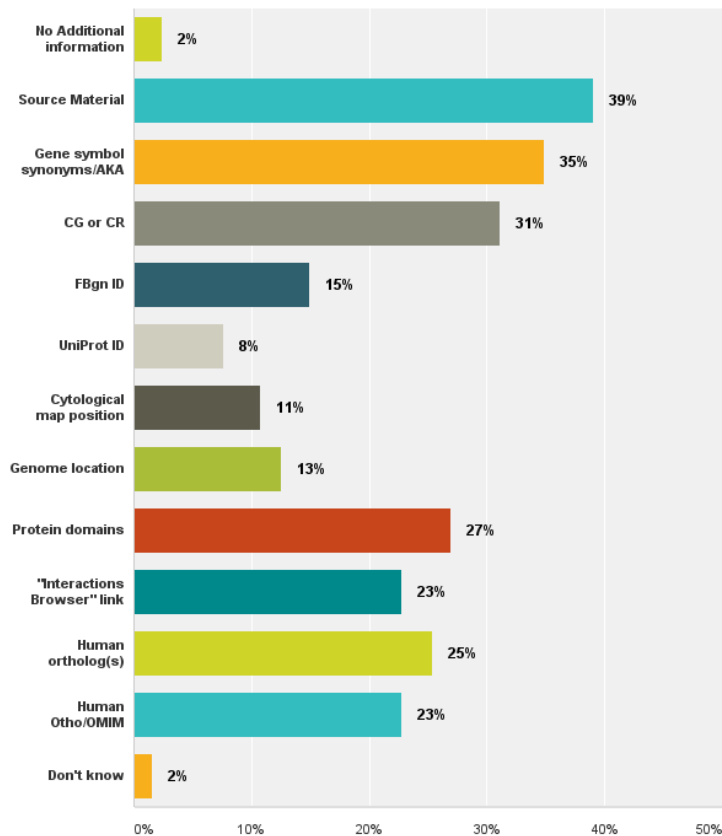
Question 2: Displaying information about member genes on the Gene Group Report

The Members table listing individual members of the group will contain the gene symbols and gene names. Additional information and links could be provided in columns to the right of the gene name field.

Gene Symbol	Gene Name	Additional information and links
Dh31-R	Diuretic hormone 31 Receptor	
Dh44-R1	Diuretic hormone 44 receptor 1	
Dh44-R2	Diuretic hormone 44 receptor 2	
hec	hector	
Pdfr	Pigment-dispersing factor receptor	

Which additional information and/or links would you like to see displayed in here?
Select a maximum of THREE of the following options.

- No additional information (just want a list of genes)
- Source Material (as in Question 1)
- Gene symbol synonyms/AKA
- CG or CR annotation ID (hyperlinks to GBrowse view)
- FBgn ID
- UniProt ID
- Cytological map position
- Genome sequence location
- Protein domains
- Hyperlink to "Interactions Browser" showing physical/genetic interactions
- Human ortholog(s)
- Human ortholog(s) and any OMIM phenotype
- Don't know

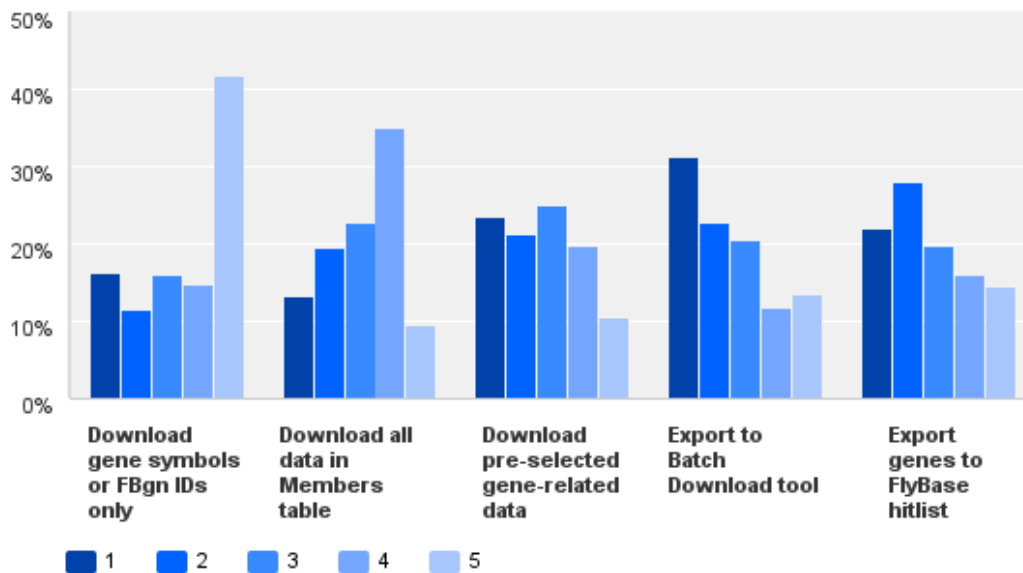


Question 3: Getting additional data on Gene Group members

In addition to the summary Members table referred to in Question 2, there will be buttons to download or export data on Gene Group members.

Which download or export tools would be most useful for you? (Rank 1-5, where 1 is the most useful and 5 is the least useful)

- Download gene symbols or FBgn IDs only
- Download all data shown in Members table
- Download data shown in Members table PLUS additional pre-selected gene-related data - e.g. all GO annotations, orthologs, protein domains (no user selection)
- Export genes to the Batch Download tool to specify gene-related data to download (user selected)
- Export genes to a standard FlyBase hitlist - access to several query tools, conversion options and Analysis/Refinement tools



Question 4: Further Analyses of Gene Groups

We are interested in how you would want to further analyse or compare data within and between Gene Groups. Your answers could help us develop tools to facilitate this analysis.

Of the options listed below, pick the types of data that you would be most likely to compare or analyse (a maximum of THREE).

- Protein-protein interactions
- Genetic interactions
- Phenotypic data
- Expression patterns
- Genomic position
- Sequence alignment/similarity
- Domain structure or organization
- Find orthologous gene sets
- Gene Ontology terms
- Don't know
- Other (please specify)

