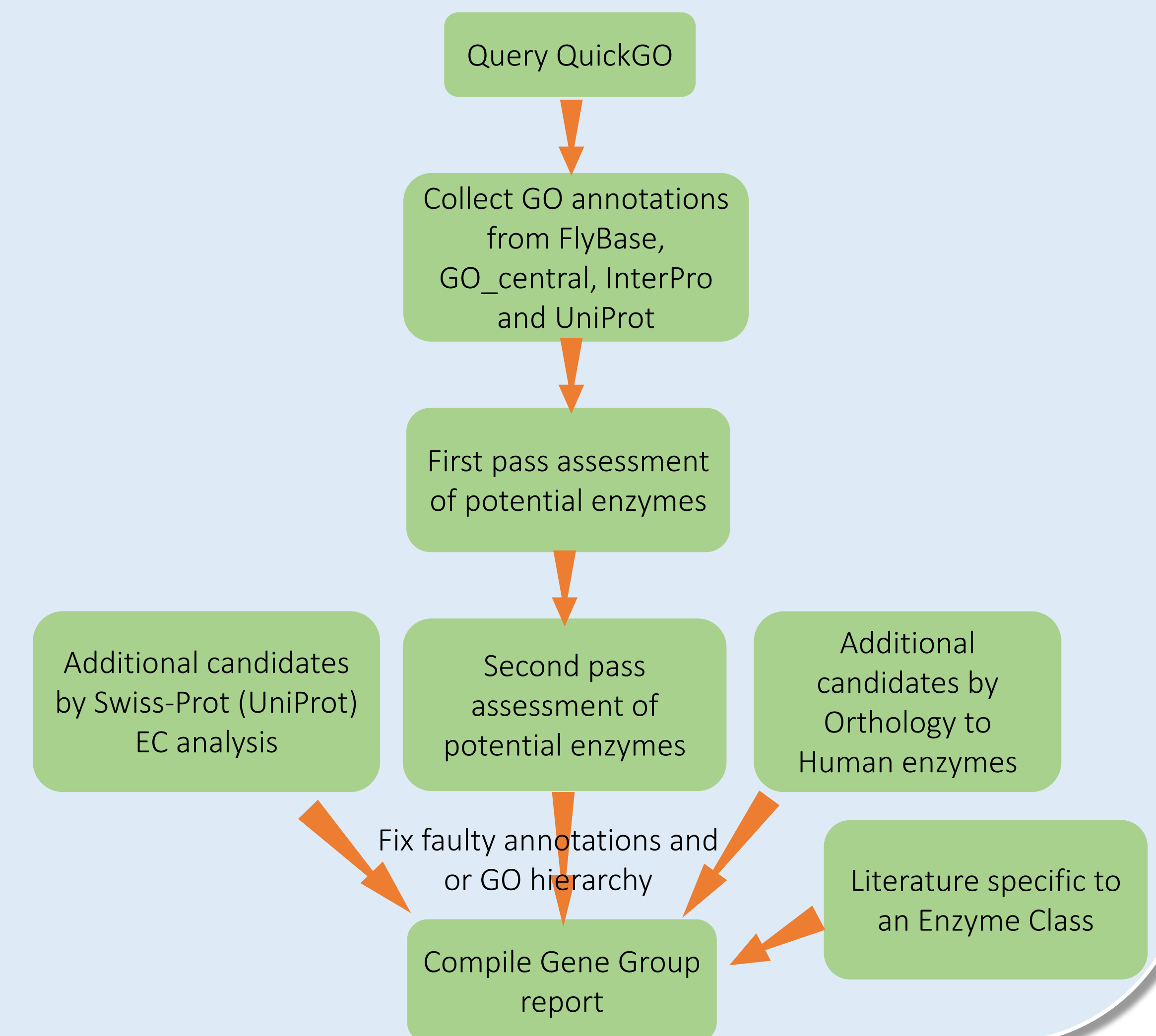


Enzymes are biocatalysts with essential roles in many different biological processes. In *Drosophila melanogaster*, there are around 4,000 genes encoding enzymes, representing almost 30% of protein coding genes. Enzymatic functions are annotated and recorded within biological databases using the Gene Ontology (GO) and Enzyme Commission (EC) numbers, both of which may be assigned manually or transferred electronically, and may be based on experimental evidence or inferred from sequence similarity. We have begun to systematically review and enhance the functional annotations of *D. melanogaster* enzymes, adding missing annotations and correcting any errors. This work will improve the enzyme information available from several different resources, including UniProt, QuickGO, AmiGO, GenBank and FlyBase. In particular, we are compiling new 'Gene Group' reports within FlyBase to facilitate access to validated *D. melanogaster* enzyme lists.

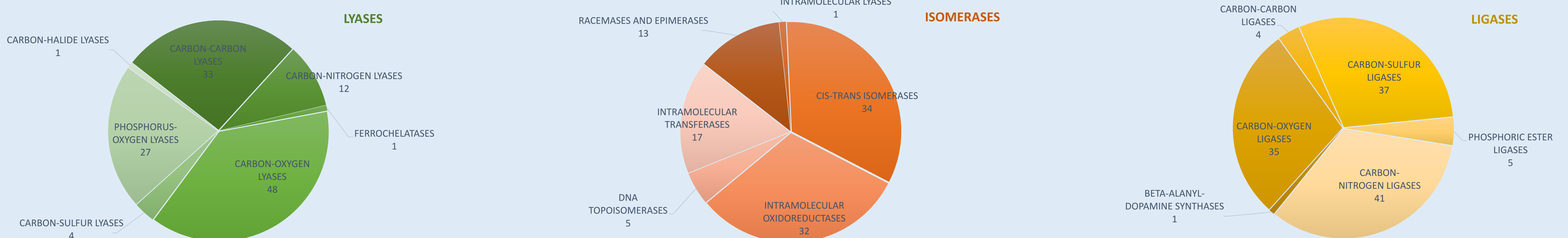
Comparison of Enzyme Annotations Before and After Analysis

Enzyme Class (EC Number)	GO Term (ID)	Number of <i>D.mel</i> enzymes Annotated in FlyBase		Analysis Result	
		Prior to Analysis	After Analysis	New Genes Added	Genes Removed
Oxidoreductases (1.-.-.-)	Oxidoreductase activity (GO:0016491)	566	-	-	-
Transferases (2.-.-.-)	Transferase activity (GO:0016740)	980	-	-	-
Hydrolases (3.-.-.-)	Hydrolase activity (GO:0016787)	1490	-	-	-
Lyases (4.-.-.-)	Lyase activity (GO:0016829)	120	125	18	13
Isomerases (5.-.-.-)	Isomerase activity (GO:0016853)	97	102	11	6
Ligases (6.-.-.-)	Ligase activity (GO:0016874)	112	119	25	18
	Total	3365	346	54	37

Workflow for Assessing the Evidence for Proteins having Enzyme Activity

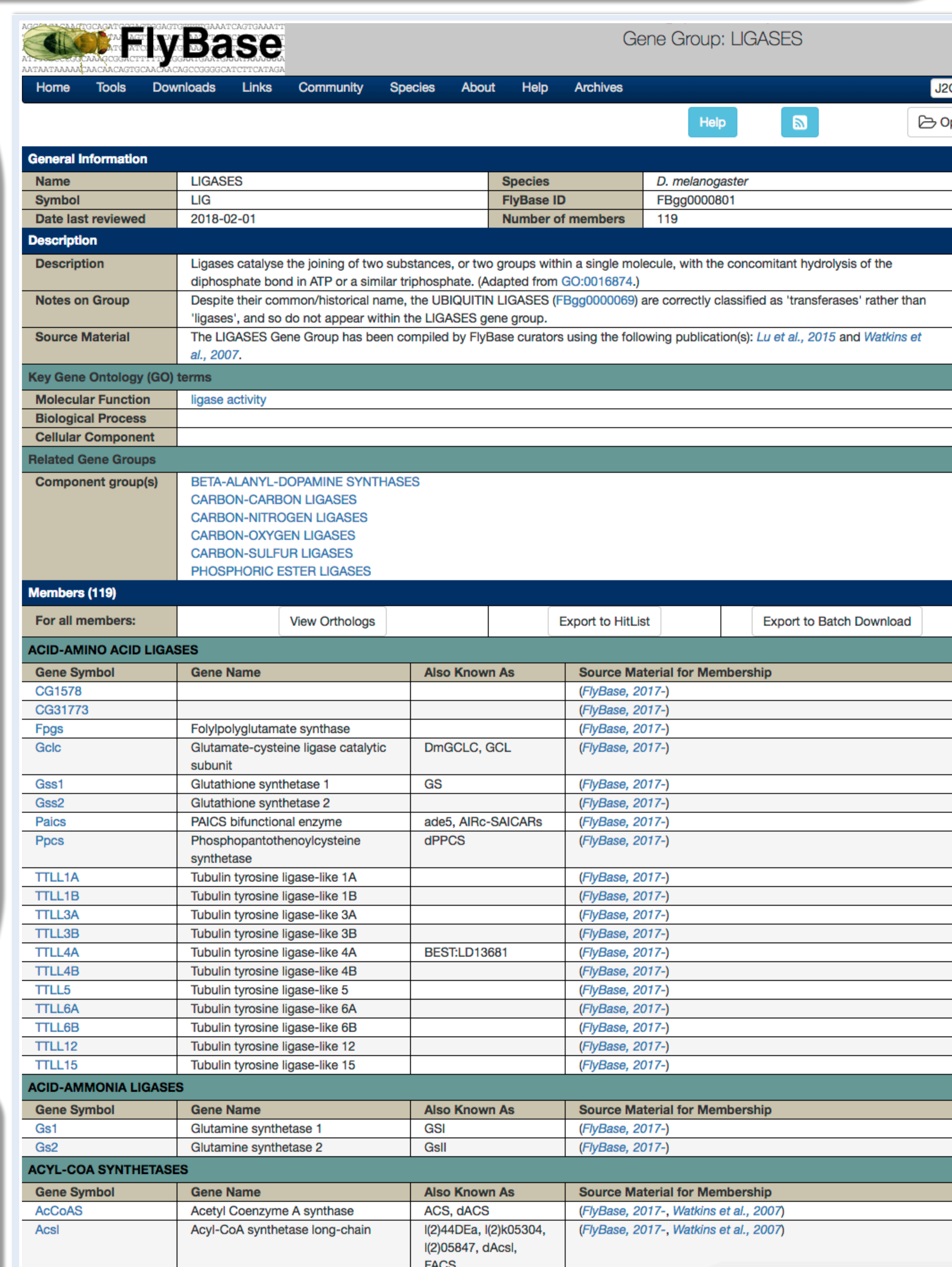


Pie charts depicts the three reviewed enzymes classes and the slices represent the sub-classes and the number of members under each one of them



Systematic and hierarchical classification of enzyme class Ligases (6.-.-.-), based on schema similar to GO hierarchy. Gene Group pages are compiled representing this hierarchy.

- LIGASES [119]**
 - BETA-ALANYL-DOPAMINE SYNTHASES [1]
 - CARBON-OXYGEN LIGASES [35]
 - AMINOACYL-TRNA SYNTHETASES [35]
 - CYTOPLASMIC AMINO-ACID tRNA SYNTHETASES [16]
 - MITOCHONDRIAL AMINO-ACID tRNA SYNTHETASES [15]
 - DUAL-LOCALIZED AMINO-ACID tRNA SYNTHETASES [4]
 - CARBON-SULFUR LIGASES [37]
 - ACYL-COA SYNTHETASES [25]
 - SUCCINATE-COA LIGASES [4]
 - UBIQUITIN-LIKE ACTIVATORS [8]
 - CARBON-NITROGEN LIGASES [41]
 - ACID-AMMONIA LIGASES [3]
 - ACID-AMINO ACID LIGASES [18]
 - CYCLO-LIGASES [2]
 - BIOTIN CARBOXYLASES [3]
 - OTHER CARBON-NITROGEN LIGASES [6]
 - CARBON-NITROGEN LIGASES, WITH GLUTAMINE AS AMIDO-N-DONOR [9]
 - CARBON-CARBON LIGASES [4]
 - PYRUVATE CARBOXYLASES [1]
 - COA CARBOXYLASES [3]
 - PHOSPHORIC ESTER LIGASES [5]
 - DNA LIGASES [3]
 - RNA LIGASES [1]
 - RNA-3'-PHOSPHATE CYCLASES [1]



Gene Group: LIGASES

Home Tools Downloads Links Community Species About Help Archives

Help

General Information

Name	LIGASES	Species	<i>D. melanogaster</i>
Symbol	LIG	FlyBase ID	FBgg0000801
Date last reviewed	2018-02-01	Number of members	119

Description

Description: Ligases catalyse the joining of two substances, or two groups within a single molecule, with the concomitant hydrolysis of the diphosphate bond in ATP or a similar triphosphate. (Adapted from GO:0016874.)

Notes on Group: Despite their common/historical name, the UBIQUITIN LIGASES (FBgg0000069) are correctly classified as 'transferases' rather than 'ligases', and so do not appear within the LIGASES gene group.

Source Material: The LIGASES Gene Group has been compiled by FlyBase curators using the following publication(s): Lu et al., 2015 and Watkins et al., 2007.

Key Gene Ontology (GO) terms

Molecular Function: ligase activity

Biological Process:

Cellular Component:

Related Gene Groups

Component group(s): BETA-ALANYL-DOPAMINE SYNTHASES, CARBON-CARBON LIGASES, CARBON-NITROGEN LIGASES, CARBON-OXYGEN LIGASES, CARBON-SULFUR LIGASES, PHOSPHORIC ESTER LIGASES

Members (119)

For all members: View Orthologs Export to HitList Export to Batch Download

ACID-AMINO ACID LIGASES

Gene Symbol	Gene Name	Also Known As	Source Material for Membership
CG1578			(FlyBase, 2017-)
CG31773			(FlyBase, 2017-)
Fpgs	Folypolyglutamate synthase		(FlyBase, 2017-)
Gclc	Glutamate-cysteine ligase catalytic subunit	DmGCLC, GCL	(FlyBase, 2017-)
Gss1	Glutathione synthetase 1	GS	(FlyBase, 2017-)
Gss2	Glutathione synthetase 2		(FlyBase, 2017-)
Paics	PAICS bifunctional enzyme	ade5, AIRc-SAICARs	(FlyBase, 2017-)
Ppcs	Phosphopantothencycysteine synthetase	dPPCS	(FlyBase, 2017-)
TTL1A	Tubulin tyrosine ligase-like 1A		(FlyBase, 2017-)
TTL1B	Tubulin tyrosine ligase-like 1B		(FlyBase, 2017-)
TTL3A	Tubulin tyrosine ligase-like 3A		(FlyBase, 2017-)
TTL3B	Tubulin tyrosine ligase-like 3B		(FlyBase, 2017-)
TTL4A	Tubulin tyrosine ligase-like 4A	BEST:LD13681	(FlyBase, 2017-)
TTL4B	Tubulin tyrosine ligase-like 4B		(FlyBase, 2017-)
TTL5	Tubulin tyrosine ligase-like 5		(FlyBase, 2017-)
TTL6A	Tubulin tyrosine ligase-like 6A		(FlyBase, 2017-)
TTL6B	Tubulin tyrosine ligase-like 6B		(FlyBase, 2017-)
TTL12	Tubulin tyrosine ligase-like 12		(FlyBase, 2017-)
TTL15	Tubulin tyrosine ligase-like 15		(FlyBase, 2017-)

ACID-AMMONIA LIGASES

Gene Symbol	Gene Name	Also Known As	Source Material for Membership
Gs1	Glutamine synthetase 1	GSI	(FlyBase, 2017-)
Gs2	Glutamine synthetase 2	GsII	(FlyBase, 2017-)

ACYL-COA SYNTHETASES

Gene Symbol	Gene Name	Also Known As	Source Material for Membership
AcCoAS	Acetyl Coenzyme A synthase	ACS, dACS	(FlyBase, 2017-, Watkins et al., 2007)
Acsl	Acyl-CoA synthetase long-chain	l(2)44DEa, l(2)k05304, l(2)05847, dAcsl, FACS	(FlyBase, 2017-, Watkins et al., 2007)