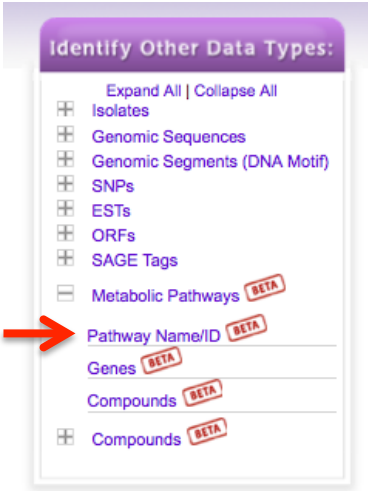
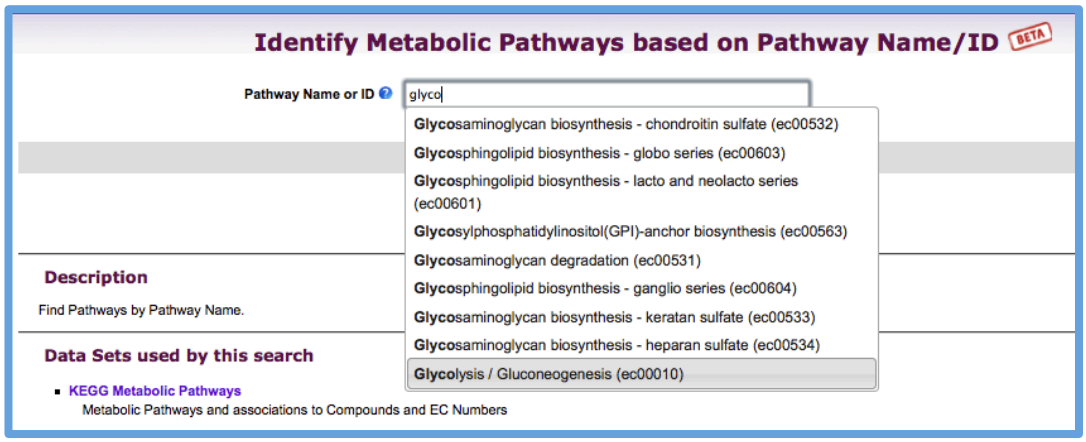
Exploring Metabolic Pathways and Compounds
Exercise 5

1. Find the metabolic pathway for glycolysis.
   For this exercise use http://plasmodb.org

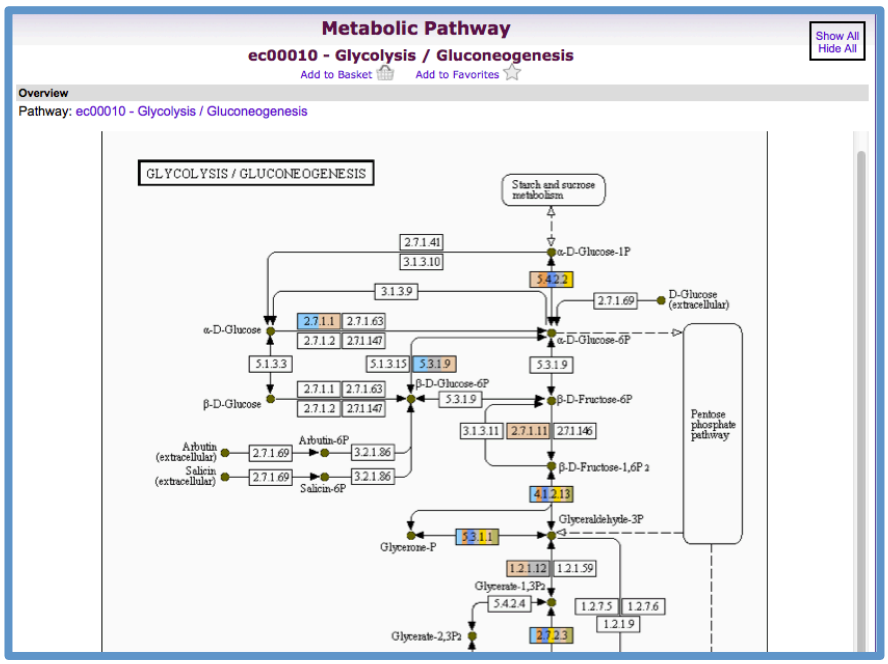
- Metabolic pathway and compound searches are available under the “Identify Other Data Types” heading on the home page. To find metabolic pathways by name, click on the “Pathway/Name/ID” option under the heading “Metabolic Pathways”.

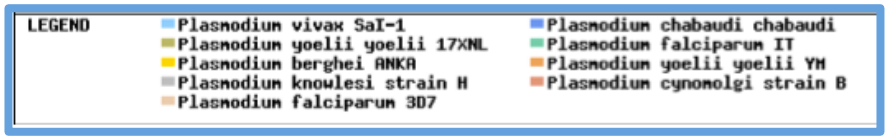


- This search provides type-ahead options.



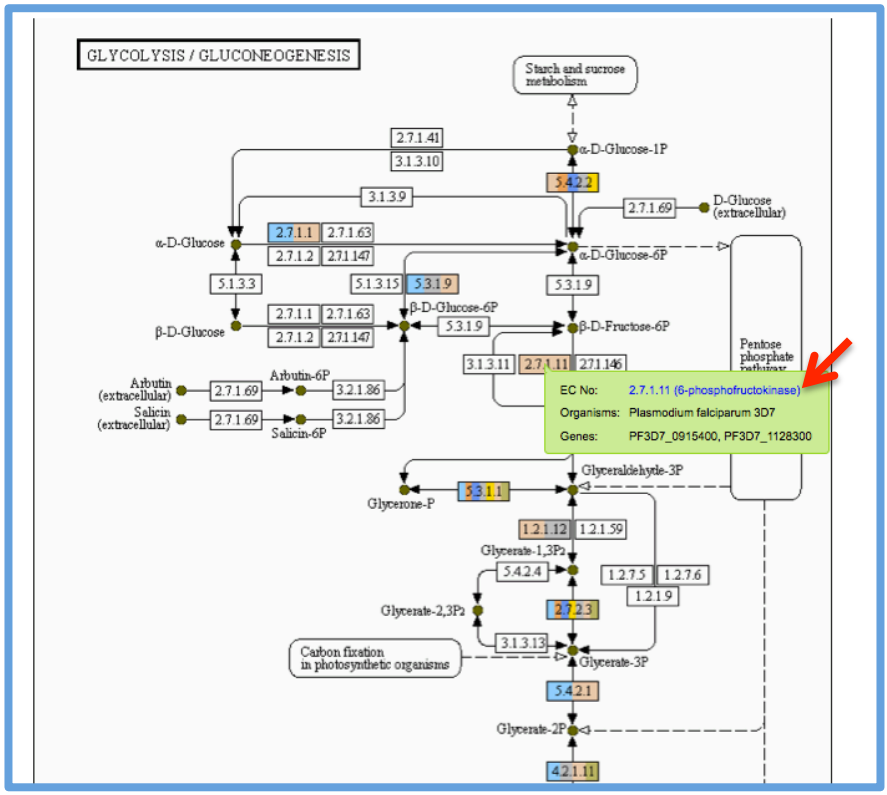
- Once you find glycolysis, the result page will display a graphical KEGG representation of the pathway. Examine the pathway – What do the rectangles with numbers like 2.7.1.11 represent? What do the circles represent? What do the colors mean? (Note that you can mouse over the various elements in the pathway to reveal popups with additional information).



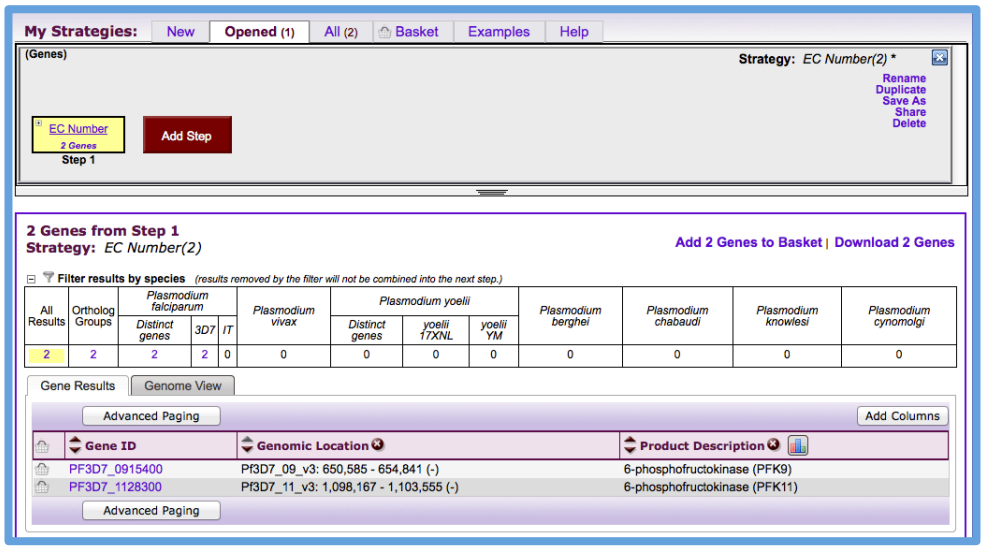


- Find the rectangle representing 6-phosphofructokinase. (hint: its EC number is 2.7.1.11).

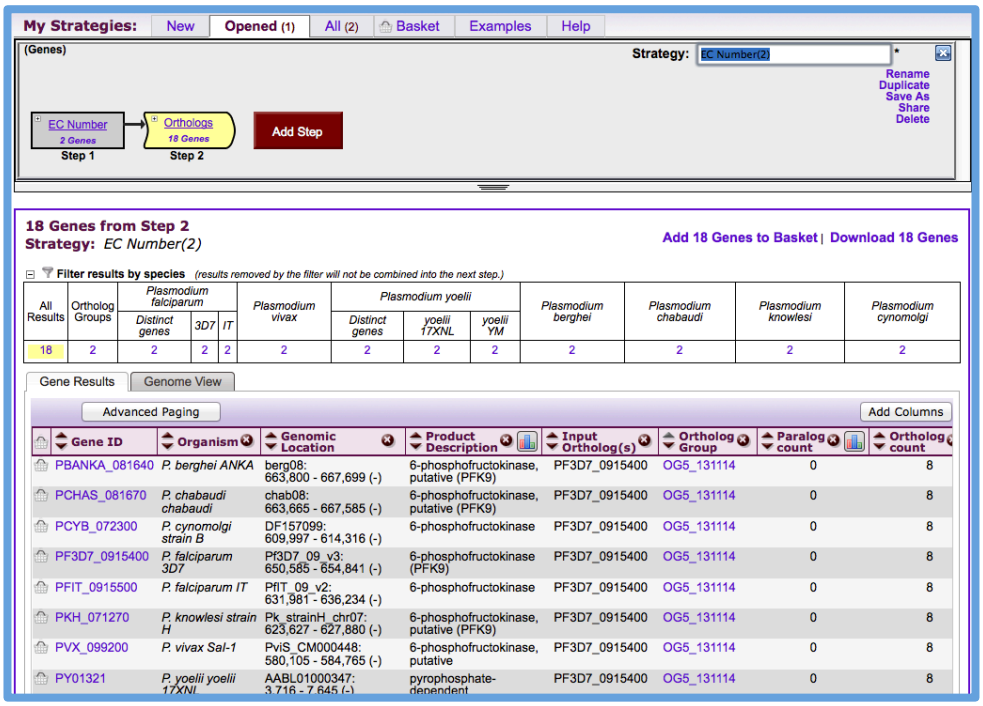
- Do you believe that this enzyme is only present in *P. falciparum*? What are some possibilities? How can you determine if this enzyme has orthologs in other Plasmodium species? (hint: you can click on the enzyme name in the popup).



- Once you click on the enzyme name/EC no. What results did you get? How can find orthologs of this gene in other *Plasmodium* species?



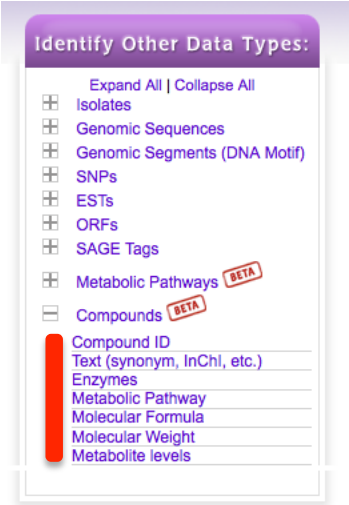
- Orthologs can be identified by add an “ortholog transform” step to the search strategy. (hint: click on add step, then select ortholog transform from the popup window. Next select the organisms you want to transform to and click on get answer).



- What do your results show? Is 6-phosphofructokinase unique to *P. falciparum*?

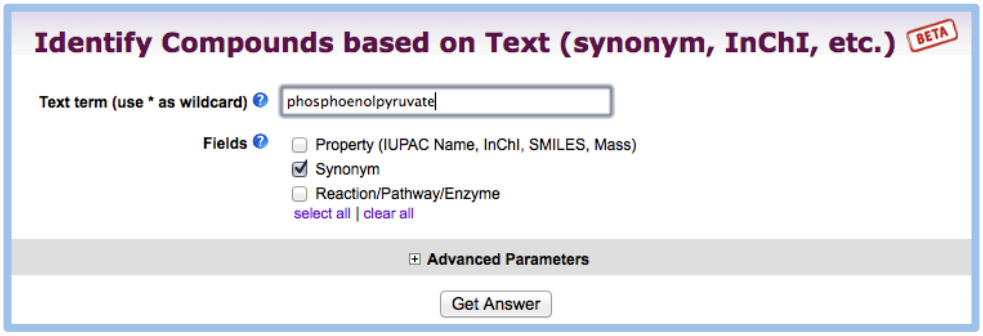
2. Compound records can be accessed by running a specific compound search available under “Identify Other Data Types” heading on the home page. Compound records can also be accessed form the mouse over popups in a metabolic pathway.

- Find Phosphoenolpyruvate (PEP) and visit its record page.

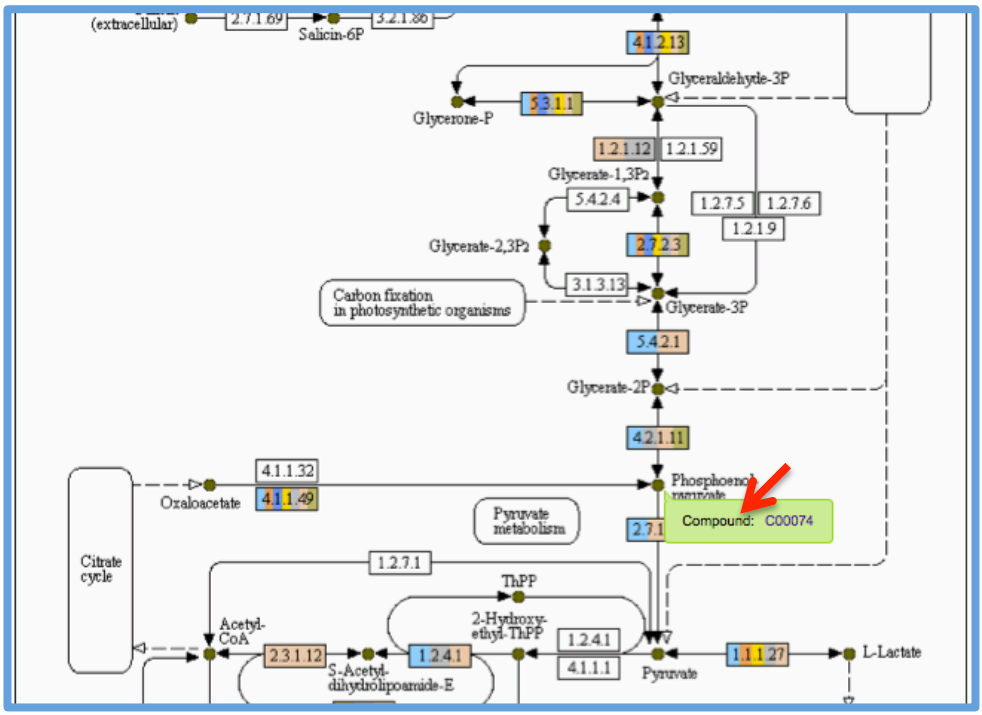


- PEP can be identified using a specific compound search. For example, compounds may be identified by ID, text search, metabolic pathway, Molecular formula, molecular weight and metabolite levels.

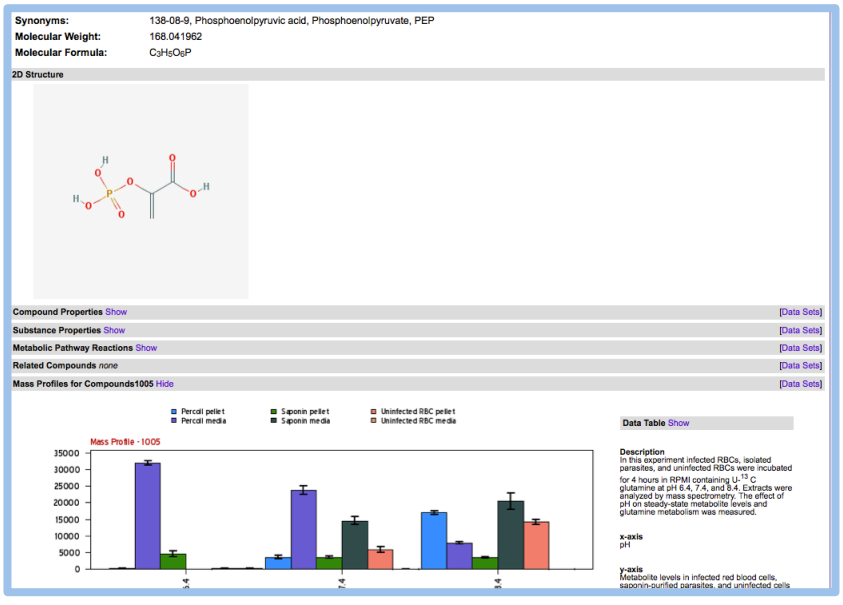
- Choose one of these options to identify PEP. For example, you can type phosphoenolpyruvate in the compound text search:



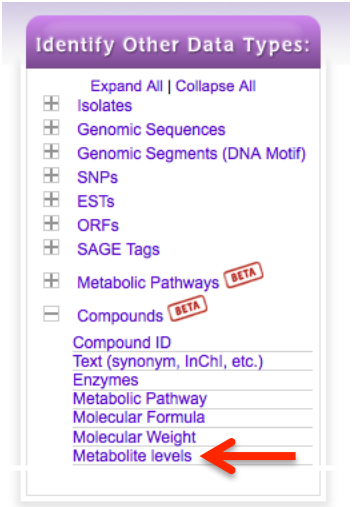
- PEP can be found in a metabolic pathway where it is present as a substrate or a product of an enzymatic reaction (ie. glycolysis). (hint: click on the compound ID in the popup).



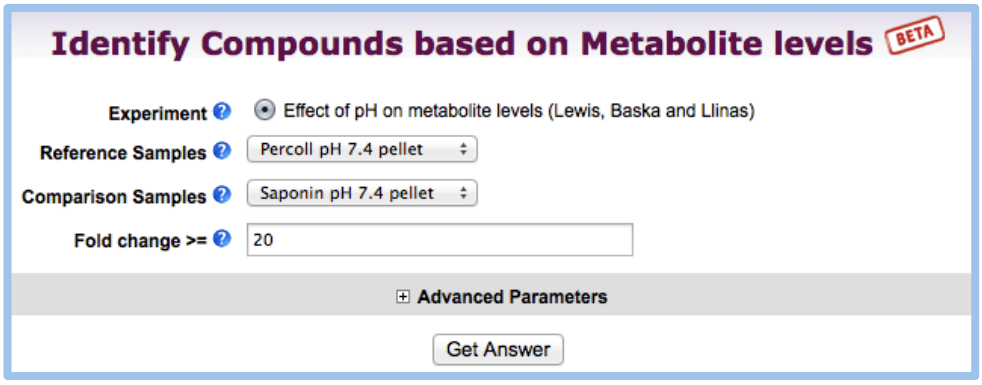
- Examine the PEP record page. Note that sections (ie. Metabolic Pathway Reactions) may be expanded by clicking on the "show" link.
- Under which conditions is PEP most highly? (hint: examine the "Mass Profiles for Compounds" section).



3. Identify metabolites (compounds) that are 20-fold enriched at pH7.4 in saponin lysed infected red blood cell (iRBCs) pellets compared the pH7.4 percoll pellet.

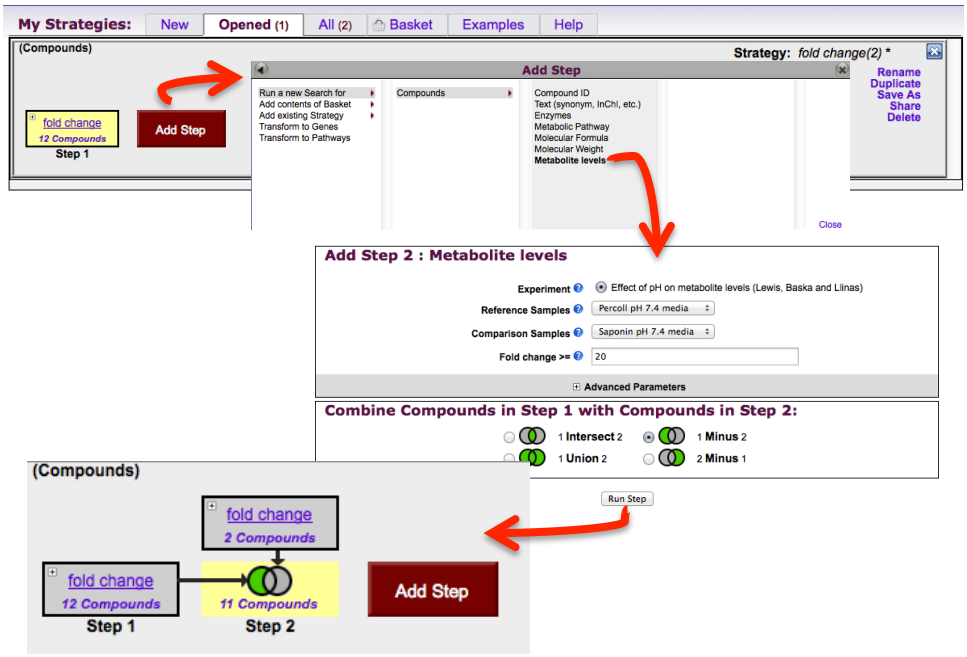


- This requires running a metabolite levels search (20-fold enriched in saponin pellet compared to the percoll pellet as the reference).

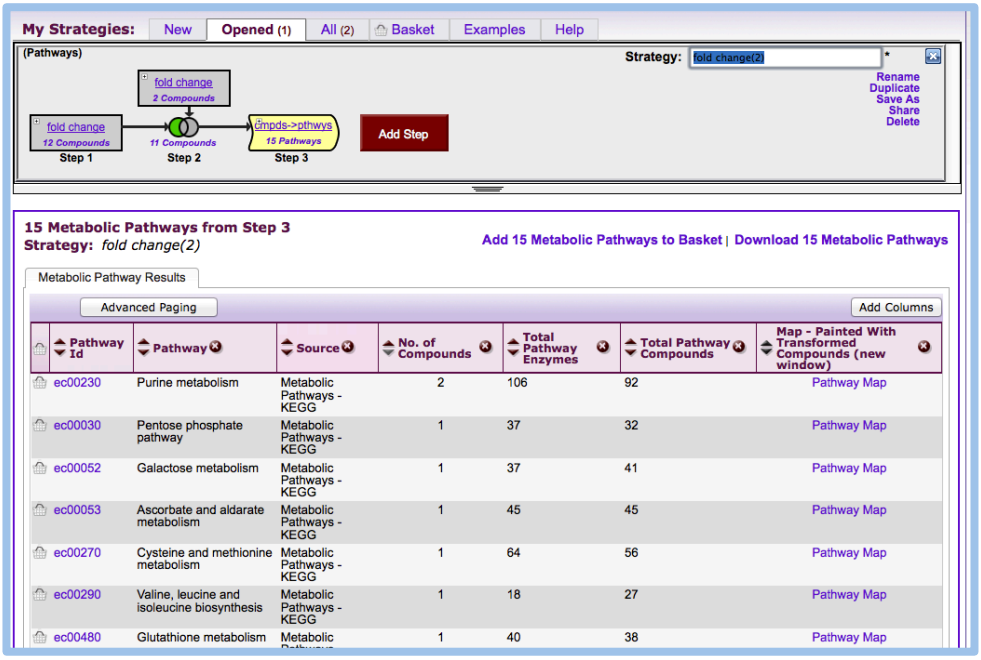


- How many compounds did you get?

- How many of these metabolites are not enriched (by 20-fold) in pH7.4 saponin media fraction compared to the Percoll media fraction? (hint: this will require adding a second step and using a subtraction operation).



- To which metabolic pathways do these compounds belong? (hint: click on add step and transform the results to metabolic pathways).



Pathway Id	Pathway	Source	No. of Compounds	Total Pathway Enzymes	Total Pathway Compounds	Map - Painted With Transformed Compounds (new window)
ec00230	Purine metabolism	Metabolic Pathways - KEGG	2	106	92	Pathway Map
ec00030	Pentose phosphate pathway	Metabolic Pathways - KEGG	1	37	32	Pathway Map
ec00052	Galactose metabolism	Metabolic Pathways - KEGG	1	37	41	Pathway Map
ec00053	Ascorbate and aldarate metabolism	Metabolic Pathways - KEGG	1	45	45	Pathway Map
ec00270	Cysteine and methionine metabolism	Metabolic Pathways - KEGG	1	64	56	Pathway Map
ec00290	Valine, leucine and isoleucine biosynthesis	Metabolic Pathways - KEGG	1	18	27	Pathway Map
ec00480	Glutathione metabolism	Metabolic	1	40	38	Pathway Map