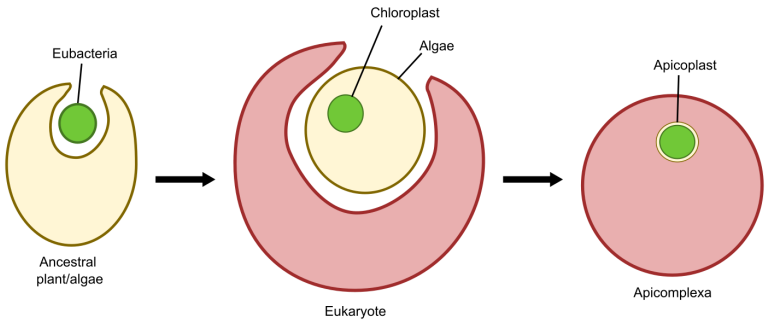
VEuPathDB
Eukaryotic Pathogen, Vector & Host Informatics Resources

Integrate Phyletic and Genomic data in a complex Search Strategy

Introduction

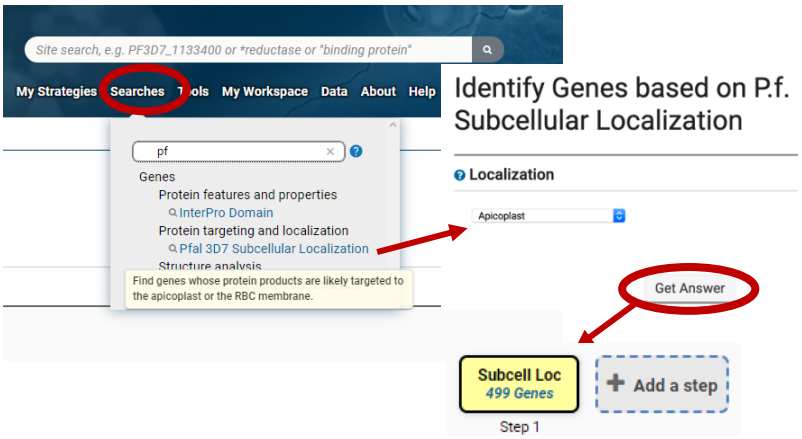


The apicoplast is a unique organelle found only in apicomplexan parasites and is thought to have originated through a rare secondary endosymbiosis event. In this process, an ancestral eukaryote first engulfed a cyanobacterium to form a chloroplast, and later, an algal cell containing that chloroplast was engulfed by the ancestor of apicomplexan, resulting in an organelle surrounded by four membranes.

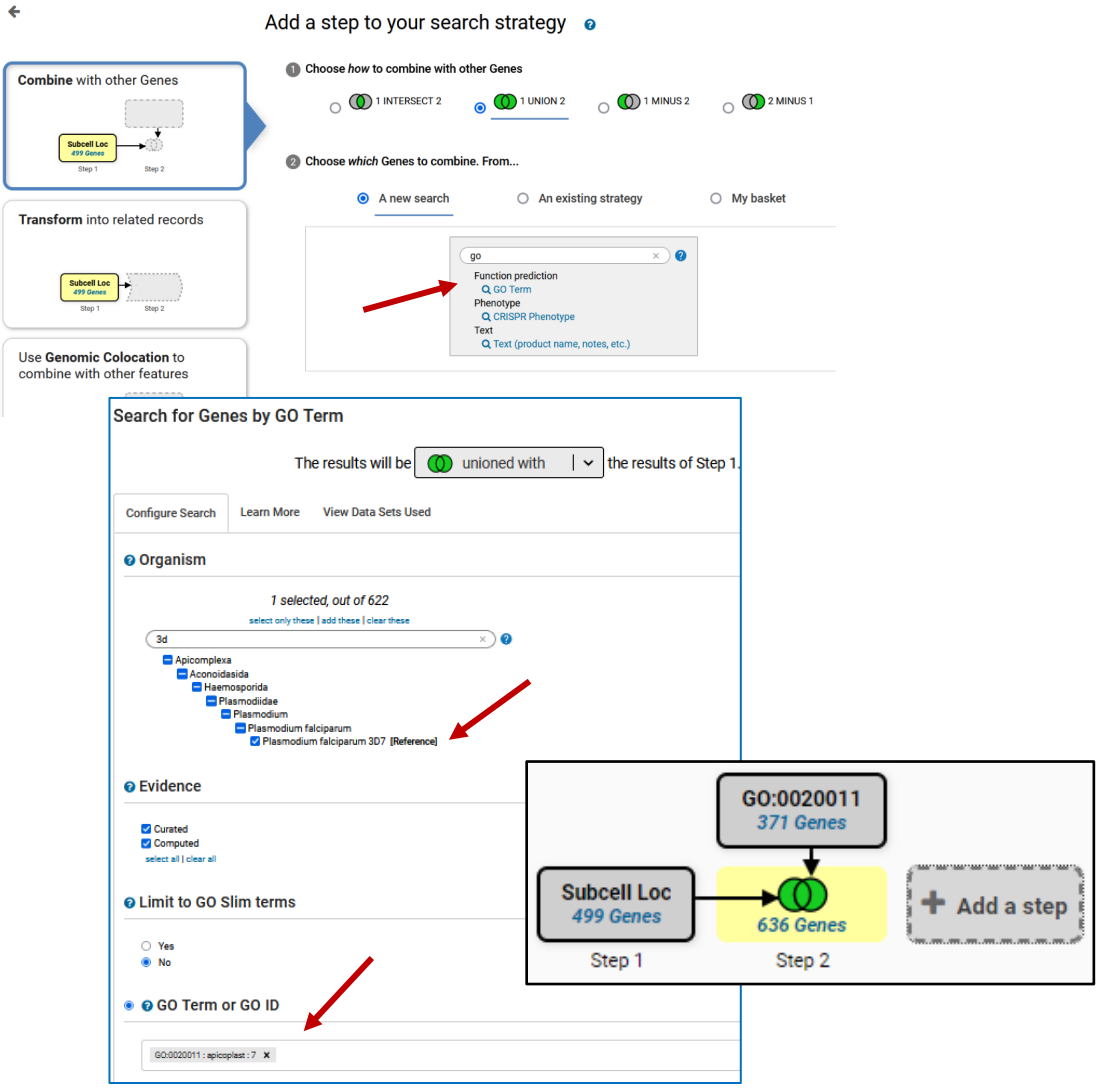
Because the apicoplast retains essential metabolic pathways distinct from those of the host, it represents an attractive target for anti-parasitic drug development. In this exercise, we explore how to identify genes targeted to the apicoplast in *Toxoplasma* and *Neospora* to better understand its functions and potential vulnerabilities.

Note: For this exercise use https://veupathdb.org/veupathdb/app

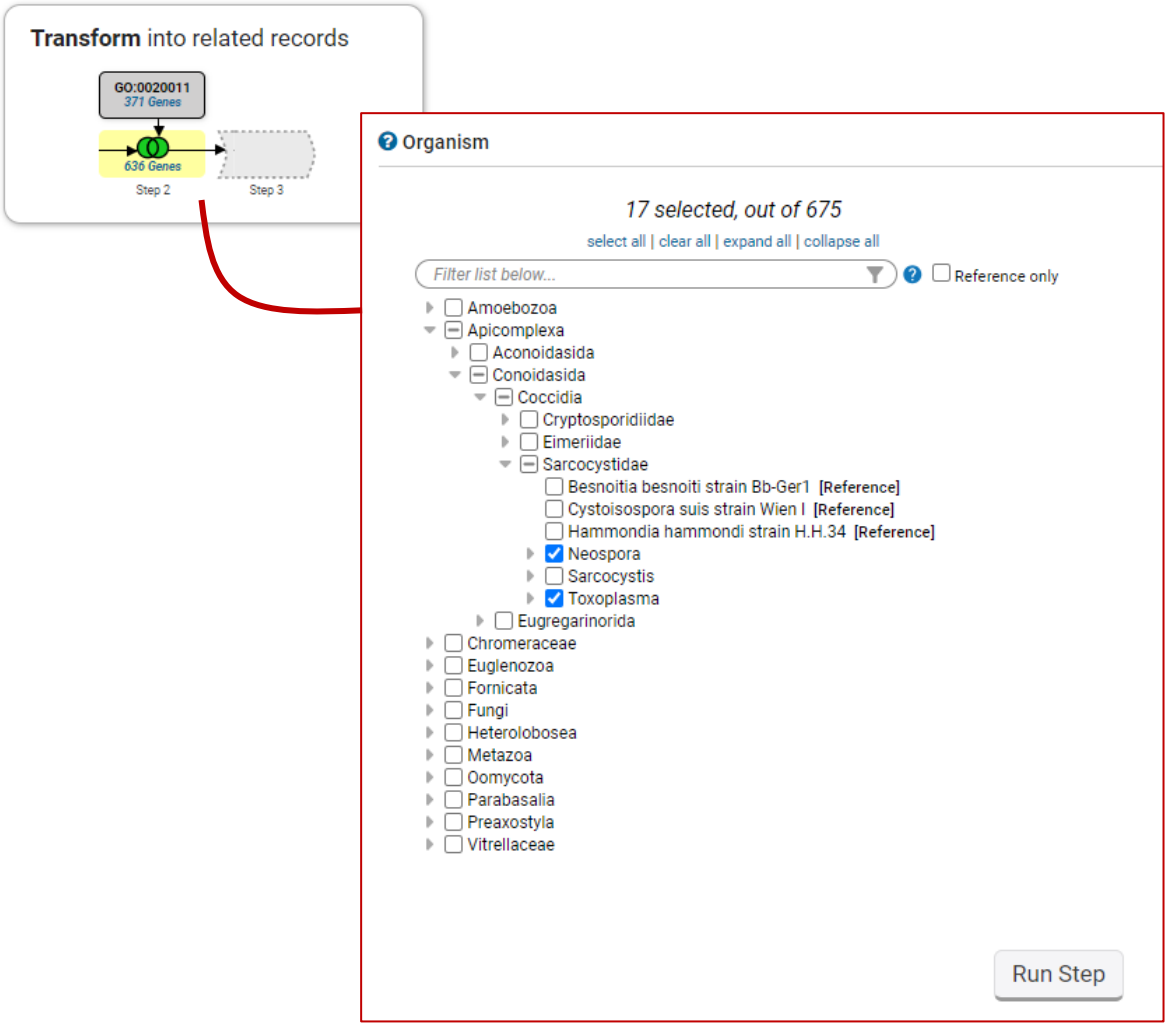
1. Start by finding genes in *Plasmodium* that are predicted to target the apicoplast.
   Hint: Navigate to the [Pfal 3D7 Subcellular Localization] search and search for Apicoplast. *You can filter the Searches menu by text query.*

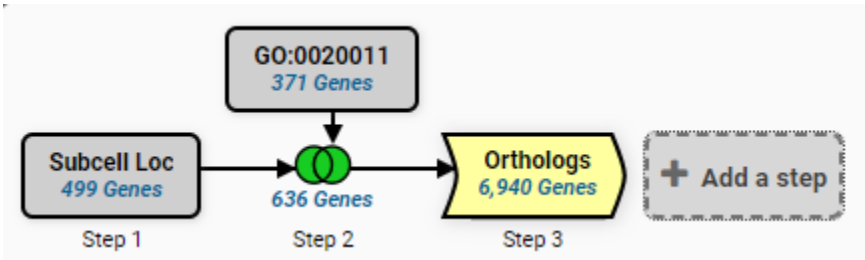


2. Expand your list of potentially Apicoplast targeted proteins by adding a GO terms search for the term “apicoplast” or the GO ID: “GO:0020011” in *P. falciparum* 3D7 (Which Boolean operation should you use, Union or intersect?)



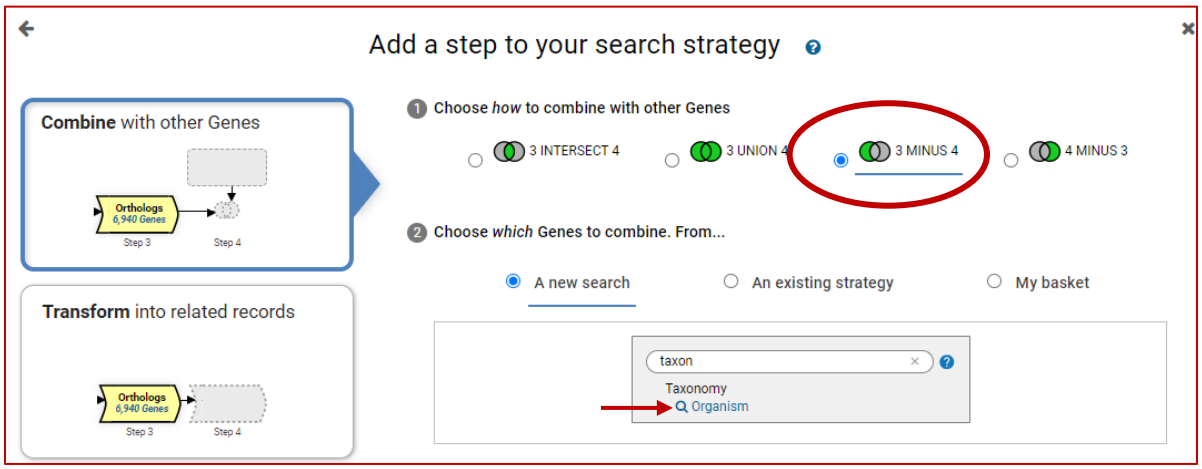
3. Add a step to your strategy that transforms the results with *Toxoplasma* and *Neospora* orthologs. Note that this finds orthologous genes from many strains and species.

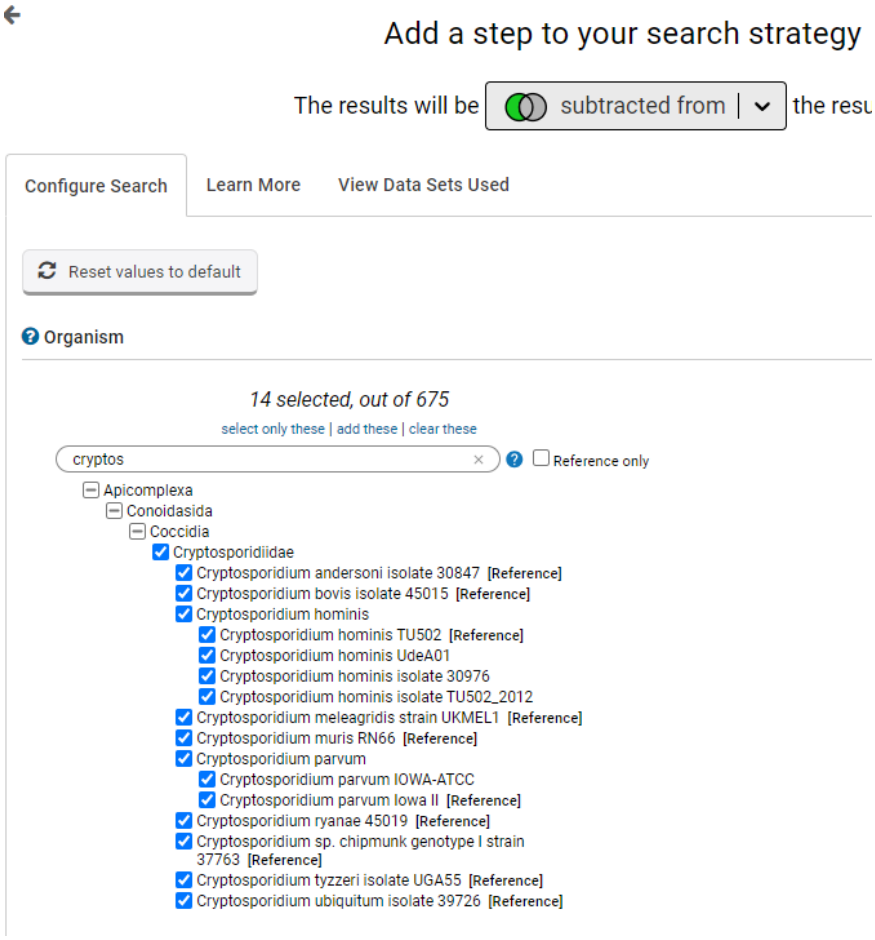


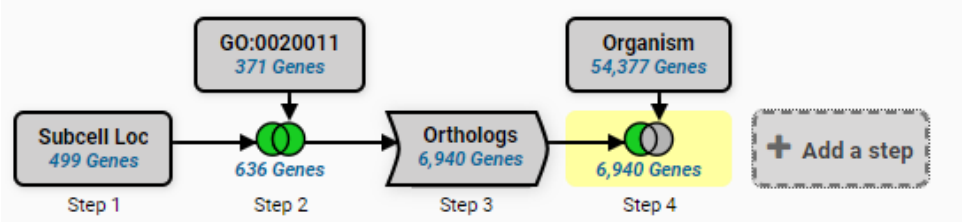


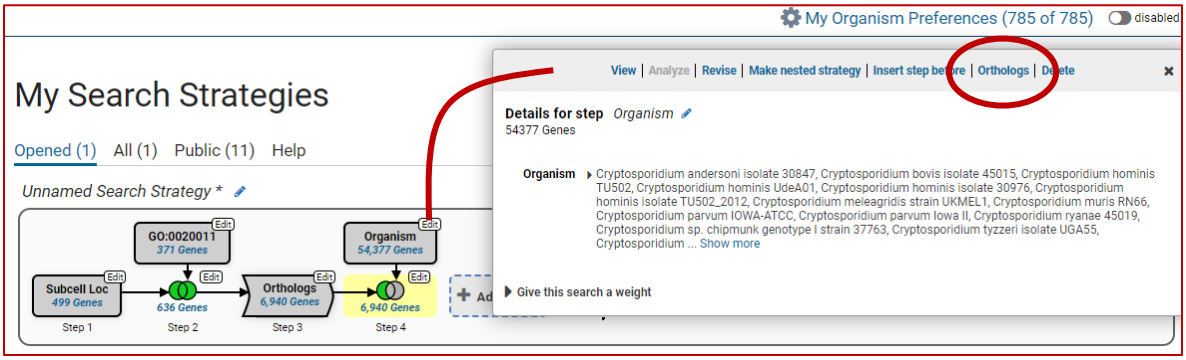
4. Although *Cryptosporidium* is an apicomplexan parasite it has lost its apicoplast! So one idea is that since it is missing this organelle, the parasite likely also lost many of the biochemical functions that typically take place in it. Use this fact to refine your results from the above search and remove genes that also have orthologs in *Cryptosporidium* (the assumption is that some of the missing genes are apicoplast targeted proteins in apicomplexa with an apicoplast).

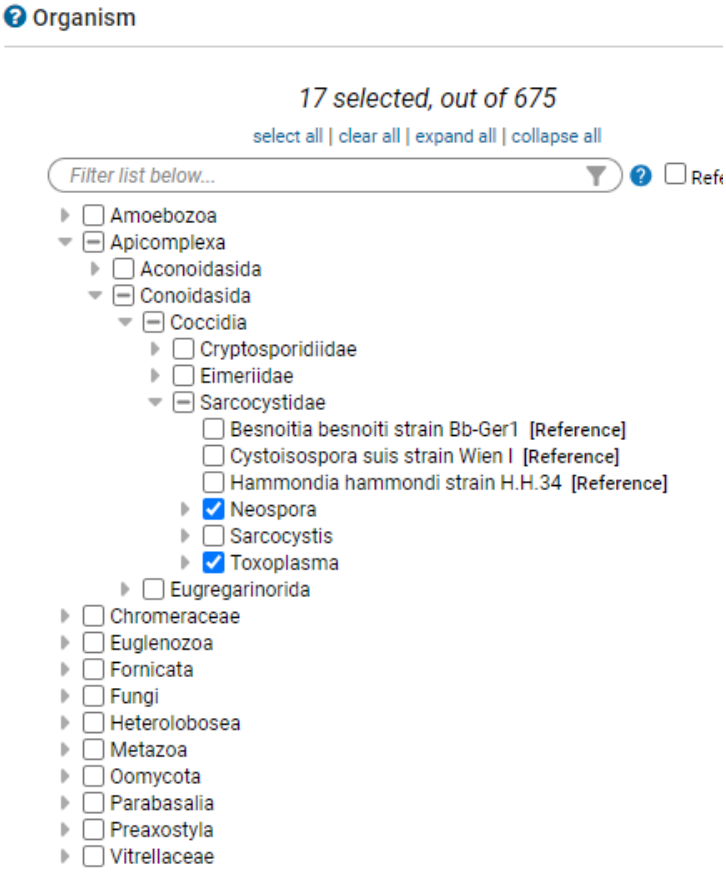
Hint: try subtracting out any orthologs present in *Cryptosporidium*. You will need to use a nested strategy. First retrieve all *Cryptosporidium* genes with the Genes by Taxonomy search and then transform these to their Toxoplasma and Neospora orthologs for the subtraction to complete. Think about what kind of intersection you should be using!

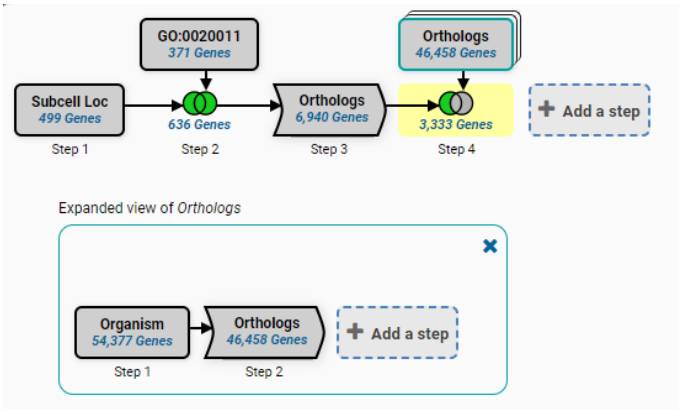





GO:0020011
371 Genes
Organism
54,377 Genes
Subcell Loc
499 Genes
636 Genes
Orthologs
6,940 Genes
6,940 Genes
Add a step
Step 1
Step 2
Step 3
Step 4


My Organism Preferences (785 of 785)
disabled
My Search Strategies
Opened (1)
All (1)
Public (11)
Help
Unnamed Search Strategy *
View | Analyze | Revise | Make nested strategy | Insert step before | Orthologs | Delete
Details for step Organism
54377 Genes
Organism
Cryptosporidium andersoni isolate 30847, Cryptosporidium bovis isolate 45015, Cryptosporidium hominis TU502, Cryptosporidium hominis UdeA01, Cryptosporidium hominis isolate 30976, Cryptosporidium hominis isolate TU502_2012, Cryptosporidium meleagridis strain UKMEL1, Cryptosporidium muris RN66, Cryptosporidium parvum IOWA-ATCC, Cryptosporidium parvum Iowa II, Cryptosporidium ryanae 45019, Cryptosporidium sp. chipmunk genotype I strain 37763, Cryptosporidium tyzzeri isolate UGA55, Cryptosporidium ... Show more
Give this search a weight
GO:0020011
371 Genes
Organism
54,377 Genes
Subcell Loc
499 Genes
636 Genes
Orthologs
6,940 Genes
6,940 Genes
Step 1
Step 2
Step 3
Step 4


Organism
17 selected, out of 675
select all | clear all | expand all | collapse all
Filter list below...
Amoebozoa
Apicomplexa
Aconoidasida
Conoidasida
Coccidia
Cryptosporidiidae
Eimeriidae
Sarcocystidae
Besnoitia besnoiti strain Bb-Ger1 [Reference]
Cystoisospora suis strain Wien I [Reference]
Hammondia hammondi strain H.H.34 [Reference]
Neospora
Sarcocystis
Toxoplasma
Eugregarinorida
Chromeraceae
Euglenozoa
Fornicata
Fungi
Heterolobosea
Metazoa
Oomycota
Parabasalia
Preaxostyla
Vitrellaceae



This leaves you with apicoplast specific genes for *Toxoplasma* and *Neospora* that you could target in future research. Note that Search Strategies can be saved, shared, and imported. https://veupathdb.org/veupathdb/app/workspace/strategies/import/543f14bfab645f7e