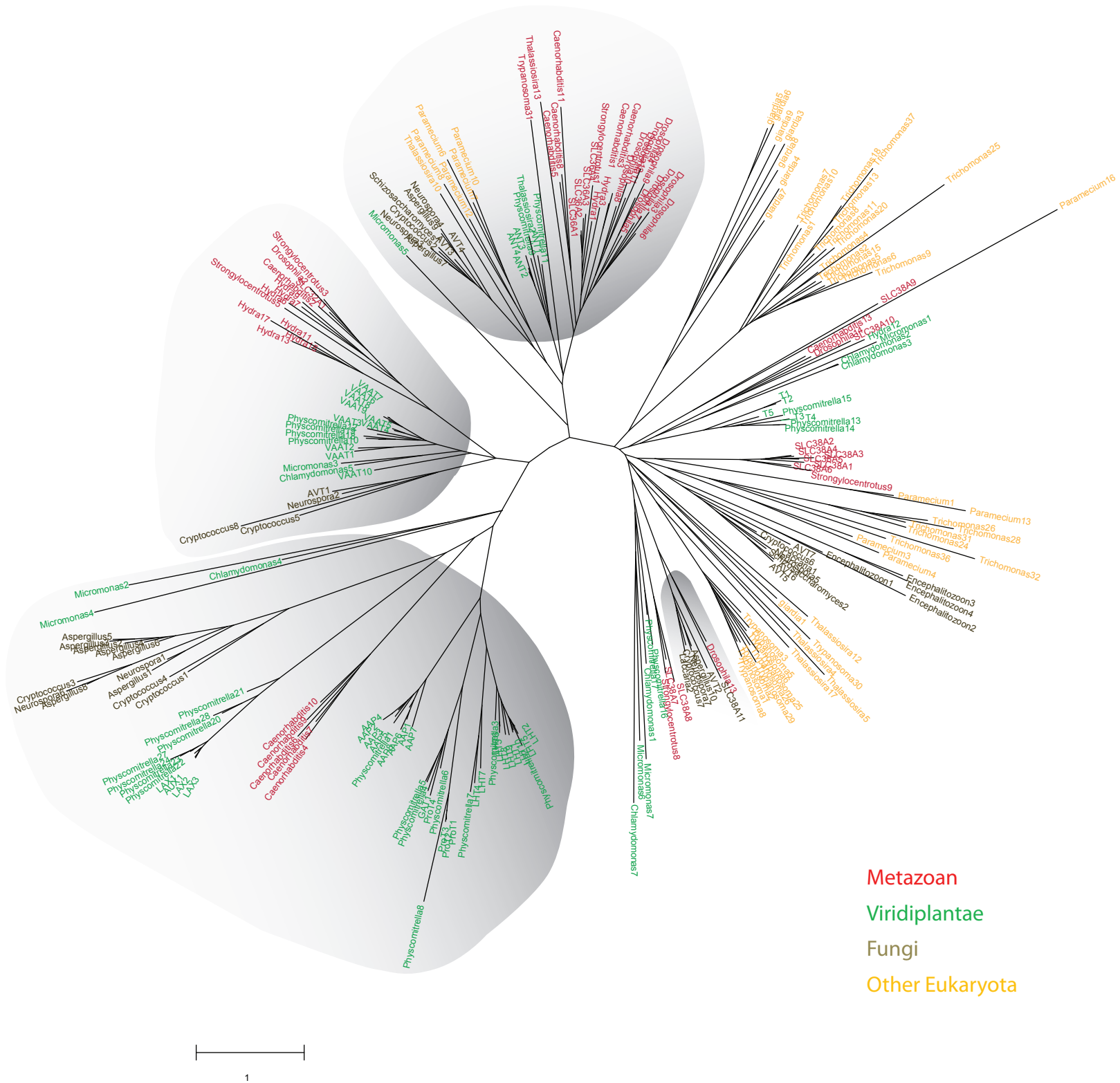


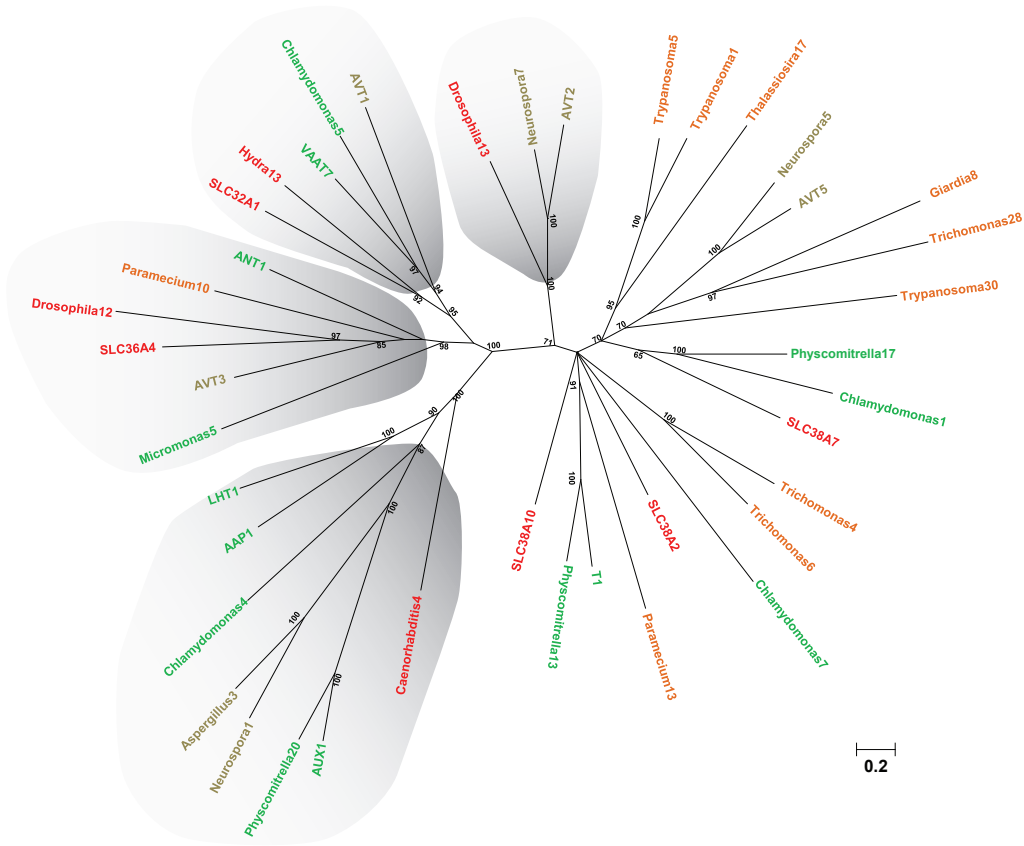
**Supplementary Figure 1.** Phylogenetic tree of members of the APC family (TC.2.A.3). Sequences from selected organisms (Supplemental Table 1) belonging to different kingdoms were aligned using Clustal-W and only domains present in all sequences were kept. The tree was constructed using Neighbor-Joining (Saitou and Nei, 1987), from the MEGA4 package (Kumar et al, 2008). The evolutionary distances were computed using the Poisson correction method (Zuckerandl and Pauling, 19665) and are in the units of the number of amino acid substitutions per site. The rate variation among sites was modeled with a gamma distribution (shape parameter = 1). All ambiguous positions were removed for each sequence pair. The grouping was confirmed by Bayesian Inference using a subset of the sequences, representative of each of the clades (Supplementary Figure 3).



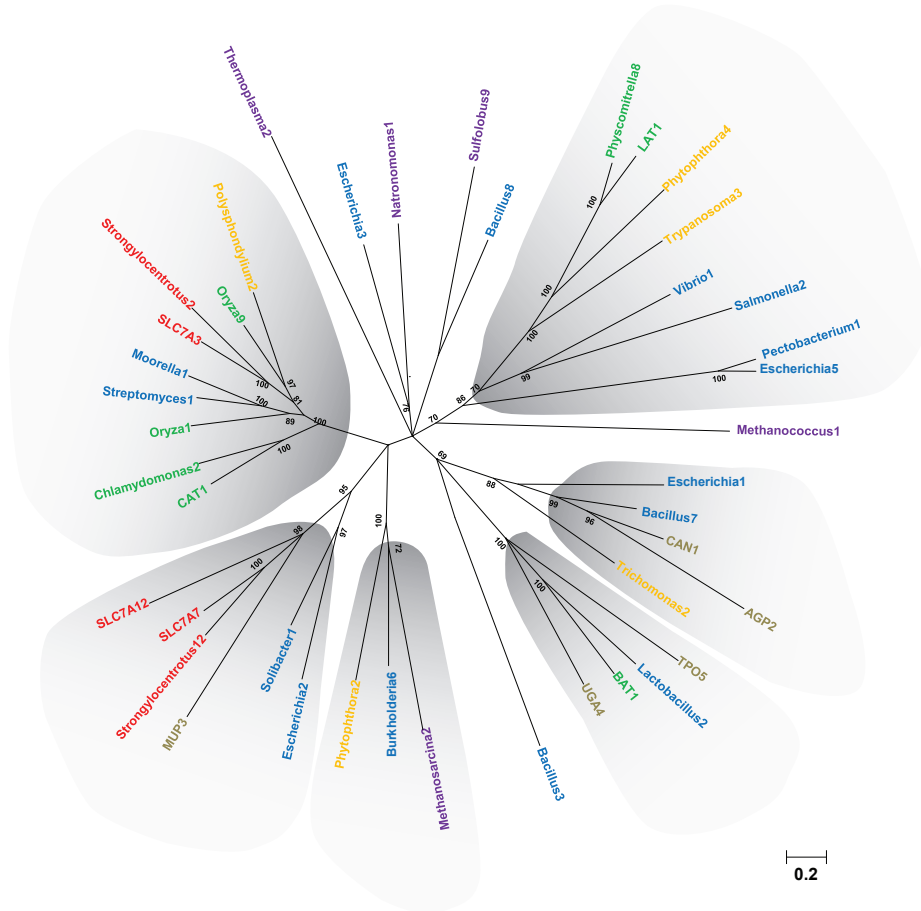
**Supplementary Figure 2.** Phylogenetic tree of members of the AAP family (TC.2.A.18). The phylogenetic tree from sequences selected from organisms (Supplemental Table 2) belonging to different kingdoms was performed as described in Supplementary Figure 1.

**A**

Metazoan  
 Viridiplantae  
 Fungi  
 Other Eukaryota  
 Bacteria  
 Archaea



**B**



**Supplementary Figure 3.** Bayesian inference tree from APC and AAAP families. Sequence from each of the clades identified with the Neighbor Joining phylogeny of the AAAP (A) and APC (B) families (see Supplemental Figures S1 and S2) were aligned by Clustal-W, retaining the domains present in all proteins. The phylogenies were constructed with MrBayes (Huelsenbeck et al, 2001; Ronquist and Huelsenbeck, 2003), using mixed protein models, and 1,000,000 and 500,000 generations respectively.

**Supplementary Table 1.** Sequences from the APC family used for phylogeny construction. Sequences from Genbank (<http://www.ncbi.nlm.nih.gov/genbank/>) were retrieved by psi-BLASTp (Altschul et al, 1997) searches using known members of the family as query.

<b>GI / Identifier</b>	<b>Species</b>	<b>Name on tree</b>
254168086	<i>Aciduliprofundum boonei</i> T469	Aciduliprofundum1
170289950	<i>Candidatus Korarchaeum cryptofilum</i> OPF8	Candidatus1
154150194	<i>Candidatus Methanoregula boonei</i> 6A8	Candidatus2
257077094	<i>Ferroplasma acidarmanus</i> fer1	Ferroplasma1
284165361	<i>Haloterrigena turkmenica</i> DSM 5511	Haloterrigena1
163799556	<i>Methanococcus voltae</i> A3	Methanococcus1
163799145	<i>Methanococcus voltae</i> A3	Methanococcus2
20091257	<i>Methanosarcina acetivorans</i> C2A	Methanosarcina1
2746072	<i>Methanosarcina barkeri</i>	Methanosarcina2
21229288	<i>Methanosarcina mazei</i> Go1	Methanosarcina3
21228948	<i>Methanosarcina mazei</i> Go1	Methanosarcina4
76800975	<i>Natronomonas pharaonis</i> DSM 2160	Natronomonas1
76800675	<i>Natronomonas pharaonis</i> DSM 2160	Natronomonas2
126459945	<i>Pyrobaculum calidifontis</i> JCM 11548	Pyrobaculum1
14591242	<i>Pyrococcus horikoshii</i> OT3	Pyrococcus1
284998687	<i>Sulfolobus islandicus</i> L.D.8.5	Sulfolobus1
227828979	<i>Sulfolobus islandicus</i> M.14.25	Sulfolobus2
227828821	<i>Sulfolobus islandicus</i> M.14.25	Sulfolobus3
229584701	<i>Sulfolobus islandicus</i> M.16.27	Sulfolobus4
238619498	<i>Sulfolobus islandicus</i> M.16.4	Sulfolobus5
229582548	<i>Sulfolobus islandicus</i> Y.N.15.51	Sulfolobus6
284175213	<i>Sulfolobus solfataricus</i> 98/2	Sulfolobus7
15921087	<i>Sulfolobus tokodaii</i> str. 7	Sulfolobus8
15922067	<i>Sulfolobus tokodaii</i> str. 7	Sulfolobus9
240103912	<i>Thermococcus gammatolerans</i> EJ3	Thermococcus1
10640472	<i>Thermoplasma acidophilum</i>	Thermoplasma1
16081747	<i>Thermoplasma acidophilum</i> DSM 1728	Thermoplasma2
13541742	<i>Thermoplasma volcanium</i> GSS1	Thermoplasma3
256371736	<i>Acidimicrobium ferrooxidans</i> DSM 10331	Acidimicrobium1
148261377	<i>Acidiphilium cryptum</i> JF-5	Acidiphilium1
126645790	<i>Algoriphagus</i> sp. PR1	Algoriphagus1
258512211	<i>Alicyclobacillus acidocaldarius</i> subsp. <i>acidocaldarius</i> DSM 446	Alicyclobacillus1
196155226	<i>Alteromonas macleodii</i> 'Deep ecotype'	Alteromonas1
167747463	<i>Anaerostipes caccae</i> DSM 14662	Anaerostipes1
228999912	<i>Bacillus mycoides</i> Rock3-17	Bacillus1
228913507	<i>Bacillus thuringiensis</i> serovar <i>pulsiensis</i> BGSC 4CC1	Bacillus2
194015764	<i>Bacillus pumilus</i> ATCC 7061	Bacillus3

229133246	<i>Bacillus cereus</i> BDRD-ST196	<i>Bacillus</i> 4
229030801	<i>Bacillus cereus</i> AH1271	<i>Bacillus</i> 5
229542890	<i>Bacillus coagulans</i> 36D1	<i>Bacillus</i> 6
49479251	<i>Bacillus thuringiensis</i> serovar konkukian str. 97-27	<i>Bacillus</i> 7
16080500	<i>Bacillus subtilis</i> subsp. <i>subtilis</i> str. 168	<i>Bacillus</i> 8
227999742	<i>Brachyspira murdochii</i> DSM 12563	<i>Brachyspira</i> 1
172062396	<i>Burkholderia ambifaria</i> MC40-6	<i>Burkholderia</i> 1
126454164	<i>Burkholderia pseudomallei</i> 1106a	<i>Burkholderia</i> 2
206563116	<i>Burkholderia cenocepacia</i> J2315	<i>Burkholderia</i> 3
172059496	<i>Burkholderia ambifaria</i> MC40-6	<i>Burkholderia</i> 4
91781402	<i>Burkholderia xenovorans</i> LB400	<i>Burkholderia</i> 5
107024469	<i>Burkholderia cenocepacia</i> AU 1054	<i>Burkholderia</i> 6
189347097	<i>Chlorobium limicola</i> DSM 245	<i>Chlorobium</i> 1
283786839	<i>Citrobacter rodentium</i> ICC168	<i>Citrobacter</i> 1
237729075	<i>Citrobacter</i> sp. 30_2	<i>Citrobacter</i> 2
226947574	<i>Clostridium botulinum</i> A2 str. Kyoto	<i>Clostridium</i> 1
150015674	<i>Clostridium beijerinckii</i> NCIMB 8052	<i>Clostridium</i> 2
164686601	<i>Clostridium bartlettii</i> DSM 16795	<i>Clostridium</i> 3
284046370	<i>Conexibacter woesei</i> DSM 14684	<i>Conexibacter</i> 1
212218186	<i>Coxiella burnetii</i> CbuK_Q154	<i>Coxiella</i> 1
260599679	<i>Cronobacter turicensis</i> z3032	<i>Cronobacter</i> 1
239906287	<i>Desulfovibrio magneticus</i> RS-1	<i>Desulfovibrio</i> 1
242240447	<i>Dickeya dadantii</i> Ech703	<i>Dickeya</i> 1
271500890	<i>Dickeya dadantii</i> Ech586	<i>Dickeya</i> 2
166031092	<i>Dorea formicigenerans</i> ATCC 27755	<i>Dorea</i> 1
269137828	<i>Edwardsiella tarda</i> EIB202	<i>Edwardsiella</i> 1
288550498	<i>Enterobacter cancerogenus</i> ATCC 35316	<i>Enterobacter</i> 1
188533227	<i>Erwinia tasmaniensis</i> Et1/99	<i>Erwinia</i> 1
15801690	<i>Escherichia coli</i> O157:H7 EDL933	<i>Escherichia</i> 1
188493591	<i>Escherichia coli</i> 53638	<i>Escherichia</i> 2
16128470	<i>Escherichia coli</i> str. K-12 substr. MG1655	<i>Escherichia</i> 3
89110879	<i>Escherichia coli</i> str. K-12 substr. W3110	<i>Escherichia</i> 4
16131966	<i>Escherichia coli</i> str. K-12 substr. MG1655	<i>Escherichia</i> 5
242379642	<i>Escherichia coli</i> 53638	<i>Escherichia</i> 6
253582761	<i>Fusobacterium varium</i> ATCC 27725	<i>Fusobacterium</i> 1
226227984	<i>Gemmatimonas aurantiaca</i> T-27	<i>Gemmatimonas</i> 1
226227437	<i>Gemmatimonas aurantiaca</i> T-27	<i>Gemmatimonas</i> 2
152970458	<i>Klebsiella pneumoniae</i> subsp. <i>pneumoniae</i> MGH 78578	<i>Klebsiella</i> 1
288937541	<i>Klebsiella variicola</i> At-22	<i>Klebsiella</i> 2
227976187	<i>Lactobacillus reuteri</i> SD2112	<i>Lactobacillus</i> 1
227523914	<i>Lactobacillus hilgardii</i> ATCC 8290	<i>Lactobacillus</i> 2
116332788	<i>Lactobacillus brevis</i> ATCC 367	<i>Lactobacillus</i> 3
199597506	<i>Lactobacillus rhamnosus</i> HN001	<i>Lactobacillus</i> 4

15674175	<i>Lactococcus lactis</i> subsp. <i>lactis</i> II1403	Lactococcus1
94986707	<i>Lawsonia intracellularis</i> PHE/MN1-00	Lawsonia1
224498726	<i>Listeria monocytogenes</i> Finland 1988	Listeria1
169829435	<i>Lysinibacillus sphaericus</i> C3-41	Lysinibacillus1
227990264	<i>Meiothermus silvanus</i> DSM 9946	Meiothermus1
260469724	<i>Mesorhizobium opportunistum</i> WSM2075	Mesorhizobium1
124267602	<i>Methylibium petroleiphilum</i> PM1	Methylibium1
218528764	<i>Methylobacterium chloromethanicum</i> CM4	Methylobacterium1
217978559	<i>Methylocella silvestris</i> BL2	Methylocella1
238063365	<i>Micromonospora</i> sp. ATCC 39149	Micromonospora1
83589589	<i>Moorella thermoacetica</i> ATCC 39073	Moorella1
83590754	<i>Moorella thermoacetica</i> ATCC 39073	Moorella2
251798187	<i>Paenibacillus</i> sp. JDR-2	Paenibacillus1
258634929	<i>Pantoea</i> sp. At-9b	Pantoea1
261820334	<i>Pectobacterium wasabiae</i> WPP163	Pectobacterium1
268589191	<i>Providencia rettgeri</i> DSM 1131	Providencia1
77458536	<i>Pseudomonas fluorescens</i> Pf0-1	Pseudomonas1
207742976	<i>Ralstonia solanacearum</i> IPO1609	Ralstonia1
187927016	<i>Ralstonia pickettii</i> 12J	Ralstonia2
254463690	Rhodobacterales bacterium Y4I	Rhodobacterales1
134101704	<i>Saccharopolyspora erythraea</i> NRRL 2338	Saccharopolyspora1
168244874	<i>Salmonella enterica</i> subsp. <i>enterica</i> serovar Heidelberg str. SL486	Salmonella1
213428685	<i>Salmonella enterica</i> subsp. <i>enterica</i> serovar Typhi str. E02-1180	Salmonella2
16767577	<i>Salmonella typhimurium</i> LT2	Salmonella3
15963846	<i>Sinorhizobium meliloti</i> 1021	Sinorhizobium1
116623871	<i>Solibacter usitatus</i> Ellin6076	Solibacter1
254402597	<i>Streptomyces svuceus</i> ATCC 29083	Streptomyces1
29830665	<i>Streptomyces avermitilis</i> MA-4680	Streptomyces2
271962357	<i>Streptosporangium roseum</i> DSM 43021	Streptosporangium1
152992623	<i>Sulfurovum</i> sp. NBC37-1	Sulfurovum1
152992627	<i>Sulfurovum</i> sp. NBC37-1	Sulfurovum2
20807215	<i>Thermoanaerobacter tengcongensis</i> MB4	Thermoanaerobacter1
282850442	<i>Veillonella parvula</i> ATCC 17745	Veillonella1
90577962	<i>Vibrio angustum</i> S14	Vibrio1
254505716	<i>Vibrio parahaemolyticus</i> 16	Vibrio2
148975737	Vibrionales bacterium SWAT-3	Vibrionales1
188577540	<i>Xanthomonas oryzae</i> pv. <i>oryzae</i> PXO99A	Xanthomonas1
289175200	<i>Xenorhabdus bovienii</i> SS-2004	Xenorhabdus1
149366126	<i>Yersinia pestis</i> CA88-4125	Yersinia1
22127397	<i>Yersinia pestis</i> KIM 10	Yersinia2
121705408	<i>Aspergillus clavatus</i> NRRL 1	Aspergillus1

121698393	<i>Aspergillus clavatus</i> NRRL 1	<i>Aspergillus</i> 2
238492327	<i>Aspergillus flavus</i> NRRL3357	<i>Aspergillus</i> 3
238503341	<i>Aspergillus flavus</i> NRRL3357	<i>Aspergillus</i> 4
159125820	<i>Aspergillus fumigatus</i> A1163	<i>Aspergillus</i> 5
70995688	<i>Aspergillus fumigatus</i> Af293	<i>Aspergillus</i> 6
67903478	<i>Aspergillus nidulans</i> FGSC A4	<i>Aspergillus</i> 7
145245147	<i>Aspergillus niger</i>	<i>Aspergillus</i> 8
145242012	<i>Aspergillus niger</i>	<i>Aspergillus</i> 9
169773161	<i>Aspergillus oryzae</i> RIB40	<i>Aspergillus</i> 10
169785403	<i>Aspergillus oryzae</i> RIB40	<i>Aspergillus</i> 11
115398536	<i>Aspergillus terreus</i> NIH2624	<i>Aspergillus</i> 12
134115709	<i>Cryptococcus neoformans</i> var. <i>neoformans</i> B-3501A	<i>Cryptococcus</i> 1
58263058	<i>Cryptococcus neoformans</i> var. <i>neoformans</i> JEC21	<i>Cryptococcus</i> 2
58261260	<i>Cryptococcus neoformans</i> var. <i>neoformans</i> JEC21	<i>Cryptococcus</i> 3
19074399	<i>Encephalitozoon cuniculi</i> GB-M1	<i>Encephalitozoon</i> 1
170111226	<i>Laccaria bicolor</i> S238N-H82	<i>Laccaria</i> 1
170086430	<i>Laccaria bicolor</i> S238N-H82	<i>Laccaria</i> 2
11595634	<i>Neurospora crassa</i>	<i>Neurospora</i> 1
85095443	<i>Neurospora crassa</i> OR74A	<i>Neurospora</i> 2
164427455	<i>Neurospora crassa</i> OR74A	<i>Neurospora</i> 3
YNR056C	<i>Saccharomyces cerevisiae</i>	BIO5
YGL077C	<i>Saccharomyces cerevisiae</i>	HNM1
YKL174C	<i>Saccharomyces cerevisiae</i>	TPO5
YDL210W	<i>Saccharomyces cerevisiae</i>	UGA4
YGR055W	<i>Saccharomyces cerevisiae</i>	MUP1
YHL036W	<i>Saccharomyces cerevisiae</i>	MUP3
YCL025C	<i>Saccharomyces cerevisiae</i>	AGP1
YBR132C	<i>Saccharomyces cerevisiae</i>	AGP2
YFL055W	<i>Saccharomyces cerevisiae</i>	AGP3
YNL270C	<i>Saccharomyces cerevisiae</i>	ALP1
YBR068C	<i>Saccharomyces cerevisiae</i>	BAP2
YDR046C	<i>Saccharomyces cerevisiae</i>	BAP3
YEL063C	<i>Saccharomyces cerevisiae</i>	CAN1
YPL265W	<i>Saccharomyces cerevisiae</i>	DIP5
YKR039W	<i>Saccharomyces cerevisiae</i>	GAP1
YDR508C	<i>Saccharomyces cerevisiae</i>	GNP1
YGR191W	<i>Saccharomyces cerevisiae</i>	HIP1
YNL268W	<i>Saccharomyces cerevisiae</i>	LYP1
YLL061W	<i>Saccharomyces cerevisiae</i>	MMP1
YOR348C	<i>Saccharomyces cerevisiae</i>	PUT4
YPL274W	<i>Saccharomyces cerevisiae</i>	SAM3
YDR160W	<i>Saccharomyces cerevisiae</i>	SSY1
YBR069C	<i>Saccharomyces cerevisiae</i>	TAT1

YOL020W	<i>Saccharomyces cerevisiae</i>	TAT2
1351645	<i>Schizosaccharomyces pombe</i>	<i>Schizosaccharomyces</i> 1
1351705	<i>Schizosaccharomyces pombe</i>	<i>Schizosaccharomyces</i> 2
3581896	<i>Schizosaccharomyces pombe</i>	<i>Schizosaccharomyces</i> 3
3150116	<i>Schizosaccharomyces pombe</i>	<i>Schizosaccharomyces</i> 4
3116147	<i>Schizosaccharomyces pombe</i>	<i>Schizosaccharomyces</i> 5
19859376	<i>Schizosaccharomyces pombe</i>	<i>Schizosaccharomyces</i> 6
3560241	<i>Schizosaccharomyces pombe</i>	<i>Schizosaccharomyces</i> 7
3150139	<i>Schizosaccharomyces pombe</i>	<i>Schizosaccharomyces</i> 8
1620894	<i>Schizosaccharomyces pombe</i>	<i>Schizosaccharomyces</i> 9
3136040	<i>Schizosaccharomyces pombe</i>	<i>Schizosaccharomyces</i> 10
71995388	<i>Caenorhabditis elegans</i>	<i>Caenorhabditis</i> 1
71993915	<i>Caenorhabditis elegans</i>	<i>Caenorhabditis</i> 3
71982608	<i>Caenorhabditis elegans</i>	<i>Caenorhabditis</i> 5
17532491	<i>Caenorhabditis elegans</i>	<i>Caenorhabditis</i> 6
17533459	<i>Caenorhabditis elegans</i>	<i>Caenorhabditis</i> 7
17531343	<i>Caenorhabditis elegans</i>	<i>Caenorhabditis</i> 8
17540018	<i>Caenorhabditis elegans</i>	<i>Caenorhabditis</i> 9
198436956	<i>Ciona intestinalis</i>	<i>Ciona</i> 1
198425036	<i>Ciona intestinalis</i>	<i>Ciona</i> 3
198418289	<i>Ciona intestinalis</i>	<i>Ciona</i> 4
198437646	<i>Ciona intestinalis</i>	<i>Ciona</i> 5
198434395	<i>Ciona intestinalis</i>	<i>Ciona</i> 8
198417646	<i>Ciona intestinalis</i>	<i>Ciona</i> 11
198427264	<i>Ciona intestinalis</i>	<i>Ciona</i> 14
198416397	<i>Ciona intestinalis</i>	<i>Ciona</i> 15
198420267	<i>Ciona intestinalis</i>	<i>Ciona</i> 18
201065915	<i>Drosophila melanogaster</i>	<i>Drosophila</i> 1
24667468	<i>Drosophila melanogaster</i>	<i>Drosophila</i> 2
21356285	<i>Drosophila melanogaster</i>	<i>Drosophila</i> 4
21357367	<i>Drosophila melanogaster</i>	<i>Drosophila</i> 5
17647653	<i>Drosophila melanogaster</i>	<i>Drosophila</i> 6
19921172	<i>Drosophila melanogaster</i>	<i>Drosophila</i> 7
NP_003036	<i>Homo sapiens</i>	SLC7A1
NP_003037	<i>Homo sapiens</i>	SLC7A2
NP_116192	<i>Homo sapiens</i>	SLC7A3
NP_004164	<i>Homo sapiens</i>	SLC7A4
NP_003477	<i>Homo sapiens</i>	SLC7A5
NP_003974	<i>Homo sapiens</i>	SLC7A6
NP_003973	<i>Homo sapiens</i>	SLC7A7
NP_036376	<i>Homo sapiens</i>	SLC7A8
NP_055085	<i>Homo sapiens</i>	SLC7A9
NP_062823	<i>Homo sapiens</i>	SLC7A10



NP_055146	Homo sapiens	SLC7A11
AAH78940	Rattus Norvegicus	SLC7A12
NP_620172	Homo sapiens	SLC7A13
NP_066000	Homo sapiens	SLC7A14
221126937	Hydra magnipapillata	Hydra1
221121310	Hydra magnipapillata	Hydra2
221127254	Hydra magnipapillata	Hydra4
221130411	Hydra magnipapillata	Hydra7
221126373	Hydra magnipapillata	Hydra8
221113260	Hydra magnipapillata	Hydra9
221118980	Hydra magnipapillata	Hydra10
226467604	Schistosoma japonicum]	Schistosoma1
226467604	Schistosoma japonicum	Schistosoma2
226466642	Schistosoma japonicum]	Schistosoma3
226466690	Schistosoma japonicum]	Schistosoma4
257206294	Schistosoma japonicum]	Schistosoma5
72089275	Strongylocentrotus purpuratus	Strongylocentrotus1
72068901	Strongylocentrotus purpuratus	Strongylocentrotus2
72021476	Strongylocentrotus purpuratus	Strongylocentrotus5
115751524	Strongylocentrotus purpuratus	Strongylocentrotus6
115644567	Strongylocentrotus purpuratus	Strongylocentrotus7
115676863	Strongylocentrotus purpuratus	Strongylocentrotus9
72021472	Strongylocentrotus purpuratus	Strongylocentrotus12
72088970	Strongylocentrotus purpuratus	Strongylocentrotus14
72017388	Strongylocentrotus purpuratus	Strongylocentrotus15
72158774	Strongylocentrotus purpuratus	Strongylocentrotus20
115625800	Strongylocentrotus purpuratus	Strongylocentrotus23
72092279	Strongylocentrotus purpuratus	Strongylocentrotus30
AT2G01170	Arabidopsis thaliana	BAT1
AT4G21120	Arabidopsis thaliana	CAT1
AT1G58030	Arabidopsis thaliana	CAT2
AT5G36940	Arabidopsis thaliana	CAT3
AT3G03720	Arabidopsis thaliana	CAT4
AT2G34960	Arabidopsis thaliana	CAT5
AT5G04770	Arabidopsis thaliana	CAT6
AT3G10600	Arabidopsis thaliana	CAT7
AT1G17120	Arabidopsis thaliana	CAT8
AT1G05940	Arabidopsis thaliana	CAT9
AT5G05630	Arabidopsis thaliana	LAT1
AT1G31830	Arabidopsis thaliana	LAT3
AT3G19553	Arabidopsis thaliana	LAT4
AT3G13620	Arabidopsis thaliana	LAT5
AT1G31820	Arabidopsis thaliana	LAT2

159462908	<i>Chlamydomonas reinhardtii</i>	<i>Chlamydomonas</i> 1
159464449	<i>Chlamydomonas reinhardtii</i>	<i>Chlamydomonas</i> 2
159468099	<i>Chlamydomonas reinhardtii</i>	<i>Chlamydomonas</i> 4
255089523	<i>Micromonas</i> sp. RCC299	<i>Micromonas</i> 1
115447681	<i>Oryza sativa</i> (japonica cultivar-group)	<i>Oryza</i> 1
115442193	<i>Oryza sativa</i> (japonica cultivar-group)	<i>Oryza</i> 2
38345948	<i>Oryza sativa</i> (japonica cultivar-group)	<i>Oryza</i> 3
115435214	<i>Oryza sativa</i> (japonica cultivar-group)	<i>Oryza</i> 4
115448121	<i>Oryza sativa</i> (japonica cultivar-group)	<i>Oryza</i> 5
77556594	<i>Oryza sativa</i> (japonica cultivar-group)	<i>Oryza</i> 6
115438394	<i>Oryza sativa</i> (japonica cultivar-group)	<i>Oryza</i> 7
115458492	<i>Oryza sativa</i> (japonica cultivar-group)	<i>Oryza</i> 8
115454391	<i>Oryza sativa</i> (japonica cultivar-group)	<i>Oryza</i> 9
77553705	<i>Oryza sativa</i> (japonica cultivar-group)	<i>Oryza</i> 10
115482164	<i>Oryza sativa</i> (japonica cultivar-group)	<i>Oryza</i> 11
115468406	<i>Oryza sativa</i> (japonica cultivar-group)	<i>Oryza</i> 12
115454291	<i>Oryza sativa</i> (japonica cultivar-group)	<i>Oryza</i> 13
115484255	<i>Oryza sativa</i> (japonica cultivar-group)	<i>Oryza</i> 14
108709462	<i>Oryza sativa</i> (japonica cultivar-group)	<i>Oryza</i> 15
115489644	<i>Oryza sativa</i> (japonica cultivar-group)	<i>Oryza</i> 16
168062753	<i>Physcomitrella patens</i> subsp. <i>patens</i>	<i>Physcomitrella</i> 1
168005081	<i>Physcomitrella patens</i> subsp. <i>patens</i>	<i>Physcomitrella</i> 2
168026085	<i>Physcomitrella patens</i> subsp. <i>patens</i>	<i>Physcomitrella</i> 4
168017509	<i>Physcomitrella patens</i> subsp. <i>patens</i>	<i>Physcomitrella</i> 5
168052102	<i>Physcomitrella patens</i> subsp. <i>patens</i>	<i>Physcomitrella</i> 6
168051104	<i>Physcomitrella patens</i> subsp. <i>patens</i>	<i>Physcomitrella</i> 7
168059656	<i>Physcomitrella patens</i> subsp. <i>patens</i>	<i>Physcomitrella</i> 8
168017975	<i>Physcomitrella patens</i> subsp. <i>patens</i>	<i>Physcomitrella</i> 9
168053703	<i>Physcomitrella patens</i> subsp. <i>patens</i>	<i>Physcomitrella</i> 10
66827465	<i>Dictyostelium discoideum</i> AX4	<i>Dictyostelium</i> 1
66806991	<i>Dictyostelium discoideum</i> AX4	<i>Dictyostelium</i> 2
167378118	<i>Entamoeba dispar</i> SAW760	<i>Entamoeba</i> 1
167377308	<i>Entamoeba dispar</i> SAW760	<i>Entamoeba</i> 2
159112306	<i>Giardia lamblia</i> ATCC 50803	<i>Giardia</i> 1
154334145	<i>Leishmania braziliensis</i> MHOM/BR/75/M2904	<i>Leishmania</i> 2
146081287	<i>Leishmania infantum</i> JPCM5	<i>Leishmania</i> 3
154333414	<i>Leishmania braziliensis</i> MHOM/BR/75/M2904	<i>Leishmania</i> 4
239890321	<i>Perkinsus marinus</i> ATCC 50983	<i>Perkinsus</i> 1
262100338	<i>Phytophthora infestans</i> T30-4	<i>Phytophthora</i> 1
262100284	<i>Phytophthora infestans</i> T30-4	<i>Phytophthora</i> 2
262100336	<i>Phytophthora infestans</i> T30-4	<i>Phytophthora</i> 3
262104197	<i>Phytophthora infestans</i> T30-4	<i>Phytophthora</i> 4
262099233	<i>Phytophthora infestans</i> T30-4	<i>Phytophthora</i> 5

262109011	Phytophthora infestans T30-4	Phytophthora6
262108560	Phytophthora infestans T30-4	Phytophthora7
262100895	Phytophthora infestans T30-4	Phytophthora8
281212435	Polysphondylium pallidum PN500	Polysphondylium1
281206076	Polysphondylium pallidum PN500	Polysphondylium2
224013042	Thalassiosira pseudonana CCMP1335	Thalassiosira1
224013810	Thalassiosira pseudonana CCMP1335	Thalassiosira2
123471297	Trichomonas vaginalis G3	Trichomonas1
123427092	Trichomonas vaginalis G3	Trichomonas2
72390577	Trypanosoma brucei TREU927	Trypanosoma1
71651736	Trypanosoma cruzi strain CL Brener	Trypanosoma2
261331530	Trypanosoma brucei gambiense DAL972	Trypanosoma3

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**Supplementary Table 2.** Sequences from the AAP family used for phylogeny construction. Sequences from Genbank (<http://www.ncbi.nlm.nih.gov/genbank/>) were retrieved by psi-BLASTp (Altschul et al, 1997) searches using known members of the family as query.

GI / Identifier	Name	
121720142	<i>Aspergillus clavatus</i> NRRL 1	Aspergillus1
121715161	<i>Aspergillus clavatus</i> NRRL 1	Aspergillus2
121717156	<i>Aspergillus clavatus</i> NRRL 1	Aspergillus3
121719831	<i>Aspergillus clavatus</i> NRRL 1	Aspergillus4
121714901	<i>Aspergillus clavatus</i> NRRL 1	Aspergillus5
121704333	<i>Aspergillus clavatus</i> NRRL 1	Aspergillus6
121706904	<i>Aspergillus clavatus</i> NRRL 1	Aspergillus7
121701841	<i>Aspergillus clavatus</i> NRRL 1	Aspergillus8
121711152	<i>Aspergillus clavatus</i> NRRL 1	Aspergillus9
121706666	<i>Aspergillus clavatus</i> NRRL 1	Aspergillus10
58266144	<i>Cryptococcus neoformans</i> var. <i>neoformans</i> JEC21	Cryptococcus1
58266738	<i>Cryptococcus neoformans</i> var. <i>neoformans</i> JEC21	Cryptococcus2
58268568	<i>Cryptococcus neoformans</i> var. <i>neoformans</i> JEC21	Cryptococcus3
58268842	<i>Cryptococcus neoformans</i> var. <i>neoformans</i> JEC21	Cryptococcus4
58261924	<i>Cryptococcus neoformans</i> var. <i>neoformans</i> JEC21	Cryptococcus5
58260614	<i>Cryptococcus neoformans</i> var. <i>neoformans</i> JEC21	Cryptococcus6
58263110	<i>Cryptococcus neoformans</i> var. <i>neoformans</i> JEC21	Cryptococcus7
58264068	<i>Cryptococcus neoformans</i> var. <i>neoformans</i> JEC21	Cryptococcus8
85014349	<i>Encephalitozoon cuniculi</i> GB-M1	Encephalitozoon1
19173597	<i>Encephalitozoon cuniculi</i> GB-M1	Encephalitozoon2
19074197	<i>Encephalitozoon cuniculi</i> GB-M1	Encephalitozoon3
19074974	<i>Encephalitozoon cuniculi</i> GB-M1	Encephalitozoon4
170086712	<i>Laccaria bicolor</i> S238N-H82	Laccaria1
170093005	<i>Laccaria bicolor</i> S238N-H82	Laccaria2
85107357	<i>Neurospora crassa</i> OR74A	Neurospora1
85109776	<i>Neurospora crassa</i> OR74A	Neurospora2
85101305	<i>Neurospora crassa</i> OR74A	Neurospora3
164425475	<i>Neurospora crassa</i> OR74A	Neurospora4
164423426	<i>Neurospora crassa</i> OR74A	Neurospora5
164423264	<i>Neurospora crassa</i> OR74A	Neurospora6
164422597	<i>Neurospora crassa</i> OR74A	Neurospora7
6322702	<i>Saccharomyces cerevisiae</i>	AVT3
6322460	<i>Saccharomyces cerevisiae</i>	AVT1
71064098	<i>Saccharomyces cerevisiae</i>	AVT4
6320771	<i>Saccharomyces cerevisiae</i>	AVT2
6320965	<i>Saccharomyces cerevisiae</i>	AVT6
37362614	<i>Saccharomyces cerevisiae</i>	AVT5
6322103	<i>Saccharomyces cerevisiae</i>	AVT7

19114463	Schizosaccharomyces pombe 972h-	Schizosaccharomyces1
19112003	Schizosaccharomyces pombe 972h-	Schizosaccharomyces2
115532594	Caenorhabditis elegans	Caenorhabditis1
17555406	Caenorhabditis elegans	Caenorhabditis2
25152682	Caenorhabditis elegans	Caenorhabditis3
32566722	Caenorhabditis elegans	Caenorhabditis4
71984028	Caenorhabditis elegans	Caenorhabditis5
32564098	Caenorhabditis elegans	Caenorhabditis6
71997719	Caenorhabditis elegans	Caenorhabditis7
17507965	Caenorhabditis elegans	Caenorhabditis8
17509747	Caenorhabditis elegans	Caenorhabditis9
17554460	Caenorhabditis elegans	Caenorhabditis10
17553766	Caenorhabditis elegans	Caenorhabditis11
86561574	Caenorhabditis elegans	Caenorhabditis13
21355283	Drosophila melanogaster	Drosophila1
24653572	Drosophila melanogaster	Drosophila2
19922120	Drosophila melanogaster	Drosophila3
24642713	Drosophila melanogaster	Drosophila4
24582818	Drosophila melanogaster	Drosophila5
20151467	Drosophila melanogaster	Drosophila6
261278425	Drosophila melanogaster	Drosophila7
24655811	Drosophila melanogaster	Drosophila8
24642715	Drosophila melanogaster	Drosophila9
281366018	Drosophila melanogaster	Drosophila10
24662401	Drosophila melanogaster	Drosophila11
24652585	Drosophila melanogaster	Drosophila12
28573957	Drosophila melanogaster	Drosophila13
20270233	Drosophila melanogaster	Drosophila14
283982429	Homo sapiens	SLC32A1
222418631	Homo sapiens	SLC36A1
40807351	Homo sapiens	SLC36A2
34535125	Homo sapiens	SLC36A3
17999520	Homo sapiens	SLC36A4
62897423	Homo sapiens	SLC38A1
18482385	Homo sapiens	SLC38A2
119585453	Homo sapiens	SLC38A3
289577102	Homo sapiens	SLC38A4
122937281	Homo sapiens	SLC38A5
193788624	Homo sapiens	SLC38A6
21361602	Homo sapiens	SLC38A7
27735137	Homo sapiens	SLC38A8
117168275	Homo sapiens	SLC38A9
20070376	Homo sapiens	SLC38A10

27735137	Homo sapiens	SLC38A11
221130196	Hydra magnipapillata	Hydra1
221114518	Hydra magnipapillata	Hydra3
221130102	Hydra magnipapillata	Hydra6
221108110	Hydra magnipapillata	Hydra7
221127702	Hydra magnipapillata	Hydra9
221108460	Hydra magnipapillata	Hydra11
221129681	Hydra magnipapillata	Hydra12
221125397	Hydra magnipapillata	Hydra13
221118392	Hydra magnipapillata	Hydra15
221125938	Hydra magnipapillata	Hydra17
115668587	Strongylocentrotus purpuratus	Strongylocentrotus1
115891432	Strongylocentrotus purpuratus	Strongylocentrotus3
115682558	Strongylocentrotus purpuratus	Strongylocentrotus5
115901647	Strongylocentrotus purpuratus	Strongylocentrotus7
115638677	Strongylocentrotus purpuratus	Strongylocentrotus8
115655641	Strongylocentrotus purpuratus	Strongylocentrotus9
253741480	giardia intestinalis ATCC 50581	giardia1
253747195	giardia intestinalis ATCC 50581	giardia3
253743366	giardia intestinalis ATCC 50581	giardia4
253744548	giardia intestinalis ATCC 50581	giardia5
253742150	giardia intestinalis ATCC 50581	giardia6
253741387	giardia intestinalis ATCC 50581	giardia7
253742363	giardia intestinalis ATCC 50581	giardia8
253743450	giardia intestinalis ATCC 50581	giardia9
145500714	Paramecium tetraurelia strain d4-2	Paramecium1
145503710	Paramecium tetraurelia strain d4-2	Paramecium3
145553401	Paramecium tetraurelia strain d4-2	Paramecium4
145538145	Paramecium tetraurelia strain d4-2	Paramecium6
145542732	Paramecium tetraurelia strain d4-2	Paramecium7
145528981	Paramecium tetraurelia strain d4-2	Paramecium8
145516999	Paramecium tetraurelia strain d4-2	Paramecium10
145517320	Paramecium tetraurelia strain d4-2	Paramecium12
145552938	Paramecium tetraurelia strain d4-2	Paramecium13
145481963	Paramecium tetraurelia strain d4-2	Paramecium16
223994085	Thalassiosira pseudonana CCMP1335	Thalassiosira2
223992851	Thalassiosira pseudonana CCMP1335	Thalassiosira4
224007597	Thalassiosira pseudonana CCMP1335	Thalassiosira5
223998941	Thalassiosira pseudonana CCMP1335	Thalassiosira10
224013251	Thalassiosira pseudonana CCMP1335	Thalassiosira12
224001708	Thalassiosira pseudonana CCMP1335	Thalassiosira13
223993835	Thalassiosira pseudonana CCMP1335	Thalassiosira17
123439593	Trichomonas vaginalis G3	Trichomonas1

123446806	Trichomonas vaginalis G3	Trichomonas2
123507087	Trichomonas vaginalis G3	Trichomonas4
123468288	Trichomonas vaginalis G3	Trichomonas5
123424464	Trichomonas vaginalis G3	Trichomonas6
123486036	Trichomonas vaginalis G3	Trichomonas7
154422478	Trichomonas vaginalis G3	Trichomonas8
123500051	Trichomonas vaginalis G3	Trichomonas9
123498976	Trichomonas vaginalis G3	Trichomonas10
123405089	Trichomonas vaginalis G3	Trichomonas11
154413671	Trichomonas vaginalis G3	Trichomonas13
154416632	Trichomonas vaginalis G3	Trichomonas15
123472736	Trichomonas vaginalis G3	Trichomonas18
123468430	Trichomonas vaginalis G3	Trichomonas20
123421044	Trichomonas vaginalis G3	Trichomonas24
123440014	Trichomonas vaginalis G3	Trichomonas25
123464250	Trichomonas vaginalis G3	Trichomonas26
123481467	Trichomonas vaginalis G3	Trichomonas28
123416448	Trichomonas vaginalis G3	Trichomonas31
154413253	Trichomonas vaginalis G3	Trichomonas32
154415927	Trichomonas vaginalis G3	Trichomonas36
123412832	Trichomonas vaginalis G3	Trichomonas37
261330865	Trypanosoma brucei gambiense DAL972	Trypanosoma1
261335674	Trypanosoma brucei gambiense DAL972	Trypanosoma2
261335665	Trypanosoma brucei gambiense DAL972	Trypanosoma3
261330931	Trypanosoma brucei gambiense DAL972	Trypanosoma5
261327815	Trypanosoma brucei gambiense DAL972	Trypanosoma6
261330861	Trypanosoma brucei gambiense DAL972	Trypanosoma8
261330525	Trypanosoma brucei gambiense DAL972	Trypanosoma25
261327728	Trypanosoma brucei gambiense DAL972	Trypanosoma26
261332711	Trypanosoma brucei gambiense DAL972	Trypanosoma29
261333112	Trypanosoma brucei gambiense DAL972	Trypanosoma30
261332621	Trypanosoma brucei gambiense DAL972	Trypanosoma31
AT1G58360	Arabidopsis thaliana	AAP1
AT5G09220	Arabidopsis thaliana	AAP2
AT1G77380	Arabidopsis thaliana	AAP3
AT5G63850	Arabidopsis thaliana	AAP4
AT1G44100	Arabidopsis thaliana	AAP5
AT5G49630	Arabidopsis thaliana	AAP6
AT5G23810	Arabidopsis thaliana	AAP7
AT1G10010	Arabidopsis thaliana	AAP8
AT3G11900	Arabidopsis thaliana	ANT1
AT4G38250	Arabidopsis thaliana	ANT2
AT5G65990	Arabidopsis thaliana	ANT3

AT2G42005	<i>Arabidopsis thaliana</i>	ANT4
AT1G48640	<i>Arabidopsis thaliana</i>	LHT10
AT5G40780	<i>Arabidopsis thaliana</i>	LHT1
AT1G24400	<i>Arabidopsis thaliana</i>	LHT2
AT1G61270	<i>Arabidopsis thaliana</i>	LHT3
AT1G47670	<i>Arabidopsis thaliana</i>	LHT4
AT1G67640	<i>Arabidopsis thaliana</i>	LHT5
AT3G01760	<i>Arabidopsis thaliana</i>	LHT6
AT4G35180	<i>Arabidopsis thaliana</i>	LHT7
AT1G71680	<i>Arabidopsis thaliana</i>	LHT8
AT1G25530	<i>Arabidopsis thaliana</i>	LHT9
AT2G39890	<i>Arabidopsis thaliana</i>	ProT1
AT3G55740	<i>Arabidopsis thaliana</i>	ProT2
AT2G36590	<i>Arabidopsis thaliana</i>	ProT3
AT5G41800	<i>Arabidopsis thaliana</i>	ProT4
AT2G40420	<i>Arabidopsis thaliana</i>	T1
AT3G56200	<i>Arabidopsis thaliana</i>	T2
AT3G30390	<i>Arabidopsis thaliana</i>	T3
AT5G38820	<i>Arabidopsis thaliana</i>	T4
AT1G80510	<i>Arabidopsis thaliana</i>	T5
AT3G28960	<i>Arabidopsis thaliana</i>	VAAT1
AT5G16740	<i>Arabidopsis thaliana</i>	VAAT10
AT5G15240	<i>Arabidopsis thaliana</i>	VAAT2
AT2G41190	<i>Arabidopsis thaliana</i>	VAAT3
AT2G39130	<i>Arabidopsis thaliana</i>	VAAT4
AT3G54830	<i>Arabidopsis thaliana</i>	VAAT5
AT3G09330	<i>Arabidopsis thaliana</i>	VAAT6
AT3G09340	<i>Arabidopsis thaliana</i>	VAAT7
AT5G02170	<i>Arabidopsis thaliana</i>	VAAT8
AT5G02180	<i>Arabidopsis thaliana</i>	VAAT9
AT1G08230	<i>Arabidopsis thaliana</i>	GAT1
AT1G77690	<i>Arabidopsis thaliana</i>	LAX3
AT2G21050	<i>Arabidopsis thaliana</i>	LAX2
AT2G38120	<i>Arabidopsis thaliana</i>	AUX1
AT5G01240	<i>Arabidopsis thaliana</i>	LAX1
159476374	<i>Chlamydomonas reinhardtii</i>	<i>Chlamydomonas</i> 1
159473525	<i>Chlamydomonas reinhardtii</i>	<i>Chlamydomonas</i> 2
159473527	<i>Chlamydomonas reinhardtii</i>	<i>Chlamydomonas</i> 3
159466506	<i>Chlamydomonas reinhardtii</i>	<i>Chlamydomonas</i> 4
159491088	<i>Chlamydomonas reinhardtii</i>	<i>Chlamydomonas</i> 5
159483671	<i>Chlamydomonas reinhardtii</i>	<i>Chlamydomonas</i> 6
159483281	<i>Chlamydomonas reinhardtii</i>	<i>Chlamydomonas</i> 7
226456327	<i>Micromonas pusilla</i> CCMP1545	<i>Micromonas</i> 1



226461197	Micromonas pusilla CCMP1545	Micromonas2
226456325	Micromonas pusilla CCMP1545	Micromonas3
226458937	Micromonas pusilla CCMP1545	Micromonas4
226455333	Micromonas pusilla CCMP1545	Micromonas5
226459038	Micromonas pusilla CCMP1545	Micromonas6
226463296	Micromonas pusilla CCMP1545	Micromonas7
168064167	Physcomitrella patens subsp. patens	Physcomitrella1
167999963	Physcomitrella patens subsp. patens	Physcomitrella2
168026449	Physcomitrella patens subsp. patens	Physcomitrella3
168066039	Physcomitrella patens subsp. patens	Physcomitrella4
168025550	Physcomitrella patens subsp. patens	Physcomitrella5
168035406	Physcomitrella patens subsp. patens	Physcomitrella6
168026105	Physcomitrella patens subsp. patens	Physcomitrella7
168037028	Physcomitrella patens subsp. patens	Physcomitrella8
168003800	Physcomitrella patens subsp. patens	Physcomitrella9
168011490	Physcomitrella patens subsp. patens	Physcomitrella10
168048761	Physcomitrella patens subsp. patens	Physcomitrella11
168058043	Physcomitrella patens subsp. patens	Physcomitrella12
167998769	Physcomitrella patens subsp. patens	Physcomitrella13
168058666	Physcomitrella patens subsp. patens	Physcomitrella14
168018811	Physcomitrella patens subsp. patens	Physcomitrella15
168012078	Physcomitrella patens subsp. patens	Physcomitrella16
168045679	Physcomitrella patens subsp. patens	Physcomitrella17
168061108	Physcomitrella patens subsp. patens	Physcomitrella18
168017275	Physcomitrella patens subsp. patens	Physcomitrella19
168025272	Physcomitrella patens subsp. patens	Physcomitrella20
168031344	Physcomitrella patens subsp. patens	Physcomitrella21
168048695	Physcomitrella patens subsp. patens	Physcomitrella22
168029276	Physcomitrella patens subsp. patens	Physcomitrella23
168049005	Physcomitrella patens subsp. patens	Physcomitrella24
168056905	Physcomitrella patens subsp. patens	Physcomitrella27
168020354	Physcomitrella patens subsp. patens	Physcomitrella28

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