

Table 1. Unreported connections to flagellar phenotype based on contextual information from STRING database.

COG number	STRING prediction
COG1699: Uncharacterized protein conserved in bacteria	Prediction is based on conserved neighborhood: COG1344, flagellin and related hook-associated protein
COG2257: Uncharacterized homolog of the cytoplasmic domain of flagellar protein FhlB	Prediction is based on coexpression with COG1344, flagellin and related hook-associated proteins
COG3034: Uncharacterized protein conserved in bacteria	Prediction is based on coexpression with COG2257, uncharacterized homolog of the cytoplasmic domain of flagellar protein FhlB

Table 2. The average number of iterations, unique matches (detected by psi-square alone), and matches found by both psi-square and 5%-ED method.

CORR./K	IT	MATCHES	SHARED	PSI-SQUARE ONLY	5%ED ONLY
cor07_step05	1.1	508.3	418	605	1
cor07_step10	2.1	513.6	418	605	1
cor07_step15	1.7	509.4	418	605	1
cor07_step20	1.3	508.4	418	605	1
cor07_step25	1.1	508.3	418	605	1
cor07_step30	1.1	508.3	418	605	1
cor07_step35	1	508.1	418	605	1
cor07_step40	1	508.1	418	605	1
cor08_step05	1.7	339.7	418	356	1
cor08_step10	3.7	352.7	418	358	1
cor08_step15	2.1	339.1	418	356	1
cor08_step20	2.4	338.1	418	356	1
cor08_step25	1.3	334.9	418	356	1
cor08_step30	1.6	335.9	418	356	1
cor08_step35	1.4	336	418	356	1
cor08_step40	1.3	335	418	356	1
cor09_step05	3.3	193.1	408	125	11
cor09_step10	3.3	188.1	409	169	10
cor09_step15	4	196.4	409	187	10
cor09_step20	3.1	189.3	410	160	9
cor09_step25	2	179.3	408	152	11
cor09_step30	2.4	183	407	150	12
cor09_step35	1.9	180.6	407	164	12
cor09_step40	2	177.4	407	151	12

Table 3. Properties of proteins in two HPs set. Proteins in HP_{s1} were found only by psi-square; and proteins in HP_{s2} were found by both, psi-square and 5%ED approaches.

SET	Protein length	TM regions	%Loop regions	%Helical regions
HP _{s1}	888.39±8.33	1.17±0.02	91.08±0.13	8.92±0.13
HP _{s2}	929.08±6.85	1.28±0.02	94.09±0.07	5.85±0.07

Table 4. Predicted molecular functions for the two groups of proteins.

HPs1 set: proteins found only by psi-square			HPs12 set: proteins found by both: the psi-square and 5%ED methods		
ID in PlasmoDB	Ortholog in Plasmodium yoelii (1: presence, 0: absence)	Putative function (based on PSI-BLAST score)	ID in PlasmoDB	Ortholog in Plasmodium yoelii (1: presence, 0: absence)	Putative function (based on PSI-BLAST score)
MAL13P1.102	1		MAL13P1.109	1	Protein kinase domain
MAL13P1.152	1		MAL13P1.114	1	Protein kinase domain
MAL13P1.158	1		MAL13P1.130	1	
MAL13P1.268	0	Distantly related to portion of CLAG domain	MAL13P1.188	1	
MAL6P1.100	1		MAL13P1.228	1	
MAL6P1.121	0	Tetrahydrofolate dehydrogenase/cyclohydr olase	MAL13P1.278	1	Protein kinase domain
MAL6P1.127	1	Enzyme with alpha/beta hydrolase fold	MAL13P1.308	1	Armadillo/beta-catenin repeats
MAL6P1.174	1		MAL13P1.328	1	
MAL6P1.200	1		MAL13P1.94	1	
MAL6P1.63	0		MAL6P1.145	1	CDP-alcohol phosphatidyltransferase (probably ethanolamine or choline-specific) family
MAL7P1.13	0		MAL6P1.147	1	HECT-domain ubiquitination enzyme
MAL7P1.167	0		MAL6P1.178	1	
MAL7P1.34	0		MAL6P1.216	1	TPR domain
MAL8P1.160	1		MAL6P1.247	1	
MAL8P1.4	1		MAL6P1.286	1	Myosin-like coiled coil
MAL8P1.88	0	PFEMP-like protein?	MAL6P1.289	1	
PF07_0014	0		MAL6P1.299	1	membrane protein PF12
PF07_0107	0		MAL7P1.119	0	
PF08_0082	1		MAL7P1.125	1	
PF08_0083	0		MAL7P1.84	1	
PF08_0091	1		MAL8P1.106	1	
PF08_0115	1	DnaJ domain	MAL8P1.109	1	Protein phosphatase 2C
PF08_0118	1		MAL8P1.12	0	
PF10_0023	1		MAL8P1.13	1	

PF10_0098	0		MAL8P1.150	1	Adenylate or Guanylate cyclase
PF10_0100	1		MAL8P1.73	1	
PF10_0157	0		PF07_0072	1	Protein kinase with calmodulin domain
PF10_0163	0		PF07_0127	1	
PF10_0170	1		PF08_0129	1	Protein phosphatase 2B-like, calcineurin-like phosphoesterase
PF10_0189	1	Cys finger	PF10_0034	1	
PF10_0223	1	Cys finger	PF10_0037	1	
PF10_0231	1		PF10_0094	1	Tubulin-tyrosine ligase family
PF10_0296	0		PF10_0119	1	
PF11_0151	1	TBC1 domain, Rab GTPase activator	PF10_0135	0	
PF11_0300	1		PF10_0138	1	
PF11_0304	1		PF10_0156	1	
PF11_0398	0		PF10_0193	1	Microtubule associated protein 1A/1B, light chain, aka autophagy 8i protein
PF11_0402	1	RRM RNA recognition motif	PF10_0220	1	Phospholipid scramblase
PF11_0441	1	Eenzyme with alpha/beta hydrolase fold	PF10_0281	1	NOA36-like repeats, also in microneme protein 4
PF11_0513	1	DnaJ domain	PF10_0295	1	
PF11_0528	1		PF10_0306	1	Membrane Occupation and Recognition Nexus (MORN) repeat
PF13_0012	1	ETRAMP	PF10_0308	1	OTU-like cysteine protease
PF13_0031	1		PF10_0345	1	
PF13_0072	1		PF10_0348	1	PFEMP-1 family
PF13_0079	1		PF10_0352	1	
PF13_0159	1	Nucleotidyl transferase, possibly nicotinate-nucleotide adenyltransferase	PF13_0162	0	
PF13_0162	1		PF10_0367	0	
PF13_0162	1		PF10_0368	1	Dynamamin GTPase effector domain
PF14_0013	1	DnaJ domain	PF11_0060	1	Ca/calmodulin-dependent protein kinase domain
PF14_0016	1	ETRAMP	PF11_0094	1	
PF14_0044	1		PF11_0168	1	Lipase/serine esterase
PF14_0045	1		PF11_0180	1	
PF14_0108	1		PF11_0193	0	
PF14_0250	1	Lipase class 3	PF11_0194	1	
PF14_0291	0		PF11_0204	0	
PF14_0344	0		PF11_0277	1	
PF14_0472	0		PF11_0278	1	
PF14_0525	1	Dual specificity protein phosphatase	PF11_0287	1	CRAL/TRIO lipid-binding domain

		(S/T and Y)			
PF14_0574	1	Zn finger, FYVE-type	PF11_0344	1	pfam02430, AMA-1, Apical membrane antigen 1
PF14_0594	0		PF11_0373	1	PFEMP
PF14_0712	1		PF11_0379	1	
PF14_0733	1		PF11_0383	1	
PF14_0734	1	Protein kinase domain	PF11_0415	1	
PF14_0760	0		PF11_0417	0	
PFA0135w	1	Tryptophan-rich secreted blood-stage antigen	PF11_0464	1	pfam00069, pkinase, Protein kinase domain
PFA0215w	0		PF11_0474	0	
PFA0635c	0		PF13_0115	1	
PFB0105c	1		PF13_0173	1	
PFB0106c	0		PF13_0197	1	merozoite surface protein 7 precursor
PFB0120w	1	ETRAMP	PF13_0255	1	
PFB0145c	1		PF13_0256	1	
PFB0190c	1	TPR/SEL-1 repeat	PF13_0314	1	PFEMP
PFB0194w	1		PF13_0326	0	pfam00241, cofilin_ADF, Cofilin/tropomyosin-type actin-binding protein
PFB0485c	0		PF14_0021	1	
PFB0900c	1		PF14_0102	1	Pr86 rhoptry precursor protein
PFB0910w	1	Merozoite Surface Antigen 2 (MSA-2) family	PF14_0135	1	
PFC0090w	1		PF14_0149	1	
PFC0695w	1		PF14_0172	1	
PFC0930c	1		PF14_0173	1	pfam00027, cNMP_binding, Cyclic nucleotide-binding domain
PFD0495c	1		PF14_0196	1	TPR Domain
PFD0705c	1		PF14_0224	1	PP1-like serine/threonine phosphatase, calcineurin-like
PFD0985w	1	PR repeat	PF14_0293	0	
PFD1135c	0	Solute carrier family 5 (choline transporter)	PF14_0333	1	
PFD1165w	1	Protein kinase domain	PF14_0334	1	Glutamate synthase, FMN-binding domain
PFE0360c	1		PF14_0346	1	cyclic nucleotide-dependent protein kinase
PFE1255w	1	SMC-RecF/N family ATPases (chromosome segregation)	PF14_0388	1	
PFE1505w	0		PF14_0495	1	
PFI0120c	1	Protein kinase domain	PF14_0572	1	

PFI0845w	1		PF14_0578	0	
PFI0850w	0	Phosphatidylserine decarboxylase	PF14_0586	1	MORN domain
PFI1200w	0		PF14_0607	1	
PFI1520w	0		PF14_0652	1	D13 Zn-finger protein
PFI1720w	0		PF14_0660	1	Ser/Thr phosphatase, calcineurin-like
PFL0065w	0		PF14_0694	0	thioredoxin, protein disulphide isomerase
PFL0275w	1	Zinc finger, C3HC4 type (RING finger)	PF14_0732	1	
PFL0800c	1		PFB0150c	1	pfam00069, protein kinase domain
PFL0895c	1	Dynamin family GTPase (role in endocytosis)	PFB0305c	1	merozoite surface protein MSP5
PFL1055c	0		PFB0475c	1	
PFL1945c	1	ETRAMP	PFB0570w	1	annotated as "altered trompospondin domain", in fact not so similar to it
PFL2530w	1	alpha/beta hydrolase fold, probably lysophospholipase	PFB0680w	1	
PFL2565w	1		PFB0815w	1	protein kinase with EF-hand
MAL13P1.329	1		PFB0935w	1	CLAG, Cytoadherence-linked asexual protein
MAL6P1.300	1	PP-loop superfamily ATPase-pyrophosphatase	PFC0120w	1	CLAG, Cytoadherence-linked asexual protein
PF07_0011	1	Modified HMA (heavy metal chaperone) domain	PFC0560c	1	
PFC0150w	1	Lipin, mutations cause fatty acid depletion in mice	PFC0820w	1	
PFD0715c	1		PFC0945w	1	pfam00069, pkinase, Protein kinase domain
PFE0200c	1	Zinc finger (AN1-like) family	PFD0100c	1	
PFE0340c	1	Rhomboid-family intramembrane protease	PFD0105c	1	
PFE0070w	1		PFD0195c	1	
			PFD0230c	1	Papain family cysteine protease
			PFD0295c	1	pfam00084, sushi, Sushi domain (SCR repeat)
			PFD0380c	1	
			PFD0385w	1	
			PFD0390c	0	AAA family ATPase
			PFD0955w	0	
			PFD1100c	1	
			PFE0045c	1	pfam00069, pkinase, Protein kinase domain

			PFE0075c	1	rhoptry-associated protein
			PFE0080c	1	rhoptry-associated protein
			PFE0175c	1	Myosin head motor domain ATPase (NOT non-specific coiled coil domain)
			PFE0365c	1	
			PFE0770w	1	
			PFE1105c	1	
			PFE1120w	1	
			PFE1130w	1	DUF803 family, maybe a transporter most similar to nucleotide-sugar transporters
			PFE1260c	1	
			PFE1410c	1	
			PFE1415w	0	DHHC/NEW1 zinc finger domain, including palmitoyl transferases
			PFI0175w	1	
			PFI0265c	1	rhoptry complex protein
			PFI0360c	1	
			PFI0410c	1	
			PFI0540w	1	
			PFI0690c	1	
			PFI0785c	1	Transporter, major facilitator superfamily
			PFI1005w	1	ADP-ribosylation factor family
			PFI1015w	1	CRAL/TRIO lipid-binding domain
			PFI1445w	1	Rhoptry complex protein
			PFI1475w	0	Merozoite surface protein MSP-1
			PFI1550c	1	
			PFI1685w	1	Protein kinase C family
			PFL0300c	0	Ser/Thr protein phosphatase, calcineurin-like
			PFL0320w	0	
			PFL0840c	1	
			PFL1090w	1	Toxoplasma gliding-associated protein homolog45
			PFL1110c	1	Cyclic nucleotide-binding domain
			PFL1165w	0	
			PFL1365w	1	
			PFL1435c	1	Myosin head motor domain ATPase (NOT non-specific coiled coil domain)
			PFL1515c	0	
			PFL1565c	1	
			PFL1700c	1	Vacuolar-type H ⁺ -translocating inorganic H ⁺ pyrophosphatase
			PFL2215w	1	Actin

		PFL2225w	1	Calmodulin-like protein
		PFL2460w	1	Coronin-type WD-40 repeat
		PFL2510w	1	Chitinase