

Table S3. Model parameters

Parameter	Units	Parameter values									Parameter sensitivities	
		Our abundances									Pathway output sensitivity (molecules/cell)	Induction ratio sensitivity (unitless)
		YMCv1	YMCv2	YMCv3	YMCv4	YMCv5	YMC_Gmgm	YMC_Sltr	YMC_Mdr	YMP_opt		
Cell_volume	L	2.9E-14	2.9E-14	2.9E-14	2.9E-14	2.9E-14	2.9E-14	2.9E-14	2.9E-14	2.9E-14	-0.05315	0.5886
Fus3_num	mole/cell	20,400	20,400	20,400	20,400	20,400	8,480	1,152.6108	3,126.0202	1,535.23	0.023494	0.19174
kbnd_Gpa1_Ste4_0_1nM	1/s	0.37091	0.46371	0.41792	0.23473	0.17467	0.14408	0.51827	0.22099	0.25443	0	0
kbnd_Gpa1_Ste4_0nM	1/s	0.10273	0.2917	0.085246	0.48965	0.63712	0.15048	0.69712	0.45474	0.068155	-0.0048102	0.40898
kbnd_Gpa1_Ste4_100nM	1/s	0.014296	0.0092506	0.0073955	0.0032538	0.030761	0.0050755	0.0036576	0.0086014	0.019244	-0.00019863	-0.0027278
kcat_Msg5_MAPK_PO4	1/s	0.062661	0.25657	2.1132	1.9057	4.9236	0.45352	1.1176	0.28938	0.40756	-0.000014174	0.00018521
kcat_nonspecific_dephosph	1/s	0.0021919	0.0024456	0.0016187	0.0020299	0.00097209	0.0023055	0.0010458	0.0016609	0.0019483	-0.002432	0.48565
kcat_Ptp_MAPK_PO4	1/s	2.8774	0.67312	5.3038	5.0353	0.079251	2.0513	0.80977	1.5396	0.86467	-0.012747	-0.008305
kcat_Ste11pSpSp_TSte5Ste7_p5	1/s	3.6382	1.8578	0.83271	1.3598	1.5125	1.474	5.4251	5.764	2.122	0.000059586	-0.0026412
kcat_Ste11pSpSp_TSte5Ste7p5_pT	1/s	4.5313	0.67029	1.6805	4.2564	0.17999	0.6331	2.2777	2.7938	4.831	0.00009483	-0.0028367
kcat_Ste4Ste18_Ste5Ste11_p5	1/s	2.7582	2.0158	1.9703	0.92917	1.6866	0.35192	1.1319	1.2015	1.8438	0.001183	-0.081004
kcat_Ste5Ste7p_SpTFus3_pT	1/s	0.70423	7.2285	6.4211	0.37901	2.0751	0.57858	4.298	7.3556	6.7879	-0.0018352	0.015704
kcat_Ste5Ste7p_SpTFus3_pY	1/s	4.4084	3.2756	9.1151	3.8196	6.1645	8.8657	4.7717	4.1195	0.86812	0.0053581	-0.10378
kcat_Ste5Ste7p_SpTFus3pT_pY	1/s	0.48489	3.2216	3.3734	1.1393	3.2421	0.60136	2.2465	8.6055	2.6079	0.012588	0.099447
kcat_Ste5Ste7p_SpTFus3pY_pT	1/s	5.051	2.5184	3.8749	5.6989	8.4967	8.0643	7.6701	2.7014	3.5252	0.0017984	-0.074865
Kd_Msg5_MAPK	µM	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	0.00005396	-0.000019026
Kd_Ste5_Fus3	µM	1	1	1	1	1	1	1	0.91	1	-0.013562	0.068296
Kd_Ste5_Ste11	µM	0.140124976	0.050269276	0.085605562	0.120593422	0.004879635	0.000490711	0.123	0.089	0.023288423	-0.0038906	0.16089
Kd_Ste5_Ste7	µM	0.001952477	0.002585651	0.002651228	0.003743536	0.004417336	0.004202339	0.084	0.118	0.022486997	-0.010591	0.084311
Kd_Ste7_MAPK	µM	0.1	0.1	0.1	0.1	0.1	0.1	0.111	0.174	0.1	0.0099677	-0.099072
kdilution	1/s	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.000128	0.0002283	-0.032901
koff_Gpa1_Ste4_0_1nM	1/s	0.034849	0.051351	0.037875	0.015203	0.0091905	0.0068791	0.02512	0.01304	0.026088	0	0
koff_Gpa1_Ste4_0nM	1/s	0.00039613	0.002307	0.0002742	0.0017299	0.00094315	0.00016565	0.00021284	0.00061339	0.00027495	0.003634	-0.30951
koff_Gpa1_Ste4_100nM	1/s	0.048251	0.053527	0.049926	0.043558	0.03228	0.059528	0.048618	0.044828	0.042329	0.0002271	0.0031188
koff_Ptp_MAPK	1/s	0.064643	2.0541	3.3202	0.40314	6.4203	0.015834	2.1741	2.8556	0.18211	0.00021845	-0.0021567
koff_Ste4Ste18_Ste5	1/s	0.26373	0.24959	0.32662	0.44666	0.24277	0.14473	0.51193	0.38334	0.28442	-0.0013917	0.098196
koff_Ste5_Fus3	1/s	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	0.010508	-0.079541
kon_Msg5_MAPK	1/(µM-s)	0.92293	2.6876	0.9207	1.048	4.7968	3.1054	7.5251	0.7096	0.14306	0.000004314	5.8485E-06
kon_Ptp_MAPK	1/(µM-s)	1.0082	0.99895	1.8816	2.5043	7.6125	0.52929	1.4339	0.36823	0.39503	-0.0097938	0.097452

Table S3. Cont.

Parameter	Units	Parameter values									Parameter sensitivities	
		Our abundances									Pathway output sensitivity (molecules/cell)	Induction ratio sensitivity (unitless)
		YMCv1	YMCv2	YMCv3	YMCv4	YMCv5	YMC_Gmgm	YMC_Sltr	YMC_Mdr	YMP_opt		
kon_Ste4Ste18_Ste5	1/(µM-s)	1.8799	1.5796	1.9209	6.6281	2.4724	1.1975	4.1494	0.90935	0.50416	0.0057415	-0.39948
kon_Ste5_Ste11	1/(µM-s)	0.10562	0.22282	0.13665	0.13043	1.8984	3.671	2.5608	2.959	0.78378	0.002528	-0.048701
kon_Ste5_Ste7	1/(µM-s)	3.775	1.8231	2.1332	1.0559	2.8241	5.3613	0.10858	0.10759	0.60177	0.0029524	-0.02465
kon_Ste7_MAPK	1/(µM-s)	3.5466	2.3746	5.9287	0.83024	0.23862	0.17671	4.0017	2.9508	6.3002	-0.00000818	0.00080915
Msg5_num	Molec/cell	38	38	38	38	38	538	103.1092	1,117.6832	120.5385	-0.000049819	-0.00012422
Ptp_num	mole/cell	193.6644	1,687.5624	291.6774	103.6648	6,597.752	768	586.0184	1,466.9592	713.2619	-0.022354	0.085701
Ste11_num	mole/cell	3,500	3,500	3,500	3,500	3,500	736	576.3054	681.0882	5,594.3184	0.0042783	-0.043625
Ste11_p5_only_PO4_factor	unitless	2,089.636	875.4747	37.421	1,022.616	1,786.6084	1,109.8612	3,577.25	1,009.7355	520.0756	-0.000025493	0.0017197
Ste5_num	mole/cell	818	818	818	818	818	818	1,283.6339	2,488.8691	3,639.6733	0.005858	-0.39832
Ste5_num	mole/cell	480	480	480	480	480	1,900	593.7692	611.233	251.5184	0.029968	-0.44323
Ste7_num	mole/cell	920	920	920	920	920	672	768.4072	1,187.5384	1,753.0551	0.012389	0.017552
Ste7_p5_only_PO4_factor	unitless	3,871.1816	2,668.4312	201.9755	2,886.6973	1,289.2803	1,683.5996	3,411.2634	4,535.8252	694.1654	-0.00003643	0.000040341

Parameter values in blue were not optimized during parameter estimation. Parameter values in red were optimized during parameter estimation.

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