Supplementary Materials

A Rab Escort Protein Regulates the MAPK Pathway That Controls Filamentous Growth in Yeast

Sheida Jamalzadeh [1] , Atindra N. Pujari [2], Paul J. Cullen [2] †

1. *Department of Chemical and Biological Engineering, University at Buffalo, State University of New York, Buffalo New York*
2. *Department of Biological Sciences, University at Buffalo, State University of New York, Buffalo New York*

† Corresponding author: Paul J. Cullen
Address: Department of Biological Sciences
532 Cooke Hall
State University of New York at Buffalo
Buffalo, NY 14260-1300
Phone: (716)-645-4923
FAX: (716)-645-2975
E-mail: pjcullen@buffalo.edu

Figure S1. Growth of the indicated strains on S-GAL-URA and S-GAL-URA-HIS media. Serial dilutions were spotted.

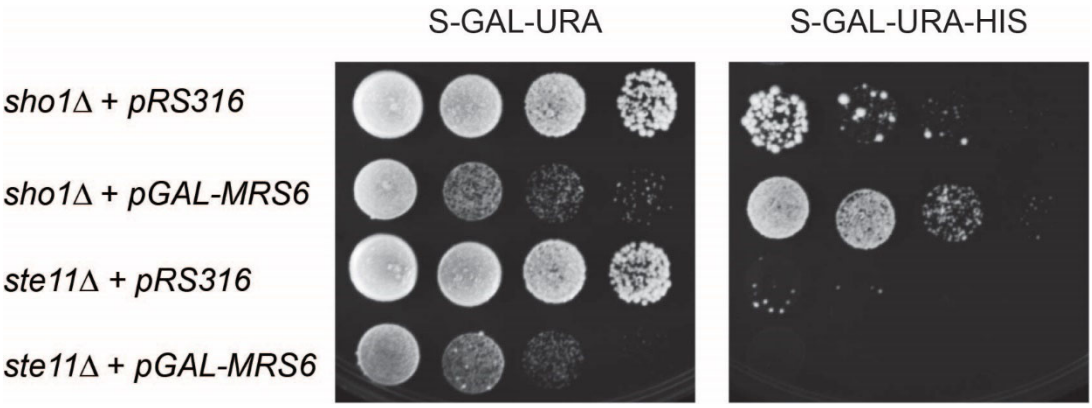


Figure S2. Growth of the indicated strains on S-D-URA, S-GAL-URA and S-GAL-URA+1M KCl media.

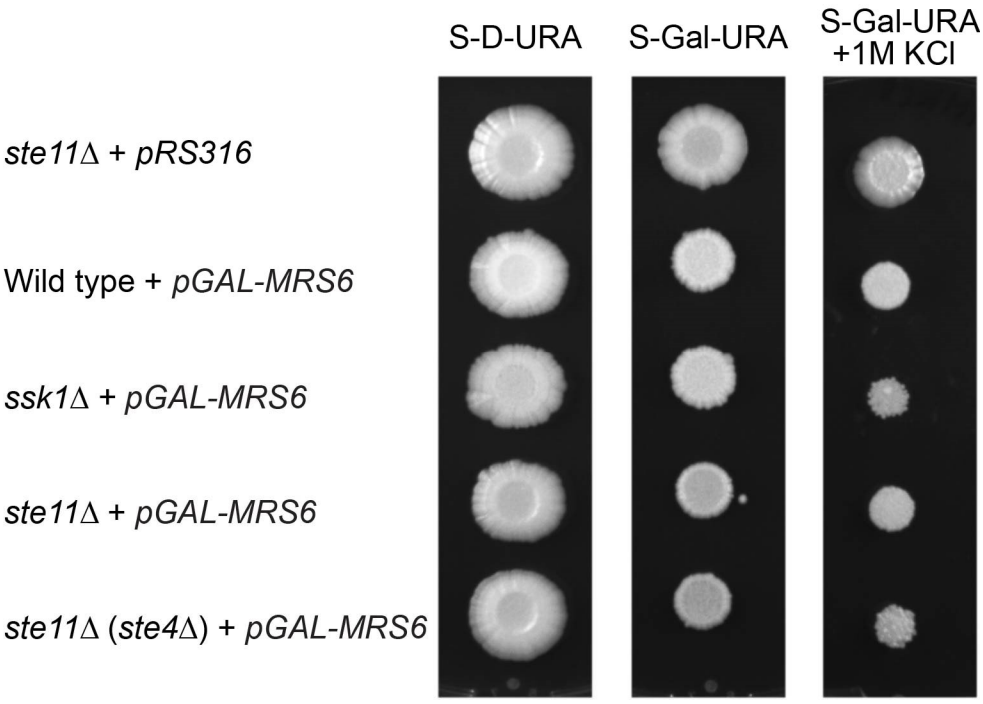


Figure S3A. Raw material for Fig. 6A.

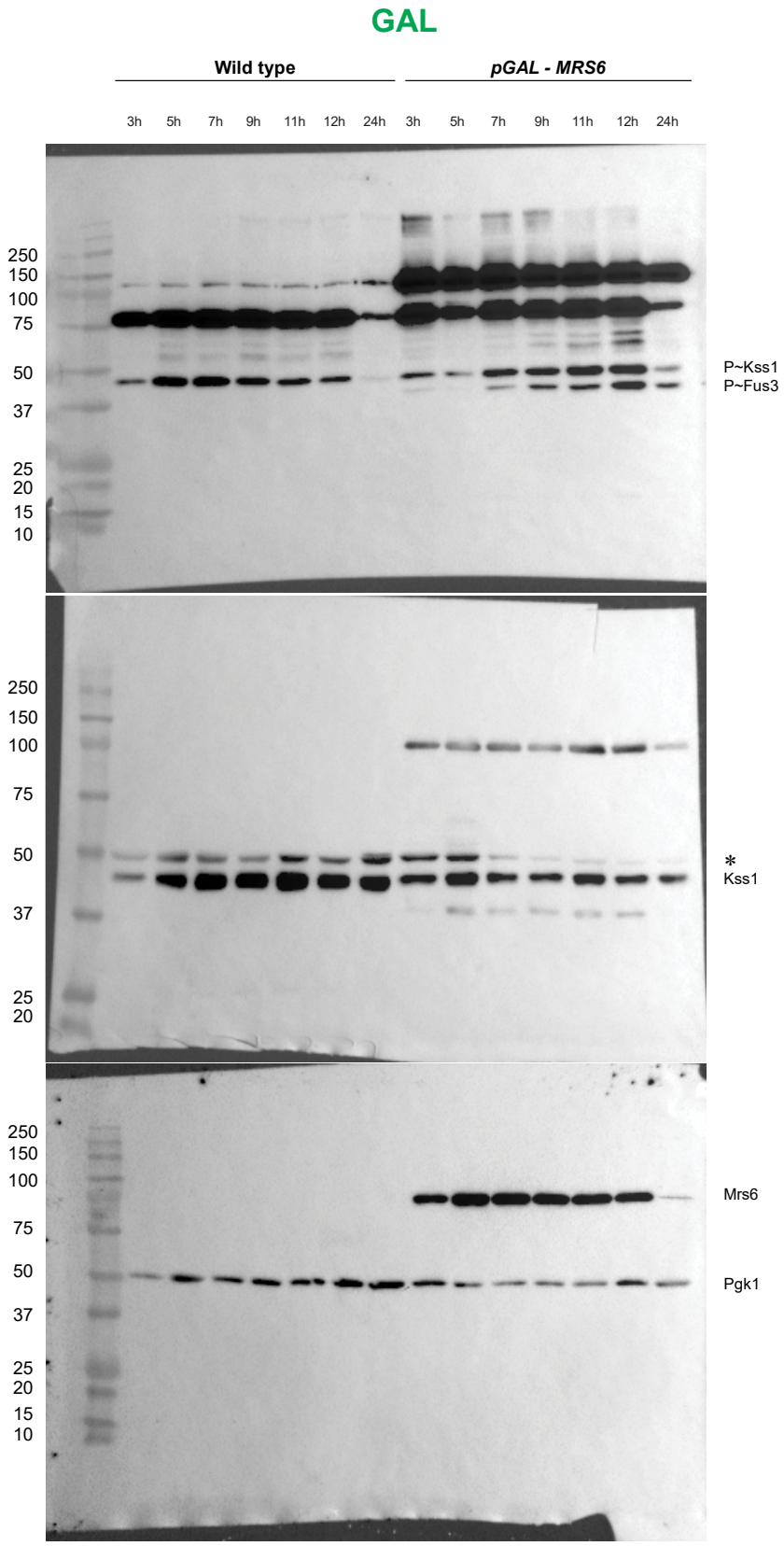


Figure S3B. Raw material for Fig. 6C.

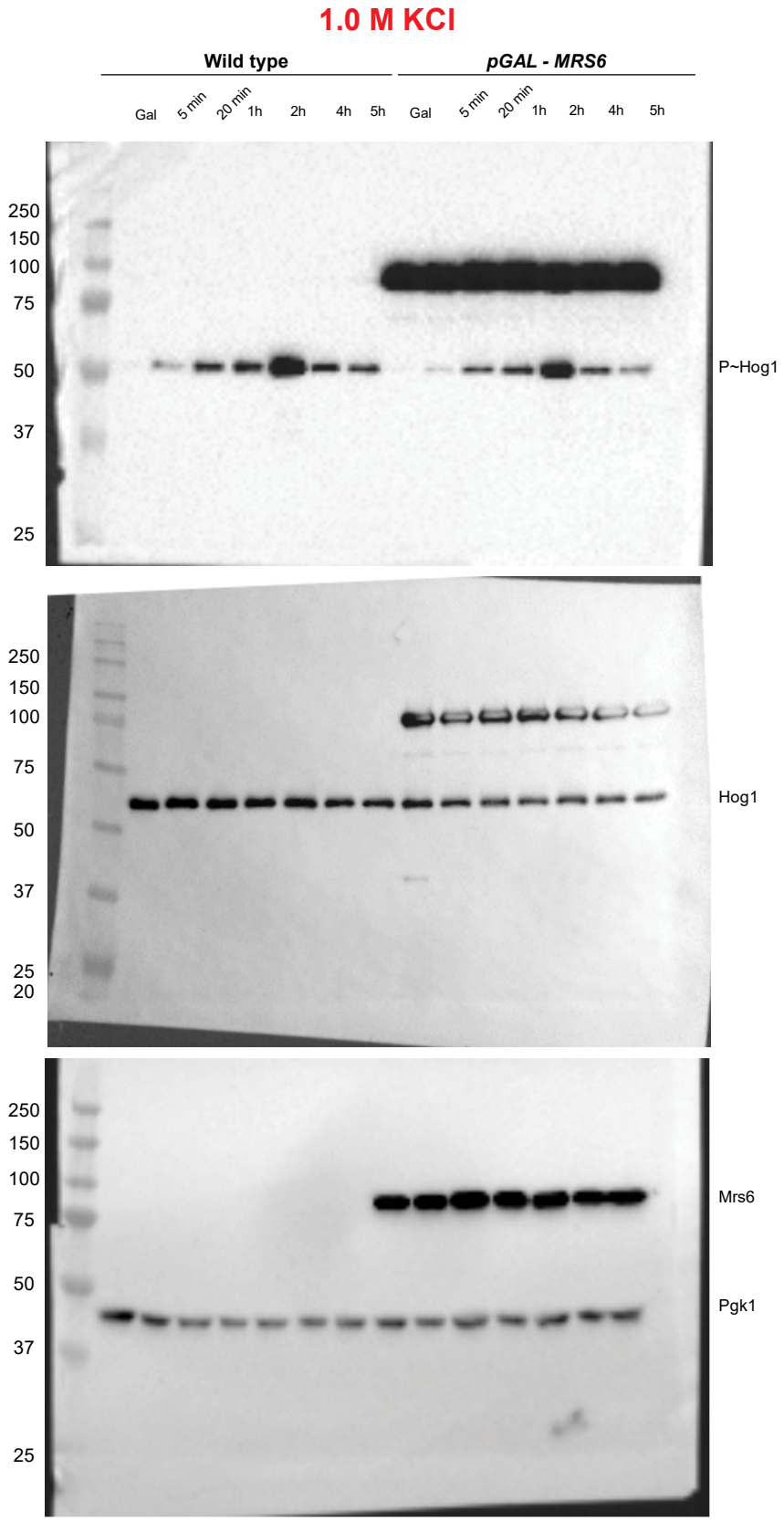


Figure S3C. Raw material for Fig. 6E.

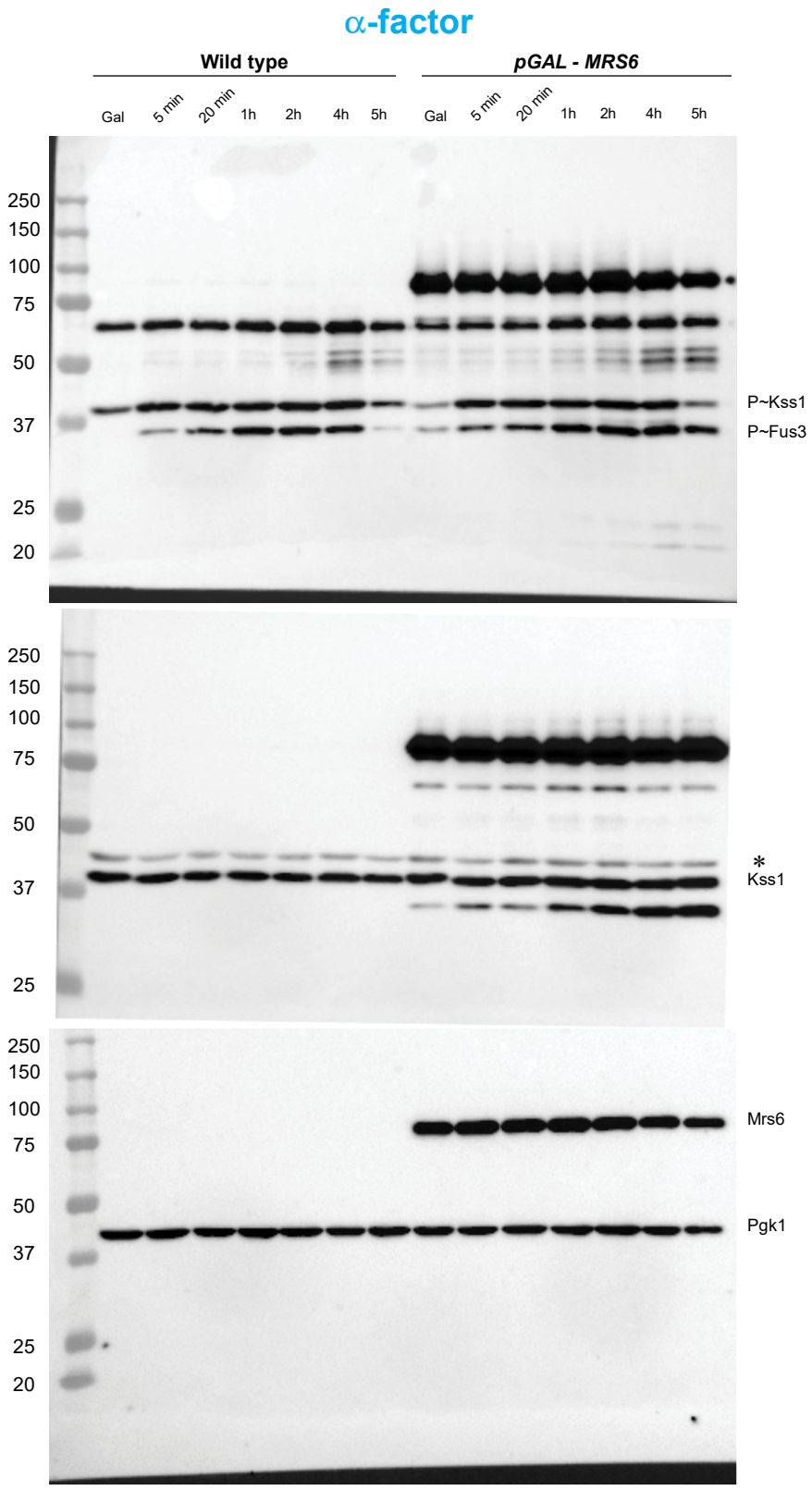


Table S1. Yeast strains used in the study.

Strain[a]	Genotype	Reference
PJ694A[b]	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ*	(James et al., 1996)
PC313	*MAT***a** *ura3-52*	(Liu et al., 1993)
PC538	*MAT***a** *ste4 FUS1-lacZ FUS1-HIS3 ura3-52*	(Cullen et al., 2004)
PC549	*MAT***a** *SY3089 ste4 FUS1-lacZ FUS1-HIS3 ura3-52 ste20::URA3*	(Cullen and Sprague, 2000)
PC610	*MAT***a** *SY3089 ste4 FUS1-lacZ FUS1-HIS3 ura3-52 ste50::URA3*	(Pitoniak et al., 2015)
PC999	*MAT***a** *ste4 FUS1-lacZ FUS1-HIS3 ura3-52 MSB2HA@500 aa*	(Cullen et al., 2004)
PC3209	*MAT***a** *ste4 FUS1-lacZ FUS1-HIS3 ura3-52 msb2::KanMX6*	(Cullen et al., 2004)
PC3551	*MAT***a** *ste4 FUS1-lacZ FUS1-HIS3 ura3-52 leu2::HYG bem4::NAT*	(Pitoniak et al., 2015)
PC3861	*MAT***a** *ste11::NAT ste4 FUS1-lacZ FUS1-HIS3 ura3-52*	(Karunanithi et al., 2010)
PC5024	*MAT***a** *ste11::NAT ura3-52*	(Pitoniak et al., 2015)
PC5392	*MAT***a** *ste4 FUS1-lacZ FUS1-HIS3 ura3-52 STE7-GFP::KanMX6*	This study
PC5692	*MAT***a** *ste4 FUS1-lacZ FUS1-HIS3 ura3-52 sho1::HYG*	(Vadaie et al., 2008)
PC6604	*MAT***a** *ura3-52 leu2 ssk1 ste11::NAT*	(Basu et al., 2020)
PC6785	*MAT***a** *ura3-52 leu2 ssk1 ste20::URA3*	(Basu et al., 2020)
PC6810	*MAT***a** *ura3-52 leu2 ssk1 ura3-*	(Basu et al., 2020)
PC3752	*MAT***a** *ste4 FUS1-lacZ FUS1-HIS3 ura3-52 opy2::URA3*	(Karunanithi and Cullen, 2012)
PC7386	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1* and *pGBDU-C1* [c]	This study
PC7387	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1* and *pGBDU-C1-MRS6*	This study
PC7388	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1* and *pGBDU-C1-BEM4*	This study
PC7389	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1-CDC42* and *pGBDU-C1*	This study
PC7390	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1-CDC42* and *pGBDU-C1-MRS6*	This study
PC7391	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1-CDC42* and *pGBDU-C1-BEM4*	This study
PC7393	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGBDU-C1-CDC42* and *pGAD-C1*	This study
PC7394	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGBDU-C1-CDC42* and *pGAD-C1-MRS6*	This study
PC7395	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1-MRS6* and *pGBDU-C1-STE11*	This study
PC7396	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1* and *pGBDU-C1-STE11*	This study
PC7397	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1-MRS6* and *pGBDU-C1-STE20*	This study
PC7398	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1* and *pGBDU-C1-STE20*	This study
PC7399	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1-MRS6* and *pGBDU-C1-STE50*	This study
PC7400	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1* and *pGBDU-C1-STE50*	This study
PC7401	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1-MRS6* and *pGBDU-C1-RDI1*	This study
PC7402	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1* and *pGBDU-C1-RDI1*	This study
PC7403	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1-MRS6* and *pGBDU-C1-STE4*	This study
PC7404	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1* and *pGBDU-C1-STE4*	This study
PC7405	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1-MRS6* and *pGBDU-C1-STE7*	This study
PC7406	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1* and *pGBDU-C1-STE7*	This study
PC7407	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1-MRS6* and *pGBDU-C1-STE11*	This study
PC7408	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1* and *pGBDU-C1-STE11*	This study
PC7409	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1-MRS6* and *pGBDU-C1-STE20*	This study
PC7410	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1* and *pGBDU-C1-STE20*	This study
PC7413	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1-MRS6* and *pGBDU-C1-CDC24*	This study
PC7414	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1* and *pGBDU-C1-CDC24*	This study
PC7417	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1-MRS6* and *pGBDU-C1-OPY2*	This study
PC7418	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1* and *pGBDU-C1-OPY2*	This study
PC7419	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1-MRS6* and *pGBDU-C1-SSK1*	This study
PC7420	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1* and *pGBDU-C1-SSK1*	This study
PC7421	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1-MRS6* and *pGBDU-C1-KSS1*	This study
PC7422	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1* and *pGBDU-C1-KSS1*	This study
PC7425	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1-MRS6* and *pGBDU-C1-BEM1*	This study
PC7426	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1* and *pGBDU-C1-BEM1*	This study
PC7427	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1-MRS6* and *pGBDU-C1-BEM4*	This study
PC7428	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1* and *pGBDU-C1-BEM4*	This study
PC7429	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1-MRS6* and *pGBDU-C1-IRE1*	This study
PC7430	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1* and *pGBDU-C1-IRE1*	This study
PC7431	*MAT***a** *trpl-901 leu2-3,112 ura3-52 his3-200 gal4Δ gal80Δ LYS2::GALl-HIS3 GAL2-ADE2 met2::GAL7-lacZ pGAD-C1-MRS6*	This study
PC7439	*MAT***a** *ste4 FUS1-lacZ FUS1-HIS3 ura3-52 pRS316* [d]	This study
PC7440	*MAT***a** *ste4 FUS1-lacZ FUS1-HIS3 ura3-52 pGAL-BMH1*[e]	This study
PC7441	*MAT***a** *ste4 FUS1-lacZ FUS1-HIS3 ura3-52 pGAL-BMH2*[e]	This study
PC7442	*MAT***a** *ste4 FUS1-lacZ FUS1-HIS3 ura3-52 pGAL-MRS6* [e]	This study
PC7443	*MAT***a** *ste4 FUS1-lacZ FUS1-HIS3 ura3-52 pGAL-KAR2* [e]	This study
PC7444	*MAT***a** *ura3-52 leu2 ssk1 pRS316* [d]	This study
PC7445	*MAT***a** *ura3-52 leu2 ssk1 pGAL-BMH1* [e]	This study
PC7446	*MAT***a** *ura3-52 leu2 ssk1 pGAL-BMH2* [e]	This study
PC7447	*MAT***a** *ura3-52 leu2 ssk1 pGAL-MRS6* [e]	This study
PC7448	*MAT***a** *ura3-52 leu2 ssk1 pGAL-KAR2* [e]	This study
PC7589	*MAT***a** *ura3-52 CDC3-mCherry::HYG + GFP-CDC42 + pRS316*	This study
PC7590	*MAT***a** *ura3-52 CDC3-mCherry::HYG + GFP-CDC42 + pGAL-MRS6*	This study
PC7592	*MAT***a** *ura3-52 CDC3-mCherry::HYG tec1::NAT + GFP-Cdc42 + pGAL-MRS6*	This study

[a] Strains are in the ∑1287b background unless otherwise indicated.

[b] This strain comes from the laboratory of M. Johnston (University of Colorado Medical Center in Denver).

[c] pGAD-C1 and PGBDU-C1 and plasmids have been described (James et al. 1996).

[d] pRS vectors are from (Sikorski and Hieter1989).

[e] *pGAL* plasmids are from (Gelperin et al. 2005).

Table S2 [a]. Analysis of the genome-wide overexpression screen.

Plate[a]	Row	Column	Gene ID	Gene Name [b]	Intensity[c]
20	A	5	*YOR202W*	*HIS3*	245
38	D	1	*YJL077C*	*ICS3*	226
42	B	2	*YHR213W-A*	*YHR213W-A*	186
30	F	7	*YOR370C*	*MRS6*	174
23	A	5	*YER177W*	*BMH1*	165
52	B	4	*YGR044C*	*RME1*	158
28	B	5	*YML116W*	*ATR1*	155
52	A	1	*YOR251C*	*TUM1*	154
52	D	1	*YPR151C*	*SUE1*	153
52	B	2	*YDL095W*	*PMT1*	151
52	A	5	*YDR418W*	*RPL12B*	150
28	C	10	*YOR028C*	*CIN5*	147
52	C	1	*YHR215W*	*PHO12*	139
52	B	3	*YDR529C*	*QCR7*	137
52	B	1	*YAR071W*	*PHO11*	136
32	C	5	*YOR212W*	*STE4*	134
52	A	3	*YLL010C*	*PSR1*	134
52	A	7	*YPL080C*	*YPL080C*	131
36	A	9	*YDR099W*	*BMH2*	131
41	D	3	*YDR152W*	*GIR2*	128
19	B	4	*YGL121C*	*GPG1*	122
42	F	2	*YIL028W*	*RPL13A*	118
52	D	5	*YGL030W*	*YIL028W*	116
56	E	8	*YDL082W*	*RPL30*	115
42	A	1	*YHL002W*	*HSE1*	115
52	C	2	*YLR209C*	*PNP1*	115
51	G	4	*YDL159W*	*STE7*	110
27	H	10	*YOR336W*	*KRE5*	109
52	A	6	*YDL191W*	*RPL35A*	106
38	E	4	*YOL085C*	*YOL085C*	104
21	C	10	*YGL209W*	*MIG2*	102
24	A	6	*YAL027W*	*SAW1*	102
37	B	1	*YBR021W*	*FUR4*	101
27	B	11	*YDR303C*	*RSC3*	100
32	B	7	*YKL028W*	*TFA1*	97
42	A	3	*YIL060W*	*YIL060W*	96
-	-	-	-	*N.D.*	94
-	-	-	-	*N.D.*	92
37	E	2	*YBL014C*	*RRN6*	85
52	F	3	*YDL138W*	*RGT2*	81
38	A	3	*YJL034W*	*KAR2*	80
4	F	1	*YDR510C-A*	*YDR510C-A*	73
44	E	11	*YDR519W*	*FPR2*	68
27	F	12	*YPR070W*	*MED1*	68
31	C	8	*YDR182W*	*CDC1*	67
4	D	3	*YHR125W*	*YHR125W*	67
61	A	7	*YOR216C*	*RUD3*	64
23	H	8	*YMR251W-A*	*HOR7*	62
46	B	1	*YML118W*	*NGL3*	62

Footnotes

[a]The data file comes from (Gelperin et al., 2005). Blank lines in the data file indicate wells for which the clone identity could not be determined after two rounds of sequencing.

[b]Gene names for the top 200 candidates are shown.

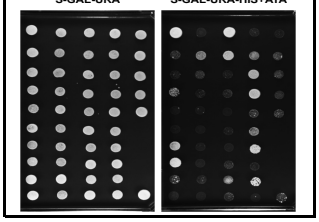
[c]Spot intensity was measured by ImageJ analysis.

Table S3. Validation of candidates from the screen by plasmid transformation into wild-type cells and the *msb2*Δ mutant.

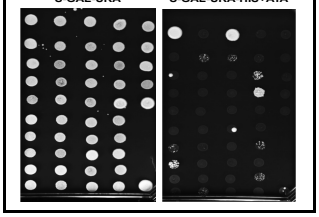
Screen Validation in WT[a]		Normalized Growth	Growth Intensity in WT
Gene	Intensity[b]	Intensity in WT [c]	Normalized to *msb2*Δ [d]
HIS3	204	4	22
STE4	184	3	20
STE7	167	3	18
BMH1	165	3	18
BMH2	151	3	16
MIG2	147	3	16
RRN6	146	3	16
MRS6	137	2	15
CIN5	132	2	14
KAR2	130	2	14
TFA1	123	2	13
RSC3	120	2	13
RGT2	113	2	12
ATR1	104	2	11
WT	57	1	6
RPL12B	57	1	6
FUR4	49	1	5
YHR125W	47	1	5
WT	30	1	3
RPL13A	24	<0.1	3
GPG1	21	<0.1	2
YIL060W	15	<0.1	2
ICS3	11	<0.1	1
HSE1	9	<0.1	1
YPL080C	8	<0.1	1
RPL21A	2	<0.1	<0.1
RPL30	2	<0.1	<0.1
FPR2	2	<0.1	<0.1
QCR7	2	<0.1	<0.1
RME1	2	<0.1	<0.1
MED1	1	<0.1	<0.1
YOL085C	1	<0.1	<0.1
YHR213W-A	1	<0.1	<0.1
GIR2	1	<0.1	<0.1
RPL35A	1	<0.1	<0.1
PMT1	1	<0.1	<0.1
YIL028W	<0.1	<0.1	<0.1
PHO11	<0.1	<0.1	<0.1
SUE1	<0.1	<0.1	<0.1
QRI1	<0.1	<0.1	<0.1
KRE5	<0.1	<0.1	<0.1
PNP1	<0.1	<0.1	<0.1
TUM1	<0.1	<0.1	<0.1
PHO12	<0.1	<0.1	<0.1
CDC1	<0.1	<0.1	<0.1
PSR1	<0.1	<0.1	<0.1

Screen Validation in *msb2*Δ[e]		Normalized Growth
Gene	Intensity[f]	Intensity in *msb2*Δ [c]
HIS3	199	22
STE4	181	20
STE7	117	13
BMH1	77	9
BMH2	16	2
MIG2	56	6
RRN6	22	2
MRS6	14	2
CIN5	16	2
KAR2	33	4
TFA1	<0.1	<0.1
RSC3	<0.1	<0.1
RGT2	<0.1	<0.1
ATR1	<0.1	<0.1
WT	9	1
RPL12B	<0.1	<0.1
FUR4	<0.1	<0.1
YHR125W	<0.1	<0.1
WT	<0.1	<0.1
RPL13A	<0.1	<0.1
GPG1	<0.1	<0.1
YIL060W	<0.1	<0.1
ICS3	<0.1	<0.1
HSE1	<0.1	<0.1
YPL080C	<0.1	<0.1
RPL21A	<0.1	<0.1
RPL30	<0.1	<0.1
FPR2	<0.1	<0.1
QCR7	<0.1	<0.1
RME1	<0.1	<0.1
MED1	<0.1	<0.1
YOL085C	<0.1	<0.1
YHR213W-A	17	2
GIR2	<0.1	<0.1
RPL35A	27	3
PMT1	<0.1	<0.1
YIL028W	<0.1	<0.1
PHO11	<0.1	<0.1
SUE1	1	<0.1
QRI1	<0.1	<0.1
KRE5	3	<0.1
PNP1	<0.1	<0.1
TUM1	<0.1	<0.1
PHO12	<0.1	<0.1
CDC1	<0.1	<0.1
PSR1	<0.1	<0.1

Screen Validation in WT[a]



Screen Validation in *msb2*Δ[e]



Validation Key

HIS3	*PMT1*	*STE4*	*YOL085C*	*QRI1*
ICS3	*CIN5*	*BMH2*	*RSC3*	*YHR125W*
YHR213W-A	*HSE1*	*YIL028W*	*MIG2*	*GPG1*
ATR1	*GIR2*	*RPL30*	*STE7*	*RPL21A*
RME1	*QCR7*	*PNP1*	*FUR4*	WT
TUM1	*PHO12*	*RPL35A*	*TFA1*	blank
MRS6	*PHO11*	*CDC1*	*RRN6*	blank
BMH1	*PSR1*	*YIL060W*	*MED1*	blank
RPL12B	*YPL080C*	*RGT2*	*KAR2*	blank
SUE1	*KRE5*	*RPL13A*	*FPR2*	WT

[a]The plasmids were transformed to PC6021 background.

[b]Colonies growth intensity measured in day 3.

[c]Values are normalized to WT's value. Wt is set to 1.

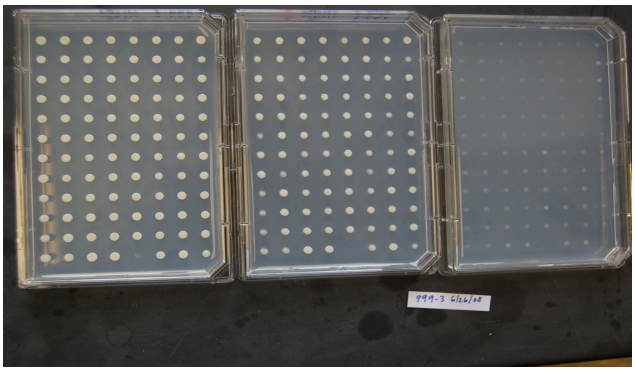
[d]Growth intensity rates of the canididates validated in wild type is normalized to *msb2*Δ mutant.

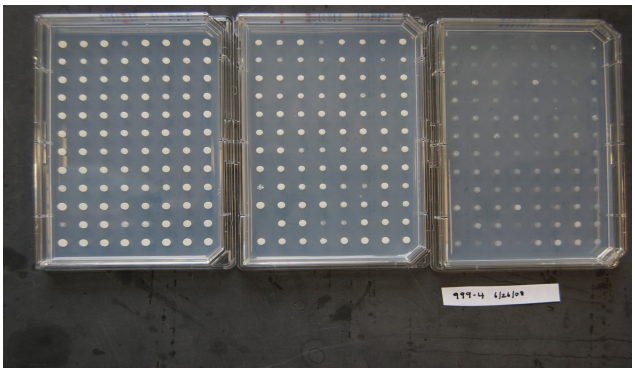
[e]The plasmids were transformed to PC3209 background.

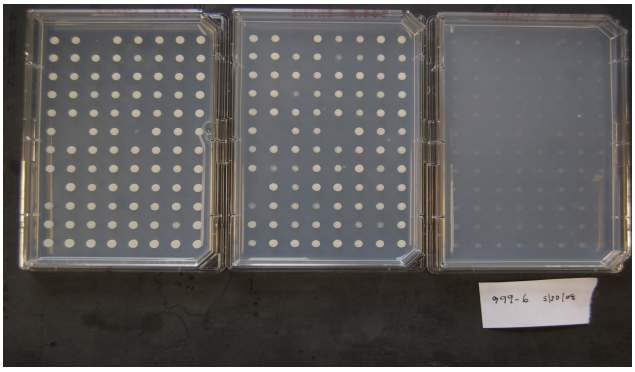
[f]Colonies growth intensity measured in day 6.

Table S4. Raw data of genome-wide screen.

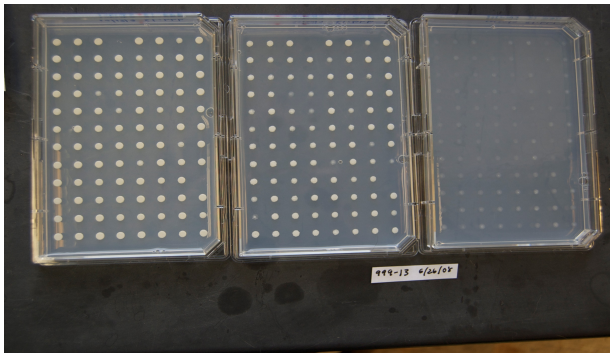
Left plate, S-GAL-URA; **middle** plate S-GAL-URA-HIS; and **right** plate S-GAL-URA-HIS+ATA.

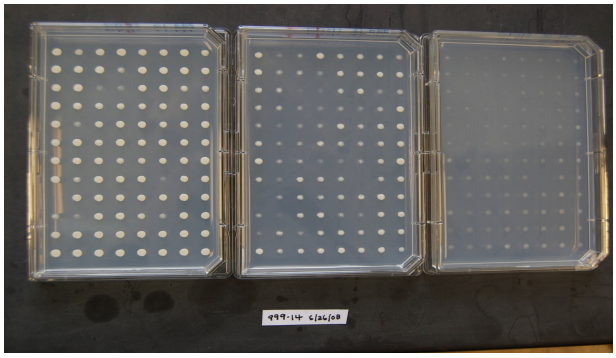


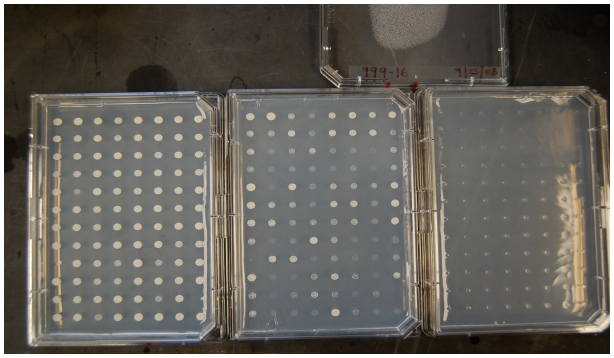


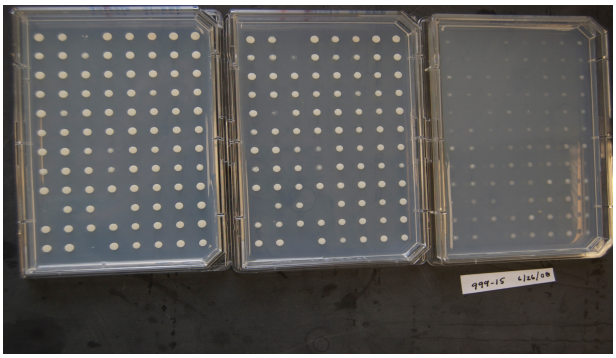


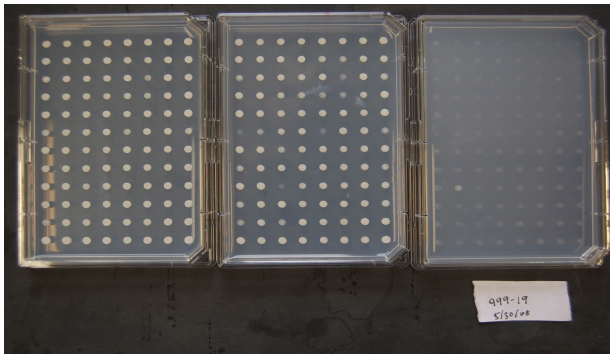
Left plate, S-GAL-URA; **middle** plate S-GAL-URA-HIS; and **right** plate S-GAL-URA-HIS+ATA.

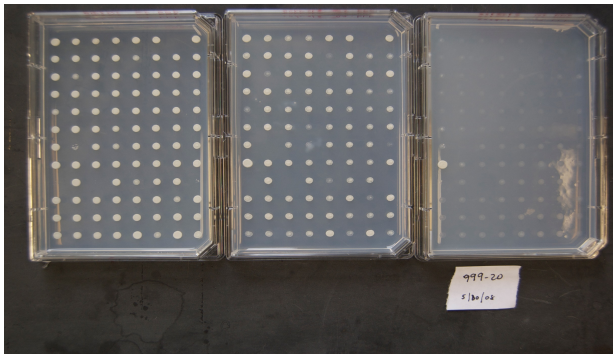




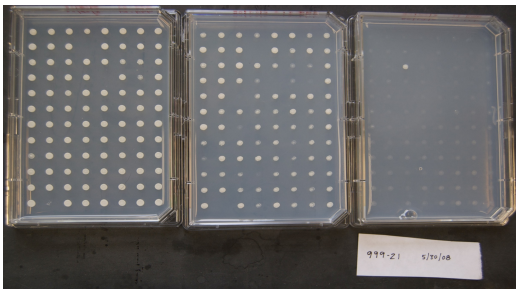


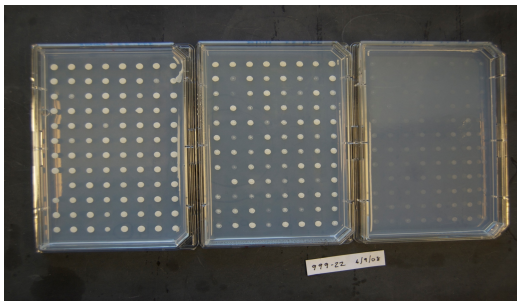


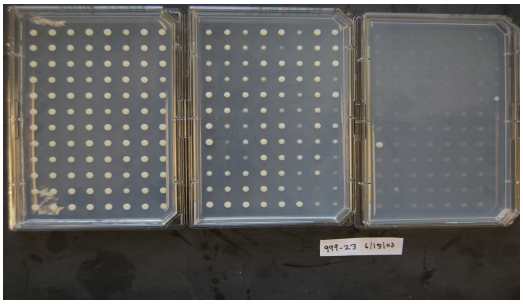


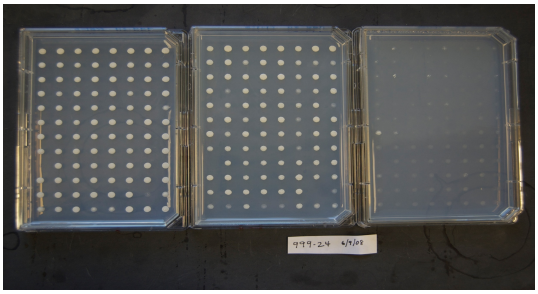


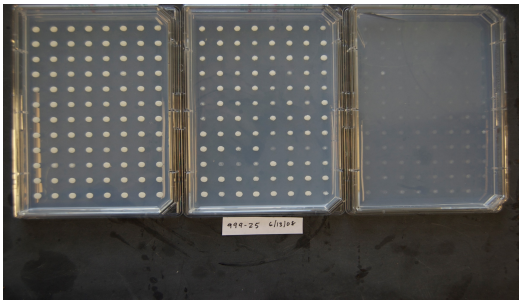
Left plate, S-GAL-URA; **middle** plate S-GAL-URA-HIS; and **right** plate S-GAL-URA-HIS+ATA.

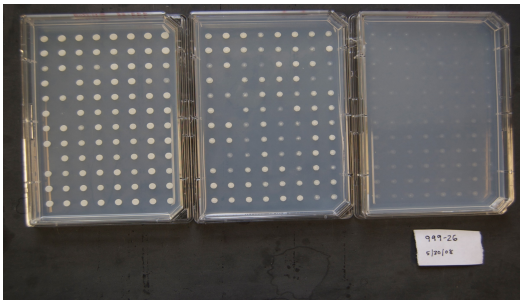


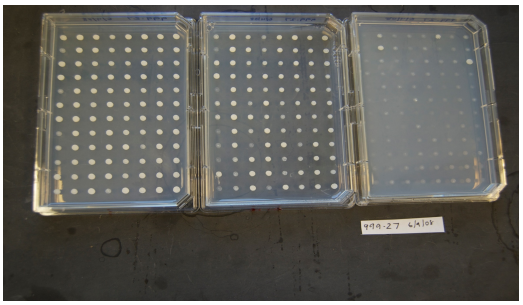


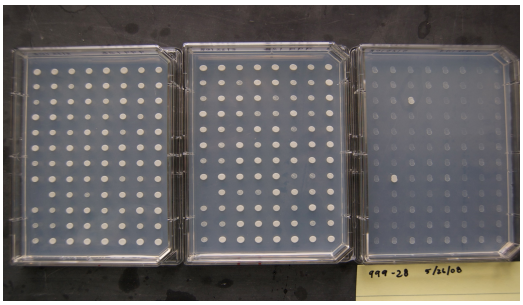


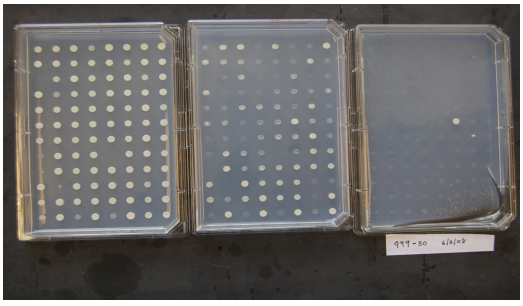




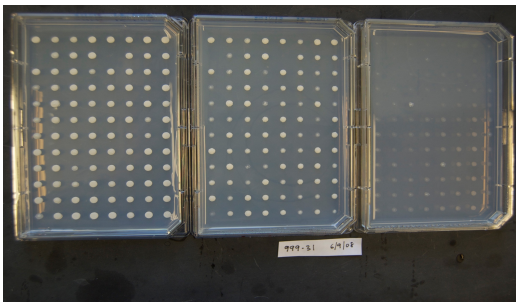


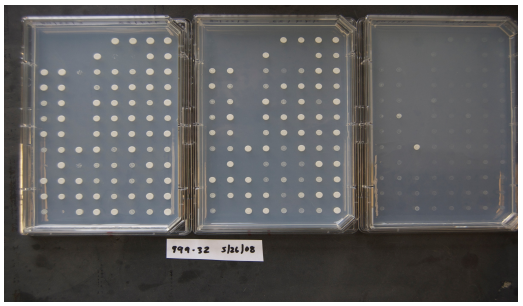


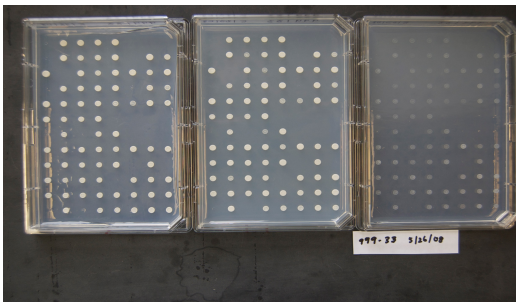


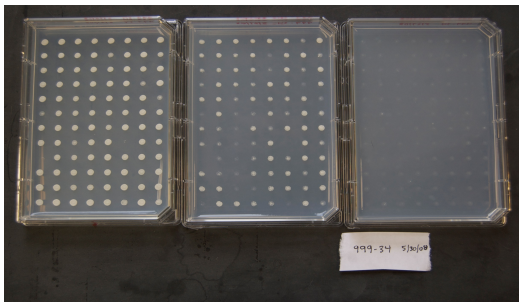


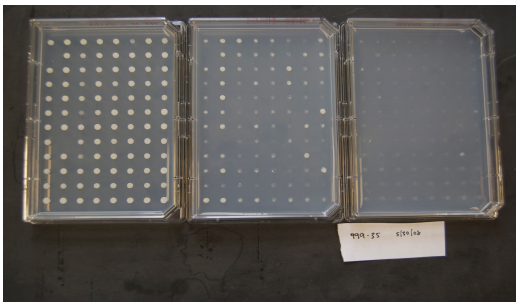
Left plate, S-GAL-URA; **middle** plate S-GAL-URA-HIS; and **right** plate S-GAL-URA-HIS+ATA.

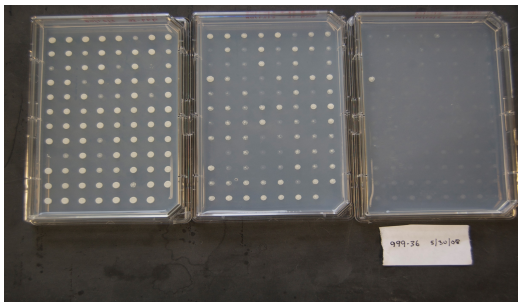


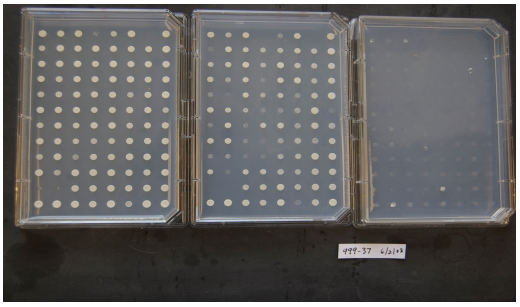


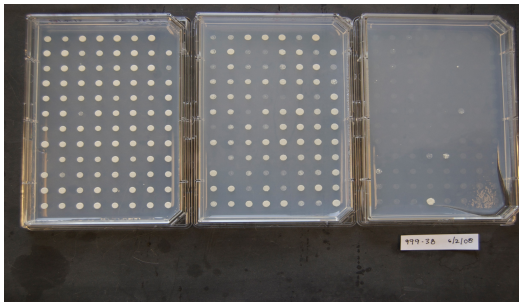


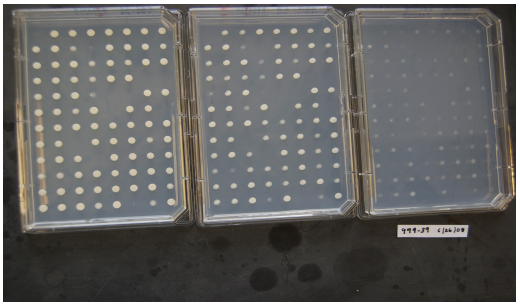


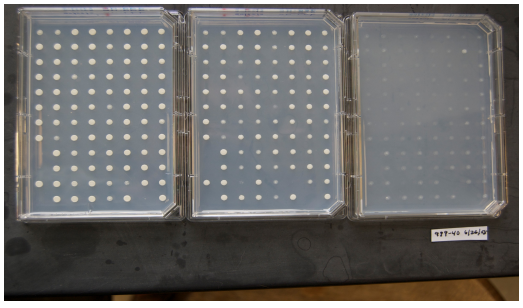




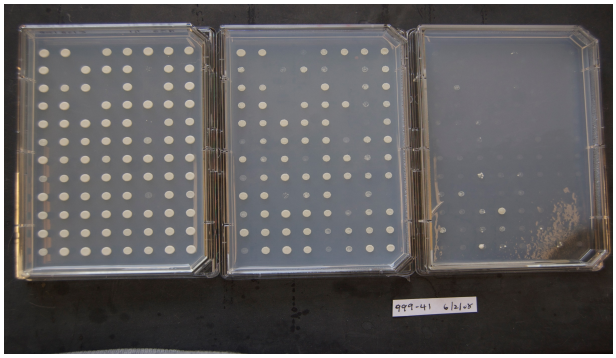


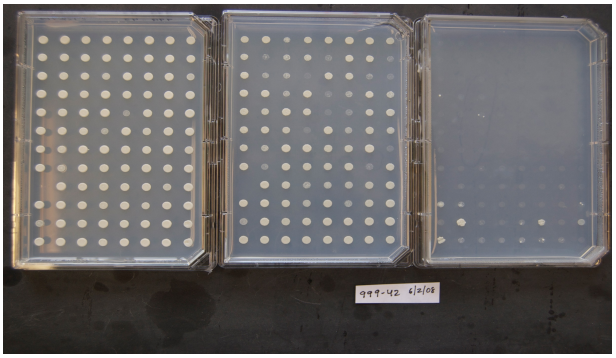


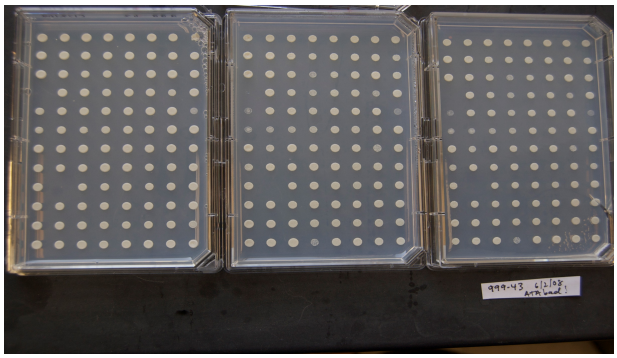


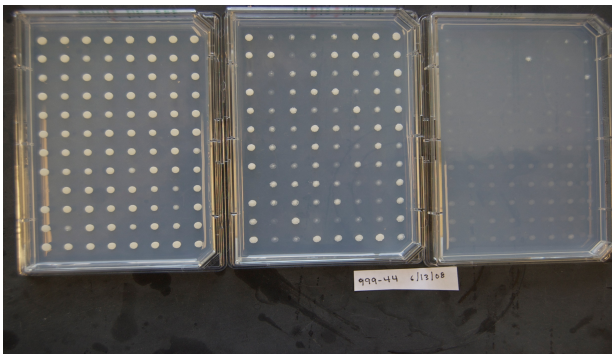


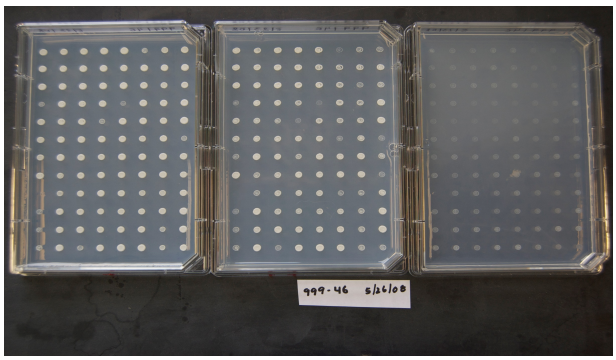
Left plate, S-GAL-URA; **middle** plate S-GAL-URA-HIS; and **right** plate S-GAL-URA-HIS+ATA.

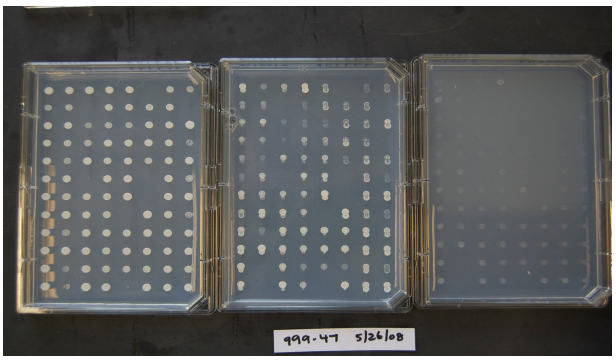


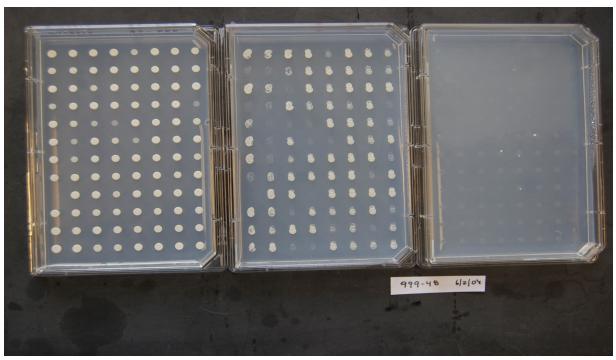


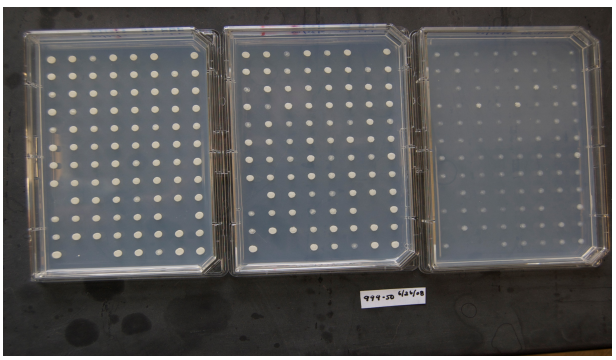




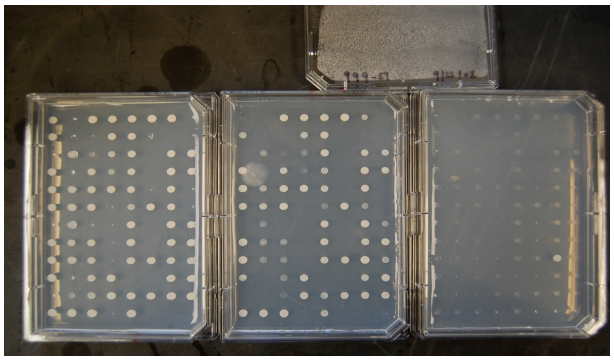


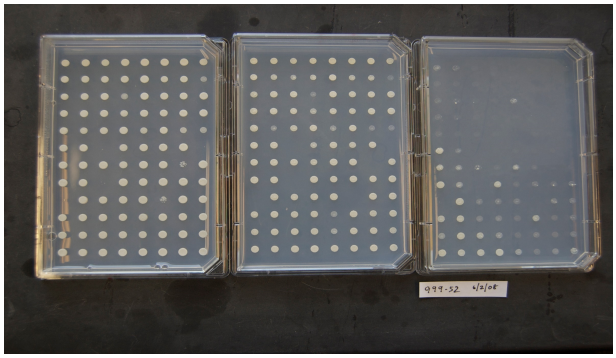


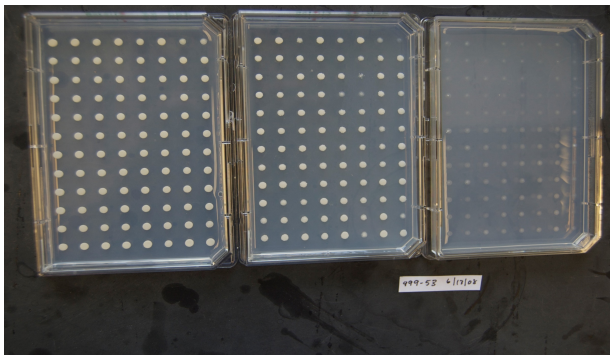


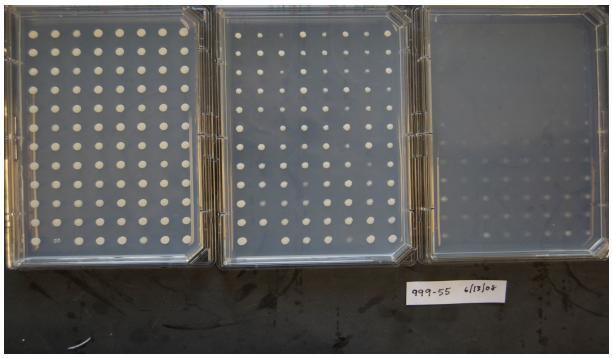


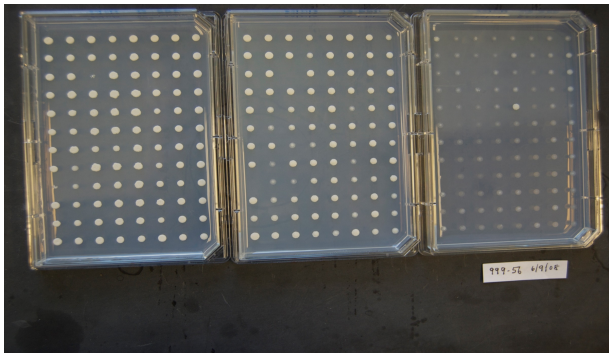
Left plate, S-GAL-URA; **middle** plate S-GAL-URA-HIS; and **right** plate S-GAL-URA-HIS+ATA.

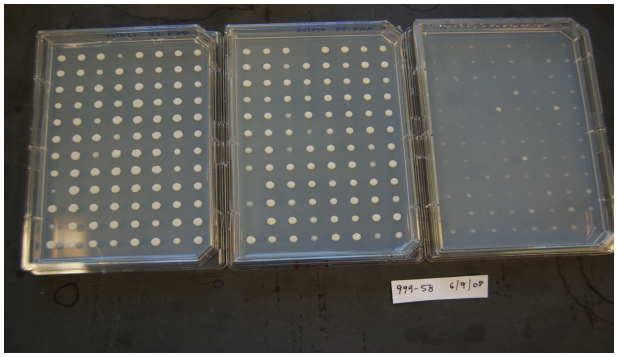


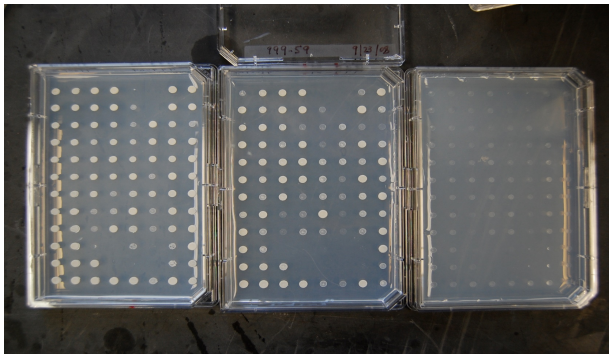












Left plate, S-GAL-URA; **middle** plate S-GAL-URA-HIS; and **right** plate S-GAL-URA-HIS+ATA.