

Gene expression versus virulence phenotype

** Virulence phenotype as annotated in CGD (August 2007)

Gene	Gene product	Fold expression <i>in vivo</i>				Virulence **	First author	Journal	Volume page no.	Date
AAF1	unknown function	0.85	0.88	1.10	1.10	attenuated	Rieg	Infection and Immunity	67(7), 3193	1999
ACE2	cell separation factor	1.14	1.09	1.03	1.06	attenuated	Kelly	Molecular Microbiology	53(3), 969	2004
ADE2	phosphoribosylamino-	1.03	1.12	0.70	1.19	attenuated	Kirsch	Infection and Immunity	59(9), 3297	1991
ALO1	D-arabinono-1,4-lactone	1.06	0.53	1.01	0.93	attenuated	Huh	Infection and Immunity	69(6), 3939	2001
ALS1	surface adhesin	4.41	4.65	3.13	1.28	attenuated	Fu	Molecular Microbiology	44(1), 61	2002
AQY1	aquaporin	1.06	1.63	1.21	1.08	normal	Carbrey	Yeast	18(15), 1391	2001
ARN1 / SIT1	Iron transporter	2.34	0.75	1.27	1.26	normal	Chuan-Jiong Hu			2002
ASH1	transcription factor	1.35	0.91	0.99	1.20	attenuated	Inglis	Molecular and Celular Biology	22(24), 8669	2002
BGL2	1-3 b-glucosyltransferase	0.95	1.08	0.82	1.15	attenuated	Sarthy	Microbiology	143(Pt 2), 367	1997
BIG1	b-1,6-glucan biosynthesis	0.99	0.90	1.22		attenuated	Umeyama	Infection and Immunity	74(4), 2373	2006
BNI1	formin	0.62	1.25	0.94	1.23	attenuated	Li	Eukaryotic Cell	118(Pt. 12), 2637	2005
CAP1	adenyl cyclase regulator	1.47	1.72	1.51	1.32	attenuated	Bahn	Journal of Bacteriology	183(10), 3211	2001
CDC10	septin	0.50	0.59	0.91	0.91	attenuated	Warenda	Infection and Immunity	71(7), 4045	2003
CDC11	septin	0.90	0.81	0.78	0.83	attenuated	Warenda	Infection and Immunity	71(7), 4045	2003
CDC24	GDP:GTP exchange factor	1.68	1.31	1.25	0.88	attenuated	Bassilana	Eukaryotic Cell	2(1), 9	2003
CDC35 / CYR1	adenyl cyclase regulator	2.02	0.93	0.97	1.09	attenuated	Rocha	Molecular Biology of the Cell	12(11), 3631	2001
CDC42	G-protein (GTPase)	0.70	0.72	0.91	1.18	attenuated	Bassilana	Eukaryotic Cell	2(1), 9	2003
CEK1 / ERK1	MAP kinase	1.01	0.94	0.94	0.92	attenuated	Csank	Infection and Immunity	66(6), 2713	1998
CHS1	chitin synthase	0.81	0.88	1.06	0.80	attenuated	Munro	Molecular Microbiology	39(5), 1414	2001
CHS2	chitin synthase	1.30	0.89	0.90	1.25	normal	Gow	PNAS	91(13), 6216	1994
CHS3	chitin synthase	1.28	1.05	1.03	1.02	attenuated	Bulawa	PNAS	92(23), 10570	1995
						attenuated in model of oropharyngeal				
CKA2	protein kinase	0.84	0.86	1.04	1.00	candidiasis	Chiang	Cellular Microbiology		2006
CLA4	ser/thr protein kinase	1.20	0.93	0.91	1.16	attenuated	Leberer	Current Biology	7(8), 539	1997
CNA1 / CMP1	calcineurin A	1.07	1.01	1.16	1.00	attenuated	Sanglard	Molecular Microbiology	48(4), 959	2003
CNB1	calcineurin B	0.58	0.85	0.92	1.00	attenuated	Blankenship	Eukaryotic Cell	2(3), 422	2003
COS1 / NIK1	histidine kinase	1.45	1.61	1.12	1.26	attenuated	Selitrechnikoff	Medical Mycology	39(1), 69	2001
CPH1	regulatory cascade	1.05	1.04	1.02	1.22	normal	Csank	Infection and Immunity	66(6), 2713	1998
CPP1	protein phosphatase	1.22	0.98	1.00	0.93	attenuated	Csank	Molecular Biology of the Cell	8(12), 2539	1997
CRH11	cell wall protein	0.22	0.16	0.57	0.91	attenuated	Pardini	Journal of Biological Chemistry		2006
CRH12	cell wall protein	0.88	0.87	1.03	1.19	attenuated	Pardini	Journal of Biological Chemistry		2006
CRK1	Cdc2 kinase	1.79	1.22	1.07	0.85	attenuated	Chen	Molecular and Celular Biology	20(23), 8696	2000
CRZ1	calcineurin dependent zinc finger	1.05	1.13	1.28	0.89	normal	Onyewu	Infection and Immunity	72(12), 7330	2004
CSF4 / UTR2	glycosidase	1.01	1.09	0.92	1.00	attenuated	Alberti-Segui	Yeast	21(4), 285	2004
CSH1 / IFO4	cell surface hydrophobicity	0.54	0.93	0.97	0.88	attenuated	Singleton	FEMS Microbiology Letters	244(2), 373	2005
CSH3 / SHR3	ER packaging chaperone	1.52	0.94	0.90	0.85	attenuated	Martínez P	Molecular Microbiology	51(2), 371	2004
CSP37	37 kDa surface protein	1.72	1.91	1.10	0.94	attenuated	Sentandreu	Journal of Bacteriology	179(15), 4654	1997
CST20 / STE20	MEKK kinase	1.06	1.09	1.04	1.17	attenuated	Leberer	PNAS	93(23), 13217	1996
CTA1	catalase	9.63	3.90	5.31	1.23	attenuated	Wysong	Infection and Immunity	66(5), 1953	1998
DAC1 / NAG2	N-acetyl GlcNH2 catabm	0.80	1.30	0.97	1.09	attenuated	Singh	Infection and Immunity	69(12), 7898	2001
ECM33	surface protein	0.53	0.43	0.24	1.05	attenuated	Martinez-Lopez	Microbiology	150(Pt 10), 3341	2004
EFG1	transcription factor	1.90	1.82	1.55	1.06	attenuated	Lo	Cell	90(5), 939	1997
ERG3	ergosterol synthesis	0.43	0.20	0.46	0.85	attenuated	Chau	Antimicrobial Agents and Chemotherapy	49(9), 3636	2005
ESS1 / PIN1	peptidyl-prolyl cis/trans isomeras	0.80	0.86	0.79	1.03	attenuated	Li	Biochemistry	44(16), 6180	2005
FAD2	fatty acid synthase	1.49	1.03	1.17	0.88	normal	Murayama	Microbiology	152(Pt 5), 1551	2006
FAD3	fatty acid synthase	1.10	0.99	0.90	1.01	normal	Murayama	Microbiology	152(Pt 5), 1551	2006
FAS2	fatty acid synthase	0.78	0.53	1.08	0.83	attenuated	Zhao	Infection and Immunity	65(2), 829	1997

<i>FBA1</i>	fructose-1,6-biphosphate aldolas	0.50	1.76	0.80	0.72	partial attenuation	Rodaki	Eukaryotic Cell	5(8), 1371	2006
<i>FET3</i>	iron transport protein	1.11	1.04	1.02	1.01	normal	Eck	Microbiology	145(Pt9), 2415	1999
<i>FLO8</i>	transcription factor	4.46	1.05	1.37	0.96	avirulent	Cao	Molecular Biology of the Cell	17(1), 295	2006
<i>FOX2</i>	b-oxidation					attenuated	Piekarska	Eukaryotic Cell	5(11), 1847	2006
<i>FTR1</i>	high affinity iron permease	0.58	0.30	0.19	0.80	attenuated	Ramanan	Science	288(5468), 1062	2000
<i>FTR2</i>	high affinity iron permease	1.05	0.21	0.50	1.06	normal	Ramanan	Science	288(5468), 1062	2000
<i>GAT1</i>	transcription factor	1.12	0.86	0.99	1.02	attenuated	Limjindaporn	Molecular Microbiology	50(3), 993	2003
<i>GNA1</i>	gln-6-P acetyl transferase	0.74	1.02	1.84	1.05	attenuated	Mio	Microbiology	146(Pt 7), 1753	2000
<i>GPI7</i>	transcription factor	1.49	1.05	1.09	0.85	attenuated	Richard	Molecular Microbiology	44(3), 841	2002
<i>HEM3</i>	uroporphyrin I synthase	2.27	1.13	1.26	1.16	attenuated	Kirsch	Infection and Immunity	59(9), 3297	1991
<i>HGT4 / SNF3 / GSP1</i>	glucose sensor	3.26	1.71	2.30	1.12	slower than normal	Brown	Eukaryotic Cell	5(10), 1726	2006
<i>HK1</i>	histidine kinase	1.44	1.08	1.09	0.94	attenuated	Calera	Infection and Immunity	68(2), 518	1999
<i>HOG1</i>	MAP kinase	0.73	0.92	1.05	1.03	attenuated	Alonso-Monge	Journal of Bacteriology	181(10), 3058	1999
<i>HSL1</i>	protein kinase	0.65	0.91	1.00	1.07	attenuated	Umeyama	Molecular Microbiology	55(2), 381	2005
<i>HST1</i>	regulatory cascade					normal	Csank	Infection and Immunity	66(6), 2713	1998
<i>HST7 / STE7</i>	MEK kinase	1.05	0.88	1.03	0.93	normal	Leberer	PNAS	93(23), 13217	1996
<i>HWP1</i>	transglutaminase	0.38	0.96	0.03	0.95	attenuated	Staab	Science	283(5407), 1535	1999
<i>ICL1</i>	isocitrate lyase	1.96	4.54	1.42	1.26	attenuated	Lorenz	Nature	412(6842), 83	2001
<i>INT1</i>	surface protein	0.66	0.89	0.88	1.30	attenuated	Gale	Science	279:1355-1358	1998
<i>IRO1</i>	possible transcription factor	0.55	1.17	0.92	1.04	attenuated	Chibana	Microbiology and Immunology	49(10), 937	2005
<i>IRS4</i>	immunogenic protein	1.38	0.99	1.10	1.02	partial attenuation	Badrane	Microbiology	151(pt 9), 2923	2005
<i>KEX2</i>	kexin (subtilase)	0.92	1.18	0.90	1.15	attenuated	Newport	The Journal of Biological Chemistry	278(3), 1713	2003
	UDP-glucose:glycoprotein									
<i>KRE5</i>	glucosyltransferase	1.27	0.97	1.12	0.93	attenuated	Herrero	Eukaryotic Cell	3(6), 1423	2004
<i>LIG4 / CDC9</i>	DNA ligase	0.87	1.16	0.69	1.22	attenuated	Andaluz	Infection and Immunity	69(1), 137	2001
<i>MAD2</i>	spindle assembly factor	0.83	1.04	1.08	0.82	attenuated	Bai	Molecular Microbiology	45(1), 31	2002
<i>MDR1</i>	membrane efflux pump	1.77	1.16	1.03	0.78	attenuated	Becker	Infection and Immunity	63(11), 4515	1995
<i>MIG1</i>	DNA-binding protein	1.01	0.86	1.05	1.12	normal	Zaragoza	Journal of Bacteriology	182(2), 320	2000
<i>MIT1</i>	inositol P-ceramide/	1.20	1.31	1.24	1.10	attenuated	Mille	The Journal of Biological Chemistry	279(46), 47952	2004
<i>MKC1</i>	MAP kinase	0.74	1.17	0.86	0.97	attenuated	Diez-Orejas	Infection and Immunity	65(2), 833	1997
	iron regulated a1,2-mannosyl									
<i>MNN5</i>	transferase	1.22	0.87		1.24	attenuated	Bai	Eukaryotic Cell	5(2), 238	2006
<i>MNT1</i>	a1,2-mannosyl transferase	0.97	0.69	0.76	1.15	attenuated	Buurman	PNAS	95(13), 7670	1998
<i>MNT2</i>	mannosyl transferases	0.78	1.11		0.94	attenuated	Munro	The Journal of Biological Chemistry	280(2), 1051	2005
<i>NAG2</i>	NAGP deacetylase	0.80	1.30	0.97	1.09	attenuated	Yamada-Okabe	FEMS Microbiology Letters	212(1), 15	2002
<i>NAG5 / HXK1</i>	NAG kinase	1.20	1.24	0.97	0.94	attenuated	Yamada-Okabe	FEMS Microbiology Letters	212(1), 15	2002
<i>NIK1 / COS1</i>	histidine kinase	1.45	1.61	1.12	1.26	attenuated	Yamada-Okabe	Journal of Bacteriology	181(23), 7243	1999
<i>NMT1</i>	N-myristoyl transferase	1.04	1.06	1.01	1.13	attenuated	Weinberg	Molecular Microbiology	16(2), 241	1995
<i>NOT4 / MOT2 / SIG1</i>	transcription factor	1.00	1.00	1.08	0.93	attenuated	Krueger	Microbiology	150(Pt 1), 229	2004
						attenuated only in intravenous infection of neutropenic and immunosuppressed mice				
<i>NOT5</i>	immunogenic protein	0.90	1.26	1.07	0.96		Cheng	Infection and Immunity	73(11), 7190	2005
<i>NRG1</i>	transcriptional repressor	2.43	1.49		0.92	attenuated	Murad	The EMBO Journal	20(17), 4742	2001
<i>NTC1 / NTH1</i>	neutral trehalase	1.10	1.26	1.29	1.38	normal	Eck	Microbiology	143(Pt 12), 3747	1997
<i>PEX5</i>	b-oxidation	1.43	1.92	1.10	0.93	normal	Piekarska	Eukaryotic Cell	5(11), 1847	2006
<i>PHR1</i>	pH-regulated expression	0.36	0.26	0.23	0.42	attenuated	Ghannoum	Infection and Immunity	63(11), 4528	1995
<i>PHR2</i>	pH-regulated expression	0.81	0.92	1.06	1.05	normal	De Bernardis	Infection and Immunity	66(7), 3317	1998
<i>PLB1</i>	phospholipase B	0.88	1.01		1.00	attenuated	Leidich	The Journal of Biological Chemistry	273(40), 26078	1998
<i>PLC2</i>	phospholipase C					normal	Kunze	Microbiology	151(Pt 10), 3381	2005
<i>PLC3</i>	phospholipase C	1.54	0.97		0.80	normal	Kunze	Microbiology	151(Pt 10), 3381	2005
<i>PLD1 / SPO14</i>	phospholipase D	1.49	1.56	0.85	0.95	attenuated	Hube	Microbiology	147(Pt 4), 879	2001
<i>PMR1</i>	P-type ATPase	0.80	0.95	0.93	0.91	attenuated	Bates	The Journal of Biological Chemistry	280(24), 23408	2005

<i>PMT1</i>	protein-O-mannosylation	1.08	0.63		0.96	attenuated	Timpel	The Journal of Biological Chemistry	273(33), 20837	1998
<i>PMT2</i>	protein-O-mannosylation	0.50	0.64	0.64	0.94	attenuated	Rouabhia	Infection and Immunity	73(8), 4571	2005
<i>PMT4</i>	protein-O-mannosylation	0.41	0.85	0.67	1.18	attenuated	Rouabhia	Infection and Immunity	73(8), 4571	2005
<i>PMT5</i>	protein-O-mannosylation	0.76	1.01	0.97	1.08	attenuated	Rouabhia	Infection and Immunity	73(8), 4571	2005
<i>PMT6</i>	protein-O-mannosylation	0.66	0.81	1.11	1.01	attenuated	Rouabhia	Infection and Immunity	73(8), 4571	2005
						1x10(6) and 1.5x10(6)				
<i>RAD52</i>	homologous recombination	0.93	0.85	0.92	0.92	cells	Chauhan	Infection and Immunity	73(12), 8069	2005
<i>RAS1</i>	regulates gene expression	1.16	1.50	1.23	1.09	attenuated	Leberer	Molecular Microbiology	42(3), 673	2001
<i>RBT1</i>	hypha-specific wall protein	0.31	0.56	1.02	1.31	attenuated	Braun	Genetics	156(1), 31	2000
<i>RBT4</i>	unknown function	0.30	0.59	0.22	0.90	attenuated	Braun	Genetics	156(1), 31	2000
<i>RBT5</i>	unknown function	0.43	0.56	0.32	0.30	attenuated	Braun	Genetics	156(1), 31	2000
<i>RFG1 / ROX1</i>	transcription factor	0.89	0.83	0.99	0.83	attenuated	Kadosh	Molecular and Celular Biology	21(7), 2496	2001
<i>RIM101</i>	transcription factor	1.51	0.94	2.86	0.83	attenuated	Davis	Infection and Immunity	68(10), 5953	2000
<i>RIM8</i>	transcription factor	1.16	1.27	0.97	0.90	attenuated	Davis	Infection and Immunity	68(10), 5953	2000
<i>RSR1</i>	GTPase	0.72	0.99	1.20	1.00	attenuated	Yaar	Microbiology	143(Pt 9), 3033	1997
<i>SAP1</i>	aspartyl proteinase	0.86	0.91	1.09	1.14	attenuated	Hube	Infection and Immunity	65(9), 3529	1997
<i>SAP2</i>	aspartyl proteinase	1.07	0.78	0.62	1.11	attenuated	Hube	Infection and Immunity	65(9), 3529	1997
<i>SAP3</i>	aspartyl proteinase	0.98	0.87	0.88	0.93	attenuated	Hube	Infection and Immunity	65(9), 3529	1997
<i>SAP4</i>	SAP4-6 KO	0.94	0.85	1.15	1.00	attenuated	Sanglard	Infection and Immunity	65(9), 3539	1997
<i>SAP5</i>	SAP4-6 KO	0.95	0.89	1.24	0.88	attenuated	Sanglard	Infection and Immunity	65(9), 3539	1997
<i>SAP6</i>	SAP4-6 KO	0.96	0.92	1.06	1.01	attenuated	Sanglard	Infection and Immunity	65(9), 3539	1997
<i>SET1</i>	methyltransferase	0.92	1.14	1.22	1.09	partial attenuation	Raman	Molecular Microbiology	60(3), 697	2006
<i>SIT4</i>	protein phosphatase	1.15	1.01	1.15	1.14	attenuated	Lee	Molecular Microbiology	51(3), 691	2004
<i>SLN1</i>	histidine kinase	1.48	1.21	0.92	0.72	attenuated	Yamada-Okabe	Journal of Bacteriology	181(23), 7243	1999
<i>SNF1</i>	essential for viability	1.12	1.04	0.99	0.87	normal	Petter	Infection and Immunity	65(12), 4909	1997
<i>SOD1</i>	superoxide dismutase	0.85	0.74	0.82	0.95	attenuated	Hwang	Microbiology	148(Pt 11), 3705	2002
<i>SOD5 / PGA3</i>	superoxide dismutase	0.11	0.12	0.10	0.68	attenuated	Martchenko	Molecular Biology of the Cell	15(2), 456	2004
<i>SPA2</i>	cell polarity regulator	1.07	1.19	1.15	1.11	attenuated	Zheng	Molecular Microbiology	49(5), 1391	2003
<i>SPT3</i>	transcriptional activator	1.32	1.05	0.87	0.76	attenuated	Laprade	Genetics	161(2), 509	2002
<i>SSK1</i>	2-component response reg.	1.16	1.35	1.14	1.25	attenuated	Calera	Infection and Immunity	67(8), 4280	2000
<i>SSN6</i>	transcriptional corepressor	1.22	0.85	0.97	1.41	attenuated	Hwang	Microbiology	47(4), 1029	2003
<i>SWI1</i>	chromatin remodelling	0.89	0.92		1.01	attenuated	Mao	FEBS Letters	580 (11), 2615	2006
<i>TEC1</i>	hyphal transcription factor	0.95	1.42	0.95	1.36	attenuated	Schweizer	Molecular Microbiology	38 (3), 435	2000
<i>TOP1</i>	topoisomerase	0.75	1.04	1.07	0.92	attenuated	Jiang	Microbiology	143 (Pt 2), 377	1997
<i>TPK1</i>	protein kinase A subunit	1.14	0.96	1.00	1.07	normal	Park			2005
<i>TPK2</i>	protein kinase A subunit	0.71	0.84	0.88	1.03	attenuated	Sonneborn	Molecular Microbiology	35 (2) 386	2000
<i>TPS1</i>	trehalose phos. synthase	0.76	0.96	0.96	1.07	attenuated	Zaragoza	Journal of Bacteriology	182(2), 320	1998
<i>TPS2</i>	trehaloseP phosphatase	1.01	0.93	0.88	0.66	attenuated	Van Dijk	Infection and Immunity	70 (4) 1772	2002
<i>TUP1</i>	transcriptional repressor	1.68	0.68	1.11	0.95	attenuated	Murad	The EMBO Journal	20(17), 4742	2001
<i>URA3</i>	nucleotide synthesis	1.51	0.96	0.95	0.83	attenuated	Kirsch	Infection and Immunity	59(9), 3297	1991
<i>UTR2</i>	cell wall protein	1.02	1.11	0.93	1.01	attenuated	Pardini	Journal of Biological Chemistry	281 (52), 40399	2006
<i>VAC1 / PEP7</i>	vesicle transport	1.44	1.03	1.05	0.85	attenuated	Franke	Microbiology	152 (Pt 10), 3111	2006
<i>VMA7</i>	vacuolar ATPase	0.81	1.21	1.05	0.94	attenuated	Poltermann	Microbiology	151 (Pt 5) 1645	2005
<i>VPS28</i>	endocytic coponents	0.71	1.13	1.03	0.95	attenuated	Cornet	Infection and Immunity	73 (12), 7977	2005
<i>VPS32 / SNF7</i>	endocytic components	1.25	0.97		1.17	attenuated	Cornet	Infection and Immunity	73 (12), 7977	2005
<i>VPS34</i>	P-inositol-3-kinase	0.91	1.21		1.17	attenuated	Bruckmann	Microbiology	146 (Pt 11), 2755	2000
<i>XOG1 / EXG1</i>	exoglucanase	0.56	1.03	0.91	1.20	normal	Gonzalez	Microbiology	143 (Pt 9), 3023	1997
<i>YHB1</i>	flavohe moglobin	1.41	1.67		1.11	attenuated	Hromatka	Molecular Biology of the Cell	16, 10, 4814	2005
<i>YVH1</i>	protein phosphatase	0.89	1.00	0.77	1.03	attenuated	Hanaoka	Microbiology	151 (Pt 7), 2223	2005
<i>YWP1 / PGA24 / FLO1 / TEP1</i>	putative cell wall protein	1.77	1.11	1.29	1.12	normal	Granger	Microbiology	151 (Pt 5), 1631	2005