

CHEM**BIO**CHEM

Supporting Information

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Supporting Information

for

Identification of Additional Players in the Alternative Biosynthesis
Pathway to Isovaleryl-CoA in the Myxobacterium *Myxococcus xanthus*

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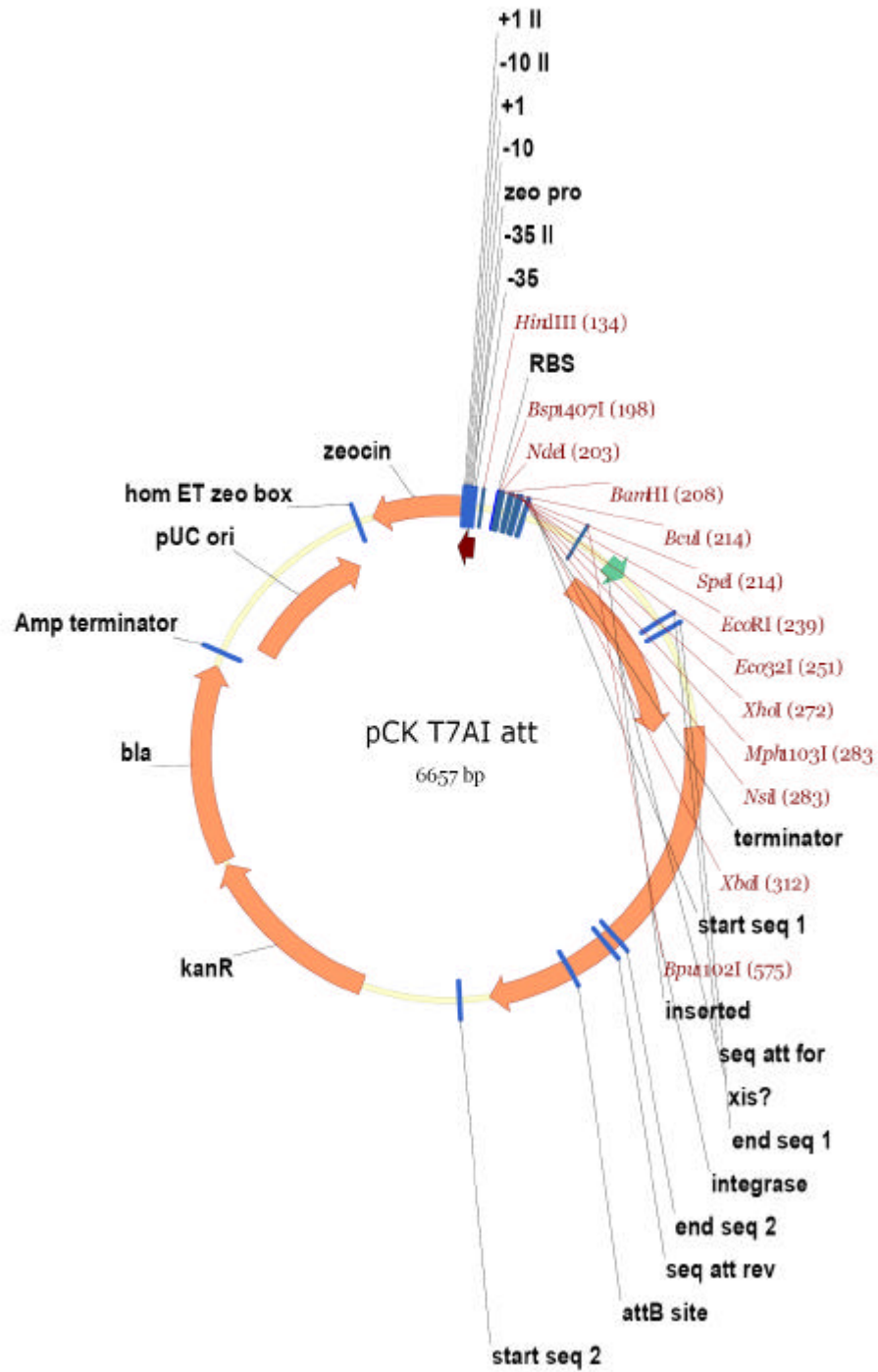


Figure S1. Map of pCK_T7A1_att used for complementation.

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Figure S2. Nucleotide sequence of pCK_T7A1_att.

Table S1. Proteins identified to be differentially regulated in wild type and bkd mutant cells. A MOWSE score higher than 51 indicates a reliable database hit and therefore the identification of the respective protein.

Protein	TIGR-annotation	MOWSE	av. ratio
Coomassie			
MXAN1687	hypothetical protein	113	3.93
MXAN6891	TPR domain protein	117	3.65
MXAN4336	Helix-turn-helix motif	118	3.45
MXAN2750	serine/threonine protein kinase, putative	98	3.28
MXAN6921	ATP synthase F1, epsilon subunit	128	3.07
MXAN1643	conserved hypothetical protein	116	3.07
MXAN2122	transposase B	136	2.80
MXAN0865	daunorubicin C-13 ketoreductase	110	2.74
MXAN1722	hypothetical protein	100	2.72
MXAN0906	serine/threonine protein kinase, putative	115	2.65
MXAN6249	sporulation protein	115	2.62
MXAN4973	crossover junction endodeoxyribonuclease RuvC	115	2.62
MXAN7074	hypothetical protein	108	2.57
MXAN5645	type III secretion inner membrane protein SctT, putative	160	2.45
MXAN7110	peptidyl-prolyl cis-trans isomerase, FKBP-type	125	2.39
MXAN6877	oxidoreductase, short-chain dehydrogenase/reductase family	92	2.39
MXAN1450	ompa-related protein precursor	138	2.39
MXAN2993	alpha-1 type II collagen	110	2.34
MXAN6923	ATP synthase F1, beta subunit	274	2.24
MXAN7388	SCO1/SenC family protein	102	2.21
MXAN0236	DNA polymerase III, beta subunit	126	2.17
MXAN3202	serine/threonine protein kinase	119	2.17
MXAN2999	conserved hypothetical protein TIGR00726	114	2.17
MXAN6923	ATP synthase F1, beta subunit	225	2.15
MXAN0709	conserved hypothetical protein	110	2.13
MXAN6923	ATP synthase F1, beta subunit	275	2.13
MXAN3840	segregation and condensation protein B	117	2.11
MXAN6923	ATP synthase F1, beta subunit	135	2.09
MXAN4727	cationic outer membrane protein OmpH, putative	124	2.05
MXAN3546	KH domain protein-related protein	111	2.04
MXAN4902	hypothetical protein	110	2.00
MXAN3142	transcriptional regulator, AraC family	115	0.46
MXAN4986	conserved hypothetical protein	122	0.46
MXAN7040	outer membrane protein P1, putative	167	0.45
MXAN3300	ribosomal protein L4/L1 family	116	0.42
MXAN1959	conserved hypothetical protein	134	0.41
MXAN4157	hypothetical protein	117	0.40
MXAN6731	dihydrodipicolinate synthase, putative	119	0.38
MXAN5932	formamidopyrimidine-DNA glycosylase, putative	124	0.36
MXAN6668	conserved hypothetical protein	116	0.36
MXAN5518	hypothetical protein	112	0.35
MXAN5932	formamidopyrimidine-DNA glycosylase, putative	125	0.30
MXAN4966	lipoprotein, putative	135	0.29
MXAN0993	sensory box histidine kinase/response regulator	117	0.21
MXAN6515	conserved hypothetical protein	107	0.20

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MXAN7190	hypothetical protein	113	21.67
MXAN2511	hypothetical protein	167	14.05
MXAN7028	ATP synthase F1, alpha subunit	153	4.44
MXAN0283	lipoprotein, putative	138	4.08
MXAN1297	serine/threonine protein kinase, putative	112	3.65
MXAN1450	ompa-related protein precursor	82	3.54
MXAN2259	TPR domain protein	130	0.28
MXAN5932	formamidopyrimidine-DNA glycosylase, putative	118	0.24
MXAN1303	conserved hypothetical protein	93	0.22
MXAN6911	TonB-dependent siderophore receptor, putative	124	0.20
MXAN0433	hypothetical protein	113	0.18
MXAN1959	conserved hypothetical protein	114	0.16
MXAN1714	cell wall surface anchor family protein [imported], putative	129	0.13
MXAN0213	transcriptional regulator, AsnC family	120	0.11
MXAN3819	hypothetical protein	117	0.09

Table S2. All genes showing changes in expression by DNA microarray comparing DK5643 (Δbkd) with DK1622 (wild-type). Up- and down-regulation refers to the *bkd* mutant.

Mx_ #	MXAN#	TIGR Annotation	Ave fold up
Mx_2765	MXAN4263	transcriptional regulator, TetR family	6.10
Mx_3769	MXAN6226	hypothetical protein	4.96
Mx_1766	MXAN2957	RNA polymerase sigma-D factor, authentic frameshift	4.87
Mx_1011	MXAN5158	AzIC family protein	4.12
Mx_567	MXAN2346	hypothetical protein	3.98
Mx_3962	MXAN3371	hypothetical protein	3.93
Mx_7255	MXAN6934	ABC transporter, ATP-binding/permease protein	3.86
Mx_791	MXAN3862	Na ⁺ /H ⁺ ion antiporter	3.60
Mx_1756	MXAN0352	ribosomal protein S6 modification protein	3.50
Mx_5083	MXAN0120	hypothetical protein	3.49
Mx_1406	MXAN1179	conserved hypothetical protein	3.44
Mx_2954	MXAN1699	hydrolase, alpha/beta fold family	3.40
Mx_1428	MXAN2539	conserved hypothetical protein	3.28
Mx_2983	MXAN4173	ABC transporter, permease protein, putative	3.19
Mx_4346	MXAN4977	sigma-54 dependent DNA-binding response regulator	3.01
Mx_4187	MXAN1450	ompa-related protein precursor	2.99
Mx_5867	MXAN6858	conserved hypothetical protein	2.96
Mx_6473	MXAN3447	hypothetical protein	2.95
Mx_5131	MXAN5987	hypothetical protein	2.92
Mx_741	MXAN3644	isochorismatase	2.90
Mx_5829	MXAN1854	hypothetical protein	2.88
Mx_5205	MXAN5102	hypothetical protein	2.85
Mx_656	MXAN3711	DNA-binding response regulator, LuxR family	2.84
Mx_4475 0	MXAN5752	hypothetical protein	2.84
Mx_6824	MXAN6646	transcriptional regulator, MarR family	2.82
Mx_6228	MXAN4445	sensory box histidine kinase/response regulator	2.79
Mx_2936	MXAN3958	tRNA pseudouridine synthase D	2.78
Mx_2629	MXAN6199	putative proline racemase	2.77
Mx_2762	MXAN4266	oxidoreductase, zinc-binding dehydrogenase family	2.73

Mx_2761	MXAN4267	HMG-CoA synthase	2.62
Mx_5023	MXAN6514	undecaprenol kinase, putative	2.72
Mx_1858	MXAN4430	hypothetical protein	2.68
Mx_937	MXAN0142	WD domain G-beta repeat/PBS lyase HEAT-like repeat protein	2.61
Mx_4513	MXAN3972	hydrolase, alpha/beta fold family	2.57
Mx_3526	MXAN0976	lipoprotein, putative	2.57
Mx_2665	MXAN4661	hypothetical protein	2.53
Mx_4673	MXAN1530	HAD-superfamily subfamily IB hydrolase, TIGR01490	2.51
Mx_504	MXAN4027	conserved hypothetical protein	2.51

Gene	MXAN#	TIGR Annotation	Ave fold down
Mx_3635	MXAN0586	hypothetical protein	22.20
Mx_3772	MXAN6223	sensor histidine kinase	21.08
Mx_2761	MXAN6415	ompa-related protein precursor	16.06
Mx_3060	MXAN2391	lipoprotein, putative	15.49
Mx_3258	MXAN5329	hypothetical protein	15.18
Mx_4973	MXAN4154	conserved domain protein	15.08
Mx_1246	MXAN2323	outer membrane protein, OMP85 family	14.05
Mx_5201	MXAN5098	putative Ig domain protein	13.57
Mx_5713	MXAN6398	3-oxoacyl-acyl carrier protein reductase, putative UDP-3-O-[3-hydroxymyristoyl] glucosamine N-acyltransferase	13.38
Mx_5424	MXAN4726	CDP-tyvelose-2-epimerase	13.36
Mx_4273	MXAN1639	class I glutamine amidotransferase family protein	12.75
Mx_6743	MXAN3825	response regulator	12.55
Mx_5033	MXAN3734	transcriptional regulator, LuxR family	12.53
Mx_4299	MXAN6750	conserved hypothetical protein	12.50
Mx_6932	MXAN0371	hypothetical protein	12.38
Mx_2715	MXAN0306	hypothetical protein	11.98
Mx_281	MXAN0109	hypothetical protein	11.81
Mx_5767	MXAN2282	oxidoreductase, zinc-binding dehydrogenase family	11.78
Mx_6509	MXAN0030	conserved hypothetical protein	11.68
Mx_5649	MXAN5161	conserved hypothetical protein	11.34
Mx_6893	MXAN0884	conserved domain protein	11.31
Mx_4383	MXAN4003	oxidoreductase, aldo/keto reductase family	11.19
Mx_2859	MXAN4712	glycosyl transferase, group 1 family protein	11.19
Mx_3086	MXAN2524	homoserine kinase, putative	11.12
Mx_3602	MXAN4687	YHS domain protein	10.98
Mx_2644	MXAN6345	hypothetical protein	10.96
Mx_2775	MXAN0709	conserved hypothetical protein molybdopterin-guanine dinucleotide biosynthesis protein B/	10.95
Mx_676	MXAN7414	formate dehydrogenase family accessory protein FdhD	10.90
Mx_3466	MXAN3386	aspartate aminotransferase, putative efflux transporter, AcrB/AcrD/AcrF family, inner membrane component	10.71
Mx_68	MXAN3903	membrane protein, putative	10.68
Mx_6995	MXAN0325	serine/threonine protein kinase	10.63
Mx_5322	MXAN0614	hypothetical protein	10.53
Mx_669	MXAN5090	cytochrome c, putative	10.53
Mx_684	MXAN5558	hypothetical protein	10.44
Mx_1912	MXAN1978	serine/threonine protein kinase	10.44
Mx_278	MXAN7208	sulfatase family protein	10.42
Mx_1309	MXAN1185	conserved hypothetical protein	10.39
Mx_1243	MXAN2320		10.36

Mx_3959	MXAN3367	hypothetical protein	10.32
Mx_3843	MXAN5793	hypothetical protein	10.32
Mx_3677	MXAN6797	putative membrane protein	10.22
Mx_4468	MXAN2931	lipoprotein, putative	10.21
Mx_878	MXAN5666	ATPase, AAA family	10.09
Mx_4124	MXAN6621	glycosyl hydrolase, family 3	9.81
Mx_403	MXAN5414	lipoprotein, putative	9.79
Mx_3846	MXAN5796	HAMP domain protein	9.78
Mx_1533	MXAN6788	conserved domain protein	9.77
Mx_3169	MXAN0012	DoxD-like family protein	9.75
Mx_744	MXAN4812	conserved hypothetical protein	9.66
Mx_7004	MXAN0334	conserved domain protein	9.62
Mx_6930	MXAN0369	signal peptidase II	9.62
Mx_1848	MXAN1968	hypothetical protein	9.62
Mx_6688	MXAN5448	RCC1 repeat domain protein	9.59
Mx_501	MXAN3694	glycosyl hydrolase, family 13 methylated-DNA-[protein]-cysteine S-methyltransferase	9.55
Mx_2366	MXAN5205	family protein	9.49
Mx_3530	MXAN0980	cytochrome c family protein	9.48
Mx_207	MXAN4022	hypothetical protein	9.45
Mx_4570	MXAN2116	sensor histidine kinase, authentic frameshift	9.42
Mx_6396 0	MXAN2174	hypothetical protein	9.38
Mx_5882	MXAN5510	radical SAM domain protein	9.37
Mx_3763	MXAN2230	transcriptional regulator, LuxR family	9.36
Mx_5951	MXAN2775	PDZ domain protein	9.32
Mx_6806	MXAN6664	branched-chain amino acid ABC transporter, permease protein LivH	9.26
Mx_3023	MXAN6579	TonB-dependent receptor, putative	9.25
Mx_573	MXAN1260	hypothetical protein	9.22
Mx_6650	MXAN1797	transposase orfB, IS3 family	9.20
Mx_2615	MXAN4676	peptidylprolyl cis-trans isomerase, cyclophilin-type	9.16
Mx_5309	MXAN0006	peptidase, M16 (pitrilysin) family, authentic frameshift	9.15
Mx_492	MXAN3756	hypothetical protein	9.08
Mx_3202	MXA N3401	conserved hypothetical protein	9.01
Mx_4988	MXAN2802	hypothetical protein	8.94
Mx_3059	MXAN2390	conserved hypothetical protein	8.94
Mx_872 0	MXAN7044	BNR/Asp-box repeat domain protein	8.91
Mx_201	MXAN3868	cytochrome c oxidase, subunit I	8.89
Mx_214	MXAN7154	conserved hypothetical protein	8.88
Mx_3965 0	MXAN3535	hypothetical protein	8.83
Mx_5407	MXAN3292	putative chaperone protein DnaJ	8.82
Mx_1547	MXAN2467	RDD domain protein	8.81
Mx_7005	MXAN0335	5-3 exonuclease family protein	8.77
Mx_2511	MXAN4576	acetyltransferase, GNAT family	8.75
Mx_5464	MXAN5575	conserved hypothetical protein	8.72
Mx_3934	MXAN3057	hydrolase, haloacid dehalogenase-like family	8.67
Mx_5452	MXAN5562	cytochrome c peroxidase	8.67
Mx_7263	MXAN6924	SPFH/band 7 domain protein	8.63
Mx_2862	MXAN0813	hypothetical protein	8.62
Mx_5070	MXAN4627	TPR domain protein	8.60
Mx_1117	MXAN0432	metallo-beta-lactamase family protein	8.59
Mx_129	MXAN2079	adenylosuccinate lyase	8.59
Mx_6665	MXAN2429	ABC transporter, permease protein	8.59
Mx_4664	MXAN5659	batE protein, putative	8.58

Mx_6566	MXAN7310	oxidoreductase, short chain dehydrogenase/reductase family	8.56
Mx_3221	MXAN1985	hypothetical protein	8.52
Mx_1929	MXAN3556	hypothetical protein	8.48
Mx_1508 0	MXAN0299	hypothetical protein	8.47
Mx_2137	MXAN2015	ATP-dependent Clp protease, ATP-binding subunit ClpX	8.28
Mx_5170	MXAN2308	conserved hypothetical protein	8.21
Mx_1364 r	MXAN5348	M23 peptidase domain protein	8.05
Mx_1577	MXAN3153	ethanolamine ammonia-lyase, large subunit/small subunit	8.02
Mx_4921 0	MXAN3423	conserved hypothetical protein	7.95
Mx_956	MXAN6497	glucokinase	7.95
Mx_2471 0	MXAN4653	lipoprotein, putative	7.87
Mx_7188	MXAN0258	ATPase domain protein	7.76
Mx_7224	MXAN6843	putative membrane protein	7.63
Mx_5971	MXAN3123	hypothetical protein	7.57
Mx_7083	MXAN7182	conserved hypothetical protein	7.53
Mx_1859.3	MXAN4428	conserved hypothetical protein	7.52
Mx_5624	MXAN3990	conserved hypothetical protein	7.51
Mx_563	MXAN1668	serine/threonine kinase associate protein KapC	7.41
Mx_3714	MXAN3320	adenylate kinase	7.38
Mx_4256 0	MXAN2197	transposase, IS630 family, degenerate	7.29
Mx_4441 0	MXAN4413	hypothetical protein	7.21
Mx_3220	MXAN1353	hypothetical protein	7.11
Mx_3016	MXAN5781	efflux ABC transporter, ATP-binding protein PilH	7.10
Mx_602	MXAN4601	non-ribosomal peptide synthase	7.09
Mx_6819	MXAN6651	endonuclease/exonuclease/phosphatase family protein	6.72
Mx_4648	MXAN5192	PBS lyase HEAT repeat-like domain protein	6.65
Mx_6765 0	MXAN3801	hypothetical protein	6.59
Mx_6479	MXAN3452	UvrABC system, A protein	6.55
Mx_233	MXAN5680	sigma-54 dependent transcriptional regulator, putative	6.54
Mx_2530	MXAN0860	conserved hypothetical protein	6.48
Mx_2822	MXAN4814	lipoprotein, putative	6.48
Mx_5077	MXAN0114	transglycosylase SLT domain protein	6.47
Mx_5454	MXAN5565	acyltransferase family protein	6.39
Mx_2998	MXAN6950	methyl-accepting chemotaxis protein	6.39
Mx_3063	MXAN2395	RNA polymerase sigma-70 factor, ECF subfamily	6.39
Mx_3940	MXAN3050	aspartate-semialdehyde dehydrogenase	6.35
Mx_4836	MXAN0639	adenylate/guanylate cyclase domain protein	6.35
Mx_3489	MXAN3919	regulator of nucleoside diphosphate kinase	6.34
Mx_6698	MXAN7145	ABC transporter, ATP-binding protein	6.32
Mx_4301	MXAN6747	tetratricopeptide repeat protein	6.32
Mx_1598	MXAN4020	sigma-54 dependent transcriptional regulator, Fis family	6.29
Mx_6448	MXAN0061	metallo-beta-lactamase family protein	6.26
Mx_4361	MXAN3831	FKBP-type peptidylprolyl cis-trans isomerase SlyD	6.15
Mx_1369	MXAN4229	histidinol dehydrogenase	6.13
Mx_3641	MXAN6384	L-fucose phosphate aldolase	6.08
Mx_2999	MXAN1480	serine/threonine kinase family protein	6.07
Mx_4601	MXAN2670	A-signal transduction regulator AsgA	6.07
Mx_2058	MXAN4037	cytidylate kinase	6.03
Mx_7029	MXAN7373	conserved hypothetical protein	6.02
Mx_5066	MXAN4631	conserved hypothetical protein TIGR00730	6.01
Mx_6450	MXAN0059	putative lipoprotein	5.99
Mx_3078	MXAN1188	hypothetical protein	5.90
Mx_6560	MXAN3636	non-ribosomal peptide synthetase	5.87

Mx_2622	MXAN7016	CRISPR-associated protein Cas4	5.86
Mx_5547	MXAN4299	non-ribosomal peptide synthase/polyketide synthase	5.83
Mx_59	MXAN7498	signal peptide peptidase SppA, 67K type	5.68
Mx_3091	MXAN5034	sensor histidine kinase	5.68
Mx_7216	MXAN6835	deoxyribonuclease I homolog, putative	5.65
Mx_160	MXAN5042	OmpA domain protein	5.64
Mx_115	MXAN4684	aspartyl-tRNA synthetase	5.64
Mx_4300	MXAN6749	PROBABLE HEMAGGLUTININ-RELATED PROTEIN, putative	5.63
Mx_5080	MXAN0117	serine/threonine kinase family protein	5.60
Mx_4631	MXAN7279	CRISPR-associated RAMP protein Cmr4	5.56
Mx_6101	MXAN1514	conserved hypothetical protein	5.54
Mx_6258	MXAN4374	hypothetical protein	5.54
Mx_5333	MXAN1575	transcriptional regulator, LysR family	5.53
Mx_5906	MXAN3268	thiazole biosynthesis protein ThiG	5.51
Mx_4437	MXAN5081	acyltransferase family protein	5.51
Mx_2236	MXAN1126	hypothetical protein	5.49
Mx_2994	MXAN6945	hypothetical protein	5.48
Mx_3698	MXAN3884	hypothetical protein	5.48
Mx_4342	MXAN4982	conserved hypothetical protein	5.47
Mx_4402	MXAN0771	iron ABC transporter, permease protein	5.41
Mx_1226	MXAN7400	tryptophan 2,3-dioxygenase, putative	5.40
Mx_5689	MXAN1682	peptidase, S9B (dipeptidyl peptidase IV) subfamily	5.40
Mx_6979	MXAN1744	lipoxygenase family protein	5.38
Mx_1776	MXAN7298	cytochrome P450 family protein	5.37
Mx_4703	MXAN6822	peptidase, M1 (aminopeptidase N) family	5.36
Mx_1339	MXAN5314	sensor histidine kinase	5.35
Mx_5748	MXAN6557	lipoprotein, putative	5.34
Mx_1897	MXAN2404	FKBP-type peptidyl-prolyl cis-trans isomerase SlyD	5.34
Mx_3858	MXAN4526	polyketide synthase type I	5.27
Mx_1615	MXAN1170	conserved hypothetical protein	5.25
Mx_582	MXAN0481	putative membrane protein	5.24
Mx_5459	MXAN5570	glycerate kinase, putative	5.16
Mx_3092	MXAN5035	peptidase, M16 (pitrilysin) family	5.15
Mx_4663	MXAN5658	hypothetical protein	5.15
Mx_5100	MXAN6479	transcriptional regulator, AraC family	5.14
Mx_3077	MXAN1189	sigma-54 dependent DNA-binding response regulator	5.14
Mx_159	MXAN5701	conserved domain protein	5.12
Mx_7125	MXAN7112	conserved hypothetical protein	5.11
Mx_6369	MXAN0949	AMP-binding protein	5.08
Mx_6209	MXAN4538	hypothetical protein	5.05
Mx_4145	MXAN4001	non-ribosomal peptide synthase/polyketide synthase	5.05
Mx_5858	MXAN5812	hypothetical protein	5.03
Mx_1873	MXAN4142	frizzy aggregation protein B	4.98
Mx_5513	MXAN2645	rod shape-determining protein MreC	4.97
Mx_28	MXAN5222	fumarate reductase, iron-sulfur protein	4.96
Mx_766	MXAN5480	transcriptional regulator, LysR family	4.96
Mx_760	MXAN3038	hypothetical protein	4.96
Mx_1350	MXAN4811	conserved hypothetical protein	4.94
Mx_7210	MXAN6829	similar to late embryogenesis abundant proteins [imported], putative	4.94
Mx_536	MXAN7043	oxidoreductase, aldo/keto reductase family	4.88
Mx_3243	MXAN0537	cardiolipin synthase, putative	4.86
Mx_5143	MXAN5023	tonB dependent receptor	4.83

Mx_6813	MXAN6657	conserved hypothetical protein	4.83
Mx_4832	MXAN0644	peptidase, M1 (aminopeptidase N) family	4.82
Mx_5650	MXAN5162	hypothetical protein	4.80
Mx_5042	MXAN3725	histidyl-tRNA synthetase	4.78
Mx_4044.3	MXAN6297	ribulose-phosphate 3-epimerase	4.77
Mx_4311	MXAN1000	membrane protein, putative	4.76
Mx_5328	MXAN1579	putative membrane protein	4.70
Mx_3806	MXAN1073	Hsp33 family protein	4.70
Mx_2384	MXAN3061	alpha-L-glutamate ligases, RimK family	4.70
Mx_1104	MXAN5348	M23 peptidase domain protein	4.67
Mx_4740	MXAN0145	scramblase family protein homolog	4.67
Mx_911.3	MXAN4461	response regulator	4.67
Mx_6014	MXAN3238	acyltransferase family protein	4.66
Mx_490 0	-	-	4.65
Mx_3853	MXAN5468	hypothetical protein	4.65
Mx_628	MXAN2716	conserved domain protein	4.61
Mx_510	MXAN3894	acyl carrier protein	4.61
Mx_3563	MXAN1913	thioredoxin family protein	4.60
Mx_5510	MXAN2642	maf protein	4.59
Mx_5963.5	MXAN2788	Rieske 2Fe-2S domain protein	4.58
Mx_4446.3	MXAN4406	putative membrane protein	4.57
Mx_4201	MXAN6029	chemotaxis sensor histidine kinase/response regulator	4.56
Mx_906	MXAN0228	DNA-binding protein	4.52
Mx_3250	MXAN2833	ABC transporter, ATP-binding protein	4.49
Mx_6302	MXAN1901	transposase, IS5 family	4.48
Mx_6912	MXAN5880	hypothetical protein	4.48
Mx_4899	MXAN3096	conserved hypothetical protein	4.46
Mx_2643	MXAN6346	hypothetical protein	4.43
Mx_2522	MXAN1391	S1 RNA binding domain protein	4.42
Mx_5593	MXAN5114	hypothetical protein	4.41
Mx_425	MXAN4085	peptidylprolyl cis-trans isomerase, FKBP-type	4.41
Mx_782	MXAN5917	acetyltransferase, GNAT family	4.41
Mx_332	MXAN2000	tetratricopeptide repeat protein	4.41
Mx_2094	MXAN2352	threonyl-tRNA synthetase	4.38
Mx_6865	MXAN4847	hypothetical protein	4.34
Mx_746	MXAN4813	ATP-dependent chaperone protein ClpB	4.33
Mx_3308	MXAN5251	phospholipase/carboxylesterase family protein	4.32
Mx_3957	MXAN3365	hypothetical protein	4.31
Mx_6918	MXAN5888	conserved hypothetical protein	4.29
Mx_3124	MXAN6963	chemotaxis protein CheW, putative	4.27
Mx_1608	MXAN3177	ATP-dependent helicase HrpA	4.27
Mx_3439	MXAN0964	peptidase, M14 family	4.25
Mx_725	MXAN6050	conserved domain protein	4.21
Mx_1763	MXAN2954	iron-sulfur cluster-binding protein, Rieske family	4.21
Mx_4484	MXAN5743	hypothetical protein	4.21
Mx_6284	MXAN1728	putative membrane protein	4.20
Mx_1582	MXAN4144	response regulator FrzZ	4.20
Mx_3910	MXAN1964	hypothetical protein	4.16
Mx_4090	MXAN1482	polysaccharide deacetylase domain protein	4.15
Mx_474	MXAN1869	hypothetical protein	4.14
Mx_5913	MXAN3277	peroxidase, putative, selenocysteine-containing	4.14
Mx_6542	MXAN0414	Ser/Thr protein phosphatase family protein	4.14
Mx_719	MXAN4001	non-ribosomal peptide synthase/polyketide synthase	4.12
Mx_4719	MXAN3079	conserved hypothetical protein	4.11

Mx_2717	MXAN0304	sensory box histidine kinase, putative	4.11
Mx_4335	MXAN3210	penicillin-binding protein transpeptidase domain protein	4.11
Mx_4437.3	MXAN5082	sensor histidine kinase, putative	4.09
Mx_3622	MXAN4745	leucyl-tRNA synthetase	4.08
Mx_292	MXAN4962	hypothetical protein	4.06
Mx_2908	MXAN5975	lipoprotein, putative	4.04
Mx_5072	MXAN4623	o-antigen ABC exporter, permease protein	4.03
Mx_5024	MXAN6513	hydrolase, NUDIX family	4.03
Mx_2518	MXAN1395	hypothetical protein	4.00
Mx_1619	MXAN1165	hypothetical protein	4.00
Mx_2728	MXAN7047	lipoprotein, putative	3.99
Mx_1834	MXAN5815	sporulation initiation inhibitor protein, putative	3.99
Mx_4378	MXAN4008	hypothetical protein	3.99
Mx_5051	MXAN4480	DNA-binding protein	3.98
Mx_3589	MXAN3684	trehalose synthase	3.97
Mx_6110	MXAN1523	acetyltransferase, GNAT family	3.95
Mx_3528	MXAN0978	voltage-gated chloride channel	3.93
Mx_1315	MXAN4417	acetyltransferase, GNAT family	3.92
Mx_4049	MXAN6303	beta-glucosidase A	3.92
Mx_5318	MXAN0610	histone deacetylase family protein	3.90
Mx_7128	MXAN7109	dienelactone hydrolase family protein	3.90
Mx_2322	MXAN5913	hypothetical protein	3.90
Mx_4591	MXAN3230	conserved hypothetical protein	3.87
Mx_735	MXAN3114	DnaJ domain protein	3.87
Mx_5306	MXAN0004	hypothetical protein	3.84
Mx_3257	MXAN5330	conserved hypothetical protein	3.84
Mx_4541	MXAN1045	hypothetical protein	3.83
Mx_6475	MXAN3449	heavy metal efflux pump, CzcA family	3.83
Mx_5559	MXAN0186	lipoprotein, putative	3.81
Mx_5054	MXAN4477	hypothetical protein	3.80
Mx_55	MXAN4683	conserved hypothetical protein TIGR00147	3.74
Mx_2453	MXAN6011	peptidase, M20 (glutamate carboxypeptidase) family	3.73
Mx_419	MXAN2809	conserved hypothetical protein	3.73
Mx_5854	MXAN5807	membrane protein, putative	3.69
Mx_1843	MXAN6611	conserved hypothetical protein	3.68
Mx_6112	MXAN6337	isocitrate dehydrogenase, NAD-dependent, putative	3.67
Mx_6026	MXAN6602	thioredoxin domain protein	3.67
Mx_2485	MXAN2483	type II DNA topoisomerase, B subunit	3.67
Mx_5665	MXAN3496	vegetative protein FRAMESHIFT	3.65
Mx_5012	MXAN2290	lipoprotein, putative	3.64
Mx_4186	MXAN1451	putative lipoprotein MlpA	3.63
Mx_2122	MXAN4593	hypothetical protein	3.63
Mx_6238.3	MXAN4950	hypothetical protein	3.61
Mx_3947	MXAN6283	conserved domain protein	3.60
Mx_3128	MXAN4763	riboflavin synthase, alpha subunit	3.59
Mx_1402	MXAN5598	OmpA domain protein	3.59
Mx_6400	MXAN3613	transposase, IS21 family	3.58
Mx_1771.3	MXAN7293	sugar ABC transporter, permease protein, putative	3.56
Mx_1561	MXAN1941	seryl-tRNA synthetase	3.56
Mx_1203	MXAN0906	serine/threonine protein kinase, putative	3.54
Mx_1554	MXAN2598	hypothetical protein	3.54
Mx_1096	MXAN0091	efflux transporter, HAE1 family, MFP subunit	3.53
Mx_5419	MXAN4730	lipoprotein releasing system, transmembrane protein, LolC/E family	3.53

Mx_2154	MXAN0207	hypothetical protein	3.53
Mx_1288	MXAN4339	sigma-54 dependent transcriptional regulator, Fis family	3.53
Mx_998	MXAN4221	dofB protein	3.52
Mx_309	MXAN2103	transposase orfB, IS3 family	3.50
Mx_3672	MXAN6544	hypothetical protein	3.50
Mx_4594	MXAN2663	glycerol 3-phosphate permease	3.50
Mx_1294	MXAN2857	lantibiotic modification protein, putative	3.50
Mx_6413	MXAN2145	transcriptional regulator, TetR family	3.49
Mx_1255	MXAN7102	lipoprotein, putative	3.48
Mx_3155	MXAN7001	response regulator	3.47
Mx_1809	MXAN3253	cytochrome c-type biogenesis protein CcmF	3.47
Mx_1593	MXAN1365	hypothetical protein	3.47
Mx_5026	MXAN6511	lipoprotein, putative	3.45
Mx_3759	MXAN2234	transcriptional regulator, TetR family	3.43
Mx_354	MXAN0760	uracil-DNA glycosylase	3.43
Mx_1626	MXAN0960	serine/threonine protein kinase, putative	3.42
Mx_1074	MXAN4289	hypothetical protein	3.41
Mx_40	MXAN4876	lipoprotein, putative	3.40
Mx_1982	MXAN3686	RNA polymerase sigma-70 factor, ECF subfamily	3.40
Mx_3067	MXAN2399	serine/threonine-protein kinase	3.39
Mx_2470	MXAN5671	hypothetical protein	3.39
Mx_3505	MXAN0590	hypothetical protein	3.38
Mx_5047	MXAN3720	kinase, pfkB family	3.37
Mx_6003	MXAN5225	fumarate reductase, cytochrome b subunit	3.37
Mx_3680	MXAN6800	phosphoenolpyruvate synthase	3.35
Mx_4295	MXAN6754	chaperonin (HSP60) family protein	3.35
Mx_321	MXAN2538	adventurous gliding motility protein AgmO	3.35
Mx_2451	MXAN6009	serine/threonine protein kinase	3.33
Mx_468	MXAN2023	BolA/YrbA family protein	3.32
Mx_3766.3	MXAN6230	conserved hypothetical protein	3.31
Mx_4690	MXAN7459	methyltransferase, putative	3.31
Mx_1829	MXAN7035	conserved hypothetical protein	3.31
Mx_3136	MXAN4755	hypothetical protein	3.30
Mx_7277	MXAN6910	conserved hypothetical protein	3.30
Mx_6511	MXAN0033	hypothetical protein	3.27
Mx_1789	MXAN0799	histidine kinase, putative	3.27
Mx_2890	MXAN0210	transglycosylase SLT domain protein	3.27
Mx_5598	MXAN5119	membrane protein, putative	3.26
Mx_2653	MXAN5401	hypothetical protein	3.25
Mx_2176	MXAN1345	sigma-54 dependent transcriptional regulator, Fis family	3.25
Mx_4725	MXAN3085	conserved domain protein	3.25
Mx_4014	MXAN5583	ABC transporter, permease protein	3.25
Mx_1863	MXAN0992	putative cysteine synthase	3.25
Mx_987	MXAN1163	serine/threonine protein kinase	3.24
Mx_5272	MXAN1601	fatty acid desaturase family protein	3.24
Mx_5166	MXAN2312	hypothetical protein	3.24
Mx_7049	MXAN2984	DHH family protein	3.23
Mx_1005	MXAN3932	polyketide synthase	3.22
Mx_3040	MXAN2623	conserved domain protein	3.22
Mx_6385	MXAN0526	hypothetical protein	3.20
Mx_933	MXAN2449	FliR/MopE/SpaR family protein	3.20
Mx_6142	MXAN3002	putative DNA protecting protein DprA/DNA topoisomerase I	3.17
Mx_866	MXAN5546	channel protein, hemolysin III family - POINT MUTATION	3.17
Mx_4954	MXAN1554	iron-sulfur cluster-binding protein, Rieske family	3.15

Mx_3121	MXAN6966	response regulator/sensory box histidine kinase	3.15
Mx_5895	MXAN3257	heme exporter protein CcmB	3.15
Mx_5008	MXAN2295	putative membrane protein	3.14
Mx_6743.3	MXAN3824	general secretion pathway protein G	3.13
Mx_3812	MXAN4787	phosphate regulon transcriptional regulatory protein PhoB	3.13
Mx_796	MXAN6043	serine/threonine protein kinase	3.13
Mx_4846	MXAN3349	DnaJ domain protein	3.12
Mx_5859	MXAN6866	sensory box histidine kinase Tat (twin-arginine translocation) pathway signal sequence	3.12
Mx_7131	MXAN7106	domain protein	3.10
Mx_6364	MXAN0954	methyltransferase, FkbM family	3.10
Mx_3342	MXAN5848	lipoprotein, putative	3.10
Mx_7233	MXAN6058	RNA polymerase sigma-70 factor, ECF subfamily	3.09
Mx_1804	MXAN2056	pantoate-beta-alanine ligase cytochrome c-type biogenesis protein,	3.09
Mx_6017	MXAN3235	CcmH/CycL/Ccl2/NrfF family	3.09
Mx_7112	MXAN7126	conserved hypothetical protein	3.08
Mx_36	MXAN6410	conserved hypothetical protein	3.07
Mx_1995	MXAN2340	adenylylsulfate reductase, thioredoxin dependent, putative	3.06
Mx_3322	MXAN2900	hypothetical protein	3.05
Mx_1131	MXAN4804	conserved hypothetical protein	3.04
Mx_1696	MXAN3188	PhoH family protein	3.04
Mx_5554	MXAN0191	fatty acid hydroxylase	3.03
Mx_4286	MXAN5633	hypothetical protein	3.02
Mx_5529	MXAN0737	putative RNA polymerase-associated protein RapA	3.02
Mx_4515	MXAN3974	sensory box sensor histidine kinase	3.02
Mx_2601	MXAN3897	DNA mismatch repair protein MutS	3.02
Mx_2897	MXAN6376	hypothetical protein	3.01
Mx_439	MXAN3537	isocitrate dehydrogenase, NADP-dependent	3.01
Mx_2144	MXAN6181	ammonium transporter DnaJ N-terminal domain:DnaJ C terminal domain -	3.01
Mx_6072	MXAN0503	FRAMESHIFT	3.00
Mx_990	MXAN0358	isoleucyl-tRNA synthetase	3.00
Mx_5751	MXAN6562	hypothetical protein	2.98
Mx_4174	MXAN6422	lipoprotein, putative	2.98
Mx_4978	MXAN4159	uridine kinase	2.97
Mx_1558	MXAN2849	hypothetical protein	2.95
Mx_4556	MXAN7070	conserved hypothetical protein	2.95
Mx_2061	MXAN4040	hypothetical protein	2.94
Mx_963	MXAN1712	conserved hypothetical protein	2.93
Mx_3313	MXAN5257	conserved hypothetical protein	2.93
Mx_6436	MXAN0075	WD40-like repeat/amidohydrolase domain protein	2.90
Mx_2852	MXAN3075	ribosomal protein L10	2.90
Mx_3842	MXAN5792	lipoprotein, putative	2.90
Mx_6622	MXAN0675	conserved hypothetical protein	2.89
Mx_3473	MXAN3379	GTP-binding protein TypA	2.89
Mx_7088	MXAN7178	response regulator	2.89
Mx_2557	MXAN1157	SUF system FeS assembly protein, NifU family	2.88
Mx_6286	MXAN1732	conserved domain protein	2.88
Mx_2426	MXAN1974	conserved hypothetical protein	2.88
Mx_6847	MXAN1234	serine/threonine kinase family protein	2.88
Mx_3956	MXAN3363	transglycosylase SLT domain protein	2.86
Mx_4870	MXAN4885	hypothetical protein	2.85
Mx_6949	MXAN0399	sensory box histidine kinase	2.84

Mx_1434	MXAN6410	conserved hypothetical protein	2.84
Mx_1124	MXAN1718	glyoxylase family protein	2.84
Mx_3801	MXAN1067	hypothetical protein	2.83
Mx_6188	MXAN2218	oxidoreductase, 2OG-Fe(II) oxygenase family	2.82
Mx_114	MXAN1837	hypothetical protein	2.81
Mx_3472	MXAN3380	hydrolase, alpha/beta fold family	2.81
Mx_1706	MXAN4832	ATP-dependent Clp protease, ATP-binding subunit ClpC	2.81
Mx_5634.3	MXAN4320	conserved hypothetical protein	2.81
Mx_3569	MXAN1919	hypothetical protein	2.80
Mx_341	MXAN6504	conserved hypothetical protein	2.80
Mx_1663	MXAN2921	mannosyltransferase, putative	2.79
Mx_3861	MXAN7455	hypothetical protein	2.78
Mx_5730	MXAN7079	hypothetical protein	2.78
Mx_5717	MXAN6394	metallo-beta-lactamase family protein	2.78
Mx_3278	MXAN7245	hypothetical protein	2.78
Mx_2488	MXAN2489	conserved hypothetical protein	2.77
Mx_1262	MXAN4914	F5/8 type C domain protein	2.77
Mx_5799	MXAN3468	hypothetical protein	2.76
Mx_6724.3	MXAN6262	conserved hypothetical protein	2.76
Mx_1430	MXAN2541	tetratricopeptide repeat protein	2.75
Mx_2744	MXAN4595	non-ribosomal peptide synthase	2.75
Mx_4895	MXAN3100	glycyl-tRNA synthetase, alpha subunit	2.75
Mx_6411	MXAN2147	lipoprotein, putative	2.74
Mx_1432	MXAN6408	IPT/TIG domain/phospholipase D family protein	2.74
Mx_885	MXAN1607	non-ribosomal peptide synthetase	2.73
Mx_2725	MXAN7050	hypothetical protein	2.72
Mx_4567	MXA N2119	polyphosphate kinase 2, internal deletion	2.72
Mx_7239	MXAN6065	tryptophan synthase, beta subunit	2.71
Mx_4525	MXAN5055	conserved hypothetical protein	2.71
Mx_4053	MXAN6306	fatty acid desaturase family protein	2.71
Mx_5744	MXAN6553	oligopeptide/dipeptide ABC transporter, ATP-binding/permease protein, putative	2.69
Mx_3564	MXAN1914	inositol-1-monophosphatase	2.67
Mx_893	MXAN3177	ATP-dependent helicase HrpA	2.67
Mx_2231	MXAN3202	serine/threonine protein kinase	2.67
Mx_4754	MXAN4237	sodium:sulfate symporter	2.67
Mx_830	MXAN4700	serine/threonine protein kinase	2.66
Mx_6241	MXAN4947	conserved hypothetical protein	2.65
Mx_3340	MXAN5850	NAD dependent epimerase/dehydratase family protein	2.65
Mx_6526	MXAN0049	hypothetical protein	2.65
Mx_485	MXAN3773	permease, putative	2.64
Mx_5332	MXAN1576	major facilitator family transporter	2.64
Mx_3960	MXAN3368	hypothetical protein	2.63
Mx_4268	MXAN1644	epoxide hydrolase, putative	2.63
Mx_6556	MXAN3639	iron-chelator utilization protein	2.62
Mx_5949.3	MXAN2774	heat shock protein, HSP20 family	2.62
Mx_4077	MXAN6241	conserved domain protein	2.61
Mx_1135	MXAN6847	response regulator/sensor histidine kinase	2.61
Mx_3884	MXAN5418	hydrolase, NUDIX family	2.60
Mx_5708	MXAN6403	ABC transporter, permease protein, putative	2.60
Mx_4634	MXAN7282	CRISPR-associated RAMP protein Cmr1	2.59
Mx_1119	MXAN5063	conserved hypothetical protein	2.59
Mx_7280	MXAN6907	conserved hypothetical protein	2.59
Mx_7174	MXAN0243	hypothetical protein	2.59

Mx_4393	MXAN5769	translation elongation factor P	2.58
Mx_5957	MXAN2780	hypothetical protein	2.58
Mx_3459	MXAN3575	hypothetical protein	2.58
Mx_1138	MXAN5380	lipoprotein, putative	2.57
Mx_886	MXAN3690	lipoprotein, putative	2.57
Mx_6423.3	MXAN2132	hypothetical protein	2.56
Mx_4435	MXAN5079	ribosomal protein S18 - POINT MUTATION	2.56
Mx_3226	MXAN1991	hypothetical protein	2.56
Mx_578	MXAN7416	polysaccharide biosynthesis protein	2.55
Mx_7146	MXAN3936	polyketide synthase	2.55
Mx_5849	MXAN5802	alanyl-tRNA synthetase	2.55
