

Supplementary Data 3. The list of essential and partially essential genes in synthetic medium from *in silico* gene deletion analysis

1. Essential genes

Locus	Name	Definition
CAC0022	<i>asd</i>	aspartate-semialdehyde dehydrogenase
CAC0027	<i>pyrE</i>	orotate phosphoribosyltransferase
CAC0031	<i>psdD</i>	phosphatidylserine decarboxylase
CAC0091	<i>ilvC</i>	ketol-acid reductoisomerase
CAC0104		adenylylsulfate reductase, subunit A
CAC0109	<i>cysD</i>	sulfate adenylyltransferase subunit 2
CAC0110	<i>cysN</i>	adenylylsulfate kinase / sulfate adenylyltransferase subunit 1
CAC0217	<i>pheA</i>	prephenate dehydrotase (pheA)
CAC0480	<i>nrdD</i>	oxygen-sensitive ribonucleoside-triphosphate reductase nrdD
CAC0484		phosphomannomutase
CAC0492	<i>alr</i>	alanine racemase
CAC0510	<i>murB</i>	UDP-N-acetylenolpyruvoylglucosamine reductase (murB)
CAC0518	<i>pykA</i>	pyruvate kinase (pykA)
CAC0519	<i>pyrC</i>	dihydroorotase
CAC0568	<i>asd</i>	aspartate semialdehyde dehydrogenase (gene asd)
CAC0578	<i>methH</i>	cobalamine-dependent methionine synthase I (methyltransferase and cobalamine-binding domain)
CAC0590	<i>ribD</i>	diaminohydroxyphosphoribosylaminopyrimidine deaminase / 5-amino-6-(5-phosphoribosylamino)uracil reductase
CAC0591	<i>ribB</i>	riboflavin synthase alpha chain
CAC0592	<i>ribA</i>	riboflavin biosynthes protein RIBA (GTPcyclohydrolase/3,4-dihydroxy-2-butanone 4-phosphate synthase)

CAC0593	<i>ribH</i>	riboflavin synthase beta chain
CAC0608	<i>lisA</i>	diaminopimelate decarboxilase, lisA
CAC0676	<i>pssA</i>	phosphatidylserine synthase
CAC0726		ribose 5-phosphate isomerase RpiB
CAC0794		nucleoside-diphosphate-sugar epimerase (UDP-glucose 4-epimerase)
CAC0798		phosphatidylserine synthase
CAC0814		3-oxoacyl-[acyl-carrier-protein] synthase III
CAC0819		phosphoribosylpyrophosphate synthetase
CAC0869		thioredoxine reductase
CAC0892		phospho-2-dehydro-3-deoxyheptonate aldolase
CAC0893		prephenate dehydrogenase
CAC0894	<i>aroB</i>	3-dehydroquinate synthetase
CAC0895	<i>aroA</i>	5-enolpyruvylshikimate-3-phosphate synthase
CAC0896	<i>aroC</i>	chorismate synthase
CAC0897	<i>aro</i>	fusion: chorismate mutase and shikimate 5-dehydrogenase
CAC0898	<i>aroK</i>	shikimate kinase
CAC0899		3-dehydroquinate dehydratase II
CAC0936	<i>hisG</i>	ATP phosphoribosyltransferase
CAC0937	<i>hisD</i>	histidinol dehydrogenase
CAC0938	<i>hisB</i>	imidazoleglycerol-phosphate dehydratase
CAC0939	<i>hisH</i>	glutamine amidotransferase
CAC0940	<i>hisA</i>	phosphoribosylformimino-5-aminoimidazole carboxamide ribonucleotide
CAC0941	<i>hisF</i>	imidazoleglycerol-phosphate synthase cyclase
CAC0942	<i>hisI_1</i>	phosphoribosyl-AMP cyclohydrolase

CAC0943	<i>his_2</i>	phosphoribosyl-ATP pyrophosphohydrolase
CAC0944	<i>tkt</i>	transketolase
CAC0965		1-acyl-sn-glycerol-3-phosphate acyltransferase
CAC0973	<i>argG</i>	argininosuccinate synthase
CAC0974	<i>argH</i>	argininosuccinate lyase
CAC1001		aspartate aminotransferase
CAC1003		superfamily I DNA helicase (rep-like helicase)
CAC1009	<i>coaE</i>	P-loop kinase (uridine kinase family)
CAC1024	<i>nadB</i>	aspartate oxidase
CAC1025	<i>nadA</i>	quinolinate synthase
CAC1036	<i>pykA</i>	pyruvate kinase
CAC1050	<i>nadE</i>	NH(3)-dependent NAD(+) synthetase
CAC1209	<i>nrdD</i>	anaerobic ribonucleotide reductase
CAC1234	<i>pheB</i>	chorismate mutase PheB of B.subtilis ortholog
CAC1262	<i>nadD</i>	predicted nucleotidyltransferases of NarD/TagD family (N-term. domain) , yqeJ ortholog
CAC1294	<i>dgkA, pgpB</i>	diacylglycerol kinase (dgkA) fused to phosphatase B domain (pgpB)
CAC1347		transaldolase
CAC1348		transketolase, TKT
CAC1390	<i>purE</i>	phosphoribosylcarboxyaminoimidazole (NCAIR) mutase
CAC1391	<i>purC</i>	phosphoribosylaminoimidazolesuccinocarboxamide (SAICAR) synthase
CAC1392	<i>purF</i>	glutamine phosphoribosylpyrophosphate amidotransferase
CAC1393	<i>purM</i>	phosphoribosylaminoimidazol (AIR) synthetase
CAC1394	<i>purN</i>	folate-dependent phosphoribosylglycinamide formyltransferase
CAC1395	<i>purH</i>	AICAR transformylase/IMP cyclohydrolase

CAC1396	<i>purD</i>	phosphoribosylamine-glycine ligase
CAC1429	<i>galE</i>	UDP-glucose 4-epimerase
CAC1479	<i>ilvE</i>	branched-chain-amino-acid transaminase (ilvE)
CAC1655	<i>purQ, purL</i>	bifunctional enzyme phosphoribosylformylglycinamide (FGAM) synthase (synthetase domain/glutamine amidotransferase domain)
CAC1718		guanylate kinase, YLOD B.subtilis ortholog
CAC1720		flavoprotein involved in panthothenate metabolism, YLOI B.subtilis ortholog
CAC1730		pentose-5-phosphate-3-epimerase
CAC1738	<i>kdtB</i>	phosphopantetheine adenylyltransferase
CAC1782	<i>nadE</i>	NH(3)-dependent NAD(+) synthase (nadE) fused to amidohydrolase domain
CAC1789	<i>smbA, pyrH</i>	uridylate kinase
CAC1792	<i>cdsA</i>	CDP-diglyceride synthetase
CAC1806		riboflavin kinase/FAD synthase
CAC1810	<i>dapG</i>	Aspartokinase
CAC1814	<i>pgsA</i>	phosphatidylglycerophosphate synthase
CAC1819	<i>aspB</i>	aspartate aminotransferase
CAC1821	<i>purB</i>	adenylosuccinate lyase
CAC1848	<i>cmk</i>	cytidylate kinase
CAC2075		predicted kinase
CAC2083	<i>folD</i>	tetrahydrofolate dehydrogenase/cyclohydrolase, FoID
CAC2117	<i>pfs</i>	nucleoside phosphorylase
CAC2243	<i>asnB</i>	N-terminal domain of asparagine synthase
CAC2250		UDP-glucose pyrophosphorylase
CAC2334		UDP-glucose 4-epimerase
CAC2335		UTP-glucose-1-phosphate uridylyltransferase

CAC2378	<i>dapA</i>	dihydrodipicolinate synthase
CAC2379	<i>dapB</i>	dihydrodipicolinate reductase
CAC2380		PLP-dependent aminotransferase
CAC2381	<i>dapD</i>	tetrahydrodipicolinate N-succinyltransferase
CAC2388	<i>argD</i>	N-acetylornithine aminotransferase
CAC2398	<i>folC</i>	folylpolyglutamate synthase
CAC2458		2-oxoacid ferredoxin oxidoreductase, beta subunit
CAC2459		2-oxoacid ferredoxin oxidoreductase, alpha subunit
CAC2624	<i>dapF</i>	diaminopimelate epimerase
CAC2644	<i>carB</i>	carbamoylphosphate synthase large subunit
CAC2650	<i>pyrD</i>	dihydroorotate dehydrogenase
CAC2652	<i>pyrF</i>	orotidine-5'-phosphate decarboxylase
CAC2653	<i>pyrI</i>	aspartate carbamoyltransferase regulatory subunit
CAC2658	<i>glnA</i>	glutamine synthetase type III
CAC2660	<i>pykA</i>	pyruvate carboxylase, PYKA
CAC2701	<i>guaB</i>	IMP dehydrogenase
CAC2723		deacetylase/dipeptidase/desuccinylase family of Zn-dependent hydrolases
CAC2832		PLP-dependent aminotransferase
CAC2856	<i>metK</i>	S-adenosylmethionine synthetase
CAC2862	<i>murA</i>	UDP-N-acetylglucosamine 1-carboxyvinyltransferase
CAC2873		acetyl-CoA acetyltransferase
CAC2895	<i>ddlA</i>	D-alanine-D-alanine ligase
CAC2914	<i>panB</i>	ketopantoate hydroxymethyltransferase
CAC2915	<i>panC</i>	pantoate--beta-alanine ligase

CAC2916	<i>panD</i>	aspartate 1-decarboxylase
CAC2927	<i>folA, folK</i>	dihydroneopterin aldolase fused to 7,8-dihydro-6-hydroxymethylpterin-pyrophosphokinase
CAC2937		ketopantoate reductase PanE/ApbA
CAC2942		uncharacterized conserved protein from YGAG family, predicted metal-dependent enzyme
CAC2960	<i>galE</i>	UDP-galactose 4-epimerase
CAC3003	<i>thyA</i>	thymidylate synthase
CAC3112	<i>adk</i>	adenylate kinase
CAC3157	<i>trpA</i>	tryptophan synthase alpha chain
CAC3158	<i>trpB</i>	tryptophan synthase beta chain
CAC3159	<i>trpF</i>	phosphoribosylanthranilate isomerase
CAC3160	<i>trpC</i>	indole-3-glycerol phosphate synthase
CAC3161	<i>trpD</i>	anthranilate phosphoribosyltransferase
CAC3162	<i>pabA</i>	putative anthranilate synthase component II
CAC3163	<i>parB</i>	para-aminobenzoate synthase component I
CAC3169	<i>ilvB</i>	acetolactate synthase large subunit
CAC3170	<i>ilvD</i>	dihydroxyacid dehydratase
CAC3171	<i>leuB</i>	isopropylmalate dehydrogenase
CAC3172	<i>leuD</i>	3-isopropylmalate dehydratase, small subunit
CAC3173	<i>leuC</i>	3-isopropylmalate dehydratase, large subunit
CAC3174	<i>leuA</i>	2-isopropylmalate synthase
CAC3176	<i>ilvN</i>	acetolactate synthase small subunit
CAC3200		predicted transcriptional regulator, homolog of Bvg accessory factor
CAC3201		formate--tetrahydrofolate ligase
CAC3221	<i>prs</i>	phosphoribosylpyrophosphate synthetase

CAC3222	<i>gcaD</i>	glucosamine-1-phosphate N-acetyltransferase /
CAC3331		alanine racemase
CAC3568	<i>accA</i>	acetyl-CoA carboxylase alpha subunit
CAC3569	<i>accD</i>	acetyl-CoA carboxylase beta subunit
CAC3570	<i>accC</i>	biotin carboxylase
CAC3571	<i>fabZ</i>	hydroxymyristoyl-(acyl carrier protein) dehydratase
CAC3572	<i>accB</i>	biotin carboxyl carrier protein of acetyl-CoA carboxylase
CAC3573	<i>fabF</i>	3-oxoacyl-(acyl-carrier-protein) synthase I
CAC3574	<i>fabG</i>	3-ketoacyl-acyl carrier protein reductase
CAC3575	<i>fabD</i>	malonyl CoA-acyl carrier protein transacylase
CAC3576	<i>fabK</i>	trans-2-enoyl-ACP reductase II
CAC3578	<i>fabH</i>	3-oxoacyl-[acyl-carrier-protein] synthase III
CAC3593	<i>purA</i>	adenylosuccinate synthase
CAC3600	<i>dapA</i>	dihydrodipicolinate synthase
CAC3604	<i>ilvD</i>	dihydroxy-acid dehydratase
CAC3626	<i>mtrA</i>	GTP cyclohydrolase I
CAC3652	<i>alsS</i>	acetolactate synthase large subunit
CA_P0163	<i>ctfA</i>	butyrate-acetoacetate CoA-transferase subunit A
CA_P0164	<i>ctfB</i>	butyrate-acetoacetate CoA-transferase subunit B

2. Partially essential genes

Locus	Name	Definition
CA_P0035	<i>adhE</i>	alcohol dehydrogenase / acetaldehyde dehydrogenase
CA_P0162	<i>adhE1</i>	alcohol dehydrogenase / acetaldehyde dehydrogenase
CAC0015	<i>serA</i>	D-3-phosphoglycerate dehydrogenase
CAC0028	<i>hydA</i>	hydrogene dehydrogenase
CAC0187	<i>nagB</i>	glucosamine-6-phosphate isomerase (glucosamine-6-phosphate
CAC0390		cystathionine gamma-synthase
CAC0391		cystathionine beta-lyase
CAC0673		L-serine dehydratase, beta chain
CAC0710	<i>pgk</i>	phosphoglycerate kinase
CAC0713	<i>eno</i>	enolase
CAC0737		NADP-specific glutamate dehydrogenase
CAC0998		homoserine dehydrogenase
CAC1235	<i>thrB</i>	homoserine kinase (thrB)
CAC1625		phosphoserine phosphatase family enzyme
CAC1742	<i>pta</i>	phosphate acetyltransferase
CAC1743	<i>askA</i>	acetate kinase
CAC2227		phosphoserine phosphatase family enzyme
CAC2229		pyruvate:ferredoxin oxidoreductase
CAC2264	<i>glyA</i>	glycine hydroxymethyltransferase
CAC2275	<i>apt</i>	adenine phosphoribosyltransferase; Apt
CAC2700	<i>guaA</i>	GMP synthase
CAC2708	<i>hbd</i>	3-hydroxybutyryl-CoA dehydrogenase

CAC2709	<i>effA</i>	electron transfer flavoprotein alpha-subunit
CAC2710	<i>effB</i>	electron transfer flavoprotein beta-subunit
CAC2711	<i>bcd</i>	butyryl-CoA dehydrogenase
CAC2712	<i>crt</i>	3-hydroxybutyryl-CoA dehydratase
CAC2892	<i>ctrA</i>	CTP synthase (UTP-ammonia lyase)
CAC2926	<i>sul</i>	dihydropteroate synthase
CAC2945		3-phosphoserine aminotransferase (Possible phosphoglycerate dehydrogenase)
CAC3075	<i>buk</i>	butyrate kinase, BUK
CAC3076	<i>ptb</i>	phosphate butyryltransferase
CAC3420		low specificity L-threonine aldolase
