

Table S1: List of metabolites

Abbreviation	Official name	Compartment	Formula	Charge
10thf	10-Formyltetrahydrofolate	Cytosol	C20H22N7O7	-1
12dgr_HP	1,2-Diacylglycerol, <i>Helicobacter pylori</i> specific	Cytosol	C36H68O5	0
13dpg	3-Phospho-D-glyceroyl phosphate	Cytosol	C3H4O10P2	-4
1p3h5c	L-1-Pyrroline-3-hydroxy-5-carboxylate	Cytosol	C5H6NO3	-1
1pyr5c	1-Pyrroline-5-carboxylate	Cytosol	C5H6NO2	-1
23dhdp	2,3-Dihydrodipicolinate	Cytosol	C7H5NO4	-2
23dhmb	(R)-2,3-Dihydroxy-3-methylbutanoate	Cytosol	C5H9O4	-1
23dhmp	(R)-2,3-Dihydroxy-3-methylpentanoate	Cytosol	C6H11O4	-1
25aics	(S)-2-[5-Amino-1-(5-phospho-D-ribose)]imidazole-4-carboxamido]succinate	Cytosol	C13H15N4O12P	-4
25dhpp	2,5-Diamino-6-hydroxy-4-(5'-phosphoribosylamino)-pyrimidine	Cytosol	C9H14N5O8P	-2
26dap-LL	LL-2,6-Diaminoheptanedioate	Cytosol	C7H14N2O4	0
26dap-M	meso-2,6-Diaminoheptanedioate	Cytosol	C7H14N2O4	0
2ahbut	(S)-2-Aceto-2-hydroxybutanoate	Cytosol	C4H9NO2	0
2ahhmd	2-Amino-4-hydroxy-6-hydroxymethyl-7,8-dihydropteridine diphosphate	Cytosol	C7H8N5O8P2	-3
2ahhmp	2-Amino-4-hydroxy-6-hydroxymethyl-7,8-dihydropteridine	Cytosol	C7H9N5O2	0
2cpr5p	1-(2-Carboxyphenylamino)-1-deoxy-D-ribose 5-phosphate	Cytosol	C12H13NO9P	-3
2dda7p	2-Dehydro-3-deoxy-D-arabino-heptonate 7-phosphate	Cytosol	C7H10O10P	-3
2ddg6p	2-Dehydro-3-deoxy-D-gluconate 6-phosphate	Cytosol	C6H8O9P	-3
2dhp	2-Dehydropantoate	Cytosol	C6H9O4	-1
2dmmq6	2-Demethylmenaquinone 8	Cytosol	C40H54O2	0
2dr1p	2-Deoxy-D-ribose 1-phosphate	Cytosol	C5H9O7P	-2
2dr5p	2-Deoxy-D-ribose 5-phosphate	Cytosol	C5H9O7P	-2
2kmb	2-keto-4-methylthiobutyrate	Cytosol	C5H7O3S	-1
2mahmp	2-Methyl-4-amino-5-hydroxymethylpyrimidine diphosphate	Cytosol	C6H8N3O7P2	-3
2me4p	2-C-methyl-D-erythritol 4-phosphate	Cytosol	C5H11O7P	-2
2mecdp	2-C-methyl-D-erythritol 2,4-cyclodiphosphate	Cytosol	C5H10O9P2	-2
2obut	2-Oxobutanoate	Cytosol	C4H5O3	-1
2ombzl	2-Octaprenyl-6-methoxy-1,4-benzoquinol	Cytosol	C47H72O3	0
2ommb1	2-Octaprenyl-3-methyl-6-methoxy- 1,4-benzoquinol	Cytosol	C48H74O3	0
2oph	2-Octaprenylphenol	Cytosol	C46H70O	0
2p4c2me	2-phospho-4-(cytidine 5'-diphospho)-2-C-methyl-D-erythritol	Cytosol	C46H70O	-4
2pg	D-Glycerate 2-phosphate	Cytosol	C3H4O7P	-3
2shchc	2-Succinyl-6-hydroxy-2,4-cyclohexadiene-1-carboxylate	Cytosol	C11H10O6	-2
34hpp	3-(4-Hydroxyphenyl)pyruvate	Cytosol	C9H7O4	-1
3dhq	3-Dehydroquinate	Cytosol	C7H9O6	-1
3dhsk	3-Dehydroshikimate	Cytosol	C7H7O5	-1
3hoctaACP	R-3-hydroxy-octadecanoic-ACP	Cytosol	C29H55N2O9PRS	-1
3hpalACP	R-3-hydroxy-palmitoyl-ACP	Cytosol	C27H51N2O9PRS	-1
3ig3p	C'-(3-Indolyl)-glycerol 3-phosphate	Cytosol	C11H12NO6P	-2
3mob	3-Methyl-2-oxobutanoate	Cytosol	C5H7O3	-1
3mop	(S)-3-Methyl-2-oxopentanoate	Cytosol	C6H9O3	-1
3ophb	3-Octaprenyl-4-hydroxybenzoate	Cytosol	C47H69O3	-1
3pg	3-Phospho-D-glycerate	Cytosol	C3H4O7P	-3
3php	3-Phosphohydroxypyruvate	Cytosol	C3H2O7P	-3
3psme	5-O-(1-Carboxyvinyl)-3-phosphoshikimate	Cytosol	C10H9O10P	-4
4abut	4-Aminobutanoate	Cytosol	C4H9NO2	0
4abz	4-Aminobenzoate	Cytosol	C7H6NO2	-1
4adcho	4-amino-4-deoxychorismate	Cytosol	C10H10NO5	-1
4ampm	4-Amino-2-methyl-5-phosphomethylpyrimidine	Cytosol	C6H8N3O4P	-2
4c2me	4-(cytidine 5'-diphospho)-2-C-methyl-D-erythritol	Cytosol	C14H23N3O14P2	-2
4h2oglt	4-Hydroxy-2-oxoglutarate	Cytosol	C5H4O6	-2
4hba	4-Hydroxy-benzyl alcohol	Cytosol	C7H8O2	0
4hbz	4-Hydroxybenzoate	Cytosol	C7H5O3	-1
4hg1usa	L-4-Hydroxyglutamate semialdehyde	Cytosol	C5H9NO4	0
4hpro-LT	trans-4-Hydroxy-L-proline	Cytosol	C5H9NO3	0

Abbreviation	Official name	Compartment	Formula	Charge
4mhetz	4-Methyl-5-(2-hydroxyethyl)-thiazole	Cytosol	C6H9NOS	0
4mop	4-Methyl-2-oxopentanoate	Cytosol	C6H9O3	-1
4mpetz	4-Methyl-5-(2-phosphoethyl)-thiazole	Cytosol	C6H8NO4PS	-2
4pasp	4-Phospho-L-aspartate	Cytosol	C4H6NO7P	-2
4ppan	D-4'-Phosphopantothenate	Cytosol	C9H15NO8P	-3
4ppcys	N-((R)-4-Phosphopantothenoyl)-L-cysteine	Cytosol	C12H20N2O9PS	-3
4r5au	4-(1-D-Ribitylamino)-5-aminouracil	Cytosol	C9H16N4O6	0
5aizc	5-amino-1-(5-phospho-D-riboseyl)imidazole-4-carboxylate	Cytosol	C9H11N3O9P	-3
5aop	5-Amino-4-oxopentanoate	Cytosol	C5H9NO3	0
5aprbu	5-Amino-6-(5'-phosphoribitylamino)uracil	Cytosol	C9H15N4O9P	-2
5apru	5-Amino-6-(5'-phosphoribosylamino)uracil	Cytosol	C9H13N4O9P	-2
5caiz	5-phosphoribosyl-5-carboxyaminoimidazole	Cytosol	C9H11N3O9P	-3
5mdr1p	5-Methylthio-5-deoxy-D-ribose 1-phosphate	Cytosol	C6H11O7PS	-2
5mdru1p	5-Methylthio-5-deoxy-D-ribulose 1-phosphate	Cytosol	C6H11O7PS	-2
5mta	5-Methylthioadenosine	Cytosol	C11H15N5O3S	0
5mthf	5-Methyltetrahydrofolate	Cytosol	C20H24N7O6	-1
5mtr	5-Methylthio-D-ribose	Cytosol	C6H12O4S	0
6pgc	6-Phospho-D-gluconate	Cytosol	C6H10O10P	-3
6pgl	6-phospho-D-glucono-1,5-lactone	Cytosol	C6H9O9P	-2
8aonn	8-Amino-7-oxononanoate	Cytosol	C9H17NO3	0
aa	Acrylamide	Cytosol	C3H5NO	0
aa[e]	Acrylamide	Extracellular	C3H5NO	0
aacoa	Acetoacetyl-CoA	Cytosol	C25H36N7O18P3S	-4
ac	Acetate	Cytosol	C2H3O2	-1
ac[e]	Acetate	Extracellular	C2H3O2	-1
acac	Acetoacetate	Cytosol	C4H5O3	-1
acac[e]	Acetoacetate	Extracellular	C4H5O3	-1
acACP	Acetyl-ACP	Cytosol	C13H23N2O8PRS	-1
acald	Acetaldehyde	Cytosol	C2H4O	0
acald[e]	Acetaldehyde	Extracellular	C2H4O	0
aacoa	Acetyl-CoA	Cytosol	C23H34N7O17P3S	-4
acgam1p	N-Acetyl-D-glucosamine 1-phosphate	Cytosol	C8H14NO9P	-2
achms	O-Acetyl-L-homoserine	Cytosol	C6H11NO4	0
acmam	N-Acetyl-D-muramoate	Cytosol	C11H18NO8	-1
acmama	N-Acetyl-D-muramoyl-L-alanine	Cytosol	C14H23N2O9	-1
ACP	acyl carrier protein	Cytosol	C11H21N2O7PRS	-1
acryl	Acrylate	Cytosol	C3H4O2	0
acser	O-Acetyl-L-serine	Cytosol	C5H9NO4	0
actACP	Acetoacetyl-ACP	Cytosol	C15H25N2O9PRS	-1
actp	Acetyl phosphate	Cytosol	C2H3O5P	-2
ad	Acetamide	Cytosol	C2H5NO	0
ad[e]	Acetamide	Extracellular	C2H5NO	0
ade	Adenine	Cytosol	C5H5N5	0
ade[e]	Adenine	Extracellular	C5H5N5	0
adn	Adenosine	Cytosol	C10H13N5O4	0
adn[e]	Adenosine	Extracellular	C10H13N5O4	0
adp	ADP	Cytosol	C10H12N5O10P2	-3
adphep7p-L,D	ADP-L-glycero-D-manno-heptose-7-phosphate	Cytosol	C17H24N5O19P3	-2
adphep-D,D	ADP-D-glycero-D-manno-heptose	Cytosol	C17H25N5O16P2	-2
adphep-L,D	ADP-L-glycero-D-manno-heptose	Cytosol	C17H25N5O16P2	-2
agm	Agmatine	Cytosol	C5H16N4	2
ahcys	S-Adenosyl-L-homocysteine	Cytosol	C14H20N6O5S	0
ahdt	2-Amino-4-hydroxy-6-(erythro-1,2,3-trihydroxypropyl) dihydropteridine triphosphate	Cytosol	C9H13N5O13P3	-3
aicar	5-Amino-1-(5-Phospho-D-riboseyl)imidazole-4-carboxamide	Cytosol	C9H13N4O8P	-2
air	5-amino-1-(5-phospho-D-riboseyl)imidazole	Cytosol	C8H12N3O7P	-2
akg	2-Oxoglutarate	Cytosol	C5H4O5	-2
akg[e]	2-Oxoglutarate	Extracellular	C5H4O5	-2
alaala	D-Alanyl-D-alanine	Cytosol	C6H12N2O3	0

Abbreviation	Official name	Compartment	Formula	Charge
ala-B	beta-Alanine	Cytosol	C3H7NO2	0
alac-S	(S)-2-Acetylactate	Cytosol	C5H7O4	-1
ala-D	D-Alanine	Cytosol	C3H7NO2	0
ala-D[e]	D-Alanine	Extracellular	C3H7NO2	0
ala-L	L-Alanine	Cytosol	C3H7NO2	0
ala-L[e]	L-Alanine	Extracellular	C3H7NO2	0
amet	S-Adenosyl-L-methionine	Cytosol	C15H23N6O5S	1
ametam	S-Adenosylmethioninamine	Cytosol	C14H24N6O3S	2
amob	S-Adenosyl-4-methylthio-2-oxobutanoate	Cytosol	C15H19N5O6S	0
amp	AMP	Cytosol	C10H12N5O7P	-2
anth	Anthranilate	Cytosol	C7H6NO2	-1
aps	Adenosine 5'-phosphosulfate	Cytosol	C10H12N5O10PS	-2
ara5p	D-Arabinose 5-phosphate	Cytosol	C5H9O8P	-2
arg-L	L-Arginine	Cytosol	C6H15N4O2	1
arg-L[e]	L-Arginine	Extracellular	C6H15N4O2	1
argsuc	N(omega)-(L-Arginino)succinate	Cytosol	C10H17N4O6	-1
asn-L	L-Asparagine	Cytosol	C4H8N2O3	0
asn-L[e]	L-Asparagine	Extracellular	C4H8N2O3	0
asp-L	L-Aspartate	Cytosol	C4H6NO4	-1
asp-L[e]	L-Aspartate	Extracellular	C4H6NO4	-1
aspsa	L-Aspartate 4-semialdehyde	Cytosol	C4H7NO3	0
atp	ATP	Cytosol	C10H12N5O13P3	-4
btamp	Biotinyl-5'-AMP	Cytosol	C20H27N7O9PS	-1
btn	Biotin	Cytosol	C7H5O6	-3
c190cACP	19 carbon cyclopropane-ACP	Cytosol	C30H55N2O8PRS	-1
cbasp	N-Carbamoyl-L-aspartate	Cytosol	C5H6N2O5	-2
cbp	Carbamoyl phosphate	Cytosol	CH2NO5P	-2
cdp	CDP	Cytosol	C9H12N3O11P2	-3
cdpdag_HP	CDP-Diacylglycerol, <i>Helicobacter pylori</i> specific	Cytosol	C45H79N3O15P2	-2
cdpea	CDPethanolamine	Cytosol	C11H19N4O11P2	-1
cgly	Cys-Gly	Cytosol	C5H10N2O3S	0
chor	Chorismate	Cytosol	C10H8O6	-2
cit	Citrate	Cytosol	C6H5O7	-3
cit[e]	Citrate	Extracellular	C6H5O7	-3
citr-L	L-Citrulline	Cytosol	C6H13N3O3	0
clpn_HP	Cardiolipin, <i>Helicobacter pylori</i> specific	Cytosol	C75H140O17P2	-2
cmp	CMP	Cytosol	C9H12N3O8P	-2
cmpkdo	CMP-3-deoxy-D-manno-octulosonate	Cytosol	C17H24N3O15P	-2
co2	CO2	Cytosol	CO2	0
co2[e]	CO2	Extracellular	CO2	0
coa	Coenzyme A	Cytosol	C21H32N7O16P3S	-4
core_ips_hp	Core oligosaccharide plus lipidA, <i>Helicobacter pylori</i> specific	Cytosol	C129H237N2O62P2	1
cpppg1	Coproporphyrinogen I	Cytosol	C36H40N4O8	-4
cpppg3	Coproporphyrinogen III	Cytosol	C36H40N4O8	-4
ctp	CTP	Cytosol	C9H12N3O14P3	-4
cys-L	L-Cysteine	Cytosol	C3H7NO2S	0
cys-L[e]	L-Cysteine	Extracellular	C3H7NO2S	0
cyst-L	L-Cystathionine	Cytosol	C7H14N2O4S	0
cytd	Cytidine	Cytosol	C9H13N3O5	0
cytd[e]	Cytidine	Extracellular	C9H13N3O5	0
dad-2	Deoxyadenosine	Cytosol	C10H13N5O3	0
dad-2[e]	Deoxyadenosine	Extracellular	C10H13N5O3	0
dadp	dADP	Cytosol	C10H12N5O9P2	-3
damp	dAMP	Cytosol	C10H12N5O6P	-2
dann	7,8-Diaminononanoate	Cytosol	C9H21N2O2	1
datp	dATP	Cytosol	C10H12N5O12P3	-4
db4p	3,4-dihydroxy-2-butanone 4-phosphate	Cytosol	C4H7O6P	-2
dcamp	N6-(1,2-Dicarboxyethyl)-AMP	Cytosol	C14H14N5O11P	-4
dcdp	dCDP	Cytosol	C9H12N3O10P2	-3

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dctp	dCTP	Cytosol	C9H12N3O13P3	-4
dcyt	Deoxycytidine	Cytosol	C9H13N3O4	0
dcyt[e]	Deoxycytidine	Extracellular	C9H13N3O4	0
dgdg	dGDP	Cytosol	C10H12N5O10P2	-3
dgmp	dGMP	Cytosol	C10H12N5O7P	-2
dgsn	Deoxyguanosine	Cytosol	C10H13N5O4	0
dgtg	dGTP	Cytosol	C10H12N5O13P3	-4
dhap	Dihydroxyacetone phosphate	Cytosol	C3H5O6P	-2
dhf	7,8-Dihydrofolate	Cytosol	C19H20N7O6	-1
dhna	1,4-Dihydroxy-2-naphthoate	Cytosol	C11H7O4	-1
dhnt	2-Amino-4-hydroxy-6-(D-erythro-1,2,3-trihydroxypropyl)-7,8-dihydropteridine	Cytosol	C9H14N5O4	1
dhor-S	(S)-Dihydroorotate	Cytosol	C5H5N2O4	-1
dhpmp	Dihydroneopterin monophosphate	Cytosol	C9H13N5O7P	-1
dhpt	Dihydropteroate	Cytosol	C14H13N6O3	-1
dhptd	4,5-dihydroxy-2,3-pentanedione	Cytosol	C5H8O4	0
din	Deoxyinosine	Cytosol	C10H12N4O4	0
dkmpp	2,3-diketo-5-methylthio-1-phosphopentane	Cytosol	C6H9O6PS	-2
dmlz	6,7-Dimethyl-8-(1-D-ribityl)lumazine	Cytosol	C13H18N4O6	0
dmpp	Dimethylallyl diphosphate	Cytosol	C5H9O7P2	-3
dnad	Deamino-NAD+	Cytosol	C21H24N6O15P2	-2
dpcoa	Dephospho-CoA	Cytosol	C21H33N7O13P2S	-2
dtbt	Dethiobiotin	Cytosol	C10H17N2O3	-1
dtgp	dTDP	Cytosol	C10H13N2O11P2	-3
dtmp	dTMP	Cytosol	C10H13N2O8P	-2
dttp	dTTP	Cytosol	C10H13N2O14P3	-4
dudp	dUDP	Cytosol	C9H11N2O11P2	-3
dump	dUMP	Cytosol	C9H11N2O8P	-2
duri	Deoxyuridine	Cytosol	C9H12N2O5	0
duri[e]	Deoxyuridine	Extracellular	C9H12N2O5	0
dutp	dUTP	Cytosol	C9H11N2O14P3	-4
dxyl	1-deoxy-D-xylulose	Cytosol	C5H10O4	0
dxyl5p	1-deoxy-D-xylulose 5-phosphate	Cytosol	C5H9O7P	-2
e4hglu	L-erythro-4-Hydroxyglutamate	Cytosol	C5H8NO5	-1
e4p	D-Erythrose 4-phosphate	Cytosol	C4H7O7P	-2
etoh	Ethanol	Cytosol	C2H6O	0
etoh[e]	Ethanol	Extracellular	C2H6O	0
f1p	D-Fructose 1-phosphate	Cytosol	C6H11O9P	-2
f6p	D-Fructose 6-phosphate	Cytosol	C6H11O9P	-2
fad	Flavin adenine dinucleotide	Cytosol	C27H31N9O15P2	-2
fadh2	Flavin adenine dinucleotide (reduced form)	Cytosol	C27H33N9O15P2	-2
fc1p	L-Fuculose 1-phosphate	Cytosol	C6H11O8P	-2
fdp	D-Fructose 1,6-bisphosphate	Cytosol	C6H10O12P2	-4
fdxox	Oxidized ferredoxin	Cytosol	X	0
fdxrd	Reduced ferredoxin	Cytosol	XH2	0
fe2	Iron (II)	Cytosol	Fe	2
fe2[e]	Iron (II)	Extracellular	Fe	2
fe3	Iron (III)	Cytosol	Fe	3
fe3[e]	Iron (III)	Extracellular	Fe	3
fgam	N2-Formyl-N1-(5-phospho-D-ribosyl)glycinamide	Cytosol	C8H13N2O9P	-2
ficytcc553	Ferricytochrome c-553	Cytosol	C42H54FeN8O6S2	3
fmn	FMN	Cytosol	C17H19N4O9P	-2
fmnh2	Reduced FMN	Cytosol	C17H21N4O9P	-2
focytcc553	Ferrocyclochrome c-553	Cytosol	C42H54FeN8O6S2	2
for	Formate	Cytosol	CH1O2	-1
for[e]	Formate	Extracellular	CH1O2	-1
fpram	2-(Formamido)-N1-(5-phospho-D-ribosyl)acetamide	Cytosol	C8H15N3O8P	-1
fprica	5-Formamido-1-(5-phospho-D-ribosyl)imidazole-4-carboxamide	Cytosol	C10H13N4O9P	-2

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frdp	Farnesyl diphosphate	Cytosol	C15H25O7P2	-3
frmd	Formamide	Cytosol	CH3NO	0
fum	Fumarate	Cytosol	C4H2O4	-2
fum[e]	Fumarate	Extracellular	C4H2O4	-2
g1p	D-Glucose 1-phosphate	Cytosol	C6H11O9P	-2
g3p	Glyceraldehyde 3-phosphate	Cytosol	C3H5O6P	-2
g6p	D-Glucose 6-phosphate	Cytosol	C6H11O9P	-2
gal	D-Galactose	Cytosol	C6H12O6	0
gal[e]	D-Galactose	Extracellular	C6H12O6	0
gal1p	alpha-D-Galactose 1-phosphate	Cytosol	C6H11O9P	-2
gam1p	D-Glucosamine 1-phosphate	Cytosol	C6H13NO8P	-1
gam6p	D-Glucosamine 6-phosphate	Cytosol	C6H13NO8P	-1
gar	N1-(5-Phospho-D-ribose)glycinamide	Cytosol	C7H14N2O8P	-1
gcald	Glycolaldehyde	Cytosol	C2H4O2	0
gdp	GDP	Cytosol	C10H12N5O11P2	-3
gdpddman	GDP-4-dehydro-6-deoxy-D-mannose	Cytosol	C16H21N5O15P2	-2
gdpfuc	GDP-L-fucose	Cytosol	C16H23N5O15P2	-2
gdpmann	GDP-D-mannose	Cytosol	C16H23N5O16P2	-2
glc-D	D-Glucose	Cytosol	C6H12O6	0
glc-D[e]	D-Glucose	Extracellular	C6H12O6	0
gln-L	L-Glutamine	Cytosol	C5H10N2O3	0
gln-L[e]	L-Glutamine	Extracellular	C5H10N2O3	0
glu1sa	L-Glutamate 1-semialdehyde	Cytosol	C5H9NO3	0
glu5sa	L-Glutamate 5-semialdehyde	Cytosol	C5H9NO3	0
gluala	5-L-Glutamyl-L-alanine	Cytosol	C8H13N2O5	-1
glu-D	D-Glutamate	Cytosol	C5H8NO4	-1
glu-L	L-Glutamate	Cytosol	C5H8NO4	-1
glu-L[e]	L-Glutamate	Extracellular	C5H8NO4	-1
glutrna	L-Glutamyl-tRNA(Glu)	Cytosol	C8H13N2O5	0
glx	Glyoxylate	Cytosol	C2H1O3	-1
gly	Glycine	Cytosol	C2H5NO2	0
gly[e]	Glycine	Extracellular	C2H5NO2	0
glyald	D-Glyceraldehyde	Cytosol	C3H6O3	0
glyc	Glycerol	Cytosol	C3H8O3	0
glyc3p	Glycerol 3-phosphate	Cytosol	C3H7O6P	-2
glyclt	Glycolate	Cytosol	C2H3O3	-1
gmhep17bp	D-Glycero-D-manno-heptose 1,7-bisphosphate	Cytosol	C7H12O13P2	-4
gmhep1p	D-Glycero-D-manno-heptose 1-phosphate	Cytosol	C7H13O10P	-2
gmhep7p	D-Glycero-D-manno-heptose 7-phosphate	Cytosol	C7H13O10P	-2
gmp	GMP	Cytosol	C10H12N5O8P	-2
grdp	Geranyl diphosphate	Cytosol	C10H17O7P2	-3
gsn	Guanosine	Cytosol	C10H13N5O5	0
gsn[e]	Guanosine	Extracellular	C10H13N5O5	0
gthrd	Reduced glutathione	Cytosol	C10H16N3O6S	-1
gtp	GTP	Cytosol	C10H12N5O14P3	-4
gua	Guanine	Cytosol	C5H5N5O	0
gua[e]	Guanine	Extracellular	C5H5N5O	0
h	H+	Cytosol	H	1
h[e]	H+	Extracellular	H	1
h2[e]	H2	Extracellular	H2	0
h2co3	carbonic acid	Cytosol	H2CO3	0
h2co3[e]	carbonic acid	Extracellular	H2CO3	0
h2mb4p	1-hydroxy-2-methyl-2-(E)-butenyl 4-diphosphate	Cytosol	C5H9O8P2	-3
h2o	H2O	Cytosol	H2O	0
h2o[e]	H2O	Extracellular	H2O	0
h2o2	Hydrogen peroxide	Cytosol	H2O2	0
h2s	Hydrogen sulfide	Cytosol	H2S	0
hco3	Bicarbonate	Cytosol	HCO3	-1
hcys-L	L-Homocysteine	Cytosol	C4H9NO2S	0

Abbreviation	Official name	Compartment	Formula	Charge
his-L	L-Histidine	Cytosol	C6H9N3O2	0
his-L[e]	L-Histidine	Extracellular	C6H9N3O2	0
hmbil	Hydroxymethylbilane	Cytosol	C40H38N4O17	-8
hmfurn	4-hydroxy-5-methyl-3(2H)-furanone	Cytosol	C5H6O3	0
hom-L	L-Homoserine	Cytosol	C4H9NO3	0
hxan	Hypoxanthine	Cytosol	C5H4N4O	0
hxan[e]	Hypoxanthine	Extracellular	C5H4N4O	0
iasp	Iminoaspartate	Cytosol	C4H4NO4	-1
ichor	Isochorismate	Cytosol	C10H8O6	-2
icit	Isocitrate	Cytosol	C6H5O7	-3
ile-L	L-Isoleucine	Cytosol	C6H13NO2	0
ile-L[e]	L-Isoleucine	Extracellular	C6H13NO2	0
imp	IMP	Cytosol	C10H11N4O8P	-2
indole	Indole	Cytosol	C8H7N	0
ins	Inosine	Cytosol	C10H12N4O5	0
ipdp	Isopentenyl diphosphate	Cytosol	C5H9O7P2	-3
kdo	3-Deoxy-D-manno-2-octulosonate	Cytosol	C8H13O8	-1
kdo8p	3-Deoxy-D-manno-octulosonate 8-phosphate	Cytosol	C8H12O11P	-3
kdolipid4_HP	KDO-lipid IV(A), <i>Helicobacter pylori</i> specific	Cytosol	C90H166N2O26P	-3
lac-D	D-Lactate	Cytosol	C3H5O3	-1
lac-L	L-Lactate	Cytosol	C3H5O3	-1
lac-L[e]	L-Lactate	Extracellular	C3H5O3	-1
lald-L	L-Lactaldehyde	Cytosol	C3H6O2	0
leu-L	L-Leucine	Cytosol	C6H13NO2	0
leu-L[e]	L-Leucine	Extracellular	C6H13NO2	0
lipidA_HP	Lipid A, <i>Helicobacter pylori</i> specific	Cytosol	C82H155N2O19P	-2
lipidX_HP	Lipid X <i>Helicobacter pylori</i> specific	Cytosol	C40H76NO12P	-2
lps_HP	Lipopolysaccharide, <i>Helicobacter pylori</i> specific	Cytosol	C188H344N4O105P2	10
lys-L	L-Lysine	Cytosol	C6H15N2O2	1
lys-L[e]	L-Lysine	Extracellular	C6H15N2O2	1
malACP	Malonyl-[acyl-carrier protein]	Cytosol	C14H22N2O10PRS	-2
malcoa	Malonyl-CoA	Cytosol	C24H33N7O19P3S	-5
mal-L	L-Malate	Cytosol	C4H4O5	-2
mal-L[e]	L-Malate	Extracellular	C4H4O5	-2
man1p	D-Mannose 1-phosphate	Cytosol	C6H11O9P	-2
man6p	D-Mannose 6-phosphate	Cytosol	C6H11O9P	-2
methf	5,10-Methenyltetrahydrofolate	Cytosol	C20H20N7O6	-1
met-L	L-Methionine	Cytosol	C5H11NO2S	0
met-L[e]	L-Methionine	Extracellular	C5H11NO2S	0
mlthf	5,10-Methylenetetrahydrofolate	Cytosol	C20H22N7O6	-1
mql6	Menaquinol 6	Cytosol	C41H58O2	0
mqn6	Menaquinone 6	Cytosol	C41H56O2	0
myrsACP	Myristoyl-ACP (n-C14:0ACP)	Cytosol	C25H47N2O8PRS	-1
na1	Sodium	Cytosol	Na	1
na1[e]	Sodium	Extracellular	Na	1
nad	Nicotinamide adenine dinucleotide	Cytosol	C21H26N7O14P2	-1
nadh	Nicotinamide adenine dinucleotide - reduced	Cytosol	C21H27N7O14P2	-2
nadp	Nicotinamide adenine dinucleotide phosphate	Cytosol	C21H25N7O17P3	-3
nadph	Nicotinamide adenine dinucleotide phosphate - reduced	Cytosol	C21H26N7O17P3	-4
nh4	Ammonium	Cytosol	H4N	1
nh4[e]	Ammonium	Extracellular	H4N	1
ni2	Ni2+	Cytosol	Ni2	2
ni2[e]	Ni2+	Extracellular	Ni2	2
nicrnt	Nicotinate D-ribonucleotide	Cytosol	C11H12NO9P	-2
nmn	Nicotinamide D-ribonucleotide	Cytosol	C11H14N2O8P	-1
nmn[e]	Nicotinamide D-ribonucleotide	Extracellular	C11H14N2O8P	-1
no	Nitric oxide	Cytosol	NO	0
no[e]	Nitric oxide	Extracellular	NO	0
no2	Nitrite	Cytosol	NO2	-1

Abbreviation	Official name	Compartment	Formula	Charge
no2[e]	Nitrite	Extracellular	NO2	-1
no3	Nitrate	Cytosol	NO3	-1
no3[e]	Nitrate	Extracellular	NO3	-1
o2	O2	Cytosol	O2	0
o2-	Superoxide anion	Cytosol	O2-	-1
o2[e]	O2	Extracellular	O2	0
oaa	Oxaloacetate	Cytosol	C4H2O5	-2
ocdcaACP	Octadecanoyl-ACP (n-C18:0ACP)	Cytosol	C29H55N2O8PRS	-1
octdp	all-trans-Octaprenyl diphosphate	Cytosol	C40H65O7P2	-3
octeACP	Octadecenoyl-ACP (n-C18:1ACP)	Cytosol	C29H53N2O8PRS	-1
orn	Ornithine	Cytosol	C5H13N2O2	1
orn[e]	Ornithine	Extracellular	C5H13N2O2	1
orot	Orotate	Cytosol	C5H3N2O4	-1
orot[e]	Orotate	Extracellular	C5H3N2O4	-1
orot5p	Orotidine 5'-phosphate	Cytosol	C10H10N2O11P	-3
pa_HP	Phosphatidic acid, <i>Helicobacter pylori</i> specific	Cytosol	C36H67O8P	-2
pac	Phenylacetic acid	Cytosol	C8H7O2	-1
pad	2-Phenylacetamide	Cytosol	C8H9NO	0
palmACP	Palmitoyl-ACP (n-C16:0ACP)	Cytosol	C27H51N2O8PRS	-1
pan4p	Pantetheine 4'-phosphate	Cytosol	C11H21N2O7PS	-2
pant-R	(R)-Pantoate	Cytosol	C6H11O4	-1
pap	Adenosine 3',5'-bisphosphate	Cytosol	C10H11N5O10P2	-4
paps	3'-Phosphoadenylyl sulfate	Cytosol	C10H11N5O13P2S	-4
pe_HP	Phosphatidylethanolamine, <i>Helicobacter pylori</i> specific	Cytosol	C38H74NO8P	0
pep	Phosphoenolpyruvate	Cytosol	C3H2O6P	-3
peptido_EC	Peptidoglycan subunit of Escherichia coli	Cytosol	C40H62N8O21	-2
pg_HP	Phosphatidylglycerol, <i>Helicobacter pylori</i> specific	Cytosol	C39H74O10P	-1
pgp_HP	Phosphatidylglycerol phosphate, <i>Helicobacter pylori</i> specific	Cytosol	C39H73O13P2	-3
phe-L	L-Phenylalanine	Cytosol	C9H11NO2	0
phe-L[e]	L-Phenylalanine	Extracellular	C9H11NO2	0
pHEME	Protoheme	Cytosol	C34H30FeN4O4	-2
pHEME[e]	Protoheme	Extracellular	C34H30FeN4O4	-2
phom	O-Phospho-L-homoserine	Cytosol	C4H8NO6P	-2
phpyr	Phenylpyruvate	Cytosol	C9H7O3	-1
pi	Phosphate	Cytosol	HO4P	-2
pi[e]	Phosphate	Extracellular	HO4P	-2
pime	Pimelate	Cytosol	C7H10O4	-2
pime[e]	Pimelate	Extracellular	C7H10O4	-2
pmcoa	Pimeloyl-CoA	Cytosol	C37H62N7O17P3S	-4
pnto-R	(R)-Pantothenate	Cytosol	C9H16NO5	-1
ppbng	Porphobilinogen	Cytosol	C10H13N2O4	-1
pphn	Prephenate	Cytosol	C10H8O6	-2
ppi	Diphosphate	Cytosol	HO7P2	-3
ppp9	Protoporphyrin	Cytosol	C34H32N4O4	-2
pppg9	Protoporphyrinogen IX	Cytosol	C34H38N4O4	-2
pram	5-Phospho-beta-D-riboseylamine	Cytosol	C5H11NO7P	-1
pran	N-(5-Phospho-D-riboseyl)anthranilate	Cytosol	C12H13NO9P	-1
pro-L	L-Proline	Cytosol	C5H9NO2	0
pro-L[e]	L-Proline	Extracellular	C5H9NO2	0
ppp	5-Phospho-alpha-D-ribose 1-diphosphate	Cytosol	C5H8O14P3	-5
ps_HP	Phosphatidylserine, <i>Helicobacter pylori</i> specific	Cytosol	C39H73NO10P	-1
pser-D	D-O-Phosphoserine	Cytosol	C3H6NO6P	-2
pser-L	O-Phospho-L-serine	Cytosol	C3H6NO6P	-2
ptrc	Putrescine	Cytosol	C4H14N2	2
pyr	Pyruvate	Cytosol	C3H3O3	-1
pyr[e]	Pyruvate	Extracellular	C3H3O3	-1
quln	Quinolate	Cytosol	C7H3NO4	-2
r1p	alpha-D-Ribose 1-phosphate	Cytosol	C5H9O8P	-2
r5p	alpha-D-Ribose 5-phosphate	Cytosol	C5H9O8P	-2

Abbreviation	Official name	Compartment	Formula	Charge
rhcys	S-Ribosyl-L-homocysteine	Cytosol	C9H17NO6S	0
rib-D	D-Ribose	Cytosol	C5H10O5	0
ribflv	Riboflavin	Cytosol	C17H20N4O6	0
ru5p-D	D-Ribulose 5-phosphate	Cytosol	C5H9O8P	-2
s7p	Sedoheptulose 7-phosphate	Cytosol	C7H13O10P	-2
sbzcoa	O-Succinylbenzoyl-CoA	Cytosol	C32H39N7O20P3S	-5
ser-D	D-Serine	Cytosol	C3H7NO3	0
ser-D[e]	D-Serine	Extracellular	C3H7NO3	0
ser-L	L-Serine	Cytosol	C3H7NO3	0
ser-L[e]	L-Serine	Extracellular	C3H7NO3	0
skm	Shikimate	Cytosol	C7H9O5	-1
skm5p	Shikimate 5-phosphate	Cytosol	C7H8O8P	-3
sl26da	N-Succinyl-LL-2,6-diaminoheptanedioate	Cytosol	C11H16N2O7	-2
sl2a6o	N-Succinyl-2-L-amino-6-oxoheptanedioate	Cytosol	C11H12NO8	-3
so3	Sulfite	Cytosol	O3S	-2
so4	Sulfate	Cytosol	O4S	-2
so4[e]	Sulfate	Extracellular	O4S	-2
sprmd	Spermidine	Cytosol	C7H22N3	3
sprm	Spermine	Cytosol	C10H30N4	4
ssaltpp	Succinate semialdehyde-thiamin diphosphate anion	Cytosol	C16H21N4O10P2S	-3
sucbz	o-Succinylbenzoate	Cytosol	C11H8O5	-5
succ	Succinate	Cytosol	C4H4O4	-2
succ[e]	Succinate	Extracellular	C4H4O4	-2
succoa	Succinyl-CoA	Cytosol	C25H35N7O19P3S	-5
suchms	O-Succinyl-L-homoserine	Cytosol	C8H12NO6	-1
thdp	2,3,4,5-Tetrahydrodipicolinate	Cytosol	C7H7NO4	-2
thf	5,6,7,8-Tetrahydrofolate	Cytosol	C19H22N7O6	-1
thm	Thiamin	Cytosol	C12H17N4OS	1
thm[e]	Thiamin	Extracellular	C12H17N4OS	1
thmmp	Thiamin monophosphate	Cytosol	C12H16N4O4PS	-1
thmpp	Thiamine diphosphate	Cytosol	C12H16N4O7P2S	-2
thr-L	L-Threonine	Cytosol	C4H9NO3	0
thr-L[e]	L-Threonine	Extracellular	C4H9NO3	0
thymd	Thymidine	Cytosol	C10H14N2O5	0
thymd[e]	Thymidine	Extracellular	C10H14N2O5	0
trdox	Oxidized thioredoxin	Cytosol	X	0
trdrd	Reduced thioredoxin	Cytosol	XH2	0
trnaglu	tRNA (Glu)	Cytosol	R	0
trp-L	L-Tryptophan	Cytosol	C11H12N2O2	0
trp-L[e]	L-Tryptophan	Extracellular	C11H12N2O2	0
tyr-L	L-Tyrosine	Cytosol	C9H11NO3	0
tyr-L[e]	L-Tyrosine	Extracellular	C9H11NO3	0
u23ga_HP	UDP-2(3-hydroxyoctadecanoyl)-3(3-hydroxypalmetoyl)glucosamine	Cytosol	C49H87N3O20P2	-2
u2ga_HP	UDP-2,3-hydroxyoctadecanoyl-octadecanoyl-D-glucosamine	Cytosol	C51H92N3O19P2	-1
u2hga_HP	UDP-2-hydroxyoctadecanoyl-D-glucosamine	Cytosol	C33H58N3O18P2	-1
u3aga_HP	UDP-3-O-(3-hydroxypalmetoyl)-N-acetylglucosamine	Cytosol	C33H55N3O19P2	-2
u3hga_HP	UDP-3-O(3-hydroxypalmetoyl)-D-glucosamine	Cytosol	C31H54N3O18P2	-1
uaagmda	Undecaprenyl-diphospho-N-acetylmuramoyl-(N-acetylglucosamine)-L-ala-D-glu-meso-2,6-diaminopimeloyl-D-ala-D-ala	Cytosol	C95H152N8O28P2	-4
uaccg	UDP-N-acetyl-3-O-(1-carboxyvinylyl)-D-glucosamine	Cytosol	C20H26N3O19P2	-3
uacgam	UDP-N-acetyl-D-glucosamine	Cytosol	C17H25N3O17P2	-2
uagmda	Undecaprenyl-diphospho-N-acetylmuramoyl-L-alanyl-D-glutamyl-meso-2,6-diaminopimeloyl-D-alanyl-D-alanine	Cytosol	C87H139N7O23P2	-4
uama	UDP-N-acetylmuramoyl-L-alanine	Cytosol	C23H33N4O20P2	-3
uamag	UDP-N-acetylmuramoyl-L-alanyl-D-glutamate	Cytosol	C28H39N5O23P2	-4
uamr	UDP-N-acetylmuramate	Cytosol	C20H28N3O19P2	-3
udcpdp	Undecaprenyl diphosphate	Cytosol	C55H89O7P2	-3

Abbreviation	Official name	Compartment	Formula	Charge
udcpp	Undecaprenyl phosphate	Cytosol	C55H89O4P	-2
udp	UDP	Cytosol	C9H11N2O12P2	-3
udpg	UDPglucose	Cytosol	C15H22N2O17P2	-2
udpgal	UDPgalactose	Cytosol	C15H22N2O17P2	-2
ugam	UDP-glucosamine	Cytosol	C15H24N3O16P2	-1
ugmd	UDP-N-acetylmuramoyl-L-alanyl-D-gamma-glutamyl-meso-2,6-diaminopimelate	Cytosol	C35H51N7O26P2	-4
ugmda	UDP-N-acetylmuramoyl-L-alanyl-D-glutamyl-meso-2,6-diaminopimeloyl-D-alanyl-D-alanine	Cytosol	C41H61N9O28P2	-4
ump	UMP	Cytosol	C9H11N2O9P	-2
uppg1	Uroporphyrinogen I	Cytosol	C40H36N4O16	-8
uppg3	Uroporphyrinogen III	Cytosol	C40H36N4O16	-8
ura	Uracil	Cytosol	C4H4N2O2	0
ura[e]	Uracil	Extracellular	C4H4N2O2	0
urea	Urea	Cytosol	CH4N2O	0
urea[e]	Urea	Extracellular	CH4N2O	0
uri	Uridine	Cytosol	C9H12N2O6	0
uri[e]	Uridine	Extracellular	C9H12N2O6	0
utp	UTP	Cytosol	C9H11N2O15P3	-4
val-L	L-Valine	Cytosol	C5H11NO2	0
val-L[e]	L-Valine	Extracellular	C5H11NO2	0
xan	Xanthine	Cytosol	C5H4N4O2	0
xan[e]	Xanthine	Extracellular	C5H4N4O2	0
xmp	Xanthosine 5'-phosphate	Cytosol	C10H11N4O9P	-2
xtsn	Xanthosine	Cytosol	C10H12N4O6	0
xu5p-D	D-Xylulose 5-phosphate	Cytosol	C5H9O8P	-2

Table S2A: List of genes and reactions included in *i*T341 GSM/GRP

Gene Locus	Abbreviation	Official Name	Equation	Confidence Level	EC Number	Protein Description	Pathway	References
HP0002, HP1574	RBFSa	Riboflavin synthase	[c] : 4r5au + db4p --> dmlz + (2) h2o + pi	4	EC 2.5.1.9	RibC, RibE	Riboflavin Metabolism	Fassbinder et al., 2000; Tomb et al., 1997
HP0002, HP1574	RBFSb	Riboflavin synthase	[c] : (2) dmlz --> 4r5au + ribflv	4	EC 2.5.1.9	RibC, RibE	Riboflavin Metabolism	Fassbinder et al., 2000; Tomb et al., 1997
HP0003	KDOPS	3-deoxy-D-manno-oculosonic acid-8-phosphate	[c] : ara5p + h2o + pep --> kdo8p + pi	2	EC 4.1.2.16	KdsA	LPS Biosynthesis	Tomb et al., 1997
HP0004, HP1186	HCO3E	carbonic anhydrase	[c] : co2 + h2o <=> h + hco3	4		Icfa, Cah	Others	Chirica et al., 2002; Mobley et al., 2001; Tomb et al., 1997
HP0005	OMPDC	Orotidine-5'-phosphate decarboxylase	[c] : h + orot5p --> co2 + ump	4	EC 4.1.1.23	PyrF	UTP/CTP de novo Synthesis	Mendez, Jimenez et al. 1994a; Tomb et al., 1997
HP0006	PANTS	Pantothenate synthase	[c] : ala-B + atp + pant-R --> amp + h + pnto-R + ppi	2	EC 6.3.2.1	PanC	Pantothenate/ CoA Biosynthesis	Tomb et al., 1997
HP0026	CS	Citrate synthase	atp[c] + h2o[c] + so4[e] --> adp[c] + h[c] + p[c] + so4[c]	4	EC 4.1.3.7	Gita	TCA cycle	Dunkley et al., 1999; Pitson et al., 1999; Tomb et al., 1997
HP0027	ICDHyr	Isocitrate dehydrogenase (NADP)	[c] : icit + nadp <=> akg + co2 + nadph	4	EC 1.1.1.42	Icd	TCA cycle	Pitson et al., 1999; Tomb et al., 1997
HP0029	DBTSr	Dethiobiotin synthase	[c] : atp + co2 + dann <=> adp + dtbt + (3) h + pi	2	EC 6.3.3.3	BioD	Biotin Biosynthesis	Tomb et al., 1997
HP0034	ASP1DC	Aspartate 1-decarboxylase	[c] : asp-L + h --> ala-B + co2	4	EC 4.1.1.11	PanD	Pantothenate/ CoA Biosynthesis	Kwon et al., 2002; Tomb et al., 1997
HP0043	MAN1PT2r	Mannose-1-phosphate guanylyltransferase (GDP)	[c] : gdp + h + man1p <=> gdpmann + pi	4	EC 2.7.7.22	AlgA	Fucose Biosynthesis	Wu et al., 2002; Boneca et al., 2003
HP0043	MAN6PI	Mannose-6-phosphate isomerase	[c] : man6p <=> f6p	4	EC 5.3.1.8	ManC	Fucose Biosynthesis	Wu et al., 2002; Boneca et al., 2003
HP0044	GMAND	GDP-D-mannose dehydratase	[c] : gdpmann --> gdpddman + h2o	4	EC 4.2.1.47	Gmd	Fucose Biosynthesis	Wu et al., 2001; Boneca et al., 2003
HP0045	GFUCS	GDP-L-fucose synthase	[c] : gdpddman + h + nadph --> gdpfuc + nadp	4	EC 1.1.1.271	Fcl	Fucose Biosynthesis	Wu et al., 2001; Boneca et al., 2003
HP0055	PRO14r	Proline transporter	na1[e] + pro-L[e] <=> na1[c] + pro-L[c]	2		PutP	Transport	Mobley et al., 2001; Tomb et al., 1997
HP0056	P5CD	1-Pyrroline-5-carboxylate dehydrogenaseII	[c] : 1pyr5c + (2) h2o + nad --> glu-L + h + nadh	2	EC 1.5.1.12	PutA	Glutamate Metabolism	Tomb et al., 1997
HP0056	PUTA3	1-Pyrroline-5-carboxylate dehydrogenase	[c] : glu5sa + h2o + nad --> glu-L + (2) h + nadh	2	EC 1.5.1.12	PutA	Glutamate Metabolism	Tomb et al., 1997
HP0056	4HGLSD	L-4-Hydroxyglutamate semialdehyde dehydrogenase, mitochondrial	[c] : 4hglusa + h2o + nad <=> e4hglu + (2) h + nadh	2	EC 1.5.1.12	PutA	Glyoxylate Metabolism	Tomb et al., 1997
HP0056	HPROx	L-Hydroxyproline oxidase (NAD)	[c] : 4hpro-LT + nad --> 1p3h5c + (2) h + nadh	2	EC1.5.1.12	PutA	Glyoxylate Metabolism	Tomb et al., 1997
HP0056	PHCD	L-1-Pyrroline-3-hydroxy-5-carboxylate dehydrogenase	[c] : 1p3h5c + (2) h2o + nad --> e4hglu + h + nadh	2	EC 1.5.1.12	PutA	Glyoxylate Metabolism	Tomb et al., 1997
HP0056	PROD2	Proline dehydrogenase	[c] : fad + pro-L --> 1pyr5c + fadh2 + h	2	EC 1.5.99.8	PutA	Proline Metabolism	Tomb et al., 1997
HP0067 -HP0070, HP0072-73	UREA	Urease	[c] : (2) h + h2o + urea --> co2 + (2) nh4	4	EC 3.5.1.5	UreA, UreB, UreE, UreF, UreG, UreH	Urea Cycle	Mobley et al., 2001; Tomb et al., 1997; Bauerfeind et al., 1997; Kelly, 1998
HP0071	UREAt	Urea transport via facilitate diffusion	urea[e] <=> urea[c]	4		Urel	Transport	Weeks et al., 2000; Bury-Mone et al., 2001; Tomb et al., 1997
HP0075	PGAMT	Phosphoglucosamine mutase	[c] : gam1p <=> gam6p	4	EC 5.4.2.10	GlmM	Aminosugar Metabolism	De Reuse et al., 1997; Tomb et al., 1997
HP0086	MDH4	Malate dehydrogenase (menaquinone 6 as acceptor)	[c] : mal-L + mqn6 --> mql6 + oaa	4	EC 1.1.99.16	Mqo	TCA cycle	Kather et al., 2000; Boneca et al., 2003
HP0089	MTAN	Methylthioadenosine nucleosidase	[c] : 5mta + h2o --> 5mtr + ade	2	EC 3.2.2.16	Mtn	Methionine Salvage Pathway	Sekowska et al., 2004; Tomb et al., 1997
HP0089	AHCYSNS	S-Adenosylhomocysteine nucleosidase	[c] : ahcys + h2o --> ade + rhcys	2	EC 3.2.2.9	Mtn	Others	Tomb et al., 1997
HP0090	MCOATA	Malonyl-CoA-ACP transacylase	[c] : ACP + malcoa <=> coa + malACP	2	EC 2.3.1.39	FabD	Fatty Acid Synthesis	Mobley et al., 2001; Tomb et al., 1997
HP0093, HP0094, HP0159, HP0208, HP0279, HP0826, HP1416	LPSSYN-HP	Formation for LPS from Core oligosaccharide-Lipid A and O-chain	[c] : adphep-D,D + core_lps_hp + (3) gdpfuc + (2) uacgam + udpg + (2) udpgal --> adp + (3) gdp + lps_HP + (5) udp	3		RfaC, RfaJ, FucC, GalTb	LPS Biosynthesis	Monteiro et al., 2000; Logan et al., 2000; Dumon et al., 2004; Tomb et al., 1997
HP0096, HP0397	PGCD	Phosphoglycerate dehydrogenase	[c] : 3pg + nad --> 3php + h + nadh	2	EC 1.1.1.95	SerA	Serine Metabolism	Tomb et al., 1997
HP0098	THRS	Threonine synthase	[c] : h2o + phom --> pi + thr-L	2	EC 4.2.3.1	ThrC	Threonine Biosynthesis	Tomb et al., 1997
HP0105	RHCCE	S-Ribosylhomocysteine cleavage enzyme	[c] : rhcys --> dhptd + hcys-L	4		LuxS	Others	Zhu et al., 2003; Forsyth and Cover, 2000; Tomb et al., 1997
HP0106	AHSERL2	O-Acetylhomoserine (thiol)-lyase	[c] : achms + h2s --> ac + h + hcys-L	2	EC 4.2.99.8	MetB	Methionine Metabolism	Tomb et al., 1997
HP0106	METB1r	Cystathionine gamma-synthase	[c] : achms + cys-L <=> ac + cyst-L + h	2	EC2.5.1.48	MetB	Methionine Metabolism	Tomb et al., 1997
HP0106	SHSL1r	O-Succinylhomoserine lyase reversible	[c] : cys-L + suchms <=> cyst-L + h + succ	2	EC2.5.1.48	MetB	Methionine Metabolism	Tomb et al., 1997
HP0106	SHSL2r	O-Succinylhomoserine lyase (H2S)	[c] : h2s + suchms <=> h + hcys-L + succ	2	EC2.5.1.48	MetB	Methionine Metabolism	Tomb et al., 1997
HP0106	SHSL4r	O-Succinylhomoserine lyase (elimination), reversible	[c] : h2o + suchms <=> 2obut + h + nh4 + succ	2	EC2.5.1.48	MetB	Methionine Metabolism	Tomb et al., 1997
HP0107	CYSS	Cysteine synthase	[c] : acser + h2s --> ac + cys-L + h	2	EC 4.2.99.8	CysC	Methionine Metabolism	Tomb et al., 1997
HP0112	FCLPA	L-Fuculose 1-phosphate aldolase	[c] : fc1p <=> dhap + lald-L	2	EC 4.1.2.17	FucA	Fucose Biosynthesis	Boneca et al., 2003; Joerger et al., 2000; Tomb et al., 1997
HP0121	PPS	Phosphoenolpyruvate synthase	[c] : atp + h2o + pyr --> amp + (2) h + pep + pi	2	EC 2.7.9.2	Ppsa	Glycolysis	Tomb et al., 1997
HP0132	SERD-L	L-Serine deaminase	[c] : ser-L --> nh4 + pyr	4	EC4.3.1.17	SdaA	Serine Metabolism	Mobley et al., 2001; Nagata et al., 2003; Mendz and Hazell, 1995; Tomb et al., 1997
HP0132	THRD-L	L-Threonine deaminase	[c] : thr-L --> 2obut + nh4	2	EC4.3.1.19	SdaA	Threonine Metabolism	Tomb et al., 1997
HP0133	SER12r	L-Serine reversible transport via proton symport	h[e] + ser-L[e] <=> h[c] + ser-L[c]	2		SdaC	Transport	Mobley et al., 2001; Tomb et al., 1997
HP0134	DDPA	3-Deoxy-D-arabino-heptulosonate 7-phosphate synthetase	[c] : e4p + h2o + pep --> 2dda7p + pi	2	EC 4.1.2.15	Dhs1	Chorismate Biosynthesis	Tomb et al., 1997
HP0140, HP0141	L-LAC12r	L-Lactate reversible transport via proton symport	h[e] + lac-L[e] <=> h[c] + lac-L[c]	2		LctP	Transport	Tomb et al., 1997
HP0144 - HP0147, HP1227	CYOO-HP	Cytochrome c 553 oxidase, Hplyori	(4) fcyctcc553[c] + (5.98) h[c] + o2[c] --> (4) fcyctcc553[c] + (2) h[e] + (1.99) h2o[c] + (0.0050) o2-[c]	4	EC 1.9.3.1	C553, CcoQ, FixN, FixO, FixP	Respiratory chain	Tsukita et al., 1999; Nagata et al., 1996; Nagata et al., 1998; Tomb et al., 1997
HP0154	ENO	Enolase	[c] : 2pg <=> h2o + pep	2	EC 4.2.1.11	Eno	Glycolysis	Tomb et al., 1997
HP0157	SHKK	Shikimate kinase	[c] : atp + skm --> adp + h + skm5p	2	EC 2.7.1.71	AroK	Chorismate Biosynthesis	Tomb et al., 1997
HP0163	PPBNGS	Porphobilinogen synthase	[c] : (2) 5aop --> h + (2) h2o + ppbng	2	EC 4.2.1.24	HemB	Heme biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP0176	FBA	Fructose-bisphosphate aldolase	[c] : fdp <=> dhap + g3p	4	EC 4.1.2.13	Fba	Glycolysis	Hoffman et al., 1996; Tomb et al., 1997
HP0176	FBA2	D-Fructose 1-phosphate D-glyceraldehyde-3-phosphate-lyase	[c] : f1p <=> dhap + glyald	2	EC 4.1.2.13	Fba	Others	Tomb et al., 1997
HP0183	GHMT2r	Glycine hydroxymethyltransferase, reversible	[c] : ser-L + thf <=> gly + h2o + mlthf	2	EC 2.1.2.1	GlyA	Glycine Metabolism	Tomb et al., 1997

Gene Locus	Abbreviation	Official Name	Equation	Confidence Level	EC Number	Protein Description	Pathway	References
HP0191, HP0192, HP0193	FRD5	Fumarate reductase	[c] : fum + mql6 <==> mqn6 + succ	4	EC 1.3.99.1	FrdA, FrdB, FrdC	TCA cycle	Ge et al., 1997; Mendz, Hazell et al. 1995; Tomb et al., 1997
HP0194	TPI	Triose-phosphate isomerase	[c] : dhap <==> g3p	4	EC 5.3.1.1	Tpi	Glycolysis	Hoffman et al., 1996; Mendz, Hazell et al. 1994a; Tomb et al., 1997
HP0196	U23GAAT-HP	UDP-3-O-(3-hydroxypalmetoyl)glycosamine acyltransferase	[c] : 3hoctaACP + u3hga_HP -> ACP + h + u23ga_HP	2		LpxD	LPS Biosynthesis	Tomb et al., 1997
HP0197	METAT	Methionine adenosyltransferase	[c] : atp + h2o + met-L -> amet + pi + ppi	2	EC 2.5.1.6	MetX	Spermidine Biosynthesis	Tomb et al., 1997
HP0198	NDPK8	Nucleoside-diphosphate kinase (ATP:dADP)	[c] : atp + dadp <==> adp + datp	2	EC 2.7.4.6	Ndk	dATP Biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP0198	NDPK7	Nucleoside-diphosphate kinase (ATP:dCDP)	[c] : atp + dcdp <==> adp + dctp	2	EC 2.7.4.6	Ndk	dCTP Biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP0198	NDPK5	Nucleoside-diphosphate kinase (ATP:dGDP)	[c] : atp + dgdp <==> adp + dgtp	2	EC 2.7.4.6	Ndk	dGTP Biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP0198	NDPK4	Nucleoside-diphosphate kinase (ATP:dTDP)	[c] : atp + dtdp <==> adp + dttp	2	EC 2.7.4.6	Ndk	dTTP Biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP0198	NDPK6	Nucleoside-diphosphate kinase (ATP:dUDP)	[c] : atp + dudp <==> adp + dutp	2	EC 2.7.4.6	Ndk	dUTP Biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP0198	NDPK1	Nucleoside-diphosphate kinase (ATP:GDP)	[c] : atp + gdp <==> adp + gtp	2	EC 2.7.4.6	Ndk	GTP de novo Synthesis	Mobley et al., 2001; Tomb et al., 1997
HP0198	NDPK3	Nucleoside-diphosphate kinase (ATP:CDP)	[c] : atp + cdp <==> adp + ctp	2	EC 2.7.4.6	Ndk	Nucleotide interconversion	Mobley et al., 2001; Tomb et al., 1997
HP0198	NDPK2	Nucleoside-diphosphate kinase (ATP:UDP)	[c] : atp + udp <==> adp + utp	4	EC 2.7.4.6	Ndk	UTP/CTP de novo Synthesis	Mendez, Jimenez et al. 1994a; Tomb et al., 1997
HP0202	KAS-HP2	B-ketoacyl synthase	[c] : accoa + h + malACP -> actACP + co2 + coa	2	EC2.3.1.41	FabH	Fatty Acid Synthesis	Mobley et al., 2001; Tomb et al., 1997
HP0202	ACOATA	Acetyl-CoA ACP transacylase	[c] : ACP + accoa <==> acACP + coa	2	EC 2.3.1.38	FabH	Fatty Acid Synthesis	Mobley et al., 2001; Tomb et al., 1997
HP0212	SODPS	Succinyl-diaminopimelate desuccinylase	[c] : h2o + sl26da -> 26dap-LL + succ	4	EC 3.5.1.18	DapE	Lysine Biosynthesis	Karita et al., 1997; Tomb et al., 1997
HP0215	DASYN-HP	CDP-Diacylglycerol synthetase Hp specific	[c] : ctp + h + pa_Hp <==> cdpgag_HP + ppi	2	EC 2.7.7.41	CdsA	Glycerolipid Synthesis	Mobley et al., 2001; Tomb et al., 1997
HP0216	DXPRII	1-deoxy-D-xylulose reductoisomerase	[c] : dxyl5p + h + nadph -> 2me4p + nadp	2	EC1.1.1.267	Dxr	Isoprenoid Biosynthesis	Boneca et al., 2003
HP0228	SULabc	Sulfate transport via ABC system	atp[c] + h2o[c] + so4[e] -> adp[c] + h[c] + pi[c] + so4[c]	2		Sop	Transport	Boneca et al., 2003
HP0230	KDOCT	3-deoxy-manno-oculosonate cytidylyltransferase	[c] : ctp + kdo -> cmpkdo + ppi	2	EC 2.7.7.38	KdsB	LPS Biosynthesis	Tomb et al., 1997
HP0237	HMBS	Hydroxymethylbilane synthase	[c] : h2o + (4) ppbng -> hmbil + (4) nh4	2	EC 4.3.1.8	HemC	Heme biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP0239	GLUTRR	Glutamy-HRNA reductase	[c] : glutma + h + nadph -> glu1sa + nadp + tmaglu	2	EC1.2.1.-	HemA	Heme biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP0240	OCTDPS	Octaprenyl pyrophosphate synthase	[c] : frdp + (5) ipdp -> octdp + (5) ppi	2	EC2.5.1.-	ispB	Others	Mobley et al., 2001; Tomb et al., 1997
HP0255	ADSS	Adenylosuccinate synthase	[c] : asp-L + gtp + imp -> dcamp + gdp + (2) h + pi	2	EC 6.3.4.4	PurA	ATP de novo Synthesis	Mobley et al., 2001; Tomb et al., 1997
HP0266, HP0581	DHORTS	Dihydroorotase	[c] : dhor-S + h2o <==> cbasp + h	4	EC 3.5.2.3	PurC	UTP/CTP de novo Synthesis	Shepley, 1995; Tomb et al., 1997
HP0279	RFAC-HP	Formation of lipidA and sugar core for Hplyori LPS	[c] : adphep-D,D + adphep-L,D + adphep7p-L,D + kdolipid4_HP + (2) udpg + udpgal -> (3) adp + core_lps_hp + (3) udp	3		RfAc	LPS Biosynthesis	Monteiro et al., 2000; Tomb et al., 1997
HP0283	DHQS	3-dehydroquininate synthase	[c] : 2dda7p -> 3dhq + pi	2	EC4.2.3.4	AroB	Chorismate Biosynthesis	Tomb et al., 1997
HP0290	DAPDC	Diaminopimelate decarboxylase	[c] : 26dap-M + h -> co2 + lys-L	2	EC 4.1.1.20	LysA	Lysine Biosynthesis	Tomb et al., 1997
HP0291	CHORM	Chorismate mutase	[c] : chor -> pphn	2	EC 5.4.99.5	PheA	Phenylalanine Biosynthesis	Boneca et al., 2003; Tomb et al., 1997
HP0293	PABB	aminodeoxychorismate synthase	[c] : chor + nh4 -> 4adcho + h2o	2	EC6.3.5.8	PabB	Folate Biosynthesis	Tomb et al., 1997
HP0294	AMID2	Aliphatic amidase, 2-Phenylacetamide	[c] : h2o + pad -> nh4 + pac	4	EC3.5.1.4	AmiE	Others	Skoulouris et al., 2001; Tomb et al., 1997
HP0294	AMID4	Aliphatic amidase, acetamide	[c] : ad + h2o -> ac + nh4	4	EC3.5.1.4	AmiE	Others	Skoulouris et al., 2001; Tomb et al., 1997
HP0294	AMID5	Aliphatic amidase, acrylamide	[c] : aa + h2o -> acryl + nh4	4	EC3.5.1.4	AmiE	Others	Skoulouris et al., 2001; Tomb et al., 1997
HP0306	G1SAT1	Glutamate-1-semialdehyde aminotransferase	[c] : glu1sa -> 5aop	2	EC 5.4.3.8	HemL	Heme biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP0313	NARK	Nitrite transport	no2[c] -> no2[e]	2		NarK	Transport	Tomb et al., 1997
HP0321	GK1	Guanylate kinase (GMP:ATP)	[c] : atp + gmp <==> adp + gdp	2	EC 2.7.4.8	Gmk	GTP de novo Synthesis	Mobley et al., 2001; Tomb et al., 1997
HP0321	DGK1	Deoxyguanylate kinase (dGMP:ATP)	[c] : atp + dgmp <==> adp + dgdp	2	EC 2.7.4.8	Gmk	Nucleotide interconversion	Mobley et al., 2001; Tomb et al., 1997
HP0329	NADS1	NAD synthase (nh3)	[c] : atp + dnad + nh4 -> amp + h + nad + ppi	4	EC 6.3.1.5	NadE	Nicotinate Biosynthesis	Kang et al., 2003; Tomb et al., 1997
HP0330	KARA2i	Ketol-acid reductoisomerase (2-Aceto-2-hydroxybutanoate)	[c] : 2ahbut + h + nadph -> 23dhmp + nadp	2	EC 1.1.1.86	ilvC	Isoleucine Metabolism	Tomb et al., 1997
HP0330	KARA1i	Acetohydroxy acid isomeroeductase	[c] : alac-S + h + nadph -> 23dhmb + nadp	2	EC 1.1.1.86	ilvC	Valine Metabolism	Tomb et al., 1997
HP0349	CTPS1	CTP synthase (NH3)	[c] : atp + nh4 + utp -> adp + ctp + (2) h + pi	4	EC 6.3.4.2	PyrG	UTP/CTP de novo Synthesis	Mendez, Jimenez et al. 1994a; Tomb et al., 1997
HP0354	DXPS	1-Deoxy-D-xylulose 5-phosphate synthase	[c] : g3p + h + pyr -> co2 + dxyl5p	2	EC2.2.1.7	Dxs	Isoprenoid Biosynthesis	Tomb et al., 1997
HP0360	UDPG4E	UDPglucose 4-epimerase	[c] : udpg <==> udpgal	4	EC 5.1.3.2	GaiE	LPS Biosynthesis	Kwon et al., 1998; Tomb et al., 1997
HP0364, HP0680	RNDR1	Ribonucleoside-diphosphate reductase (ADP)	[c] : adp + trdr -> dadp + h2o + trdox	2	EC 1.17.4.1	NrdA, NrdB	dATP Biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP0364, HP0680	RNDR3	Ribonucleoside-diphosphate reductase (CDP)	[c] : cdp + trdr -> dcdp + h2o + trdox	2	EC 1.17.4.1	NrdA, NrdB	dCTP Biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP0364, HP0680	RNDR2	Ribonucleoside-diphosphate reductase (GDP)	[c] : gdp + trdr -> dgdp + h2o + trdox	4	EC 1.17.4.1	NrdA, NrdB	dGTP Biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP0364, HP0680	RNDR4	Ribonucleoside-diphosphate reductase (UDP)	[c] : trdr + udp -> dudp + h2o + trdox	2	EC 1.17.4.1	NrdA, NrdB	dUTP Biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP0370, HP0371, HP0557, HP0950	ACCOACr	Acetyl-CoA carboxylase, reversible reaction	[c] : accoa + atp + hco3 <==> adp + h + malcoa + pi	4	EC 6.4.1.2	AccA, AccC, AccD	Fatty Acid Synthesis	Burns et al., 1995; Tomb et al., 1997
HP0372	DCTPD	DCTP deaminase	[c] : dctp + h + h2o -> dutp + nh4	2	EC 3.5.4.13	Dcd	Nucleotide interconversion	Mobley et al., 2001; Tomb et al., 1997
HP0372	DCTPD2	DCTP deaminase	[c] : ctp + h + h2o -> nh4 + utp	2	EC 3.5.4.13	Dcd	Nucleotide interconversion	Tomb et al., 1997
HP0376	FCLT	Ferrocyclatase	[c] : fe2 + ppp9 -> (2) h + pheme	2	EC 4.99.1.1	HemH	Heme biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP0380	GLUDy	Glutamate dehydrogenase (NADP)	[c] : glu-L + h2o + nadp <==> akg + h + nadph + nh4	4	EC 1.4.1.4	GdhA	Glutamate Metabolism	Mobley et al., 2001; Tomb et al., 1997
HP0381	PPPGO	Protoporphyrinogen oxidase	[c] : (1.5) o2 + pppg9 -> (3) h2o + ppp9	2	EC 1.3.3.4	HemK	Heme biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP0389	SPODM	Superoxide dismutase	[c] : (2) h + (2) o2- -> h2o2 + o2	4	EC 1.15.1.1	SodB	ROS detoxification	Seyler et al., 2001; Tomb et al., 1997
HP0396	OPHBDC	Octaprenyl-hydroxybenzoate decarboxylase	[c] : 3ophb + h -> 2oph + co2	2	EC4.1.1.-	UbiD	Ubiquinone Biosynthesis	Boneca et al., 2003
HP0400	DMPPS	1-Hydroxy-2-methyl-2-(E)-butenyl 4-diphosphate reductase (dmpp)	[c] : h + h2mb4p + nadh -> dmpp + h2o + nad	2		IspH	Isoprenoid Biosynthesis	Boneca et al., 2003
HP0400	IPDPS	1-Hydroxy-2-methyl-2-(E)-butenyl 4-diphosphate reductase (ipdp)	[c] : h + h2mb4p + nadh -> h2o + ipdp + nad	2	EC1.17.1.2	IspH	Isoprenoid Biosynthesis	Boneca et al., 2003
HP0401	PSCVT	3-Phosphoshikimate 1-carboxyvinyltransferase	[c] : pep + skm5p <==> 3psme + pi	2	EC 2.5.1.19	AroA	Chorismate Biosynthesis	Tomb et al., 1997

Gene Locus	Abbreviation	Official Name	Equation	Confidence Level	EC Number	Protein Description	Pathway	References
HP0409	GMPS2	GMP synthase	[c] : atp + gln-L + h2o + xmp --> amp + glu-L + gmp + (2) h + ppi	2	EC 6.3.5.2	GuaA	GTP de novo Synthesis	Mobley et al., 2001; Tomb et al., 1997
HP0422	GLUDC	Glutamate Decarboxylase	[c] : glu-L + h --> 4abut + co2	2	EC 4.1.1.15	SpeA	Glutamate Metabolism	Tomb et al., 1997
HP0422	ARGDC	Arginine decarboxylase	[c] : arg-L + h --> agm + co2	2	EC 4.1.1.19	SpeA	Spermidine Biosynthesis	Tomb et al., 1997
HP0476, HP0643	GLUTRS	Glutamyl-tRNA synthetase	[c] : atp + glu-L + trnagu --> amp + glutma + ppi	2	EC 6.1.1.17	GitX	Heme biosynthesis	Tomb et al., 1997
HP0493	PAPPT3	Phospho-N-acetylmuramoyl-pentapeptide-transferase (meso-2,6-diaminopimelate)	[c] : udcp + ugmda --> uagmda + ump	2	EC 2.7.8.13	MraY	Peptidoglycan Biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP0494	UAMAGS	UDP-N-acetylmuramoyl-L-alanyl-D-glutamate synthetase	[c] : atp + glu-D + uama --> adp + h + pi + uamag	2	EC 6.3.2.9	MurD	Peptidoglycan Biosynthesis	Tomb et al., 1997
HP0509	GLYCTO1	Glycolate oxidase	[c] : glyclt + o2 --> glx + h2o2	2	EC 1.1.3.15	GlcD	Others	Mobley et al., 2001; Tomb et al., 1997
HP0510	DHDPRy	Dihydrodipicolinate reductase (NADPH)	[c] : 23dhdp + h + nadph --> nadp + thdp	2	EC 1.3.1.26	DapB	Lysine Biosynthesis	Tomb et al., 1997
HP0512	GLNS	Glutamine synthetase	[c] : atp + glu-L + nh4 --> adp + gln-L + h + pi	4	EC 6.3.1.2	GlnA	Glutamine Biosynthesis	Garner et al., 1998; Tomb et al., 1997
HP0549	GLUR	Glutamate racemase	[c] : glu-D <=> glu-L	2	EC 5.1.1.3	Glr	Others	Mobley et al., 2001; Tomb et al., 1997
HP0558	KAS-HP	β-ketoacyl synthase	[c] : acACP + h + malACP --> ACP + actACP + co2	2	EC2.3.1.41	FabF	Fatty Acid Synthesis	Mobley et al., 2001; Tomb et al., 1997
HP0558, HP0561, HP0195, HP1376	C140SN	Fatty acid biosynthesis (n-C14:0)	[c] : actACP + (17) h + (5) malACP + (12) nadph --> (5) ACP + (5) co2 + (6) h2o + mysrACP + (12) nadp	2		FabF, FabG, FabI, FabZ	Fatty Acid Synthesis	Tomb et al., 1997
HP0558, HP0561, HP0195, HP1376	C160SN	Fatty acid biosynthesis (n-C16:0)	[c] : actACP + (20) h + (6) malACP + (14) nadph --> (6) ACP + (6) co2 + (7) h2o + (14) nadp + palmACP	2		FabF, FabG, FabI, FabZ	Fatty Acid Synthesis	Tomb et al., 1997
HP0558, HP0561, HP0195, HP1376	C180SN	Fatty acid biosynthesis (n-C18:0)	[c] : actACP + (23) h + (7) malACP + (16) nadph --> (7) ACP + (7) co2 + (8) h2o + (16) nadp + oocdaACP	2		FabF, FabG, FabI, FabZ	Fatty Acid Synthesis	Tomb et al., 1997
HP0558, HP0561, HP0195, HP1376	C181SN	Fatty acid biosynthesis (n-C18:1)	[c] : actACP + (22) h + (7) malACP + (15) nadph --> (7) ACP + (7) co2 + (8) h2o + (15) nadp + octeACP	2		FabF, FabG, FabI, FabZ	Fatty Acid Synthesis	Tomb et al., 1997
HP0558, HP0561, HP0195, HP1376	KAS15	3-Hydroxy-octadecanoyl-ACP synthase	[c] : (2) h + malACP + nadph + palmACP --> 3hactoACP + ACP + co2 + nadp	2		FabF, FabG, FabI, FabZ	Fatty Acid Synthesis	Tomb et al., 1997
HP0558, HP0561, HP0195, HP1376, HP0416	C190cSN	Fatty acid biosynthesis (C19:0cSN)	[c] : amet + octeACP --> ahcys + c190cACP + h	2		FabF, FabG, FabI, FabZ, Cfa	Fatty Acid Synthesis	Tomb et al., 1997
HP0566	DAPE	Diaminopimelate epimerase	[c] : 26dap-LL <=> 26dap-M	2	EC 5.1.1.7	DapF	Lysine Biosynthesis	Tomb et al., 1997
HP0572	ADPT	Adenine phosphoribosyltransferase	[c] : ade + prpp --> amp + ppi	4	EC 2.4.2.7	Apt	Salvage pathway of ATP	Mendez, Jimenez et al. 1994b; Mobley et al., 2001; Tomb et al., 1997
HP0574	RPI	Ribose-5-phosphate isomerase	[c] : r5p <=> ru5p-D	4	EC 5.3.1.6	Rpi	Pentose-Phosphate-Pathway	Mendez and Hazell, 1991; Boneca et al., 2003
HP0577	FTHFLI	Formate-tetrahydrofolate ligase	[c] : atp + for + thf --> 10thf + adp + pi	2	EC 6.3.4.3	FoI	THF Metabolism	Tomb et al., 1997
HP0577	MTHFC	Methylenetetrahydrofolate cyclohydrolase	[c] : h2o + methf <=> 10thf + h	2	EC 3.5.4.9	FoID	THF Metabolism	Tomb et al., 1997
HP0577	MTHFD	Methylenetetrahydrofolate dehydrogenase (NADP)	[c] : mlthf + nadp <=> methf + nadph	2	EC 1.5.1.5	FoID	THF Metabolism	Tomb et al., 1997
HP0587	ADCL	4-Aminobenzoate synthase	[c] : 4adcho --> 4abz + h + pyr	2	EC4.1.3.38	PabC	Folate Biosynthesis	Tomb et al., 1997
HP0588 - HP0591	ORR	Ferredoxin oxidoreductase	[c] : ak + coa + fdxox + h --> co2 + fdxrd + succoa	4	EC1.2.7.3	OorA, OorB, OorC, OorD	TCA cycle	Hughes et al., 1998; Tomb et al., 1997
HP0598	AOXSr	8-Amino-7-oxononanoate synthase	[c] : ala-L + h + pmcoa <=> 8aonn + co2 + coa	2	EC 2.3.1.47	BioF	Biotin Biosynthesis	Tomb et al., 1997
HP0604	UPPDC1	Uroporphyrinogen decarboxylase (uroporphyrinogen III)	[c] : (4) h + uppg3 --> (4) co2 + cpppg3	2	EC 4.1.1.37	HemE	Heme biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP0604	UPPDC2	Uroporphyrinogen decarboxylase (uroporphyrinogen I)	[c] : (4) h + uppg1 --> (4) co2 + cpppg1	2	EC 4.1.1.37	HemE	Heme biosynthesis	Tomb et al., 1997
HP0618	ADK1	Adenylate kinase	[c] : amp + atp <=> (2) adp	2	EC 2.7.4.3	Adk	ATP de novo Synthesis	Mobley et al., 2001; Tomb et al., 1997
HP0618	DADK	Deoxyadenylate kinase	[c] : atp + damp <=> adp + dadp	4	EC 2.7.4.11	Adk	Nucleotide interconversion	Mobley et al., 2001; Mendz, Jimenez et al. 1994a; Tomb et al., 1997
HP0620	PPA	Inorganic diphosphatase	[c] : h2o + ppi --> h + (2) pi	4	EC 3.6.1.1	Ppa	Others	Oliva et al., 2000; Tomb et al., 1997
HP0623	UAMAS	UDP-N-acetylmuramoyl-L-alanine synthetase	[c] : ala-L + atp + uamr --> adp + h + pi + uama	2	EC 6.3.2.8	MurC	Peptidoglycan Biosynthesis	Tomb et al., 1997
HP0624	SDPTA	Succinyldiaminopimelate transaminase	[c] : ak + sl26da <=> glu-L + sl2a6o	2	EC 2.6.1.17	AspB	Lysine Biosynthesis	Tomb et al., 1997
HP0625	MECDPDH	2C-Methyl-D-erythritol 2,4 cyclodiphosphate dehydratase	[c] : 2mecdcp + h --> h2mb4p + h2o	2		IspG	Isoprenoid Biosynthesis	Boneca et al., 2003
HP0626	THDPS	Tetrahydrodipicolinate succinylase	[c] : h2o + succoa + thdp --> coa + sl2a6o	2	EC 2.3.1.117	DapD	Lysine Biosynthesis	Tomb et al., 1997
HP0630	NADPHQR	NADPH Quinone Reductase	[c] : h + mqn6 + nadph --> mqI6 + nadp	4	EC1.6.5.5	MdaB	Respiratory chain	Wang and Maier, 2004; Tomb et al., 1997
HP0631 - HP0634	HYDA1	Hydrogenase (Menaquinone)	(2) h[c] + h2[e] + mqn6[c] --> (2) h[e] + mqI6[c]	4	EC1.12.7.2	HydA, HydB, HydC, HydD	Respiratory chain	Benoit et al., 2004; Maier et al., 1996; Tomb et al., 1997
HP0642, HP1161	FLDO	NAD(P)H-flavin oxidoreductase	[c] : fmnh2 + nadp --> fmn + h + nadph	4		Fdo, FldA	Respiratory chain	Marais et al., 2003; Tomb et al., 1997
HP0646	GALU	UTP-glucose-1-phosphate uridylyltransferase	[c] : g1p + h + utp <=> ppi + udpg	4	EC 2.7.7.9	GalU	LPS Biosynthesis	Tomb et al., 1997; Kim et al., 2004
HP0648	UAGCVT	UDP-N-acetylglucosamine 1-carboxyvinyltransferase	[c] : pep + uacgam --> pi + uaccg	2	EC 2.5.1.7	MurZ	Aminosugar Metabolism	Tomb et al., 1997
HP0649	ASPT	L-Aspartase	[c] : asp-L --> fum + nh4	4	EC 4.3.1.1	AspA	Aspartate Metabolism	Mendez and Hazell, 1995; Tomb et al., 1997
HP0652	PSP-D	Phosphoserine phosphatase (D-serine)	[c] : h2o + pser-D --> pi + ser-D	2	EC 3.1.3.3	SerB	Serine Metabolism	Tomb et al., 1997
HP0652	PSP-L	Phosphoserine phosphatase (L-serine)	[c] : h2o + pser-L --> pi + ser-L	2	EC 3.1.3.3	SerB	Serine Metabolism	Tomb et al., 1997
HP0663	CHORS	Chorismate synthase	[c] : 3psme --> chor + pi	4	EC4.2.3.5	AroC	Chorismate Biosynthesis	Ahn et al., 2004; Tomb et al., 1997
HP0665, HP1226	CPPPGO	Coproporphyrinogen oxidase (O2 required)	[c] : cpppg3 + (2) h + o2 --> (2) co2 + (2) h2o + pppg9	2	EC 1.3.3.3	HemN	Heme biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP0672	ASPTA	Aspartate transaminase	[c] : ak + asp-L <=> glu-L + oaa	2	EC 2.6.1.1	AspB2	Aspartate Metabolism	Tomb et al., 1997
HP0672	EHGLAT	L-erythro-4-Hydroxyglutamate:2-oxoglutarate aminotransferase	[c] : ak + e4hglu --> 4h2oglt + glu-L	2	EC 2.6.1.1	AspB2	Glyoxylate Metabolism	Tomb et al., 1997
HP0672	PHETA1	Phenylalanine transaminase	[c] : ak + phe-L <=> glu-L + phpyr	2	EC 2.6.1.58	AspB2	Phenylalanine Biosynthesis	Tomb et al., 1997
HP0672	TYRTA	Tyrosine transaminase	[c] : ak + tyr-L <=> 34hpp + glu-L	2	EC 2.6.1.5	AspB2	Tyrosine Biosynthesis	Tomb et al., 1997
HP0683	G1PACT	Glucosamine-1-phosphate N-acetyltransferase	[c] : accoa + gam1p --> acgam1p + coa + h	2	EC 2.3.1.157	GlmU	Aminosugar Metabolism	Tomb et al., 1997
HP0683	UAGDP	UDP-N-acetylglucosamine diphosphorylase	[c] : acgam1p + h + utp --> ppi + uacgam	2	EC 2.7.7.23	GlmU	Aminosugar Metabolism	Tomb et al., 1997
HP0683	UAGDP2	UDP-glucosamine diphosphorylase	[c] : gam1p + h + utp --> ppi + uagam	1	EC2.7.7.23	GlmU	Aminosugar Metabolism	Tomb et al., 1997
HP0687	FE2abc	Iron (II) transport via ABC system	atp[c] + fe2[e] + h2o[c] --> adp[c] + fe2[c] + h[c] + pi[c]	4		FeoB	Transport	Velayudhan et al., 2000; Tomb et al., 1997
HP0690	ACACT1r	Acetyl-CoA C-acetyltransferase	[c] : (2) accoa <=> aaccoa + coa	2	EC 2.3.1.9	AtoB	Others	Tomb et al., 1997

Gene Locus	Abbreviation	Official Name	Equation	Confidence Level	EC Number	Protein Description	Pathway	References
HP0691, HP0692	OCOAT1	3-Oxoacid CoA-transferase (Succinyl-CoA: acetoacetate)	[c] : acac + succoa -> acooa + succ	4	EC 2.8.3.5	YxjD, YxjE	TCA cycle	Corthesy-Theulaz et al., 1997; Boneca et al., 2003
HP0700	DAGK-HP	Diacylglycerol kinase Hp specific	[c] : 12dgr_HP + atp -> adp + h + pa_HP	2	EC 2.7.1.107	DgkA	Glycerolipid Synthesis	Tomb et al., 1997
HP0723	ASNN	L-Asparaginase	[c] : asn-L + h2o -> asp-L + nh4	4	EC 3.5.1.1	AnsB	Asparagine Metabolism	Stark et al., 1997; Mendz and Hazell, 1995; McGee et al., 1999
HP0723	ASNS2	Asparagine synthetase	[c] : asp-L + atp + nh4 -> amp + asn-L + h + ppi	4	EC 6.3.1.1	AnsB	Asparagine Metabolism	Tomb et al., 1997
HP0724	ASNI2	L-Asparagine transport in via proton symport	asn-L[e] + h[e] -> asn-L[c] + h[c]	2		DcuA	Transport	Tomb et al., 1997
HP0724	ASP2r	L-Aspartate reversible transport via proton symport	asp-L[e] + h[e] <=> asp-L[c] + h[c]	4		DcuA	Transport	Mendez, Jimenez et al. 1994a; Tomb et al., 1997
HP0724	MAL12r	L-Malate reversible transport via proton symport	h[e] + mal-L[e] <=> h[c] + mal-L[c]	4		DcuA	Transport	Mendez, Meek et al. 1998; Tomb et al., 1997
HP0724	SUCC12	Succinate transport via proton symport	h[e] + succ[e] <=> h[c] + succ[c]	4		DcuA	Transport	Mendez, Meek et al. 1998; Tomb et al., 1997
HP0724	SUCFUMi	Succinate:fumarate antiporter	fum[e] + succ[c] <=> fum[c] + succ[e]	4		DcuA	Transport	Mendez, Meek et al. 1998; Tomb et al., 1997
HP0735	HXPRT	Hypoxanthine phosphoribosyltransferase (Hypoxanthine)	[c] : hxn + prpp -> imp + ppi	4	EC 2.4.2.8	Gpt	Salvage pathway of GTP	Mendez, Jimenez et al. 1994b; Mobley et al., 2001; Tomb et al., 1997
HP0735	GUAPRT	Guanine phosphoribosyltransferase	[c] : gua + prpp -> gmp + ppi	4	EC 2.4.2.8	Gpt	Salvage pathway of GTP	Mendez, Jimenez et al. 1994b; Mobley et al., 2001; Tomb et al., 1997
HP0735	XPPT	Xanthine phosphoribosyltransferase	[c] : prpp + xan -> ppi + xmp	2	EC 2.4.2.22	Gpt	Salvage pathway of XTP	Tomb et al., 1997
HP0736	PSERT	Phosphoserine transaminase	[c] : 3php + glu-L -> akp + pser-L	2	EC 2.6.1.52	SerC	Serine Metabolism	Tomb et al., 1997
HP0737	PGPP-HP	Phosphatidylglycerol phosphate phosphatase Hp specific	[c] : h2o + pgp_HP -> pg_HP + pi	3	EC 3.1.3.27	PgpA	Glycerolipid Synthesis	Hirai et al., 1995; Tomb et al., 1997
HP0738	ALAALAr	D-Alanine-D-alanine ligase	[c] : (2) ala-D + atp <=> adp + alala + h + pi	2	EC 6.3.2.4	Dd1A	Peptidoglycan Biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP0740	UGMDDS	UDP-N-acetylmuramoyl-L-alanyl-D-glutamyl-meso-2,6-diaminopimeloyl-D-alanyl-D-alanine synthetase	[c] : alala + atp + ugmD -> adp + h + pi + ugmDa	2	EC 6.3.2.15	MurF	Peptidoglycan Biosynthesis	Tomb et al., 1997
HP0742	PRPPS	Phosphoribosylpyrophosphate synthetase	[c] : atp + r5p <=> amp + h + prpp	2	EC 2.7.6.1	PrsA	IMP Synthesis	Mobley et al., 2001; Tomb et al., 1997
HP0772	AMAA	N-acetylmuramoyl-L-alanine amidase	[c] : acmama + h2o -> acmam + ala-L	2	EC 3.5.1.28	AmiA	Peptidoglycan Biosynthesis	Tomb et al., 1997
HP0777	UMPk	UMP kinase	[c] : atp + ump <=> adp + udp	4	EC 2.7.4.-	PyrH	UTP/CTP de novo Synthesis	Mendez, Jimenez et al. 1994a; Tomb et al., 1997
HP0779	ACONT	Aconitase	[c] : cit <=> icit	4	EC 4.2.1.3	AcnB	TCA cycle	Pitson et al., 1999; Tomb et al., 1997
HP0802	GTPCII	GTP cyclohydrolase II	[c] : gtp + (3) h2o -> 25dhpp + for + (2) h + ppi	4	EC 3.5.4.25	RibA	Riboflavin Metabolism	Fassbinder et al., 2000; Tomb et al., 1997
HP0804	DB4PS	3,4-Dihydroxy-2-butanone 4-phosphate synthase	[c] : ru5p-D -> db4p + for + h	4		RibB	Riboflavin Metabolism	Worst et al., 1998; Fassbinder et al., 2000; Tomb et al., 1997
HP0808	ACPS	Acyl Carrier Protein Synthase	[c] : coa + h2o -> (2) h + pan4p + pap	2	EC 2.7.8.7	AcpS	Pantothenate/ CoA Biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP0814	THZSN	Thiazole synthesis from xylulose	[c] : cys-L + dxyl + tyr-L -> 4hba + 4mhzt + co2 + h + h2o + nh4 + pyr	2		ThiF	Thiamin Biosynthesis	Tomb et al., 1997
HP0818, HP0819	PROabc	L-proline transport via ABC system	atp[c] + h2o[c] + pro-L[e] -> adp[c] + h[c] + pi[c] + pro-L[c]	2		ProV, ProWX	Transport	Tomb et al., 1997
HP0822	HSDy	Homoserine dehydrogenase (NADPH)	[c] : hom-L + nadp <=> aspsa + h + nadph	2	EC 1.1.1.3	MetL	Threonine Biosynthesis	Tomb et al., 1997
HP0822, HP1229	ASPK	Aspartate kinase	[c] : asp-L + atp <=> 4pasp + adp	2	EC 2.7.2.4	MetL, LysC	Aspartate Metabolism	Tomb et al., 1997
HP0824, HP0825, HP1164, HP1458	TRDR	Thioredoxin reductase (NADPH)	[c] : h + nadph + trdx -> nadp + trdrd	2	EC 1.8.1.9	TrxA, TrxB	Others	Mobley et al., 2001; Tomb et al., 1997
HP0828, HP1212, HP1131 - HP1137	ATPS4r	ATP synthase (four protons for one ATP)	adp[c] + (4) h[e] + pi[c] <=> atp[c] + (3) h[c] + h2o[c]	2	EC 3.6.3.14	AtpA, AtpB, AtpC, AtpD, AtpE, AtpF, AtpG, AtpH	Respiratory chain	Mobley et al., 2001; Tomb et al., 1997
HP0829	IMPD	IMP dehydrogenase	[c] : h2o + imp + nad -> h + nadh + xmp	2	EC 1.1.1.205	GuaB	GTP de novo Synthesis	Mobley et al., 2001; Tomb et al., 1997
HP0831	DPCOAK	Dephospho-CoA kinase	[c] : atp + dpcoa -> adp + coa + h	2	EC 2.7.1.24	CoaE	Pantothenate/ CoA Biosynthesis	Boneca et al., 2003
HP0832	SPMS	Spermidine synthase	[c] : ametam + ptrc -> 5mta + h + spmd	4	EC 2.5.1.16	SpeE	Spermidine Biosynthesis	Tomb et al., 1997; Lu et al., 2004
HP0832	SPRMS	Spermine synthase	[c] : ametam + spmd -> 5mta + h + sprm	2	EC 2.5.1.22	SpeE	Spermidine Biosynthesis	Tomb et al., 1997
HP0843	TMPPP	Thiamine-phosphate diphosphorylase	[c] : 2mahmp + 4mpetz + h -> ppi + thmmp	2	EC 2.5.1.3	ThiB	Thiamin Biosynthesis	Tomb et al., 1997
HP0844	PMPK	Phosphomethylpyrimidine kinase	[c] : 4ampm + atp -> 2mahmp + adp	2	EC 2.7.4.7	ThiD	Thiamin Biosynthesis	Tomb et al., 1997
HP0845	HETZK	Hydroxyethylthiazole kinase	[c] : 4mhetz + atp -> 4mpetz + adp + h	2	EC 2.7.1.50	ThiM	Thiamin Biosynthesis	Tomb et al., 1997
HP0854	GMPR	GMP reductase	[c] : gmp + (2) h + nadph -> imp + nadp + nh4	2	EC 1.1.7.17	GuaC	Nucleotide interconversion	Mobley et al., 2001; Tomb et al., 1997
HP0857	S7PI	Sedoheptulose 7-phosphate isomerase	[c] : s7p -> gmhep7p	2	EC 5.-.-.	GmhA	LPS Biosynthesis	Tomb et al., 1997
HP0858	GMHEPAT	D-Glycero-D-manno-hepse 1-phosphate adenyltransferase	[c] : atp + gmhep1p + h -> adphep-D.D + ppi	2		RfaE	LPS Biosynthesis	Tomb et al., 1997
HP0858	GMHEPK	D-Glycero-D-manno-hepse 7-phosphate kinase	[c] : atp + gmhep7p -> adp + gmhep17bp + h	2		RfaE	LPS Biosynthesis	Tomb et al., 1997
HP0859	AGMHE	ADP-D-glycero-D-manno-hepse epimerase	[c] : adphep-D.D -> adphep-L.D	2	EC 5.1.3.20	RfaD	LPS Biosynthesis	Tomb et al., 1997
HP0860	GMHEPPA	D-Glycero-D-manno-hepse 1,7-bisphosphate phosphatase	[c] : gmhep17bp + h2o -> gmhep1p + pi	2		YaeD	LPS Biosynthesis	Tomb et al., 1997
HP0865	DUTPDP	DUTP diphosphatase	[c] : dutp + h2o -> dumpp + h + ppi	2	EC 3.6.1.23	Dut	dTTP Biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP0867	LPADSS-HP	LipidA_HP disaccharide synthase	[c] : lipidX_HP + u2ga_HP -> (2) h + lipidA_HP + udp	3		LpxB	LPS Biosynthesis	Moran et al., 1997; Tomb et al., 1997
HP0871	CDAPPA-HP	CDP-Diacylglycerol pyrophosphatase Hp specific	[c] : cdpdag_HP + h2o -> cmp + (2) h + pa_HP	2	EC 3.6.1.26	Cdh	Glycerolipid Synthesis	Tomb et al., 1997
HP0875	CAT	Catalase	[c] : (2) h2o2 -> (2) h2o + o2	4	EC 1.11.1.6	KatA	ROS detoxification	Loewen et al., 2004; Bai et al., 2003; Bauerfeind et al., 1997; Tomb et al., 1997; Harris and Hazell, 2003
HP0903	ACKr	Acetate kinase	[c] : ac + atp <=> actp + adp	2	EC 2.7.2.1	AckA	Others	Mobley et al., 2001; Tomb et al., 1997
HP0905	PTAr	Phosphotransacetylase	[c] : accoa + pi <=> actp + coa	2	EC 2.3.1.8	Pta	Others	Tomb et al., 1997
HP0919, HP1237	CBPS	Carbamoyl-phosphate synthase (glutamine-hydrolysing)	[c] : (2) atp + gln-L + h2o + hco3 -> (2) adp + cbp + glu-L + (2) h + pi	4	EC 6.3.5.5	PyrAa, PyrAb	UTP/CTP de novo Synthesis	Dauids et al., 2002; Tomb et al., 1997
HP0921, HP1346	GAPD	Glyceraldehyde-3-phosphate dehydrogenase	[c] : g3p + nad + pi <=> 13dgp + h + nadh	4	EC 1.2.1.12	Gap	Glycolysis	Hoffman et al., 1996; Tomb et al., 1997
HP0928	GTPCI	GTP cyclohydrolase I	[c] : gtp + h2o -> ahdt + for + h	2	EC 3.5.4.16	FolE	Folate Biosynthesis	Tomb et al., 1997
HP0929	DMATT	Dimethylallyltransferase	[c] : dmpp + ipdp -> grdp + ppi	2	EC 2.5.1.1	IspA	Others	Mobley et al., 2001; Tomb et al., 1997
HP0929	GRTT	Geranyltransferase	[c] : grdp + ipdp -> frdp + ppi	2	EC 2.5.1.10	IspA	Others	Mobley et al., 2001; Tomb et al., 1997
HP0930	ACP1(FMN)	Acid phosphatase (FMN)	[c] : fmn + h2o -> pi + ribflv	2	EC 3.1.3.2	SurE	Riboflavin Metabolism	Tomb et al., 1997
HP0936	PRO12r	L-Proline reversible transport via proton symport	h[e] + pro-L[e] <=> h[c] + pro-L[c]	2		ProP	Transport	Tomb et al., 1997
HP0941	ALAR	Alanine racemase	[c] : ala-L <=> ala-D	2	EC 5.1.1.1	Alr	Alanine Metabolism	Tomb et al., 1997

Gene Locus	Abbreviation	Official Name	Equation	Confidence Level	EC Number	Protein Description	Pathway	References
HP0942	ALAT2	L-Alanine transport in via proton symport	ala-L[e] + h[e] --> ala-L[c] + h[c]	2		DagA	Transport	Mobley et al., 2001; Tomb et al., 1997
HP0942	ALA4	Alanine-Sodium symporter	ala-L[e] + na1[e] --> ala-L[c] + na1[c]	2		DagA	Transport	Mobley et al., 2001; Tomb et al., 1997
HP0942	DALAI2	D-Alanine transport via proton symport	ala-D[e] + h[e] --> ala-D[c] + h[c]	2		DagA	Transport	Mobley et al., 2001; Tomb et al., 1997
HP0942	DSER12	D-serine transport via proton symport	h[e] + ser-D[e] --> h[c] + ser-D[c]	2		DagA	Transport	Mobley et al., 2001; Tomb et al., 1997
HP0942	GLY12	Glycine transport in via proton symport	gly[e] + h[e] --> gly[c] + h[c]	2		DagA	Transport	Mobley et al., 2001; Tomb et al., 1997
HP0943	DAAD	D-Amino acid dehydrogenase	[c] : ala-D + fad + h2o --> fadh2 + nh4 + pyr	4	EC 1.4.99.1	DadA	Alanine Metabolism	Nagata et al., 2003; Tomb et al., 1997
HP0957	MOAT-HP	Kdo-Lipid IV (A) formation	[c] : cmpkdo + lipidA_HP --> cmp + h + kdolipid4_HP	2		KdtA	LPS Biosynthesis	Tomb et al., 1997
HP0961	G3PD1	Glycerol-3-phosphate dehydrogenase (NAD)	[c] : glyc3p + nad <==> dhap + h + nadh	2	EC 1.1.1.94	GpsA	Glycerolipid Synthesis	Tomb et al., 1997
HP0961	G3PD2	Glycerol-3-phosphate dehydrogenase (NADP)	[c] : glyc3p + nadp <==> dhap + h + nadph	2	EC 1.1.1.94	GpsA	Glycerolipid Synthesis	Tomb et al., 1997
HP0974	PGM	Phosphoglycerate mutase	[c] : 2pg <==> 3pg	2	EC 5.4.2.1	Pgm	Glycolysis	Tomb et al 1997
HP0976	AMAOTr	Adenosylmethionine-8-amino-7-oxononanoate transaminase	[c] : 8aonn + amet <==> amob + dann	2	EC 2.6.1.62	BioA	Biotin Biosynthesis	Tomb et al., 1997
HP1011	DHORD3	Dihydroorotic acid dehydrogenase (menaquinone 6)	[c] : dhor-S + mqn6 <==> mql6 + orot	4	EC 1.3.3.1	PyrD	UTP/CTP de novo Synthesis	Copeland et al., 2000; Tomb et al., 1997
HP1013	DHDPS	Dihydrodipicolinate synthase	[c] : aspsa + pyr --> 23dhdp + h + (2) h2o	2	EC 4.2.1.52	DapA	Lysine Biosynthesis	Tomb et al., 1997
HP1016	PGSA-HP	Phosphatidylglycerol synthase Hp specific	[c] : cdpdag_HP + glyc3p <==> cmp + h + pgg_HP	2	EC 2.7.8.5	PgsA	Glycerolipid Synthesis	Mobley et al., 2001; Tomb et al., 1997
HP1017	ARG12r	L-Arginine reversible transport via proton symport	arg-L[e] + h[e] <==> arg-L[c] + h[c]	4		RocE	Transport	Mendz and Burns, 2003; Tomb et al., 1997
HP1017	ORN12r	Ornithine reversible transport in via proton symport	h[e] + orn[e] <==> h[c] + orn[c]	2		RocE	Transport	Mobley et al., 2001; Tomb et al., 1997
HP1020	MECDPS	2-C-Methyl-D-erythritol 2,4-cyclodiphosphate synthase	[c] : 2p4c2me --> 2mecdcp + cmp	2	EC4.6.1.12	IspDF	Isoprenoid Biosynthesis	Boneca et al., 2003
HP1020	MEPCT	2-C-Methyl-D-erythritol 4-phosphate cytidyltransferase	[c] : 2me4p + ctp + h --> 4c2me + ppi	2	EC2.7.7.60	IspDF	Isoprenoid Biosynthesis	Boneca et al., 2003
HP1036	HPPK	2-Amino-4-hydroxy-6-hydroxymethylhydropteridine diphosphokinase	[c] : 2ahhmp + atp --> 2ahhmd + amp + h	2	EC 2.7.6.3	Folk	Folate Biosynthesis	Tomb et al., 1997
HP1038	DHQD	3-Dehydroquinate dehydratase	[c] : 3dhq <==> 3dhsk + h2o	4	EC 4.2.1.10	AroQ	Chorismate Biosynthesis	Lee et al., 2003; Tomb et al., 1997
HP1045	ACS	Acetyl-CoA synthetase	[c] : ac + atp + coa --> accoa + amp + ppi	2	EC 6.2.1.1	AcoE	Others	Mobley et al., 2001; Tomb et al., 1997
HP1050	HSK	Homoserine kinase	[c] : atp + hom-L --> adp + h + phom	2	EC 2.7.1.39	ThrB	Threonine Biosynthesis	Tomb et al., 1997
HP1052	UHGADA-HP	UDP-3-O-acetylglucosamine deacetylase	[c] : h2o + u3aga_HP --> ac + u3hga_HP	2		EnvA	LPS Biosynthesis	Tomb et al., 1997
HP1058	MOHMT	3-Methyl-2-oxobutanoate hydroxymethyltransferase	[c] : 3mob + h2o + mlthf --> 2dhp + thf	2	EC 2.1.2.11	PanB	Pantothenate/ CoA Biosynthesis	Tomb et al., 1997
HP1071	PSSA-HP	Phosphatidylserine synthase Hp specific	[c] : cdpdag_HP + ser-L <==> cmp + h + ps_HP	4	EC 2.7.8.8	PssA	Glycerolipid Synthesis	Ge and Taylor, 1997; Tomb et al., 1997
HP1077, HP1576	Niabc	Nickel transport via ABC system	atp[c] + h2o[c] + ni2[e] --> adp[c] + h[c] + ni2[c] + pi[c]	4		NixA, AbcC	Transport	Hendricks and Mobley, 1997; Tomb et al., 1997
HP1084	ASPCT	Aspartate carbamoyltransferase	[c] : asp-L + cbp --> cbaasp + h + pi	4	EC 2.1.3.2	PyrB	UTP/CTP de novo Synthesis	Burns et al., 1997; Tomb et al., 1997
HP1087	FMNAT	FMN adenylyltransferase	[c] : atp + fmn + h --> fad + ppi	2	EC 2.7.7.2	RibF	Riboflavin Metabolism	Tomb et al., 1997
HP1087	RBFK	Riboflavin kinase	[c] : atp + ribfv --> adp + fmn + h	2	EC 2.7.1.26	RibF	Riboflavin Metabolism	Tomb et al., 1997
HP1088	TKT1	Transketolase	[c] : r5p + xu5p-D <==> g3p + s7p	4	EC 2.2.1.1	TktA1	Pentose-Phosphate-Pathway	Mendz and Hazell, 1991; Tomb et al., 1997
HP1088	TKT2	Transketolase	[c] : e4p + xu5p-D <==> f6p + g3p	4	EC 2.2.1.1	TktA2	Pentose-Phosphate-Pathway	Mendz and Hazell, 1991; Tomb et al., 1997
HP1091	AKG12r	2-Oxoglutarate reversible transport via symport	akg[e] + h[e] <==> akg[c] + h[c]	2		KgIP	Transport	Tomb et al., 1997
HP1099	EDA	2-Dehydro-3-deoxy-phosphogluconate aldolase	[c] : 2ddg6p --> g3p + pyr	4	EC 4.1.2.14	Eda	Entner-Doudoroff Pathway	Hoffman et al., 1996; Mendz, Hazell et al. 1994a; Tomb et al., 1997
HP1099	DDPGA	2-Dehydro-3-deoxy-phosphogluconate aldolase	[c] : 4h2oglt <==> glx + pyr	2	EC 4.1.2.14	Eda	Glyoxylate Metabolism	Tomb et al., 1997
HP1100	EDD	6-Phosphogluconate dehydratase	[c] : 6pgc --> 2ddg6p + h2o	4	EC 4.2.1.12	Edd	Entner-Doudoroff Pathway	Hoffman et al., 1996; Mendz, Hazell et al. 1994a; Tomb et al., 1997
HP1101	G6PDH2	Glucose 6-phosphate dehydrogenase	[c] : g6p + nadp --> 6pgl + h + nadph	4	EC 1.1.1.49	G6pdh2	Pentose-Phosphate-Pathway	Mendz and Hazell, 1991; Mendz, Hazell et al. 1994a; Tomb et al., 1997
HP1102	PGL	6-Phosphogluconolactonase	[c] : 6pgl + h2o --> 6pgc + h	4	EC 3.1.1.31	DevB	Pentose-Phosphate-Pathway	Mendz and Hazell, 1991; Tomb et al., 1997
HP1103	HEX1	Glucokinase (D-glucose-ATP)	[c] : atp + glc-D --> adp + g6p + h	4	EC 2.7.1.1	Gik	Glycolysis	Mendz and Hazell, 1993; Tomb et al., 1997
HP1104	ALCD2y	Alcohol dehydrogenase (ethanol, NADP)	[c] : etoh + nadp <==> acald + h + nadph	4	EC1.1.1.2	Cad	Others	Salmela et al., 1993; Tomb et al., 1997
HP1108 - HP1111	PDH2	Pyruvate dehydrogenase - FMN dependent	[c] : coa + fmn + h + pyr --> accoa + co2 + fmnh2	4	EC 1.2.7.1	PorA, PorB, PorC, PorD	Glycolysis	Hoffman et al., 1996; Hughes et al., 1995; Tomb et al., 1997
HP1112	ADSL1r	Adenylosuccinate lyase	[c] : dcamp <==> amp + fum	2	EC 4.3.2.2	PurB	ATP de novo Synthesis	Mobley et al., 2001; Tomb et al., 1997
HP1112	ADSL2r	Adenylosuccinate lyase	[c] : 25aics <==> aicar + fum	2	EC 4.3.2.2	PurB	IMP Synthesis	Mobley et al., 2001; Tomb et al., 1997
HP1118	GTMLT	γ-Glutamyltransferase	[c] : ala-L + glthrd --> cgly + gluala	4	EC 2.3.2.2	Ggt	Others	Chevalier et al., 1999; Tomb et al., 1997
HP1140	BACCL	Biotin-[acetyl-CoA-carboxylase] ligase	[c] : atp + btn + h --> btamp + ppi	2	EC 6.3.4.15	BirA	Biotin Biosynthesis	Tomb et al., 1997
HP1155	UAGPT3	UDP-N-acetylglucosamine-N-acetylmuramyl-(pentapeptide)pyrophosphoryl-undecaprenol N-acetylglucosamine transferase	[c] : uacgam + uagmda --> h + uaagmda + udp	2		MurG	Peptidoglycan Biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP1158	HPROa	L-Hydroxyproline reductase (NAD)	[c] : 1p3h5c + (2) h + nadh --> 4hpro-LT + nad	2	EC 1.5.1.2	ProC	Glyoxylate Metabolism	Tomb et al., 1997
HP1158	P5CR	Pyroline-5-carboxylate reductase	[c] : 1pyr5c + (2) h + nadph --> nadp + pro-L	2	EC 1.5.1.2	ProC	Proline Metabolism	Tomb et al., 1997
HP1166	PGI	Glucose-6-phosphate isomerase	[c] : g6p <==> f6p	4	EC 5.3.1.9	Pgi	Glycolysis	Hoffman et al., 1996; Mendz and Hazell, 1991; Mendz, Hazell et al. 1994a
HP1169 - HP1172	GLNabc	L-Glutamine transport via ABC system	atp[c] + gln-L[e] + h2o[c] --> adp[c] + gln-L[c] + h[c] + pi[c]	2		GlnH, GlnP, GlnQ	Transport	Mobley et al., 2001; Tomb et al., 1997
HP1174	GAL12	D-Galactose transport in via proton symport	gal[e] + h[e] --> gal[c] + h[c]	2		GlUP	Transport	Tomb et al., 1997
HP1174	GLC12	D-Glucose transport in via proton symport	glc-D[e] + h[e] --> glc-D[c] + h[c]	4		GlUP	Transport	Mendz, Burns et al. 1995; Tomb et al., 1997
HP1178	DURIPP	Deoxyuridine phosphorylase	[c] : duri + pi <==> 2dr1p + ura	2	EC2.4.2.23	DeoD	Nucleotide interconversion	Mobley et al., 2001; Tomb et al., 1997
HP1178	PUNP5	Purine-nucleoside phosphorylase (Inosine)	[c] : ins + pi <==> hxan + r1p	2	EC 2.4.2.1	DeoD	Nucleotide interconversion	Mobley et al., 2001; Tomb et al., 1997
HP1178	PUNP6	Purine-nucleoside phosphorylase (Deoxyinosine)	[c] : din + pi <==> 2dr1p + hxan	2	EC 2.4.2.1	DeoD	Nucleotide interconversion	Mobley et al., 2001; Tomb et al., 1997
HP1178	PUNP1	Purine-nucleoside phosphorylase (Adenosine)	[c] : adn + pi <==> ade + r1p	4	EC 2.4.2.1	DeoD	Salvage pathway of ATP	Mobley et al., 2001; Mendz, Jimenez et al. 1994a; Tomb et al., 1997
HP1178	PUNP2	Purine-nucleoside phosphorylase (Deoxyadenosine)	[c] : dad-2 + pi <==> 2dr1p + ade	2	EC 2.4.2.1	DeoD	Salvage pathway of ATP	Mobley et al., 2001; Tomb et al., 1997
HP1178	PUNP3	Purine-nucleoside phosphorylase (Guanosine)	[c] : gsn + pi <==> gua + r1p	4	EC 2.4.2.1	DeoD	Salvage pathway of GTP	Mobley et al., 2001; Mendz, Jimenez et al. 1994a; Tomb et al., 1997

Gene Locus	Abbreviation	Official Name	Equation	Confidence Level	EC Number	Protein Description	Pathway	References
HP1178	PUNP4	Purine-nucleoside phosphorylase (Deoxyguanosine)	[c] : dgsn + pi <=> 2dr1p + gua	2	EC 2.4.2.1	DeoD	Salvage pathway of GTP	Mobley et al., 2001; Tomb et al., 1997
HP1178	PUNP7	Purine-nucleoside phosphorylase (Xanthosine)	[c] : pi + xtsn <=> r1p + xan	2	EC 2.4.2.1	DeoD	Salvage pathway of XTP	Mobley et al., 2001; Tomb et al., 1997
HP1179	PPM	Phosphopentomutase	[c] : r1p <=> r5p	2	EC 5.4.2.7	DeoB	Nucleotide interconversion	Tomb et al., 1997
HP1179	PPM2	Phosphopentomutase 2 (deoxyribose)	[c] : 2dr1p <=> 2dr5p	2	EC 5.4.2.7	DeoB	Nucleotide interconversion	Tomb et al., 1997
HP1180	ADNI2	Adenosine transport in via proton symport	adn[e] + h[e] -> adn[c] + h[c]	4		NupC	Transport	Mobley et al., 2001; Mendz, Jimenez et al. 1994a; Tomb et al., 1997
HP1180	CYTDI2	Cytidine transport in via proton symport	cytd[e] + h[e] -> cytd[c] + h[c]	2		NupC	Transport	Mobley et al., 2001; Tomb et al., 1997
HP1180	DADNI2	Deoxyadenosine transport in via proton symport	dad-2[e] + h[e] -> dad-2[c] + h[c]	4		NupC	Transport	Mobley et al., 2001; Mendz, Jimenez et al. 1994a; Tomb et al., 1997
HP1180	DCYT12	Deoxycytidine transport in via proton symport	dcyt[e] + h[e] -> dcyt[c] + h[c]	2		NupC	Transport	Mobley et al., 2001; Tomb et al., 1997
HP1180	DURII2	Deoxyuridine transport in via proton symport	dur[e] + h[e] -> dur[c] + h[c]	2		NupC	Transport	Mobley et al., 2001; Tomb et al., 1997
HP1180	THMDI2	Thymidine transport in via proton symport	h[e] + thymd[e] -> h[c] + thymd[c]	2		NupC	Transport	Mobley et al., 2001; Tomb et al., 1997
HP1180	URI12	Uridine transport in via proton symport	h[e] + ur[e] -> h[c] + ur[c]	4		NupC	Transport	Mobley et al., 2001; Mendz, Jimenez et al. 1994a; Tomb et al., 1997
HP1183, HP1552	NAI3-1	Sodium proton antiporter (H:NA is 1:1)	h[e] + na1[c] <=> h[c] + na1[e]	4		NhaA, NapA	Transport	Tomb et al., 1997
HP1189	ASAD	Aspartate-semialdehyde dehydrogenase	[c] : aspsa + nadp + pi <=> 4pasp + h + nadph	4	EC 1.2.1.11	Asd	Aspartate Metabolism	Moore et al., 2002; Tomb et al., 1997
HP1210	SERAT	Serine O-acetyltransferase	[c] : accoa + ser-L <=> acser + coa	2	EC 2.3.1.30	CysE	Methionine Metabolism	Tomb et al., 1997
HP1218	PRAGSr	Phosphoribosylglycinamide synthase	[c] : atp + gly + pram <=> adp + gar + h + pi	2	EC 6.3.4.13	PurD	IMP Synthesis	Mobley et al., 2001; Tomb et al., 1997
HP1221	UDCPDPS	Undecaprenyl diphosphate synthase	[c] : frdp + (8) lppd -> (8) ppi + udcpdp	2	EC2.5.1.31	UppS	Others	Boneca et al., 2003
HP1222	LDH-D1	D-Lactate dehydrogenase	[c] : lac-D + mqn6 <=> mql6 + pyr	2	EC1.1.2.4	Did	Respiratory chain	Mobley et al., 2001; Tomb et al., 1997
HP1224	UPP3S	Uroporphyrinogen-III synthase	[c] : hmbil -> h2o + uppg3	2	EC 4.2.1.75	HemD	Heme biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP1227, HP1538 - HP1540	BC10	Cytochrome bc1 complex (complex III)	(2) fcytc553[c] + (2) h[c] + mql6[c] -> (2) fcytc553[c] + (4) h[e] + mqn6[c]	2	EC1.10.2.2	C553, FbcF, FbcH	Respiratory chain	Tomb et al., 1997
HP1228	DNMPPA	Dihydroneopterin monophosphate dephosphorylase	[c] : dhpmp + h2o -> dhnp + pi	2	EC3.6.1.-	InvA	Folate Biosynthesis	Tomb et al., 1997
HP1228	DNTPPA	Dihydroneopterin triphosphate pyrophosphatase	[c] : ahd + h2o -> dhpmp + h + ppi	2	EC3.6.1.-	InvA	Folate Biosynthesis	Boneca et al., 2003
HP1232	DHPS	Dihydropterolate synthase (PPI)	[c] : 2ahmp + 4abz -> dhpt + h2o	2	EC 2.5.1.15	FolP	Folate Biosynthesis	Tomb et al., 1997
HP1232	FOLD3	Dihydropterolate synthase (H2O)	[c] : 2ahmd + 4abz -> dhpt + ppi	2	EC2.5.1.15	FolP	Folate Biosynthesis	Tomb et al., 1997
HP1238	FORAMD	Formamidase	[c] : frmd + h2o -> for + nh4	4	EC 3.5.1.49	AmiF	Others	Skoulouris et al., 2001; Boneca et al., 2003; Tomb et al., 1997
HP1249	SHK3Dr	Shikimate dehydrogenase	[c] : 3dhs + h + nadph <=> nadp + skm	2	EC 1.1.1.25	AroE	Chorismate Biosynthesis	Tomb et al., 1997
HP1257	ORPT	Orotate phosphoribosyltransferase	[c] : orot5p + ppi <=> orot + prpp	4	EC 2.4.2.10	PyrE	UTP/CTP de novo Synthesis	Mendz, Jimenez et al. 1994a; Tomb et al., 1997; Kim, Song et al. 2003
HP1260 - HP1273	NDH-1	NADH dehydrogenase (menaquinone) (complex I)	(3) h[c] + mqn6[c] + nadph[c] -> (2) h[e] + mql6[c] + nadp[c]	4	EC1.6.5.3	Nqo10, Nqo11, Nqo12, Nqo13, Nqo14, Nqo3, Nqo4, Nqo5, Nqo6, Nqo7, Nqo8, Nqo9, NuoE, NuoF	Respiratory chain	Smith et al., 2000; Tomb et al., 1997
HP1275	PMANM	Phosphomannomutase	[c] : man1p <=> man6p	2	EC 5.4.2.8	AlgC	Fucose Biosynthesis	Boneca et al., 2003
HP1277, HP1278	TRPS1	Tryptophan synthase (indoleglycerol phosphate)	[c] : 3ig3p + ser-L -> g3p + h2o + trp-L	2	EC 4.2.1.20	TrpA, TrpB	Tryptophan Biosynthesis	Tomb et al., 1997
HP1277, HP1278	TRPS2	Tryptophan synthase (indole)	[c] : indole + ser-L -> h2o + trp-L	2	EC 4.2.1.20	TrpA, TrpB	Tryptophan Biosynthesis	Tomb et al., 1997
HP1277, HP1278	TRPS3	Tryptophan synthase (indoleglycerol phosphate)	[c] : 3ig3p -> g3p + indole	2	EC 4.2.1.20	TrpA, TrpB	Tryptophan Biosynthesis	Tomb et al., 1997
HP1279	IGPS	Indole-3-glycerol-phosphate synthase	[c] : 2cpr5p + h -> 3ig3p + co2 + h2o	2	EC 4.1.1.48	TrpC	Tryptophan Biosynthesis	Tomb et al., 1997
HP1279	PRAIi	Phosphoribosylanthranilate isomerase (irreversible)	[c] : pran -> 2cpr5p	2	EC 5.3.1.24	TrpC	Tryptophan Biosynthesis	Tomb et al., 1997
HP1280	ANPRT	Anthranilate phosphoribosyltransferase	[c] : anth + prpp -> ppi + pran	2	EC 2.4.2.18	TrpD	Tryptophan Biosynthesis	Tomb et al., 1997
HP1281, HP1282	ANS2	Anthranilate synthase 2	[c] : chor + nh4 -> anth + h + h2o + pyr	2		TrpE	Chorismate Metabolism	Tomb et al., 1997
HP1281, HP1282	ANS	Anthranilate synthase	[c] : chor + gln-L -> anth + glu-L + h + pyr	2	EC 4.1.3.27	TrpE	Tryptophan Biosynthesis	Tomb et al., 1997
HP1290	NMNTP	Nicotinamide D-ribonucleotide transport	h[e] + nmn[e] -> h[c] + nmn[c]	2		PnuC	Transport	Tomb et al., 1997
HP1325	FUM	Fumarase	[c] : fum + h2o <=> mal-L	4	EC 4.2.1.2	FumC	TCA cycle	Pitson et al., 1999; Tomb et al., 1997
HP1337	NMNAT	Nicotinamide-nucleotide adenyltransferase	[c] : atp + h + nmn -> nad + ppi	2	EC 2.7.7.1	NadD	Nicotinate Biosynthesis	Boneca et al., 2003
HP1337	NNAT	Nicotinate-nucleotide adenyltransferase	[c] : atp + h + nicmt -> dnad + ppi	2	EC 2.7.7.18	NadD	Nicotinate Biosynthesis	Boneca et al., 2003
HP1345	PGK	Phosphoglycerate kinase	[c] : 3pg + atp <=> 13dpg + adp	2	EC 2.7.2.3	Pgk	Glycolysis	Tomb et al., 1997
HP1348	PASYN-HP	Phosphatidic acid synthase Hp specific	[c] : c190cACP + glyc3p + myrsACP -> (2) ACP + pa_HP	2	EC2.3.1.51	PlsB, PlsC	Glycerolipid Synthesis	Mobley et al., 2001; Tomb et al., 1997
HP1355	NNDPR	Nicotinate-nucleotide diphosphorylase (carboxylating)	[c] : (2) h + prpp + quin -> co2 + nicmt + ppi	4	EC 2.4.2.19	NadC	Nicotinate Biosynthesis	Kim, Kim et al. 2003; Tomb et al., 1997
HP1356	QULNS	Quinolinate synthase	[c] : dhap + iasp -> (2) h2o + pi + quin	2		NadA	Nicotinate Biosynthesis	Tomb et al., 1997
HP1357	PSD-HP	Phosphatidylserine decarboxylase Hp specific	[c] : h + ps_HP -> co2 + pe_HP	3	EC 4.1.1.65	Psd	Glycerolipid Synthesis	Mobley et al., 2001; Hirai et al., 1995; Tomb et al., 1997
HP1360	HBZOPT	Hydroxybenzoate octaprenyltransferase	[c] : 4hbz + octdp -> 3ophb + ppi	2	EC2.5.1.-	UbiA	Ubiquinone Biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP1375	UAGAAAT-HP	UDP-N-acetylglucosamine acyltransferase	[c] : 3hpalmACP + uacgpp <=> ACP + u3aga_HP	4	EC2.3.1.129	LpxA	LPS Biosynthesis	Lee and Suh, 2003; Tomb et al., 1997
HP1380	PPND	Prephenate dehydrogenase	[c] : nad + pphn -> 34phg + co2 + nadh	2	EC 1.3.1.12	TyrA	Tyrosine Biosynthesis	Tomb et al., 1997
HP1385	FBP	Fructose-bisphosphatase	[c] : fdp + h2o -> f6p + pi	4	EC 3.1.3.11	Fbp	Glycolysis	Hoffman et al., 1996; Tomb et al., 1997
HP1386	RPE	Ribulose 5-phosphate 3-epimerase	[c] : ru5p-D <=> xu5p-D	2	EC 5.1.3.1	Rpe	Pentose-Phosphate-Pathway	Tomb et al. 1997
HP1394	NADK	NAD kinase	[c] : atp + nad -> adp + h + nadp	2	EC 2.7.1.23	PpnK	Nicotinate Biosynthesis	Tomb et al., 1997
HP1398	ALAD-L	L-Alanine dehydrogenase	[c] : ala-L + h2o + nad -> h + nadh + nh4 + pyr	4	EC 1.4.1.1	Ald	Alanine Metabolism	Nagata et al., 2003; Tomb et al., 1997
HP1399	ARGN	Arginase	[c] : arg-L + h2o -> orn + urea	4	EC 3.5.3.1	RocF	Urea Cycle	Mendz, Holmes et al. 1998; Mendz and Hazell, 1996; Tomb et al., 1997
HP1400, HP0686, HP0807, HP0889, HP0888	FEDCabc	Iron (III) dicitrate transport via ABC system	atp[c] + (2) cit[e] + fe3[e] + h2o[c] -> adp[c] + (2) cit[c] + fe3[c] + h[c] + pi[c]	4		FecA, FecD, FecE	Transport	Velayudhan et al., 2000; Waidner et al., 2002

Gene Locus	Abbreviation	Official Name	Equation	Confidence Level	EC Number	Protein Description	Pathway	References
HP1406	BTS2	Biotin synthase (ala-L producing)	[c] : cys-L + dtbt <=> ala-L + btn + (2) h	2	EC2.8.1.6	BioB	Biotin Biosynthesis	Tomb et al., 1997
HP1418	UAPGR	UDP-N-acetylenolpyruvoylglucosamine reductase	[c] : h + nadph + uacog -> nadp + uamr	2	EC 1.1.1.158	MurB	Aminosugar Metabolism	Tomb et al., 1997
HP1434, HP1141	FTHFD	Formyltetrahydrofolate deformylase	[c] : 10thf + h2o -> for + h + thf	2	EC 3.5.1.10	PurU, Fmt	THF Metabolism	Mobley et al., 2001; Tomb et al., 1997
HP1443	CDPMEK	4-(Cytidine 5'-diphospho)-2-C-methyl-D-erythritol kinase	[c] : 4c2me + atp -> 2p4c2me + adp + h	2	EC2.7.1.148	IspE	Isoprenoid Biosynthesis	Boneca et al., 2003
HP1461	CCP	Cytochrome c peroxidase	[c] : (2) focytc553 + (2) h + h2o2 -> (2) ficytc553 + (2) h2o	4	EC1.11.1.5	Cper	ROS detoxification	Marcelli et al., 1996; Tomb et al., 1997
HP1468	ILETA	Isoleucine transaminase	[c] : akg + ile-L <=> 3mop + glu-L	2	EC 2.6.1.42	IivE	Isoleucine Metabolism	Tomb et al., 1997
HP1468	LEUTA	Leucine transaminase	[c] : akg + leu-L <=> 4mop + glu-L	2	EC 2.6.1.6	IivE	Leucine Metabolism	Tomb et al., 1997
HP1468	VALTA	Valine transaminase	[c] : akg + val-L <=> 3mob + glu-L	2	EC 2.6.1.42	IivE	Valine Metabolism	Tomb et al., 1997
HP1474	URIDK2r	Uridylate kinase (dUMP)	[c] : atp + dump <=> adp + dudp	2	EC2.7.4.9	Tmk	dTTP Biosynthesis	Mobley et al., 2001; Tomb et al., 1997
HP1474	DTMPK	DTMP kinase	[c] : atp + dtmp <=> adp + dtdp	2	EC 2.7.4.9	Tmk	Nucleotide interconversion	Mobley et al., 2001; Tomb et al., 1997
HP1474	TMDK1	Thymidine kinase (ATP:thymidine)	[c] : atp + thymd -> adp + dtmp + h	4	EC 2.7.1.21	Tmk	Nucleotide interconversion	Mendez, Jimenez et al. 1994a; Tomb et al., 1997
HP1475	PTPATI	Parantheine-phosphate adenylyltransferase	[c] : atp + h + pan4p -> dpcoa + ppi	4	EC 2.7.7.3	KdtB	Pantothenate/ CoA Biosynthesis	Eom et al., 2003; Tomb et al., 1997
HP1483	AMMQT6	S-Adenosylmethionine methyltransferase	[c] : 2dmmq6 + amet -> ahcys + h + mqn6	2	EC2.1.1.-	UbiE	Menaquinone Biosynthesis	Lee et al., 1997; Tomb et al., 1997
HP1483	OMBZLM	2-Octaprenyl-6-methoxy-benzoquinol methylase	[c] : 2ombz1 + amet -> 2ormb1 + ahcys + h	4	EC2.1.1.-	UbiE	Ubiquinone Biosynthesis	Lee et al., 1997; Tomb et al., 1997
HP1491	Pit2r	Phosphate reversible transport via symport	h[e] + pi[e] <=> h[c] + pi[c]	2		PitE	Transport	Tomb et al., 1997
HP1494	UAAGDS	UDP-N-acetylmuramoyl-L-alanyl-D-glutamyl-meso-2,6-diaminopimelate synthetase	[c] : 26dap-M + atp + uamag -> adp + h + pi + ugmd	2	EC 6.3.2.13	MurE	Peptidoglycan Biosynthesis	Tomb et al., 1997
HP1495	TALA	Transaldolase	[c] : g3p + s7p <=> e4p + f6p	4	EC 2.2.1.2	Tal	Pentose-Phosphate-Pathway	Mendez and Hazell, 1991; Tomb et al., 1997
HP1505	APRAUR	5-Amino-6-(5-phosphoribosylamino)uracil reductase	[c] : 5apru + h + nadph -> 5apru + nadp	4	EC 1.1.1.193	RibD	Riboflavin Metabolism	Fassbinder et al., 2000; Tomb et al., 1997
HP1505	DHPPDA	Diaminohydroxyphosphoribosylaminopyrimidine deaminase	[c] : 25dhp + h + h2o -> 5apru + nh4	4	EC 3.5.4.26	RibD	Riboflavin Metabolism	Fassbinder et al., 2000; Tomb et al., 1997
HP1506	GLU2r	L-Glutamate transport via proton symport, reversible	glu-L[e] + h[e] <=> glu-L[c] + h[c]	2		GIS	Transport	Mobley et al., 2001; Tomb et al., 1997
HP1510	DHNPA	Dihydroneopterin aldolase	[c] : dhnt -> 2ahhmp + gcald + h	2	EC 4.1.2.25	FolB	Folate Biosynthesis	Tomb et al., 1997
HP1532	GF6PTA	Glutamine-fructose-6-phosphate transaminase	[c] : f6p + gln-L -> gam6p + glu-L	2	EC 2.6.1.16	GlmS	Aminosugar Metabolism	Tomb et al., 1997
HP1533	TMDSF	Thymidylate synthase (Flavin-dependent)	[c] : dump + fmnh2 + mlthf -> dtmp + fmn + thf	4	EC 2.1.1.45	ThyX	Nucleotide interconversion	Mylykallio et al., 2002; Tomb et al., 1997
HP1545	DHFS	Dihydrofolate synthase	[c] : atp + dhpt + glu-L -> adp + dhf + pi + h	2	EC 6.3.2.12	FolC	Folate Biosynthesis	Tomb et al., 1997
HP1563	NTRARz	nitrate reductase (TRDRD)	[c] : no3 + trdr -> h2o + no2 + trdox	4		AhpC	Nitrite Metabolism	Bryk et al., 2000; Tomb et al., 1997
	CHCOAL	6-Carboxyhexanoate-CoA ligase	[c] : atp + coa + pime -> amp + pmcoa + ppi	1	EC 6.2.1.14		Biotin Biosynthesis	Ploux et al., 1992
	KAS14	3-Hydroxy-palmetoyl-ACP synthesis	[c] : (2) h + malACP + myrsACP + nadph -> 3hpalmACP + ACP + co2 + nadp	1			Fatty Acid Synthesis	Model proposal
	DHFRI	Dihydrofolate reductase (irreversible)	[c] : dhf + h + nadph -> nadp + thf	1	EC 1.5.1.3		Folate Biosynthesis	Model proposal
	GLUN	Glutaminase	[c] : gln-L + h2o -> glu-L + nh4	4	EC 3.5.1.2		Glutamate Metabolism	Stark et al., 1997; Mendz and Hazell, 1995; McGee et al., 1999
	ORNTA	Ornithine transaminase	[c] : akg + orn -> glu-L + glu5a	1	EC 2.6.1.13		Glutamate Metabolism	Model proposal
	CLPNS-HP	Cardiolipin Synthase (Hpi)	[c] : (2) pg_HP <=> clpn_HP + glyc	3			Glycerolipid Synthesis	Hirai et al., 1995; Mobley et al., 2001
	GLYK	Glycerol kinase	[c] : atp + glyc -> adp + glyc3p + h	1	EC 2.7.1.30		Glycerolipid Synthesis	Model proposal
	PEPT-HP	Ethanolamine phosphotransferase	[c] : cmp + h + pe_HP <=> 12dgr_HP + cdpea	1	EC 2.7.8.1		Glycerolipid Synthesis	Model proposal
	PHCHGS	L-1-Pyrroline-3-hydroxy-5-carboxylate spontaneous conversion to L-4-Hydroxyglutamate semialdehyde	[c] : 1p3h5c + h + h2o <=> 4hglusa	4			Glyoxylate Metabolism	
	AICART	Phosphoribosylaminoimidazolecarboxamide formyltransferase	[c] : 10thf + aicar <=> fprica + thf	2	EC 2.1.2.3		IMP Synthesis	Mobley et al., 2001
	AIRC2r	Phosphoribosylaminoimidazole carboxylase	[c] : air + atp + hco3 <=> 5caiz + adp + h + pi	2	EC4.1.1.21		IMP Synthesis	Mobley et al., 2001
	AIRC3	Phosphoribosylaminoimidazole carboxylase (mutase rxn)	[c] : 5aizc <=> 5caiz	2			IMP Synthesis	
	GARFTI	Phosphoribosylglycinamide formyltransferase, irreversible	[c] : 10thf + gar -> fgam + h + thf	2	EC 2.1.2.2		IMP Synthesis	Mobley et al., 2001
	GART	GAR transformylase-T	[c] : atp + for + gar -> adp + fgam + h + pi	2			IMP Synthesis	Mobley et al., 2001
	GLUPRT	Glutamine phosphoribosylidiphosphate amidotransferase	[c] : gln-L + h2o + prpp -> glu-L + ppi + pram	4	EC 2.4.2.14		IMP Synthesis	Mobley et al., 2001
	IMPC	IMP cyclohydrolase	[c] : h2o + imp <=> fprica	2	EC 3.5.4.10		IMP Synthesis	Mobley et al., 2001
	PRAIS	Phosphoribosylaminoimidazole synthase	[c] : atp + fpram -> adp + air + (2) h + pi	2	EC 6.3.3.1		IMP Synthesis	Mobley et al., 2001
	PRASCS	Phosphoribosylaminoimidazolesuccinocarboxamide synthase	[c] : 5aizc + asp-L + atp <=> 25aics + adp + h + pi	2	EC 6.3.2.6		IMP Synthesis	Mobley et al., 2001
	PRFGS	Phosphoribosylformylglycinamide synthase	[c] : atp + fgam + gln-L + h2o -> adp + fpram + glu-L + h + pi	2	EC 6.3.5.3		IMP Synthesis	Mobley et al., 2001
	A5PISO	Arabinose-5-phosphate isomerase	[c] : ru5p-D <=> ara5p	1	EC 5.3.1.13		LPS Biosynthesis	Model proposal
	GALK	Galactokinase	[c] : atp + gal -> adp + gal1p + h	1	EC 2.7.1.6		LPS Biosynthesis	Model proposal
	GALTI	Galactose-1-phosphate uridylyltransferase (irreversible)	[c] : gal1p + h + utp -> ppi + udpgal	1	EC 2.7.7.10		LPS Biosynthesis	Model proposal
	KDOPP	3-Deoxy-manno-oculosonate-8-phosphatase	[c] : h2o + kdo8p -> kdo + pi	1	EC 3.1.3.45		LPS Biosynthesis	Model proposal
	RFA-HP	Adphep7p-L.D formation	[c] : adphep-L.D + atp -> adp + adphep7p-L.D + h	1			LPS Biosynthesis	Model proposal
	U2GAAT	U2hga_Hp formation	[c] : 3hctaACP + ugam -> ACP + u2hga_HP	1			LPS Biosynthesis	Moran et al., 1997
	U2GAAT2	U2ga_Hp formation	[c] : ocacaACP + u2hga_HP -> ACP + u2ga_HP	1			LPS Biosynthesis	Moran et al., 1997
	USHD-HP	UDP-sugar hydrolase	[c] : h2o + u23ga_HP -> (2) h + lipidX_HP + ump	1			LPS Biosynthesis	Model proposal
	DHNAOT2	1,4-Dihydroxy-2-naphthoate octaprenyltransferase	[c] : dhna + octdp -> 2dmmq6 + co2 + h + ppi	1			Menaquinone Biosynthesis	Model proposal
	ICHORSI	Isochorismate Synthase	[c] : chor -> ichor	1	EC5.4.4.2		Menaquinone Biosynthesis	Model proposal
	NPHS	Naphthoate synthase	[c] : sbzcoa -> coa + dhna	1	EC 4.1.3.36		Menaquinone Biosynthesis	Model proposal
	OXGDC2	2-Oxoglutarate decarboxylase	[c] : akg + h + thmpp -> co2 + ssaltp	1	EC 4.1.1.71		Menaquinone Biosynthesis	Model proposal
	SHCHCS2	2-Succinyl-6-hydroxy-2,4-cyclohexadiene 1-carboxylate synthase	[c] : ichor + ssaltp -> 2shhc + pyr + thmpp	1	EC2.5.1.64		Menaquinone Biosynthesis	Model proposal

Gene Locus	Abbreviation	Official Name	Equation	Confidence Level	EC Number	Protein Description	Pathway	References
	SUCBZL	O-Succinylbenzoate-CoA ligase	[c] : atp + coa + suczb -> amp + ppi + sbzcoa	1	EC 6.2.1.26		Menaquinone Biosynthesis	Model proposal
	SUCBZS	O-Succinylbenzoate-CoA synthase	[c] : 2shhc -> h2o + suczb	1			Menaquinone Biosynthesis	Model proposal
	HSERTA	Homoserine O-trans-acetylase	[c] : accoa + hom-L <=> achms + coa	1	EC 2.3.1.31		Methionine Metabolism	Model proposal
	DKMPPD	2,3-Diketo-5-methylthio-1-phosphopentane degradation reaction	[c] : dkmp + h2o + o2 -> 2kmb + for + (2) h + pi	1			Methionine Salvage Pathway	Sekowska et al., 2004
	MDRPPd	5-Methylthio-5-deoxy-D-ribose 1-phosphate dehydratase	[c] : 5mdru1p <=> dkmp + h2o	1			Methionine Salvage Pathway	Sekowska et al., 2004
	MTRI	5-Methylthioribose-1-phosphate isomerase	[c] : 5mdr1p <=> 5mdru1p	1	EC 5.3.1.23		Methionine Salvage Pathway	Sekowska et al., 2004
	MTRK	5-Methylthioribose kinase	[c] : 5mtr + atp -> 5mdr1p + adp + h	1	EC 2.7.1.100		Methionine Salvage Pathway	Sekowska et al., 2004
	UNK2	2-Keto-4-methylthiobutyrate transamination	[c] : 2kmb + gln-L + h -> glu-L + met-L	1			Methionine Salvage Pathway	Sekowska et al., 2004
	ASPO2	L-Aspartate oxidase	[c] : asp-L + nad -> (2) h + iasp + nadh	1	EC1.4.3.16		Nicotinate Biosynthesis	Model proposal
	NO	Peroxyinitrite formation (spontaneous)	[c] : no + o2 -> no3	4			Nitrite Metabolism	Bryk et al., 2000; Nagata et al., 1998
	CYTK1	Cytidylate kinase (CMP)	[c] : atp + cmp <=> adp + cdp	1	EC 2.7.4.14		Nucleotide Interconversion	Model proposal
	DURIK1	Deoxyuridine kinase (ATP:Deoxyuridine)	[c] : atp + duri -> adp + dump + h	1			Nucleotide Interconversion	Model proposal
	UPPRT	Uracil phosphoribosyltransferase	[c] : prpp + ura -> ppi + ump	4	EC 2.4.2.9		Nucleotide Interconversion	Mendz, Jimenez et al. 1994a; Mobley et al., 2001
	H2CO3D	Carboxylic acid dissociation	[c] : co2 + h2o <=> h2co3	4	EC 4.2.1.1		Others	
	ADSK	Adenylyl-sulfate kinase	[c] : aps + atp -> adp + h + paps	1	EC 2.7.1.25		Others	Model proposal
	DHPDTC	4,5-Dihydroxy-2,3-pentanedione cyclization (spontaneous)	[c] : dhptd -> h2o + hmfum	4			Others	Zhu et al., 2003
	GCALDDr	Glycolaldehyde dehydrogenase	[c] : gcald + h2o + nad <=> glyclt + (2) h + nadh	1	EC 1.2.1.21		Others	Model proposal
	H2CO3D2	Carboxylic acid dissociation	[c] : h + hco3 <=> h2co3	4			Others	spontaneous
	LacR	Lactate racemase	[c] : lac-L <=> lac-D	1	EC 5.1.2.1		Others	Model proposal
	ME1-rev	Malic enzyme	[c] : mal-L + nad <=> co2 + nadh + pyr	4	EC1.1.1.37		Others	Mendz, Hazell et al. 1994b
	PAPSR	Phosphoadenylyl-sulfate reductase (thioredoxin)	[c] : paps + trdrd -> (2) h + pap + so3 + trdox	1	EC 1.8.4.8		Others	Model proposal
	PGMT	Phosphoglucomutase	[c] : g1p <=> g6p	1	EC 5.4.2.2		Others	Model proposal
	PYRDC	Pyruvate decarboxylase	[c] : h + pyr -> acald + co2	1	EC 4.1.1.1		Others	Model proposal
	SADT2	Sulfate adenylyltransferase	[c] : atp + gtp + h2o + so4 -> aps + gdp + pi + ppi	1			Others	Model proposal
	SULR	Sulfite reductase (NADPH2)	[c] : (3) h2o + h2s + (3) nadp <=> (5) h + (3) nadph + so3	1	EC 1.8.2.2		Others	Model proposal
	sink-ahcys(c)	sink S-Adenosyl-L-homocysteine	[c] : ahcys <=>				Others	Model proposal
	sink-amob@	sink S-Adenosyl-4-methylthio-2-oxobutanoate	[c] : amob <=>				Others	Model proposal
	BPNT	3',5'-Bisphosphate nucleotidase	[c] : h2o + pap -> amp + pi	1	EC 3.1.3.7		Pantothenate/ CoA Biosynthesis	Model proposal
	DPR	2-Dehydropantoate 2-reductase	[c] : 2dhp + h + nadph -> nadp + pant-R	1	EC 1.1.1.169		Pantothenate/ CoA Biosynthesis	Model proposal
	PNTK	Pantothenate kinase	[c] : atp + pnto-R -> 4ppan + adp + h	1	EC 2.7.1.33		Pantothenate/ CoA Biosynthesis	Model proposal
	PPCDC	Phosphopantothenoylcysteine decarboxylase	[c] : 4ppcys + h -> co2 + pan4p	1	EC 4.1.1.36		Pantothenate/ CoA Biosynthesis	Model proposal
	PPNCL2	Phosphopantothenate-cysteine ligase	[c] : 4ppan + ctp + cys-L -> 4ppcys + cmp + h + ppi	1	EC 6.3.2.5		Pantothenate/ CoA Biosynthesis	Model proposal
	G6PDH1	Glucose-6-phosphate dehydrogenase	[c] : g6p + nad -> 6pgl + h + nadh	4	EC1.1.1.47		Pentose-Phosphate-Pathway	Hoffman et al., 1996; Mendz, Hazell et al. 1994a;
	GND	Phosphogluconate dehydrogenase	[c] : 6pgc + nadp -> co2 + nadph + ru5p-D	4	EC 1.1.1.44		Pentose-Phosphate-Pathway	Mendz and Hazell, 1991
	PPTGS	Peptidoglycan subunit synthesis	[c] : uaagmda -> h + peptido_EC + udcppd	1			Peptidoglycan Biosynthesis	Model proposal
	UDCCPDp	Undecaprenyl-diphosphatase	[c] : h2o + udcppd -> h + pi + udcpp	1	EC 3.6.1.27		Peptidoglycan Biosynthesis	Model proposal
	PPNDH	Prephenate dehydratase	[c] : h + pphn -> co2 + h2o + phpyr	2	EC 4.2.1.51		Phenylalanine Biosynthesis	
	GSSADr	L-Glutamate 5-semialdehyde dehydratase, reversible	[c] : glu5sa <=> 1pyr5c + h + h2o	4			Proline Metabolism	Voet, 1999
	ADD	Adenine deaminase	[c] : ade + h + h2o -> hxn + nh4	4	EC 3.5.4.2		Purine metabolism	Mendz et al., 1997
	ADNUC	Adenosine nucleosidase	[c] : adn + h2o -> ade + rib-D	4	EC 3.2.2.7		Purine metabolism	Mendz, Jimenez et al. 1994b; Mobley et al., 2001
	GNNUC	Guanosine nucleosidase	[c] : gsn + h2o -> gua + rib-D	4	EC3.2.2.1		Purine metabolism	Mendz, Jimenez et al. 1994b; Mobley et al., 2001
	FADOX	Flavodoxin oxidase (Menaquinone)	[c] : fadh2 + mqn6 -> fad + mql6	1			Respiratory chain	Model proposal
	FRDO	Ferrodoxin oxidase (NADPH)	[c] : fdxrd + nadp -> fdcox + h + nadph	1			Respiratory chain	Model proposal
	PMDPHT	Pyrimidine phosphatase	[c] : 5aprbu + h2o -> 4r5au + pi	1			Riboflavin Metabolism	Model proposal
	ADMDCr	Adenosylmethionine decarboxylase	[c] : amet + h <=> ametam + co2	1	EC 4.1.1.50		Spermidine Biosynthesis	Model proposal
	AGMT	Agmatinase	[c] : agm + h2o -> ptrc + urea	1	EC 3.5.3.11		Spermidine Biosynthesis	Model proposal
	AKO	α-Ketoglutarate oxidase	[c] : akgl + fad + h2o -> co2 + fadh2 + succ	4			TCA cycle	Pitson et al., 1999
	MALS	Malate synthase	[c] : accoa + glx + h2o -> coa + h + mal-L	4	EC 4.1.3.2		TCA cycle	Pitson et al., 1999
	MTHFR2	5,10-Methylenetetrahydrofolate reductase (NADH)	[c] : (2) h + mthf + nadh -> 5mthf + nad	1			THF Metabolism	Model proposal
	AATr	Acrylamide transport via diffusion	aa[e] <=> aa[c]	4			Transport	Orbach and Finkelstein, 1980
	ACACT2	Acetoacetate transport via proton symport	aca[c] + h[e] <=> aca[c] + h[c]	1			Transport	Model proposal
	ACALDt	Acetaldehyde reversible transport	acald[e] <=> acald[c]	4			Transport	Salmela et al., 1993
	ACI2r	Acetate reversible transport via proton symport	ac[e] + h[e] <=> ac[c] + h[c]	1			Transport	Model proposal
	ADEI2	Adenine transport in via proton symport	ade[e] + h[e] -> ade[c] + h[c]	4			Transport	Mendz, Jimenez et al. 1994b
	ADTr	Acetamide transport via diffusion	ad[e] -> ad[c]	4			Transport	Orbach and Finkelstein, 1980
	ASNabc	L-Asparagine transport via ABC system	asn-L[e] + atp[c] + h2o[c] -> adp[c] + asn-L[c] + h[c] + pi[c]	1			Transport	Model proposal
	CO2t	CO2 transporter via diffusion	co2[e] <=> co2[c]	4			Transport	Diffusion
	CYSabc	L-Cysteine transport via ABC system	atp[c] + cys-L[e] + h2o[c] -> adp[c] + cys-L[c] + h[c] + pi[c]	1			Transport	Model proposal
	ETOHI2r	Ethanol reversible transport via proton symport	etoh[e] + h[e] <=> etoh[c] + h[c]	1			Transport	Model proposal

Gene Locus	Abbreviation	Official Name	Equation	Confidence Level	EC Number	Protein Description	Pathway	References
FOR1		Formate transport via diffusion	for[e] <=> for[c]	4			Transport	Orbach and Finkelstein, 1980
FUMI3		Fumarate transport, irve	fum[c] + h[e] -> fum[e] + h[c]	4			Transport	Mendz, Meek et al. 1998
GSNI2		Guanosine transport in via proton symport	gsn[e] + h[e] -> gsn[c] + h[c]	4			Transport	Mendz, Jimenez et al. 1994b
GUA1		Guanine transport	gua[e] <=> gua[c]	4			Transport	Mendz, Jimenez et al. 1994b
H2CO3TP		H2CO3 transport	h2co3[e] <=> h2co3[c]	4			Transport	Mendz, Jimenez et al. 1994a
H2O1		H2O transport via diffusion	h2o[e] <=> h2o[c]	4			Transport	
HEMEti		(Proto-) Heme transport	atp[c] + h2o[c] + pheme[e] -> adp[c] + h[c] + pi[c] + pheme[c]	4			Transport	Worst et al., 1999
HISabc		L-Histidine transport via ABC system	atp[c] + h2o[c] + his-L[e] -> adp[c] + h[c] + his-L[c] + pi[c]	1			Transport	Model proposal
HYXN1		Hypoxanthine transport	hxn[e] <=> hxn[c]	4			Transport	Mendz, Jimenez et al. 1994b
ILEabc		L-Isoleucine transport via ABC system	atp[c] + h2o[c] + ile-L[e] -> adp[c] + h[c] + ile-L[c] + pi[c]	1			Transport	Model proposal
LEUabc		L-Leucine transport via ABC system	atp[c] + h2o[c] + leu-L[e] -> adp[c] + h[c] + leu-L[c] + pi[c]	1			Transport	Nedenskov, 1994
LYSI2r		L-Lysine reversible transport via proton symport	h[e] + lys-L[e] <=> h[c] + lys-L[c]	1			Transport	Model proposal
METabc		L-Methionine transport via ABC system	atp[c] + h2o[c] + met-L[e] -> adp[c] + h[c] + met-L[c] + pi[c]	1			Transport	Model proposal
NH4I2r		Ammonia transport in via proton symport	nh4[e] <=> nh4[c]	1			Transport	Model proposal
NO3I2		Nitrate transport in via proton symport, in	h[e] + no3[e] -> h[c] + no3[c]	2			Transport	
NO3I3		Nitrate transport out via proton antiport, out	h[e] + no3[c] -> h[c] + no3[e]	3			Transport	Model proposal
NO1		Nitric oxide transport	no[e] <=> no[c]	4			Transport	
O2t		O2 transport (diffusion)	o2[e] <=> o2[c]	4			Transport	
OROATP		Orotate transport via ABC system	h[e] + orot[e] -> h[c] + orot[c]	4			Transport	Mendz, Jimenez et al. 1994b
PHEI2r		L-Phenylalanine reversible transport via proton symport	h[e] + phe-L[e] <=> h[c] + phe-L[c]	1			Transport	Model proposal
PIME1r		Pimelate transport, reversible	pime[e] <=> pime[c]	1			Transport	Ploux et al., 1992
PYRI2r		Pyruvate reversible transport via proton symport	h[e] + pyr[e] <=> h[c] + pyr[c]	1			Transport	Model proposal
THMabc		Thiamine transport via ABC system	atp[c] + h2o[c] + thm[e] -> adp[c] + h[c] + pi[c] + thm[c]	4			Transport	Model proposal
THR12r		L-Threonine reversible transport via proton symport	h[e] + thr-L[e] <=> h[c] + thr-L[c]	1			Transport	Model proposal
TRP12r		L-Tryptophan reversible transport via proton symport	h[e] + trp-L[e] <=> h[c] + trp-L[c]	1			Transport	Model proposal
TYRI2r		L-Tyrosine reversible transport via proton symport	h[e] + tyr-L[e] <=> h[c] + tyr-L[c]	1			Transport	Model proposal
URAI2		Uracil transport in via proton symport	h[e] + ura[e] -> h[c] + ura[c]	4			Transport	Mendz, Jimenez et al. 1994a
VALabc		L-Valine transport via ABC system	atp[c] + h2o[c] + val-L[e] -> adp[c] + h[c] + pi[c] + val-L[c]	1			Transport	Model proposal
XANI2		Xanthine transport in via proton symport	h[e] + xan[e] -> h[c] + xan[c]	1			Transport	Model proposal
ARGSL		Argininosuccinate lyase	[c] : argsuc <=> arg-L + fum	4	EC 4.3.2.1		Urea Cycle	Mendz and Hazell, 1996
ARGSS		Argininosuccinate synthase	[c] : asp-L + atp + citr-L -> amp + argsuc + h + ppi	4	EC 6.3.4.5		Urea Cycle	Mendz and Hazell, 1996
OCBT1		Ornithine carbamoyltransferase, irreversible	[c] : cbp + orn -> citr-L + h + pi	4	EC 2.1.3.3		Urea Cycle	Mendz and Hazell, 1996

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Table S2B: List of exchange reactions included in *i*IT341 GSM/GPR

Abbreviation	Official name	Reaction	Direction
BiomassHP	growth demand		Irreversible
DM-hmfurn(c)	4-hydroxy-5-methyl-3(2H)-furanone demand	[c] : hmfurn -->	Irreversible
EX_aa(e)	Acetamide exchange	[e] : aa <==>	Reversible
EX_ac(e)	Acetate exchange	[e] : ac <==>	Reversible
EX_acac(e)	Acetoacetate exchange	[e] : acac <==>	Reversible
EX_acald(e)	Acetaldehyde exchange	[e] : acald <==>	Reversible
EX_ad(e)	Acrylamide exchange	[e] : ad <==>	Reversible
EX_ade(e)	Adenine exchange	[e] : ade <==>	Reversible
EX_adn(e)	Adenosine exchange	[e] : adn <==>	Reversible
EX_akg(e)	2-Oxoglutarate exchange	[e] : akg <==>	Reversible
EX_ala-D(e)	D-Alanine exchange	[e] : ala-D <==>	Reversible
EX_ala-L(e)	L-Alanine exchange	[e] : ala-L <==>	Reversible
EX_arg-L(e)	L-Arginine exchange	[e] : arg-L <==>	Reversible
EX_asn-L(e)	L-Asparagine exchange	[e] : asn-L <==>	Reversible
EX_asp-L(e)	L-Aspartate exchange	[e] : asp-L <==>	Reversible
EX_cit(e)	Citrate exchange	[e] : cit <==>	Reversible
EX_co2(e)	CO2 exchange	[e] : co2 <==>	Reversible
EX_cys-L(e)	L-Cysteine exchange	[e] : cys-L <==>	Reversible
EX_cyt(d)	Cytidine exchange	[e] : cytd <==>	Reversible
EX_dad-2(e)	Deoxyadenosine exchange	[e] : dad-2 <==>	Reversible
EX_dcyt(e)	Deoxycytidine exchange	[e] : dcyt <==>	Reversible
EX_duri(e)	Deoxyuridine exchange	[e] : duri <==>	Reversible
EX_etoh(e)	Ethanol exchange	[e] : etoh <==>	Reversible
EX_fe2(e)	Fe2+ exchange	[e] : fe2 <==>	Reversible
EX_fe3(e)	Fe3+ exchange	[e] : fe3 <==>	Reversible
EX_for(e)	Formate exchange	[e] : for <==>	Reversible
EX_fum(e)	Fumarate exchange	[e] : fum <==>	Reversible
EX_gal(e)	D-Galactose exchange	[e] : gal <==>	Reversible
EX_glc(e)	D-Glucose exchange	[e] : glc-D <==>	Reversible
EX_gln-L(e)	L-Glutamine exchange	[e] : gln-L <==>	Reversible
EX_glu-L(e)	L-Glutamate exchange	[e] : glu-L <==>	Reversible
EX_gly(e)	Glycine exchange	[e] : gly <==>	Reversible
EX_gsn(e)	Guanosine exchange	[e] : gsn <==>	Reversible
EX_gua(e)	Guanine exchange	[e] : gua <==>	Reversible
EX_h(e)	H+ exchange	[e] : h <==>	Reversible
EX_h2(e)	H2 exchange	[e] : h2 <==>	Reversible
EX_h2co3(e)	carbonic acid exchange	[e] : h2co3 <==>	Reversible
EX_h2o(e)	H2O exchange	[e] : h2o <==>	Reversible
EX_his-L(e)	L-Histidine exchange	[e] : his-L <==>	Reversible
EX_hxan(e)	Hypoxanthine exchange	[e] : hxan <==>	Reversible
EX_ile-L(e)	L-Isoleucine exchange	[e] : ile-L <==>	Reversible
EX_lac-L(e)	L-Lactate exchange	[e] : lac-L <==>	Reversible
EX_leu-L(e)	L-Leucine exchange	[e] : leu-L <==>	Reversible
EX_lys-L(e)	L-Lysine exchange	[e] : lys-L <==>	Reversible
EX_mal-L(e)	L-Malate exchange	[e] : mal-L <==>	Reversible
EX_met-L(e)	L-Methionine exchange	[e] : met-L <==>	Reversible
EX_na1(e)	Sodium exchange	[e] : na1 <==>	Reversible
EX_nh4(e)	Ammonia exchange	[e] : nh4 <==>	Reversible
EX_ni2(e)	Ni2+ exchange	[e] : ni2 <==>	Reversible
EX_nmn(e)	NMN exchange	[e] : nmn <==>	Reversible
EX_no(e)	Nitric oxide exchange	[e] : no <==>	Reversible
EX_no2(e)	Nitrite exchange	[e] : no2 <==>	Reversible