

Classification I	Classification II	Subsystem	Functional Role	Occurrence
Amino Acids and Derivatives desulfurase (EC 4.4.1.-)	Alanine, serine, and glycine 2	Alanine Biosynthesis	Cysteine	
Amino Acids and Derivatives dehydrogenase [decarboxylating]	Alanine, serine, and glycine (glycine cleavage system P protein)	Glycine cleavage system	Glycine	4
Amino Acids and Derivatives Dihydrolipoamide dehydrogenase (EC 1.8.1.4)	Alanine, serine, and glycine 3	Glycine cleavage system		
Amino Acids and Derivatives Aminomethyltransferase (glycine cleavage system T protein) (EC:2.1.2.10)	Alanine, serine, and glycine 2	Glycine synthesis	Serine	1
Amino Acids and Derivatives hydroxymethyltransferase (EC 2.1.2.1)	Alanine, serine, and glycine 2	Glycine synthesis	Low-	
Amino Acids and Derivatives specificity L-threonine aldolase (EC 4.1.2.5)	Alanine, serine, and glycine 2	Serine Biosynthesis		
Amino Acids and Derivatives Phosphoserine aminotransferase (EC 2.6.1.52)	Alanine, serine, and glycine 1	Serine Biosynthesis		
Amino Acids and Derivatives Phosphoserine phosphatase (EC 3.1.3.3)	Alanine, serine, and glycine 1	Serine Biosynthesis	Serine	
Amino Acids and Derivatives hydroxymethyltransferase (EC 2.1.2.1)	Arginine; urea cycle, polyamines 2	Arginine Putrescine and	4-	
Amino Acids and Derivatives aminobutyrate degradation	Urease accessory protein UreF	3		
Amino Acids and Derivatives aminobutyrate degradation	Arginine; urea cycle, polyamines Agmatine deiminase (EC 3.5.3.12)	1	Arginine Putrescine and	4-
Amino Acids and Derivatives aminobutyrate degradation	Arginine; urea cycle, polyamines Proline dehydrogenase (EC 1.5.99.8)	(Proline oxidase)	1	Arginine Putrescine and
Amino Acids and Derivatives aminobutyrate degradation	Arginine; urea cycle, polyamines Delta-1-pyrroline-5-carboxylate dehydrogenase (EC 1.5.1.12)	1	Arginine Putrescine and	4-
Amino Acids and Derivatives aminobutyrate degradation	Arginine; urea cycle, polyamines 4-aminobutyrate aminotransferase (EC 2.6.1.19)	4	Arginine Putrescine and	4-
Amino Acids and Derivatives aminobutyrate degradation	Arginine; urea cycle, polyamines Arginine decarboxylase (EC 4.1.1.19)	9	Arginine Putrescine and	4-
Amino Acids and Derivatives aminobutyrate degradation	Arginine; urea cycle, polyamines Urease accessory protein UreE	7	Arginine Putrescine and	4-
Amino Acids and Derivatives aminobutyrate degradation	Arginine; urea cycle, polyamines Ornithine aminotransferase (EC 2.6.1.13)	1	Arginine Putrescine and	4-
Amino Acids and Derivatives aminobutyrate degradation	Arginine; urea cycle, polyamines 3-polyprenyl-4-hydroxybenzoate carboxy-lyase (EC 4.1.1.-)	1	Arginine Putrescine and	4-
Amino Acids and Derivatives aminobutyrate degradation	Arginine; urea cycle, polyamines Ornithine carbamoyltransferase (EC 2.1.3.3)	1	Arginine Putrescine and	4-
Amino Acids and Derivatives aminobutyrate degradation	Arginine; urea cycle, polyamines Urease alpha subunit (EC 3.5.1.5)	9	Polyamine Metabolism	
Amino Acids and Derivatives Spermidine Putrescine ABC transporter permease component potC (TC_3.A.1.11.1)	Arginine; urea cycle, polyamines 2	Polyamine Metabolism		
Amino Acids and Derivatives Arginine decarboxylase (EC 4.1.1.19)	Arginine; urea cycle, polyamines 9	Polyamine Metabolism		
Amino Acids and Derivatives Putrescine transport system permease protein potH (TC_3.A.1.11.2)	Arginine; urea cycle, polyamines 1	Polyamine Metabolism		
Amino Acids and Derivatives Spermidine Putrescine ABC transporter permease component potB (TC_3.A.1.11.1)	Arginine; urea cycle, polyamines 1	Polyamine Metabolism		
Amino Acids and Derivatives Ornithine decarboxylase (EC 4.1.1.17)	Arginine; urea cycle, polyamines 1	Urea decomposition		
Amino Acids and Derivatives Urea ABC transporter, permease protein UrtC	Arginine; urea cycle, polyamines 6	Urea decomposition		
Amino Acids and Derivatives Urease alpha subunit (EC 3.5.1.5)	Arginine; urea cycle, polyamines 9	Urea decomposition		
Amino Acids and Derivatives Urease accessory protein UreF	Arginine; urea cycle, polyamines 3	Urea decomposition		
Amino Acids and Derivatives Urea ABC transporter, permease protein UrtB	Arginine; urea cycle, polyamines 2	Urea decomposition		
Amino Acids and Derivatives Urea ABC transporter, ATPase protein UrtD	Arginine; urea cycle, polyamines 1	Urea decomposition		
Amino Acids and Derivatives Urea carboxylase	Arginine; urea cycle, polyamines 2	Urea decomposition		
Amino Acids and Derivatives Urea ABC transporter, urea binding protein	Arginine; urea cycle, polyamines 1	Urea decomposition		
Amino Acids and Derivatives Urease accessory protein UreE	Aromatic amino acids and derivatives 7	Central meta-cleavage		
Amino Acids and Derivatives pathway of aromatic compound degradation	2-hydroxymuconic semialdehyde hydrolase (EC 3.7.1.9)	1		
Amino Acids and Derivatives phosphoshikimate 1-carboxyvinyltransferase (EC 2.5.1.19)	Aromatic amino acids and derivatives 10	Chorismate Synthesis		3-
Amino Acids and Derivatives Prephenate dehydrogenase (EC 1.3.1.12)	Aromatic amino acids and derivatives 7	Chorismate Synthesis		
Amino Acids and Derivatives Shikimate kinase (EC 2.7.1.71)	Aromatic amino acids and derivatives 1	Chorismate Synthesis		
Amino Acids and Derivatives Shikimate 5-dehydrogenase (EC 1.1.1.25)	Aromatic amino acids and derivatives 1	Chorismate Synthesis		
Amino Acids and Derivatives Phospho-2-dehydro-3-deoxyheptonate aldolase (EC 2.5.1.54)	Aromatic amino acids and derivatives 5	Chorismate Synthesis		

Amino Acids and Derivatives	Aromatic amino acids and derivatives	Chorismate Synthase	
Chorismate mutase (EC 5.4.99.5)	1		
Amino Acids and Derivatives	Aromatic amino acids and derivatives	Chorismate Synthase	3-
dehydroquinase synthase (EC 4.2.3.4)	5		
Amino Acids and Derivatives	Aromatic amino acids and derivatives	Chorismate Synthase	
Chorismate synthase (EC 4.2.3.5)	2		
Amino Acids and Derivatives	Aromatic amino acids and derivatives	Phenylalanine synthesis	
Aspartate aminotransferase (EC 2.6.1.1)	6		
Amino Acids and Derivatives	Aromatic amino acids and derivatives	Phenylalanine synthesis	
Chorismate mutase (EC 5.4.99.5)	1		
Amino Acids and Derivatives	Aromatic amino acids and derivatives	Tryptophan synthesis	
Tryptophan synthase beta chain like (EC 4.2.1.20)	1		
Amino Acids and Derivatives	Aromatic amino acids and derivatives	Tryptophan synthesis	
Indole-3-glycerol phosphate synthase (EC 4.1.1.48)	1		
Amino Acids and Derivatives	Aromatic amino acids and derivatives	Tryptophan synthesis	
Anthranilate synthase, aminase component (EC 4.1.3.27)	2		
Amino Acids and Derivatives	Aromatic amino acids and derivatives	Tryptophan synthesis	
Tryptophan synthase beta chain (EC 4.2.1.20)	3		
Amino Acids and Derivatives	Aromatic amino acids and derivatives	Tyrosine synthesis	
Chorismate mutase (EC 5.4.99.5)	1		
Amino Acids and Derivatives	Aromatic amino acids and derivatives	Tyrosine synthesis	
Aspartate aminotransferase (EC 2.6.1.1)	5		
Amino Acids and Derivatives	Aromatic amino acids and derivatives	Tyrosine synthesis	
Prephenate dehydrogenase (EC 1.3.1.12)	7		
Amino Acids and Derivatives	Branched-chain amino acids	Branched-Chain Amino Acid	
Biosynthesis	Dihydroxy-acid dehydratase (EC 4.2.1.9)		
Amino Acids and Derivatives	Branched-chain amino acids	Branched-Chain Amino Acid	
Biosynthesis	3-isopropylmalate dehydrogenase (EC 1.1.1.85)		
Amino Acids and Derivatives	Branched-chain amino acids	Branched-Chain Amino Acid	
Biosynthesis	Acetolactate synthase large subunit (EC 2.2.1.6)		
Amino Acids and Derivatives	Branched-chain amino acids	Branched-Chain Amino Acid	
Biosynthesis	2-isopropylmalate synthase (EC 2.3.3.13)		
Amino Acids and Derivatives	Branched-chain amino acids	Branched-Chain Amino Acid	
Biosynthesis	Threonine dehydratase (EC 4.3.1.19)		
Amino Acids and Derivatives	Branched-chain amino acids	Branched-Chain Amino Acid	
Biosynthesis	3-isopropylmalate dehydratase large subunit (EC 4.2.1.33)		
Amino Acids and Derivatives	Branched-chain amino acids	Branched-Chain Amino Acid	
Biosynthesis	Ketol-acid reductoisomerase (EC 1.1.1.86)		
Amino Acids and Derivatives	Branched-chain amino acids	Branched-Chain Amino Acid	
Biosynthesis	Branched-chain amino acid aminotransferase (EC 2.6.1.42)		
Amino Acids and Derivatives	Branched-chain amino acids	HMG CoA Synthase	Isovaleryl-
CoA dehydrogenase (EC 1.3.99.10)	2		
Amino Acids and Derivatives	Branched-chain amino acids	HMG CoA Synthase	
Methylcrotonyl-CoA carboxylase biotin-containing subunit (EC 6.4.1.4)	1		
Amino Acids and Derivatives	Branched-chain amino acids	Isoleucine degradation	Branched-
chain alpha-keto acid dehydrogenase, E1 component, beta subunit (EC 1.2.4.4)	5		
Amino Acids and Derivatives	Branched-chain amino acids	Isoleucine degradation	
Dihydrolipoamide dehydrogenase (EC 1.8.1.4)	3		
Amino Acids and Derivatives	Branched-chain amino acids	Isoleucine degradation	3-
hydroxyacyl-CoA dehydrogenase (EC 1.1.1.35)	1		
Amino Acids and Derivatives	Branched-chain amino acids	Isoleucine degradation	Branched-
chain amino acid aminotransferase (EC 2.6.1.42)	45		
Amino Acids and Derivatives	Branched-chain amino acids	Isoleucine degradation	Branched-
chain alpha-keto acid dehydrogenase, E1 component, alpha subunit (EC 1.2.4.4)	2		
Amino Acids and Derivatives	Branched-chain amino acids	Isoleucine degradation	Acyl-CoA
dehydrogenase (EC 1.3.99.3)	1		
Amino Acids and Derivatives	Branched-chain amino acids	Isoleucine degradation	Enoyl-CoA
hydratase (EC 4.2.1.17)	1		
Amino Acids and Derivatives	Branched-chain amino acids	Isoleucine degradation	Acyl-CoA
dehydrogenase, short-chain specific (EC 1.3.99.2)	3		
Amino Acids and Derivatives	Branched-chain amino acids	Isoleucine degradation	Lipoamide
acyltransferase component of branched-chain alpha-keto acid dehydrogenase complex (EC 2.3.1.-)	2		
Amino Acids and Derivatives	Branched-chain amino acids	Leucine Biosynthesis v2	3-
isopropylmalate dehydrogenase (EC 1.1.1.85)	3		
Amino Acids and Derivatives	Branched-chain amino acids	Leucine Biosynthesis v2	3-
isopropylmalate dehydratase large subunit (EC 4.2.1.33)	1		
Amino Acids and Derivatives	Branched-chain amino acids	Leucine Biosynthesis v2	2-
isopropylmalate synthase (EC 2.3.3.13)	12		
Amino Acids and Derivatives	Branched-chain amino acids	Leucine Biosynthesis v2	Branched-
chain amino acid aminotransferase (EC 2.6.1.42)	44		
Amino Acids and Derivatives	Branched-chain amino acids	Leucine Degradation and HMG-CoA	
Metabolism	2-oxoisovalerate dehydrogenase beta subunit (EC 1.2.4.4)		
Amino Acids and Derivatives	Branched-chain amino acids	Leucine Degradation and HMG-CoA	
Metabolism	Methylcrotonyl-CoA carboxylase biotin-containing subunit (EC 6.4.1.4)		
Amino Acids and Derivatives	Branched-chain amino acids	Leucine Degradation and HMG-CoA	
Metabolism	Branched-chain amino acid aminotransferase (EC 2.6.1.42)		
Amino Acids and Derivatives	Branched-chain amino acids	Leucine Degradation and HMG-CoA	
Metabolism	Isovaleryl-CoA dehydrogenase (EC 1.3.99.10)		
Amino Acids and Derivatives	Branched-chain amino acids	Leucine Degradation and HMG-CoA	
Metabolism	Succinyl-CoA:3-ketoacid-coenzyme A transferase subunit B (EC 2.8.3.5)		
Amino Acids and Derivatives	Branched-chain amino acids	Leucine Degradation and HMG-CoA	

Metabolism	Succinyl-CoA:3-ketoacid-coenzyme A transferase subunit A (EC 2.8.3.5)	1	
Amino Acids and Derivatives	Branched-chain amino acids	Valine Biosynthesis	
Acetolactate synthase large subunit (EC 2.2.1.6)		2	
Amino Acids and Derivatives	Branched-chain amino acids	Valine degradation	Branched-
chain alpha-keto acid dehydrogenase, E1 component, alpha subunit (EC 1.2.4.4)		2	
Amino Acids and Derivatives	Branched-chain amino acids	Valine degradation	Acyl-CoA
dehydrogenase, short-chain specific (EC 1.3.99.2)		3	
Amino Acids and Derivatives	Branched-chain amino acids	Valine degradation	Branched-
chain amino acid aminotransferase (EC 2.6.1.42)		45	
Amino Acids and Derivatives	Branched-chain amino acids	Valine degradation	Branched-
chain alpha-keto acid dehydrogenase, E1 component, beta subunit (EC 1.2.4.4)		5	
Amino Acids and Derivatives	Branched-chain amino acids	Valine degradation	
Dihydrolipoamide dehydrogenase (EC 1.8.1.4)		3	
Amino Acids and Derivatives	Branched-chain amino acids	Valine degradation	Lipoamide
acyltransferase component of branched-chain alpha-keto acid dehydrogenase complex (EC 2.3.1.-)		2	
Amino Acids and Derivatives	Branched-chain amino acids	Valine degradation	Enoyl-CoA
hydratase (EC 4.2.1.17)		1	
Amino Acids and Derivatives	Branched-chain amino acids	Valine degradation	Acyl-CoA
dehydrogenase (EC 1.3.99.3)		1	
Amino Acids and Derivatives	Branched-chain amino acids	Valine degradation	3-
hydroxyacyl-CoA dehydrogenase (EC 1.1.1.35)		1	
Amino Acids and Derivatives	Glutamine, glutamate, aspartate, asparagine; ammonia assimilation		
Asp-Glu-tRNA(Asn-Gln) transamidation	Glutamyl-tRNA synthetase (EC 6.1.1.18)	2	
Amino Acids and Derivatives	Glutamine, glutamate, aspartate, asparagine; ammonia assimilation		
Asp-Glu-tRNA(Asn-Gln) transamidation	Glutamyl-tRNA synthetase (EC 6.1.1.17)	3	
Amino Acids and Derivatives	Glutamine, glutamate, aspartate, asparagine; ammonia assimilation		
Asp-Glu-tRNA(Asn-Gln) transamidation	Aspartyl-tRNA(Asn) amidotransferase subunit A (EC 6.3.5.-)	1	
Amino Acids and Derivatives	Glutamine, glutamate, aspartate, asparagine; ammonia assimilation		
Asp-Glu-tRNA(Asn-Gln) transamidation	Aspartyl-tRNA(Asn) synthetase	1	
Amino Acids and Derivatives	Glutamine, glutamate, aspartate, asparagine; ammonia assimilation		
Asp-Glu-tRNA(Asn-Gln) transamidation	Glutamyl-tRNA(Gln) synthetase	3	
Amino Acids and Derivatives	Glutamine, glutamate, aspartate, asparagine; ammonia assimilation		
Asp-Glu-tRNA(Asn-Gln) transamidation	Glutamyl-tRNA(Gln) amidotransferase subunit A (EC 6.3.5.-)	1	
Amino Acids and Derivatives	Glutamine, glutamate, aspartate, asparagine; ammonia assimilation		
Asp-Glu-tRNA(Asn-Gln) transamidation	Aspartyl-tRNA synthetase (EC 6.1.1.12)	1	
Amino Acids and Derivatives	Glutamine, glutamate, aspartate, asparagine; ammonia assimilation		
Asp-Glu-tRNA(Asn-Gln) transamidation	Asparaginyl-tRNA synthetase (EC 6.1.1.22)	1	
Amino Acids and Derivatives	Glutamine, glutamate, aspartate, asparagine; ammonia assimilation		
Glutamate biosynthesis	Glutamate synthase [NADPH] small chain (EC 1.4.1.13)	5	
Amino Acids and Derivatives	Glutamine, glutamate, aspartate, asparagine; ammonia assimilation		
Glutamate biosynthesis	Glutamate synthase [NADPH] large chain (EC 1.4.1.13)	13	
Amino Acids and Derivatives	Glutamine, glutamate, aspartate, asparagine; ammonia assimilation		
Glutamate, aspartate and asparagine biosynthesis	Ferredoxin-dependent glutamate synthase (EC 1.4.7.1)	1	
Amino Acids and Derivatives	Glutamine, glutamate, aspartate, asparagine; ammonia assimilation		
Glutamate, aspartate and asparagine biosynthesis	Glutamate synthase [NADPH] small chain (EC 1.4.1.13)	5	
Amino Acids and Derivatives	Glutamine, glutamate, aspartate, asparagine; ammonia assimilation		
Glutamate, aspartate and asparagine biosynthesis	Glutamate synthase [NADPH] large chain (EC 1.4.1.13)	13	
Amino Acids and Derivatives	Glutamine, glutamate, aspartate, asparagine; ammonia assimilation		
Glutamate, aspartate and asparagine biosynthesis	Aspartate ammonia-lyase (EC 4.3.1.1)	2	
Amino Acids and Derivatives	Glutamine, glutamate, aspartate, asparagine; ammonia assimilation		
Glutamate, aspartate and asparagine biosynthesis	Aspartate aminotransferase (EC 2.6.1.1)	6	
Amino Acids and Derivatives	Histidine	Histidine Biosynthesis	Phosphoribosyl-ATP
pyrophosphatase (EC 3.6.1.31)		1	
Amino Acids and Derivatives	Histidine	Histidine Biosynthesis	Phosphoribosyl-AMP
cyclohydrolase (EC 3.5.4.19)		1	
Amino Acids and Derivatives	Histidine	Histidine Biosynthesis	Histidinol-phosphatase (EC 3.1.3.15)
		1	
Amino Acids and Derivatives	Histidine	Histidine Biosynthesis	Imidazole glycerol phosphate synthase cyclase subunit (EC 4.1.3.-)
		2	
Amino Acids and Derivatives	Histidine	Histidine Biosynthesis	Histidinol-phosphate
aminotransferase (EC 2.6.1.9)		1	
Amino Acids and Derivatives	Histidine	Histidine Degradation	Urocanate hydratase (EC 4.2.1.49)
		7	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine		cysteine
biosynthesis	Sulfate transport system permease protein cysT	1	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine		cysteine
biosynthesis	Cysteinyl-tRNA synthetase (EC 6.1.1.16)	2	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine		cysteine
biosynthesis	Sulfate and thiosulfate binding protein cysP	1	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine		Lysine Biosynthesis
DAP Pathway	Diaminopimelate epimerase alternative form predicted for S.aureus (EC 5.1.1.7)	1	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine		Lysine Biosynthesis
DAP Pathway	Diaminopimelate decarboxylase (EC 4.1.1.20)	1	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine		Lysine Biosynthesis
DAP Pathway	N-acetyl-L,L-diaminopimelate deacetylase (EC 3.5.1.47)	3	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine		Lysine Biosynthesis

DAP Pathway	N-succinyl-L,L-diaminopimelate aminotransferase alternative	(EC 2.6.1.17)	1	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine			Lysine Biosynthesis
DAP Pathway	Dihydrodipicolinate synthase (EC 4.2.1.52)		2	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine			Methionine
Biosynthesis	Homoserine dehydrogenase (EC 1.1.1.3)		2	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine			Methionine
Biosynthesis	S-adenosylmethionine synthetase (EC 2.5.1.6)		2	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine			Methionine
Biosynthesis	O-succinylhomoserine sulfhydrylase (EC 4.2.99.9)		2	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine			Methionine
Biosynthesis	Cystathionine beta-synthase (EC 4.2.1.22)		1	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine			Methionine
Biosynthesis	5-methyltetrahydrofolate--homocysteine methyltransferase (EC 2.1.1.13)		2	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine			Methionine
Biosynthesis	Cystathionine gamma-synthase (EC 2.5.1.48)		1	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine			Methionine
Biosynthesis	Homoserine kinase (EC 2.7.1.39)		4	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine			Methionine
Biosynthesis	Homoserine O-acetyltransferase (EC 2.3.1.31)		2	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine			Methionine
Biosynthesis	O-acetylhomoserine sulfhydrylase (EC 4.2.99.10)		2	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine			Methionine
Biosynthesis	Methionine ABC transporter ATP-binding protein		1	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine			Methionine
Biosynthesis	Methionine ABC transporter substrate-binding protein		1	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine			Methionine
Biosynthesis	5-methyltetrahydropteroyltriglutamate--homocysteine methyltransferase (EC 2.1.1.14)		8	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine			Methionine
Biosynthesis	Adenosylhomocysteinase (EC 3.3.1.1)		4	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine			Methionine Salvage
Methylthioribose-1-phosphate isomerase (EC 5.3.1.23)			1	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine			Methionine Salvage
5-methylthioribose kinase (EC 2.7.1.100)			2	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine			Methionine Salvage
Branched-chain amino acid aminotransferase (EC 2.6.1.42)			44	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine			Threonine synthesis
Homoserine kinase (EC 2.7.1.39)			4	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine			Threonine synthesis
Threonine synthase (EC 4.2.3.1)			3	
Amino Acids and Derivatives	Lysine, threonine, methionine, and cysteine			Threonine synthesis
Homoserine dehydrogenase (EC 1.1.1.3)			2	
Amino Acids and Derivatives	Proline and 4-hydroxyproline	Proline Catabolism		Proline,Na+
Cotransport			1	
Amino Acids and Derivatives	Proline and 4-hydroxyproline	Proline Synthesis		Glutamate
5-kinase (EC 2.7.2.11)			1	
Carbohydrates	Aminosugars	N-Acetyl-D-Glucosamine Utilization		PTS system, N-
acetylglucosamine-specific IIBC component (EC 2.7.1.69)			1	
Carbohydrates	Aminosugars	N-Acetyl-D-Glucosamine Utilization		N-acetylglucosamine-6-
phosphate deacetylase (EC 3.5.1.25)			2	
Carbohydrates	Aminosugars	UDP-N-acetylmuramate from Fructose-6-phosphate		Biosynthesis
UDP-N-acetylglucosamine 1-carboxyvinyltransferase (EC 2.5.1.7)			1	
Carbohydrates	Aminosugars	UDP-N-acetylmuramate from Fructose-6-phosphate		Biosynthesis
Glucosamine-1-phosphate N-acetyltransferase (EC 2.3.1.157)			1	
Carbohydrates	Aminosugars	UDP-N-acetylmuramate from Fructose-6-phosphate		Biosynthesis
Phosphoglucosamine mutase (EC 5.4.2.10)			1	
Carbohydrates	Aminosugars	UDP-N-acetylmuramate from Fructose-6-phosphate		Biosynthesis
N-acetylglucosamine-1-phosphate uridyltransferase (EC 2.7.7.23)			1	N-
Carbohydrates	Aminosugars	UDP-N-acetylmuramate from Fructose-6-phosphate		Biosynthesis
Glucosamine--fructose-6-phosphate aminotransferase [isomerizing] (EC 2.6.1.16)			5	
Carbohydrates	Central carbohydrate metabolism	Acetogenesis from Pyruvate		Dihydrolipoamide
dehydrogenase (EC 1.8.1.4)			2	
Carbohydrates	Central carbohydrate metabolism	Acetogenesis from Pyruvate		Phosphate
acetyltransferase (EC 2.3.1.8)			1	
Carbohydrates	Central carbohydrate metabolism	Acetogenesis from Pyruvate		Acetaldehyde
dehydrogenase (EC 1.2.1.10)			2	
Carbohydrates	Central carbohydrate metabolism	Acetogenesis from Pyruvate		Acetate kinase (EC
2.7.2.1)			1	
Carbohydrates	Central carbohydrate metabolism	Embden-Meyerhof and Gluconeogenesis		Glucose-6-
phosphate isomerase (EC 5.3.1.9)			4	
Carbohydrates	Central carbohydrate metabolism	Embden-Meyerhof and Gluconeogenesis		2,3-
bisphosphoglycerate-independent phosphoglycerate mutase (EC 5.4.2.1)			4	
Carbohydrates	Central carbohydrate metabolism	Embden-Meyerhof and Gluconeogenesis		
Polyphosphate glucokinase (EC 2.7.1.63)			2	
Carbohydrates	Central carbohydrate metabolism	Embden-Meyerhof and Gluconeogenesis		
Phosphoglycerate kinase (EC 2.7.2.3)			2	
Carbohydrates	Central carbohydrate metabolism	Embden-Meyerhof and Gluconeogenesis		NAD-
dependent glyceraldehyde-3-phosphate dehydrogenase (EC 1.2.1.12)			3	
Carbohydrates	Central carbohydrate metabolism	Embden-Meyerhof and Gluconeogenesis		Glycogen
synthase (EC 2.4.1.21)			1	
Carbohydrates	Central carbohydrate metabolism	Embden-Meyerhof and Gluconeogenesis		Pyruvate

kinase (EC 2.7.1.40)	3			
Carbohydrates	Central carbohydrate metabolism	Embden-Meyerhof and Gluconeogenesis		Fructose-
bisphosphate aldolase class II (EC 4.1.2.13)	4			
Carbohydrates	Central carbohydrate metabolism	Embden-Meyerhof and Gluconeogenesis		
Pyruvate, phosphate dikinase (EC 2.7.9.1)	1			
Carbohydrates	Central carbohydrate metabolism	Embden-Meyerhof and Gluconeogenesis		Fructose-
1,6-bisphosphatase, GlpX type (EC 3.1.3.11)	3			
Carbohydrates	Central carbohydrate metabolism	Embden-Meyerhof and Gluconeogenesis		NAD(P)-
dependent glyceraldehyde 3-phosphate dehydrogenase (EC 1.2.1.59)	1			
Carbohydrates	Central carbohydrate metabolism	Embden-Meyerhof and Gluconeogenesis		1,4-alpha-
glucan phosphorylase (EC 2.4.1.1)	1			
Carbohydrates	Central carbohydrate metabolism	Embden-Meyerhof and Gluconeogenesis		Fructose-
1,6-bisphosphatase, Bacillus type (EC 3.1.3.11)	1			
Carbohydrates	Central carbohydrate metabolism	Embden-Meyerhof and Gluconeogenesis		Glucose-6-
phosphate 1-dehydrogenase (EC 1.1.1.49)	6			
Carbohydrates	Central carbohydrate metabolism	Embden-Meyerhof and Gluconeogenesis		
Phosphoenolpyruvate synthase (EC 2.7.9.2)	6			
Carbohydrates	Central carbohydrate metabolism	Embden-Meyerhof and Gluconeogenesis	Archaeal	
Pyruvate kinase (EC 2.7.1.40)	1			
Carbohydrates	Central carbohydrate metabolism	Embden-Meyerhof and Gluconeogenesis	Archaeal	
2,3-bisphosphoglycerate-independent phosphoglycerate mutase (EC 5.4.2.1)	3			
Carbohydrates	Central carbohydrate metabolism	Embden-Meyerhof and Gluconeogenesis	Archaeal	
Phosphoenolpyruvate synthase (EC 2.7.9.2)	2			
Carbohydrates	Central carbohydrate metabolism	Embden-Meyerhof and Gluconeogenesis	Archaeal	
Fructose-1,6-bisphosphatase, GlpX type (EC 3.1.3.11)	2			
Carbohydrates	Central carbohydrate metabolism	Entner-Doudoroff Pathway		2,3-
bisphosphoglycerate-independent phosphoglycerate mutase (EC 5.4.2.1)	4			
Carbohydrates	Central carbohydrate metabolism	Entner-Doudoroff Pathway		Phosphoenolpyruvate
synthase (EC 2.7.9.2)	5			
Carbohydrates	Central carbohydrate metabolism	Entner-Doudoroff Pathway		Pyruvate, phosphate
dikinase (EC 2.7.9.1)	1			
Carbohydrates	Central carbohydrate metabolism	Entner-Doudoroff Pathway		NAD(P)-dependent
glyceraldehyde 3-phosphate dehydrogenase (EC 1.2.1.59)	1			
Carbohydrates	Central carbohydrate metabolism	Entner-Doudoroff Pathway		Phosphoglycerate
kinase (EC 2.7.2.3)	2			
Carbohydrates	Central carbohydrate metabolism	Entner-Doudoroff Pathway		Pyruvate kinase (EC
2.7.1.40)	3			
Carbohydrates	Central carbohydrate metabolism	Entner-Doudoroff Pathway		Glucose-6-phosphate
1-dehydrogenase (EC 1.1.1.49)	6			
Carbohydrates	Central carbohydrate metabolism	Entner-Doudoroff Pathway		NAD-dependent
glyceraldehyde-3-phosphate dehydrogenase (EC 1.2.1.12)	2			
Carbohydrates	Central carbohydrate metabolism	Entner-Doudoroff Pathway		Polyphosphate
glucokinase (EC 2.7.1.63)	1			
Carbohydrates	Central carbohydrate metabolism	glyoxylate degradation	Malate synthase (EC	
2.3.3.9)	1			
Carbohydrates	Central carbohydrate metabolism	glyoxylate degradation	2-oxoisovalerate	
dehydrogenase alpha subunit (EC 1.2.4.4)	2			
Carbohydrates	Central carbohydrate metabolism	glyoxylate degradation	Dihydrolipoamide	
dehydrogenase (EC 1.8.1.4)	3			
Carbohydrates	Central carbohydrate metabolism	glyoxylate degradation	Pyruvate dehydrogenase E1	
component beta subunit (EC 1.2.4.1)	1			
Carbohydrates	Central carbohydrate metabolism	glyoxylate degradation	2-oxoisovalerate	
dehydrogenase beta subunit (EC 1.2.4.4)	5			
Carbohydrates	Central carbohydrate metabolism	glyoxylate degradation	Dihydrolipoamide	
acetyltransferase component of pyruvate dehydrogenase complex (EC 2.3.1.12)	2			
Carbohydrates	Central carbohydrate metabolism	glyoxylate degradation	Malate synthase G (EC	
2.3.3.9)	2			
Carbohydrates	Central carbohydrate metabolism	Glyoxylate Synthesis	Aconitate hydratase 2 (EC	
4.2.1.3)	1			
Carbohydrates	Central carbohydrate metabolism	Glyoxylate Synthesis	Citrate synthase (si) (EC	
2.3.3.1)	1			
Carbohydrates	Central carbohydrate metabolism	Glyoxylate Synthesis	Aconitate hydratase (EC	
4.2.1.3)	26			
Carbohydrates	Central carbohydrate metabolism	Methylglyoxal Metabolism	Aldehyde	
dehydrogenase A (EC 1.2.1.22)	1			
Carbohydrates	Central carbohydrate metabolism	Pentose phosphate pathway	Glucose-6-phosphate	
1-dehydrogenase (EC 1.1.1.49)	6			
Carbohydrates	Central carbohydrate metabolism	Pentose phosphate pathway	6-phosphogluconate	
dehydrogenase, decarboxylating (EC 1.1.1.44)	1			
Carbohydrates	Central carbohydrate metabolism	Pentose phosphate pathway	Transketolase (EC	
2.2.1.1)	4			
Carbohydrates	Central carbohydrate metabolism	Pentose phosphate pathway	Ribulose-phosphate	
3-epimerase (EC 5.1.3.1)	2			
Carbohydrates	Central carbohydrate metabolism	Pyruvate Alanine Serine Interconversions		
Alanine dehydrogenase (EC 1.4.1.1)	1			
Carbohydrates	Central carbohydrate metabolism	Pyruvate Alanine Serine Interconversions		D-
serine dehydratase (EC 4.3.1.18)	1			
Carbohydrates	Central carbohydrate metabolism	Pyruvate Alanine Serine Interconversions		D-
amino acid dehydrogenase small subunit (EC 1.4.99.1)	1			
Carbohydrates	Central carbohydrate metabolism	Pyruvate Alanine Serine Interconversions		D-
serine/D-alanine/glycine transporter	1			

Carbohydrates Pyruvate kinase (EC 2.7.1.40)	Central carbohydrate metabolism	Pyruvate metabolism	I: anaplerotic reactions, PEP
Carbohydrates Phosphoenolpyruvate carboxykinase [ATP] (EC 4.1.1.49)	Central carbohydrate metabolism	Pyruvate metabolism	I: anaplerotic reactions, PEP
Carbohydrates Phosphoenolpyruvate synthase (EC 2.7.9.2)	Central carbohydrate metabolism	Pyruvate metabolism	I: anaplerotic reactions, PEP
Carbohydrates protein (EC 1.3.99.1)	Central carbohydrate metabolism	TCA Cycle	Succinate dehydrogenase iron-sulfur
Carbohydrates 1	Central carbohydrate metabolism	TCA Cycle	Aconitate hydratase 2 (EC 4.2.1.3)
Carbohydrates 26	Central carbohydrate metabolism	TCA Cycle	Aconitate hydratase (EC 4.2.1.3)
Carbohydrates flavoprotein subunit (EC 1.3.99.1)	Central carbohydrate metabolism	TCA Cycle	Succinate dehydrogenase
Carbohydrates subunit (EC 1.2.7.3)	Central carbohydrate metabolism	TCA Cycle	2-oxoglutarate oxidoreductase, beta
Carbohydrates alpha subunit (EC 1.2.7.3)	Central carbohydrate metabolism	TCA Cycle	2-oxoglutarate oxidoreductase,
Carbohydrates 1.1.99.16)	Central carbohydrate metabolism	TCA Cycle	Malate:quinone oxidoreductase (EC
Carbohydrates component (EC 1.2.4.2)	Central carbohydrate metabolism	TCA Cycle	2-oxoglutarate dehydrogenase E1
Carbohydrates (EC 4.2.1.2)	Central carbohydrate metabolism	TCA Cycle	Fumarate hydratase class I, aerobic
Carbohydrates 4.2.1.2)	Central carbohydrate metabolism	TCA Cycle	Fumarate hydratase class II (EC
Carbohydrates 1.8.1.4)	Central carbohydrate metabolism	TCA Cycle	Dihydrolipoamide dehydrogenase (EC
Carbohydrates anaerobic (EC 4.2.1.2)	Central carbohydrate metabolism	TCA Cycle	Fumarate hydratase class I,
Carbohydrates beta chain (EC 6.2.1.5)	Central carbohydrate metabolism	TCA Cycle	Succinyl-CoA ligase [ADP-forming]
Carbohydrates 1	Central carbohydrate metabolism	TCA Cycle	Citrate synthase (si) (EC 2.3.3.1)
Carbohydrates 4.1.3.6)	Central carbohydrate metabolism	TCA Cycle	Citrate lyase beta chain (EC
Carbohydrates 1.1.1.42)	Central carbohydrate metabolism	TCA Cycle	Isocitrate dehydrogenase [NADP] (EC
Carbohydrates dehydrogenase (EC 1.2.1.12)	CO2 fixation	Calvin-Benson cycle	NAD-dependent glyceraldehyde-3-phosphate
Carbohydrates	CO2 fixation	Calvin-Benson cycle	Phosphoglycerate kinase (EC 2.7.2.3)
Carbohydrates 4.1.2.13)	CO2 fixation	Calvin-Benson cycle	Fructose-bisphosphate aldolase class II (EC
Carbohydrates	CO2 fixation	Calvin-Benson cycle	Transketolase (EC 2.2.1.1)
Carbohydrates 2	CO2 fixation	Calvin-Benson cycle	Ribulose-phosphate 3-epimerase (EC 5.1.3.1)
Carbohydrates dehydrogenase (EC 1.2.1.59)	CO2 fixation	Calvin-Benson cycle	NAD(P)-dependent glyceraldehyde 3-phosphate
Carbohydrates 3.1.3.11)	CO2 fixation	Calvin-Benson cycle	Fructose-1,6-bisphosphatase, GlpX type (EC
Carbohydrates (EC 2.7.1.144)	Di- and oligosaccharides	Lactose degradation	Tagatose-6-phosphate kinase
Carbohydrates 3.2.1.23)	Di- and oligosaccharides	Lactose degradation	Beta-galactosidase (EC
Carbohydrates hydrolase (EC 3.2.1.26)	Di- and oligosaccharides	Sucrose Metabolism	Sucrose-6-phosphate
Carbohydrates uridylyltransferase (EC 2.7.7.9)	Di- and oligosaccharides	Sucrose Metabolism	UTP--glucose-1-phosphate
Carbohydrates enzyme (EC 2.4.1.18)	Di- and oligosaccharides	Sucrose Metabolism	1,4-alpha-glucan branching
Carbohydrates isomerase (EC 5.3.1.9)	Di- and oligosaccharides	Sucrose Metabolism	Glucose-6-phosphate
Carbohydrates 1	Di- and oligosaccharides	Sucrose Metabolism	alpha-amylase (EC 3.2.1.1)
Carbohydrates uridylyltransferase (EC 2.7.7.9)	Di- and oligosaccharides	Trehalose biosynthesis	UTP--glucose-1-phosphate
Carbohydrates	Di- and oligosaccharides	Trehalose biosynthesis	Trehalase (EC 3.2.1.28)
Carbohydrates 1.1.1.1)	Fermentation	Heterofermentative lactate fermentation	Alcohol dehydrogenase (EC
Carbohydrates 2.7.2.3)	Fermentation	Heterofermentative lactate fermentation	Phosphoglycerate kinase (EC
Carbohydrates 2	Monosaccharides	D-arabinose degradation	Ribulose-phosphate 3-epimerase (EC 5.1.3.1)
Carbohydrates 2	Monosaccharides	D-galactarate degradation	Glycerate kinase (EC 2.7.1.31)
Carbohydrates 2	Monosaccharides	D-galactarate degradation	Glucarate dehydratase (EC 4.2.1.40)
Carbohydrates 2	Monosaccharides	D-glucarate degradation	Glycerate kinase (EC 2.7.1.31)
Carbohydrates 2	Monosaccharides	D-glucarate degradation	Glucarate dehydratase (EC 4.2.1.40)
Carbohydrates 2	Monosaccharides	Galactose degradation	Sucrose-6-phosphate hydrolase (EC 3.2.1.26)

Carbohydrates uridylyltransferase (EC 2.7.7.9)	Monosaccharides	Galactose degradation	UTP--glucose-1-phosphate	
Carbohydrates	Monosaccharides	Galactose degradation	UDP-glucose 4-epimerase (EC 5.1.3.2)	11
Carbohydrates 2.7.1.12) (Gluconate kinase 2)	Monosaccharides	Ketogluconate metabolism	Thermoresistant gluconokinase (EC 4)	
Carbohydrates	Monosaccharides	L-ascorbate degradation	Transport protein SgaT, putative	3
Carbohydrates	Monosaccharides	L-ascorbate degradation	Hexulose-6-phosphate isomerase	1
Carbohydrates Bacillus type (EC 3.1.3.11)	Monosaccharides	Mannose and fructose metabolism	Fructose-1,6-bisphosphatase,	
Carbohydrates class II (EC 4.1.2.13)	Monosaccharides	Mannose and fructose metabolism	Fructose-bisphosphate aldolase	2
Carbohydrates specific IIABC component (EC 2.7.1.69)	Monosaccharides	mannose and GDP-mannose metabolism	PTS system, fructose-	
Carbohydrates 5.4.2.8)	Monosaccharides	mannose and GDP-mannose metabolism	Phosphomannomutase (EC 1)	
Carbohydrates isomerase (EC 5.3.1.8)	Monosaccharides	mannose and GDP-mannose metabolism	Mannose-6-phosphate	
Carbohydrates guanylyltransferase (GDP) (EC 2.7.7.22)	Monosaccharides	mannose and GDP-mannose metabolism	Mannose-1-phosphate	1
Carbohydrates 2.7.1.56)	Monosaccharides	mannose and GDP-mannose metabolism	1-phosphofructokinase (EC 3)	
Carbohydrates 2	Monosaccharides	The Tartronate Semialdehyde Hub	Glycerate kinase (EC 2.7.1.31)	2
Carbohydrates	Monosaccharides	The Tartronate Semialdehyde Hub	Glucarate dehydratase (EC 4.2.1.40)	
Carbohydrates chain (EC 4.1.3.6)	Organic acids	Citrate Metabolism, Transport, and Regulation	Citrate lyase beta	1
Carbohydrates	Organic acids	Methylcitrate cycle	Aconitate hydratase 2 (EC 4.2.1.3)	1
Carbohydrates	Organic acids	Methylcitrate cycle	Methylisocitrate lyase (EC 4.1.3.30)	4
Carbohydrates (EC 4.2.1.79)	Organic acids	Methylcitrate cycle	2-methylcitrate dehydratase FeS dependent	7
Carbohydrates 3	Organic acids	Methylcitrate cycle	Acetyl-coenzyme A synthetase (EC 6.2.1.1)	
Carbohydrates	Organic acids	Methylcitrate cycle	Propionate--CoA ligase (EC 6.2.1.17)	1
Carbohydrates 6	Organic acids	Methylcitrate cycle	2-methylcitrate dehydratase (EC 4.2.1.79)	
Carbohydrates	Organic acids	Methylcitrate cycle	2-methylcitrate synthase (EC 2.3.3.5)	2
Carbohydrates cycle 1	Organic acids	Methylcitrate cycle	PrpF protein involved in 2-methylcitrate	
Carbohydrates protein PduU	Organic acids	Propanediol utilization	Propanediol utilization polyhedral body	1
Carbohydrates 2.3.1.8)	Sugar alcohols	Ethanolamine utilization	Phosphate acetyltransferase (EC 1)	
Carbohydrates polyhedral-body-like protein EutS	Sugar alcohols	Ethanolamine utilization	Ethanolamine utilization	1
Carbohydrates chain (EC 4.3.1.7)	Sugar alcohols	Ethanolamine utilization	Ethanolamine ammonia-lyase heavy	2
Carbohydrates	Sugar alcohols	Ethanolamine utilization	Acetate kinase (EC 2.7.2.1)	1
Carbohydrates 3	Sugar alcohols	Galactitol degradation	Tagatose-6-phosphate kinase (EC 2.7.1.144)	
Carbohydrates 4.1.2.13)	Sugar alcohols	Hexitol degradation	Fructose-bisphosphate aldolase class II (EC 4)	
Carbohydrates 1.1.1.140)	Sugar alcohols	Hexitol degradation	Sorbitol-6-phosphate 2-dehydrogenase (EC 1)	
Carbohydrates 3.1.3.25)	Sugar alcohols	Inositol catabolism	Myo-inositol-1(or 4)-monophosphatase (EC 1)	
Cell Division and Cell Cycle partitioning protein Para	Cell Cycle	Cell cycle in Prokaryota	Bacterial Cell Division Plasmid	1
Cell Division and Cell Cycle division protein ftsK	Cell Cycle	Cell cycle in Prokaryota	Bacterial Cell Division Cell	6
Cell Division and Cell Cycle protein Era	Cell Cycle	Cell cycle in Prokaryota	Bacterial Cell Division GTP-binding	2
Cell Division and Cell Cycle division protein ftsH (EC 3.4.24.-)	Cell Cycle	Cell cycle in Prokaryota	Bacterial Cell Division Cell	2
Cell Division and Cell Cycle division protein ftsJ	Cell Cycle	Cell cycle in Prokaryota	Bacterial Cell Division Cell	1
Cell Division and Cell Cycle division protein ftsW	Cell Cycle	Cell cycle in Prokaryota	Bacterial Cell Division Cell	4
Cell Division and Cell Cycle division protein ftsA	Cell Cycle	Cell cycle in Prokaryota	Bacterial Cell Division Cell	3
Cell Division and Cell Cycle division protein ftsI [Peptidoglycan synthetase] (EC 2.4.1.129)	Cell Cycle	Cell cycle in Prokaryota	Bacterial Cell Division Cell	4
Cell Division and Cell Cycle Circadian oscillation regulator KaiB	Cell Cycle	Cell cycle in Prokaryota	Cyanobacterial Circadian Clock	1
Cell Division and Cell Cycle Group 2 RNA polymerase sigma factor	Cell Cycle	Cell cycle in Prokaryota	Cyanobacterial Circadian Clock	1
Cell Division and Cell Cycle 1	Cell Cycle	Structural elements	Cytoskeleton	Cell division protein ftsA
Cell Division and Cell Cycle factor Tu	Cell Cycle	Structural elements	Cytoskeleton	Translation elongation
Cell Wall and Capsule biosynthesis	Capsule	Capsular and extracellular polysacchrides	Capsular polysaccharide	1
		Capsular polysaccharide synthesis enzyme Cap8D		1

Cell Wall and Capsule	Capsular and extracellular polysacchrides		Colanic acid biosynthesis
Mannose-1-phosphate guanylyltransferase (GDP) (EC 2.7.7.22)	1		
Cell Wall and Capsule	Capsular and extracellular polysacchrides		Colanic acid biosynthesis
GDP-mannose 4,6-dehydratase (EC 4.2.1.47)	2		
Cell Wall and Capsule	Capsular and extracellular polysacchrides		Colanic acid biosynthesis
Phosphomannomutase (EC 5.4.2.8)	1		
Cell Wall and Capsule	Cell wall of Mycobacteria	linker unit-arabinogalactan synthesis	
Glucose-1-phosphate thymidyltransferase (EC 2.7.7.24)	1		
Cell Wall and Capsule	Cell wall of Mycobacteria	linker unit-arabinogalactan synthesis	
UDP-galactopyranose mutase (EC 5.4.99.9)	3		
Cell Wall and Capsule	Glycosylation	N-linked Glycosylation in Bacteria	UDP-glucose 4-epimerase (EC 5.1.3.2)
10			
Cell Wall and Capsule	Gram-Negative cell wall components	dTDP-rhamnose synthesis	Glucose-1-phosphate thymidyltransferase (EC 2.7.7.24)
15			
Cell Wall and Capsule	Gram-Negative cell wall components	Lipid A biosynthesis	Lipid A
biosynthesis lauroyl acyltransferase (EC 2.3.1.-)	2		
Cell Wall and Capsule	Gram-Negative cell wall components	Lipid A biosynthesis	UDP-3-O-[3-hydroxymyristoyl] glucosamine N-acyltransferase (EC 2.3.1.-)
1			
Cell Wall and Capsule	Gram-Negative cell wall components	Lipid A biosynthesis	Lipid A
biosynthesis (KDO) 2-(lauroyl)-lipid IVA acyltransferase (EC 2.3.1.-)	1		
Cell Wall and Capsule	Gram-Positive cell wall components	CMP-N-acetylneuraminate	
Biosynthesis	UDP-N-acetylglucosamine 2-epimerase (EC 5.1.3.14)	1	
Cell Wall and Capsule	Gram-Positive cell wall components	D-alanyl lipoteichoic acid	
Biosynthesis	Protein dltB	1	
Cell Wall and Capsule	Gram-Positive cell wall components	D-alanyl lipoteichoic acid	
Biosynthesis	D-alanine--poly(phosphoribitol) ligase subunit 1 (EC 6.1.1.13)	1	
Cell Wall and Capsule	Gram-Positive cell wall components	Teichoic acid Biosynthesis	
Teichoic acid export ATP-binding protein tagH (EC 3.6.3.40)	2		
Cell Wall and Capsule	Gram-Positive cell wall components	Teichoic acid Biosynthesis	
Putative CDP-glycerol:glycerophosphate glycerophosphotransferase (EC 2.7.8.-)	2		
Cell Wall and Capsule	Gram-Positive cell wall components	Teichoic acid Biosynthesis	
Poly(glycerol-phosphate) alpha-glucosyltransferase (EC 2.4.1.52)	3		
Cell Wall and Capsule	Gram-Positive cell wall components	Teichoic acid Biosynthesis	N-
acetylmannosaminyltransferase (EC 2.4.1.187)	1		
Cell Wall and Capsule	Gram-Positive cell wall components	Teichoic acid Biosynthesis	
CDP-glycerol:poly(glycerophosphate) glycerophosphotransferase (EC 2.7.8.12)	2		
Cell Wall and Capsule	Gram-Positive cell wall components	Teichoic acid Biosynthesis	
Teichoic acid translocation permease protein tagG	3		
Cell Wall and Capsule	Peptidoglycan biosynthesis	Peptidoglycan Biosynthesis	UDP-N-
acetylmuramoylalanyl-D-glutamyl-2,6-diaminopimelate--D-alanyl-D-alanyl ligase (EC 6.3.2.15)	1		Glutamine
Cell Wall and Capsule	Peptidoglycan biosynthesis	Peptidoglycan Biosynthesis	
synthetase (EC 6.3.1.2)	4		
Cell Wall and Capsule	Peptidoglycan biosynthesis	Peptidoglycan Biosynthesis	UDP-N-
acetylmuramoylalanyl-D-glutamate--2,6-diaminopimelate ligase (EC 6.3.2.13)	2		
Cell Wall and Capsule	Peptidoglycan biosynthesis	Peptidoglycan Biosynthesis	D-alanyl-D-
alanine carboxypeptidase (EC 3.4.16.4)	8		
Cell Wall and Capsule	Peptidoglycan biosynthesis	Peptidoglycan Biosynthesis	Cell
division protein ftsI [Peptidoglycan synthetase] (EC 2.4.1.129)	4		
Cell Wall and Capsule	Peptidoglycan biosynthesis	Peptidoglycan Biosynthesis	UDP-N-
acetylenolpyruvoylglucosamine reductase (EC 1.1.1.158)	1		
Cell Wall and Capsule	Peptidoglycan biosynthesis	Peptidoglycan Biosynthesis	N-
acetylglucosamine-1-phosphate uridyltransferase (EC 2.7.7.23)	1		
Cell Wall and Capsule	Peptidoglycan biosynthesis	Peptidoglycan Biosynthesis	Phospho-N-
acetylmuramoyl-pentapeptide-transferase (EC 2.7.8.13)	2		
Cell Wall and Capsule	Peptidoglycan biosynthesis	Peptidoglycan Biosynthesis	UDP-N-
acetylmuramoylalanine--D-glutamate ligase (EC 6.3.2.9)	2		
Cell Wall and Capsule	Peptidoglycan biosynthesis	Peptidoglycan Biosynthesis	UDP-N-
acetylglucosamine 1-carboxyvinyltransferase (EC 2.5.1.7)	3		
Cell Wall and Capsule	Peptidoglycan biosynthesis	Peptidoglycan Biosynthesis	
Multimodular transpeptidase-transglycosylase (EC 2.4.1.129) (EC 3.4.-.-)	2		
Cell Wall and Capsule	Peptidoglycan biosynthesis	Peptidoglycan Biosynthesis	Penicillin-
binding protein 7 precursor (PBP-7) (D-alanyl-D-alanine- endopeptidase) (EC 3.4.99.-)	1		
Cell Wall and Capsule	Peptidoglycan biosynthesis	Peptidoglycan Biosynthesis	UDP-N-
acetylglucosamine--N-acetylmuramyl-(pentapeptide) pyrophosphoryl-undecaprenol N-acetylglucosamine transferase (EC 2.4.1.227)	3		
Clustering-based Subsystems	282458.1-266-4-271	SA_88: FtsK/SpoIIIE/diarrheal toxin	
family protein	2		
Clustering-based Subsystems	EC49-61	Ribosomal large subunit pseudouridine synthase A	
(EC 4.2.1.70)	1		
Clustering-based Subsystems	EC49-61	RNA polymerase associated protein rapA (EC 3.6.1.-)	
3			
Clustering-based Subsystems	EC49-61	Survival protein surA precursor (Peptidyl-prolyl	
cis-trans isomerase surA) (EC 5.2.1.8)	1		
Clustering-based Subsystems	LMPTP YwlE cluster	Serine hydroxymethyltransferase (EC	
2.1.2.1)	1		
Clustering-based Subsystems	NusA-TFII Cluster	Translation initiation factor 2	1
Clustering-based Subsystems	NusA-TFII Cluster	Transcription termination protein	
NusA	7		
Clustering-based Subsystems	NusA-TFII Cluster	COG0779: clustered with	
transcription termination protein NusA	2		
Clustering-based Subsystems	SA:14-24	Two-component response regulator SA14-24	

2	Clustering-based Subsystems	SA:14-24	Two-component sensor kinase SA14-24	1
	Clustering-based Subsystems	SA:14-24	SA 27: YycH protein	2
	Clustering-based Subsystems	SA:14-24	Adenylosuccinate synthetase (EC 6.3.4.4)	
3	Clustering-based Subsystems	SA:14-24	Zn-dependent hydrolase (beta-lactamase	
	superfamily)	1		
	Clustering-based Subsystems	SA:14-24	Phosphoesterase, DHH family protein	2
	Clustering-based Subsystems	SA:14-24	LSU ribosomal protein L9p	1
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Cobalamin synthesis	Cobalamin synthase
1	Cofactors, Vitamins, Prosthetic Groups, Pigments		Cobalamin synthesis	Adenosylcobinamide-
	phosphate synthase	1		
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Biotin	Biotin biosynthesis
	Adenosylmethionine-8-amino-7-oxonanoate aminotransferase (EC 2.6.1.62)	2		
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Biotin	Biotin biosynthesis
	oxonanoate synthase (EC 2.3.1.47)	1		8-amino-7-
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Biotin	Biotin biosynthesis
	CoA synthase (EC 6.2.1.14)	1		Pimeloyl-
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Biotin	Biotin biosynthesis
	ATPase component CbiO of ABC cassette	2		bioY-linked
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Biotin	Biotin biosynthesis
	synthase (EC 2.8.1.6)	1		Biotin
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Coenzyme A	Coenzyme A Biosynthesis
	Ketol-acid reductoisomerase (EC 1.1.1.86)	3		
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Coenzyme A	Coenzyme A Biosynthesis
	Pantothenate:Na+ symporter (TC 2.A.21.1.1)	4		
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Coenzyme A	Coenzyme A Biosynthesis
	Phosphopantothenoylcysteine decarboxylase (EC 4.1.1.36)	2		
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Coenzyme A	Coenzyme A Biosynthesis
	Phosphopantetheine adenylyltransferase (EC 2.7.7.3)	3		
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Coenzyme A	Coenzyme A Biosynthesis
	dehydropantoate 2-reductase (EC 1.1.1.169)	1		2-
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Coenzyme A	Coenzyme A Biosynthesis
	Phosphopantothenoylcysteine synthetase (EC 6.3.2.5)	2		
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Coenzyme A	Coenzyme A Biosynthesis in
	Pathogens		3	
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Coenzyme A	Coenzyme A Biosynthesis in
	Pathogens		2	
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Coenzyme A	Coenzyme A Biosynthesis in
	Pathogens		1	
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Coenzyme A	Coenzyme A Biosynthesis in
	Pathogens		3	
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Coenzyme A	Coenzyme A Biosynthesis in
	Pathogens		3	
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Coenzyme A	Coenzyme A Biosynthesis in
	Pathogens		3	
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Coenzyme A	Coenzyme A Biosynthesis in
	Pathogens		2	
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Folate and pterines	Folate Biosynthesis
	Thymidylate synthase (EC 2.1.1.45)	3		
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Folate and pterines	Folate Biosynthesis
	Dihydropteroate synthase (EC 2.5.1.15)	1		
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Folate and pterines	Folate Biosynthesis
	Dihydropteroin aldolase (EC 4.1.2.25)	2		
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Folate and pterines	Folate Biosynthesis
	Folylpolylglutamate synthase (EC 6.3.2.17)	1		
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Folate and pterines	Folate Biosynthesis
	Dihydrofolate synthase (EC 6.3.2.12)	1		
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Folate and pterines	Molybdopterin
	biosynthesis			1
	Molybdopterin-guanine dinucleotide biosynthesis protein A			
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Folate and pterines	Molybdopterin
	biosynthesis			1
	Molybdenum cofactor biosynthesis protein E			
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Folate and pterines	Molybdopterin
	biosynthesis			4
	Molybdenum cofactor biosynthesis protein B			
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Folate and pterines	Molybdopterin
	biosynthesis			7
	Molybdenum cofactor biosynthesis protein C			
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Folate and pterines	Molybdopterin
	biosynthesis			2
	Molybdopterin biosynthesis protein A			
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Iron-sulfur clusters	Fe-S cluster
	assembly			1
	Iron-sulfur cluster assembly ATPase protein SufC			
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Iron-sulfur clusters	Fe-S cluster
	assembly			1
	Chaperone protein hscA			
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Iron-sulfur clusters	Fe-S cluster
	assembly			5
	Cysteine desulfurase (EC 4.4.1.-)			
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Iron-sulfur clusters	Fe-S cluster
	assembly			5
	Iron-sulfur cluster assembly protein SufB			
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Isoprenoids	Carotenoids
	desaturase, neurosporene or lycopene producing (EC 1.3.-.-)	7		Phytoene
	Cofactors, Vitamins, Prosthetic Groups, Pigments		Isoprenoids	Carotenoids
	Geranylgeranyl pyrophosphate synthetase (EC 2.5.1.29)	3		

Cofactors, Vitamins, Prosthetic Groups, Pigments	Isoprenoids	Isoprenoid Biosynthesis	
Acetyl-CoA acetyltransferase (EC 2.3.1.9)	2		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Isoprenoids	Isoprenoid Biosynthesis	4-
hydroxy-3-methylbut-2-enyl diphosphate reductase (EC 1.17.1.2)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Isoprenoids	Isoprenoid Biosynthesis	
Geranyltranstransferase (EC 2.5.1.10)	7		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Isoprenoids	Isoprenoid Biosynthesis	1-
hydroxy-2-methyl-2-(E)-butenyl 4-diphosphate synthase (EC 1.17.4.3)			2
Cofactors, Vitamins, Prosthetic Groups, Pigments	Isoprenoids	Isoprenoid Biosynthesis	1-
deoxy-D-xylulose 5-phosphate reductoisomerase (EC 1.1.1.267)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Isoprenoids	polyisoprenoid biosynthesis	
Geranyltranstransferase (EC 2.5.1.10)	7		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Isoprenoids	polyisoprenoid biosynthesis	
Octaprenyl-diphosphate synthase (EC 2.5.1.-)	7		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Isoprenoids	polyisoprenoid biosynthesis	
Undecaprenyl pyrophosphate synthetase (EC 2.5.1.31)	3		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Lipoate and Lipoamide	Lipoic acid	
metabolism Lipoyl-[acyl-carrier-protein] synthase	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	NAD and NADP	NAD and NADP cofactor	
biosynthesis global Ribosylnicotinamide kinase (EC 2.7.1.22)	29		
Cofactors, Vitamins, Prosthetic Groups, Pigments	NAD and NADP	NAD and NADP cofactor	
biosynthesis global Nicotinamide-nucleotide adenyltransferase (EC 2.7.7.1)	29		
Cofactors, Vitamins, Prosthetic Groups, Pigments	NAD and NADP	NAD and NADP cofactor	
biosynthesis global Glutamine amidotransferase chain of NAD synthetase	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	NAD and NADP	NAD and NADP cofactor	
biosynthesis global L-aspartate oxidase (EC 1.4.3.16)	2		
Cofactors, Vitamins, Prosthetic Groups, Pigments	NAD and NADP	NAD and NADP cofactor	
biosynthesis global Nicotinate-nucleotide adenyltransferase (EC 2.7.7.18)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	NAD and NADP	NAD and NADP cofactor	
biosynthesis global Nicotinate phosphoribosyltransferase (EC 2.4.2.11)	2		
Cofactors, Vitamins, Prosthetic Groups, Pigments	NAD and NADP	NAD and NADP cofactor	
biosynthesis global Quinolate phosphoribosyltransferase [decarboxylating] (EC 2.4.2.19)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	NAD and NADP	NAD and NADP cofactor	
biosynthesis global NAD synthetase (EC 6.3.1.5)	2		
Cofactors, Vitamins, Prosthetic Groups, Pigments	NAD and NADP	NAD and NADP cofactor	
biosynthesis global ADP-ribose pyrophosphatase (EC 3.6.1.13)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	NAD and NADP	NAD and NADP cofactor	
biosynthesis in pathogens L-aspartate oxidase (EC 1.4.3.16)	2		
Cofactors, Vitamins, Prosthetic Groups, Pigments	NAD and NADP	NAD and NADP cofactor	
biosynthesis in pathogens Nicotinate phosphoribosyltransferase (EC 2.4.2.11)	2		
Cofactors, Vitamins, Prosthetic Groups, Pigments	NAD and NADP	NAD and NADP cofactor	
biosynthesis in pathogens Nicotinate-nucleotide adenyltransferase (EC 2.7.7.18)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	NAD and NADP	NAD and NADP cofactor	
biosynthesis in pathogens Quinolate phosphoribosyltransferase [decarboxylating] (EC 2.4.2.19)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	NAD and NADP	NAD and NADP tutorial	10
L-aspartate oxidase (EC 1.4.3.16)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Quinone cofactors	Coenzyme PQQ	
synthesis Coenzyme PQQ synthesis protein D	2		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Quinone cofactors	Coenzyme PQQ	
synthesis Coenzyme PQQ synthesis protein E	7		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Quinone cofactors	Menaquinone and	
Phylloquinone Biosynthesis O-succinylbenzoic acid--CoA ligase (EC 6.2.1.26)	2		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Quinone cofactors	Menaquinone and	
Phylloquinone Biosynthesis Menaquinone biosynthesis related protein, putative DHNA-CoA thioesterase	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Quinone cofactors	Pyrroloquinoline	
Quinone biosynthesis Microsomal dipeptidase (EC 3.4.13.19)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Quinone cofactors	Pyrroloquinoline	
Quinone biosynthesis Coenzyme PQQ synthesis protein E	7		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Quinone cofactors	Pyrroloquinoline	
Quinone biosynthesis Coenzyme PQQ synthesis protein D	2		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Quinone cofactors	Ubiquinone	
Biosynthesis Ubiquinone biosynthesis monooxygenase UbiF/COQ7 (EC 1.14.13.-)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Quinone cofactors	Ubiquinone	
Biosynthesis 3-polyprenyl-4-hydroxybenzoate carboxy-lyase (EC 4.1.1.-)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Quinone cofactors	Ubiquinone	
Biosynthesis 4-hydroxybenzoate polyprenyltransferase (EC 2.5.1.-)	3		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Riboflavin, FMN, FAD	FMN and FAD	
biosynthesis 6,7-dimethyl-8-ribityllumazine synthase (EC 2.5.1.9)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Riboflavin, FMN, FAD	FMN and FAD	
biosynthesis 3,4-dihydroxy-2-butanone 4-phosphate synthase	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Riboflavin, FMN, FAD	FMN and FAD	
biosynthesis GTP cyclohydrolase II (EC 3.5.4.25)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Riboflavin, FMN, FAD	FMN and FAD	
biosynthesis in pathogens GTP cyclohydrolase II (EC 3.5.4.25)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Riboflavin, FMN, FAD	FMN and FAD	
biosynthesis in pathogens 6,7-dimethyl-8-ribityllumazine synthase (EC 2.5.1.9)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Riboflavin, FMN, FAD	FMN and FAD	
biosynthesis in pathogens 3,4-dihydroxy-2-butanone 4-phosphate synthase	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Riboflavin, FMN, FAD	Riboflavin	

metabolism	3,4-dihydroxy-2-butanone 4-phosphate synthase	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Riboflavin, FMN, FAD		Riboflavin	
metabolism	GTP cyclohydrolase II (EC 3.5.4.25)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Riboflavin, FMN, FAD		Riboflavin	
metabolism	6,7-dimethyl-8-ribityllumazine synthase (EC 2.5.1.9)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Siderophores		Siderophore enterobactin	
biosynthesis	Isochorismate synthase (EC 5.4.4.2)	3		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Siderophores		Siderophore enterobactin	
biosynthesis	Menaquinone-specific isochorismate synthase (EC 5.4.4.2)	3		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Siderophores		Siderophore enterobactin	
biosynthesis	2,3-dihydro-2,3-dihydroxybenzoate dehydrogenase (EC 1.3.1.28)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Siderophores		Siderophore enterobactin	
biosynthesis and ferric enterbactin transport	2,3-dihydro-2,3-dihydroxybenzoate dehydrogenase (EC 1.3.1.28)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Siderophores		Siderophore enterobactin	
biosynthesis and ferric enterbactin transport	Ferric enterobactin transport system permease			
protein fepG (TC 3.A.1.14.2)		1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Siderophores		Siderophore enterobactin	
biosynthesis and ferric enterbactin transport	Isochorismate synthase (EC 5.4.4.2)	3		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Siderophores		Siderophore enterobactin	
biosynthesis and ferric enterbactin transport	Ferric enterobactin transport ATP-binding protein fepC (TC 3.A.1.14.2)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Siderophores		Siderophore enterobactin	
biosynthesis and ferric enterbactin transport	Menaquinone-specific isochorismate synthase (EC 5.4.4.2)	3		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Siderophores		Siderophore enterobactin	
biosynthesis and ferric enterbactin transport	Ferric enterobactin transport system permease			
protein fepD (TC 3.A.1.14.2)		1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Tetrapyrroles		Porphyrin, Heme, and	
Siroheme Biosynthesis	Precorrin-2 oxidase (EC 1.3.1.76)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Tetrapyrroles		Porphyrin, Heme, and	
Siroheme Biosynthesis	Uroporphyrinogen III decarboxylase (EC 4.1.1.37)	3		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Tetrapyrroles		Porphyrin, Heme, and	
Siroheme Biosynthesis	Glutamyl-tRNA reductase (EC 1.2.1.70)	3		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Tetrapyrroles		Porphyrin, Heme, and	
Siroheme Biosynthesis	Ferrochelatase, protoheme ferro-lyase (EC 4.99.1.1)	2		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Tetrapyrroles		Porphyrin, Heme, and	
Siroheme Biosynthesis	Porphobilinogen deaminase (EC 2.5.1.61)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Tetrapyrroles		Porphyrin, Heme, and	
Siroheme Biosynthesis	Coproporphyrinogen III oxidase, oxygen-independent (EC 1.3.99.22)			2
Cofactors, Vitamins, Prosthetic Groups, Pigments	Tetrapyrroles		Porphyrin, Heme, and	
Siroheme Biosynthesis	Sirohydrochlorin ferrochelatase (EC 4.99.1.4)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Tetrapyrroles		Porphyrin, Heme, and	
Siroheme Biosynthesis	Porphobilinogen synthase (EC 4.2.1.24)	7		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Tetrapyrroles		Porphyrin, Heme, and	
Siroheme Biosynthesis	Uroporphyrinogen-III methyltransferase (EC 2.1.1.107)	2		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Tetrapyrroles		Porphyrin, Heme, and	
Siroheme Biosynthesis	Protoporphyrinogen IX oxidase, aerobic (EC 1.3.3.4)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Tetrapyrroles		Porphyrin, Heme, and	
Siroheme Biosynthesis	Glutamyl-tRNA synthetase (EC 6.1.1.17)	2		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Thiamine and thiamine pyrophosphate			
Thiamin biosynthesis	Thiamin pyrophosphokinase (EC 2.7.6.2)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Thiamine and thiamine pyrophosphate			
Thiamin biosynthesis	Thiamin-related ABC transporter, ATPase component	4		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Thiamine and thiamine pyrophosphate			
Thiamin biosynthesis	Hydroxyethylthiazole kinase (EC 2.7.1.50)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Thiamine and thiamine pyrophosphate			
Thiamin biosynthesis	Thiamin-phosphate pyrophosphorylase (EC 2.5.1.3)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Thiamine and thiamine pyrophosphate			
Thiamin biosynthesis	Thiamin-related ABC transporter, transmembrane component 1	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Thiamine and thiamine pyrophosphate			
Thiamin biosynthesis	Predicted thiazole transporter ThiU	3		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Thiamine and thiamine pyrophosphate			
Thiamin biosynthesis	Thiamin biosynthesis protein ThiC	4		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Thiamine and thiamine pyrophosphate			
Thiamin biosynthesis	Glycine oxidase ThiO (EC 1.4.3.19)	1		
Cofactors, Vitamins, Prosthetic Groups, Pigments	Thiamine and thiamine pyrophosphate			
Thiamin biosynthesis	Sulfur carrier protein adenylyltransferase ThiF	6		
Degradation of Xenobiotics	Anaerobic degradation of aromatic compounds		Anaerobic benzoate	
metabolism	Acetyl-CoA acetyltransferase (EC 2.3.1.9)	1		
DNA metabolism	DNA Repair		DNA Repair Base Excision	
3.1.11.1)		1		
DNA metabolism	DNA Repair		DNA Repair Base Excision	
DNA metabolism	DNA Repair		DNA Repair Base Excision	
DNA metabolism	DNA Repair		DNA Repair Base Excision	
3		3		
DNA metabolism	DNA Repair		DNA Repair Base Excision	
exonuclease recJ (EC 3.1.-.-)		1		
DNA metabolism	DNA Repair		DNA Repair Base Excision	
3.2.2.20)		1		
DNA metabolism	DNA Repair		DNA Repair Base Excision	
			ATP-dependent DNA ligase (EC	

6.5.1.1)	2				
DNA metabolism	DNA Repair	DNA repair, bacterial	DNA mismatch repair protein MutS		3
DNA metabolism	DNA Repair	DNA repair, bacterial	DNA mismatch repair protein MutL		1
DNA metabolism	DNA Replication	DNA-replication	Holliday junction DNA helicase RuvB	2	
DNA metabolism	DNA Replication	DNA-replication	Chromosomal replication initiator protein dnaA		2
DNA metabolism	DNA Replication	DNA-replication	DNA polymerase III alpha subunit (EC 2.7.7.7)		11
DNA metabolism	DNA Replication	DNA-replication	Replicative DNA helicase (EC 3.6.1.-)		1
DNA metabolism	DNA Replication	DNA-replication	DNA polymerase I (EC 2.7.7.7)	1	
DNA metabolism	DNA Replication	DNA-replication	Helicase loader DnaI		1
DNA metabolism	DNA Replication	DNA-replication	Exodeoxyribonuclease V beta chain (EC 3.1.11.5)		1
DNA metabolism	DNA Replication	DNA-replication	Arrested fork binding		6
DNA metabolism	DNA Replication	DNA-replication	ATP-dependent DNA helicase RecG (EC 3.6.1.-)		1
DNA metabolism	DNA Replication	DNA-replication	Single-stranded-DNA-specific exonuclease recJ (EC 3.1.-.-)		1
DNA metabolism	DNA Replication	DNA-replication	DNA polymerase III subunits gamma and tau (EC 2.7.7.7)		1
DNA metabolism	DNA Replication	DNA-replication	DNA primase (EC 2.7.7.-)		6
DNA metabolism	DNA Replication	DNA-replication	DNA replication protein dnaC		3
DNA metabolism	DNA uptake, competence	gram plus late competence	late competence protein		
comEC, DNA transport				2	
Fatty Acids and Lipids (EC 6.3.2.-)	Lipids	Fatty acids	carnitine metabolism	Crotonobetaine carnitine-CoA ligase	
Fatty Acids and Lipids protein] reductase (EC 1.1.1.100)	Lipids	Fatty acids	Fatty Acid Biosynthesis	FASII	3-oxoacyl-[acyl-carrier
Fatty Acids and Lipids transferase beta chain (EC 6.4.1.2)	Lipids	Fatty acids	Fatty Acid Biosynthesis	FASII	Acetyl-coenzyme A carboxyl
Fatty Acids and Lipids transferase (EC 2.7.8.-)	Lipids	Fatty acids	Fatty Acid Biosynthesis	FASII	4'-phosphopantetheinyl
Fatty Acids and Lipids transferase alpha chain (EC 6.4.1.2)	Lipids	Fatty acids	Fatty Acid Biosynthesis	FASII	Acetyl-coenzyme A carboxyl
Fatty Acids and Lipids ferredoxin--NAD(+) reductase component	Lipids	Fatty acids	fatty acid metabolism	3-phenylpropionate dioxygenase (EC 1.18.1.3)	3
Fatty Acids and Lipids	Lipids	Fatty acids	fatty acid metabolism	Alcohol dehydrogenase (EC 1.1.1.1)	4
Fatty Acids and Lipids (2.3.1.9)	Lipids	Fatty acids	fatty acid metabolism	Acetyl-CoA acetyltransferase (EC	3
Fatty Acids and Lipids (5.1.2.3)	Lipids	Fatty acids	fatty acid metabolism	3-hydroxybutyryl-CoA epimerase (EC	1
Fatty Acids and Lipids (5)	Lipids	Fatty acids	fatty acid metabolism	Aldehyde dehydrogenase (EC 1.2.1.3)	5
Fatty Acids and Lipids (1.1.1.35)	Lipids	Fatty acids	fatty acid metabolism	3-hydroxyacyl-CoA dehydrogenase (EC	1
Fatty Acids and Lipids (1.3.99.3)	Lipids	Fatty acids	fatty acid metabolism	Acyl-CoA dehydrogenase (EC	1
Fatty Acids and Lipids specific (EC 1.3.99.2)	Lipids	Fatty acids	fatty acid metabolism	Acyl-CoA dehydrogenase, short-chain	3
Fatty Acids and Lipids (1)	Lipids	Fatty acids	fatty acid metabolism	Enoyl-CoA hydratase (EC 4.2.1.17)	1
Fatty Acids and Lipids acetyltransferase (EC 2.3.1.9)	Lipids	Fatty acids	fatty acid oxidation pathway	Acetyl-CoA	3
Fatty Acids and Lipids (1.3.99.3)	Lipids	Fatty acids	fatty acid oxidation pathway	Acyl-CoA dehydrogenase (EC	1
Fatty Acids and Lipids short-chain specific (EC 1.3.99.2)	Lipids	Fatty acids	fatty acid oxidation pathway	Acyl-CoA dehydrogenase,	3
Fatty Acids and Lipids dehydrogenase (EC 1.1.1.35)	Lipids	Fatty acids	fatty acid oxidation pathway	3-hydroxyacyl-CoA	1
Fatty Acids and Lipids (4.2.1.17)	Lipids	Fatty acids	fatty acid oxidation pathway	Enoyl-CoA hydratase (EC	1
Fatty Acids and Lipids kinase (EC 2.7.1.31)	Lipids	Glycerolipids	Glycerolipid and glycerphospholipid metabolism	Glycerate	2
Fatty Acids and Lipids glycerol-3-phosphate dehydrogenase (EC 1.1.99.5)	Lipids	Glycerolipids	Glycerolipid and glycerphospholipid metabolism	Aerobic	2
Fatty Acids and Lipids phosphate acyltransferase (EC 2.3.1.15)	Lipids	Glycerolipids	Glycerolipid and glycerphospholipid metabolism	Glycerol-3-	1
Fatty Acids and Lipids dehydrogenase (EC 1.1.1.1)	Lipids	Glycerolipids	Glycerolipid and glycerphospholipid metabolism	Alcohol	2
Fatty Acids and Lipids glycerol-3-phosphate acyltransferase (EC 2.3.1.51)	Lipids	Glycerolipids	Glycerolipid and glycerphospholipid metabolism	1-acyl-sn-	1
Fatty Acids and Lipids synthetase (EC 2.7.8.-)	Lipids	Glycerolipids	Glycerolipid and glycerphospholipid metabolism	Cardiolipin	4
Fatty Acids and Lipids (1.2.1.8)	Lipids	Phospholipids	Betaine biosynthesis	Betaine aldehyde dehydrogenase (EC	1
Fatty Acids and Lipids (1)	Lipids	Phospholipids	Betaine biosynthesis	Choline dehydrogenase (EC 1.1.99.1)	1
Fatty Acids and Lipids dehydrogenase (EC 1.1.1.6)	Lipids	Triacylglycerols	Glycerol fermentation to 1,3-propanediol	Glycerol	3
Fatty Acids and Lipids dehydrogenase (EC 1.1.99.5)	Lipids	Triacylglycerols	Glycerol Metabolism	Glycerol-3-phosphate	1
Fatty Acids and Lipids phosphate dehydrogenase (EC 1.1.99.5)	Lipids	Triacylglycerols	Glycerol Metabolism	Aerobic glycerol-3-	2
Fatty Acids and Lipids (1)	Lipids	Triacylglycerols	Glycerol Metabolism	Glycerol dehydrogenase (EC	

1.1.1.6)	3				
Fatty Acids and Lipids dehydrogenase [NAD(P)+]	Triacylglycerols (EC 1.1.1.94)	1	Glycerol Metabolism	Glycerol-3-phosphate	
Fatty Acids and Lipids phosphodiesterase	Triacylglycerols (EC 3.1.4.46)	1	Glycerol Metabolism	Glycerophosphoryl diester	
Membrane Transport	ABC transporters		ABC transporter alkylphosphonate	(TC 3.A.1.9.1)	
Phosphonate ABC transporter	permease protein phnE1	(TC 3.A.1.9.1)	2		
Membrane Transport	ABC transporters		ABC transporter alkylphosphonate	(TC 3.A.1.9.1)	
Phosphonate ABC transporter	permease protein phnE	(TC 3.A.1.9.1)	1		
Membrane Transport	ABC transporters		ABC transporter alkylphosphonate	(TC 3.A.1.9.1)	
Phosphonate ABC transporter	phosphate-binding periplasmic component	(TC 3.A.1.9.1)	1		
Membrane Transport	ABC transporters		ABC transporter branched-chain amino acid	(TC 3.A.1.4.1)	
3.A.1.4.1)	High-affinity branched-chain amino acid transport system permease protein LivH	(TC 3.A.1.4.1)	5		
Membrane Transport	ABC transporters		ABC transporter branched-chain amino acid	(TC 3.A.1.4.1)	
3.A.1.4.1)	Branched-chain amino acid transport ATP-binding protein livF	(TC 3.A.1.4.1)	2		
Membrane Transport	ABC transporters		ABC transporter branched-chain amino acid	(TC 3.A.1.4.1)	
3.A.1.4.1)	Branched-chain amino acid transport ATP-binding protein livG	(TC 3.A.1.4.1)	2		
Membrane Transport	ABC transporters		ABC transporter branched-chain amino acid	(TC 3.A.1.4.1)	
3.A.1.4.1)	Branched-chain amino acid transport system permease protein livM	(TC 3.A.1.4.1)	3		
Membrane Transport	ABC transporters		ABC transporter branched-chain amino acid	(TC 3.A.1.4.1)	
3.A.1.4.1)	High-affinity leucine-specific transport system, periplasmic binding protein livK	(TC 3.A.1.4.1)	1		
Membrane Transport	ABC transporters		ABC transporter dipeptide	(TC 3.A.1.5.2)	
Dipeptide transport	ATP-binding protein dppD	(TC 3.A.1.5.2)	3		
Membrane Transport	ABC transporters		ABC transporter dipeptide	(TC 3.A.1.5.2)	
Dipeptide-binding ABC transporter,	periplasmic substrate-binding component	(TC 3.A.1.5.2)			3
Membrane Transport	ABC transporters		ABC transporter dipeptide	(TC 3.A.1.5.2)	
Dipeptide transport	system permease protein dppC	(TC 3.A.1.5.2)	1		
Membrane Transport	ABC transporters		ABC transporter dipeptide	(TC 3.A.1.5.2)	
Dipeptide transport	system permease protein dppB	(TC 3.A.1.5.2)	1		
Membrane Transport	ABC transporters		ABC transporter dipeptide	(TC 3.A.1.5.2)	
Dipeptide transport	ATP-binding protein dppF	(TC 3.A.1.5.2)	2		
Membrane Transport	ABC transporters		ABC transporter ferric enterobactin	(TC 3.A.1.14.2)	
Ferric enterobactin transport	ATP-binding protein fepC	(TC 3.A.1.14.2)	1		
Membrane Transport	ABC transporters		ABC transporter ferric enterobactin	(TC 3.A.1.14.2)	
Ferric enterobactin transport	system permease protein fepD	(TC 3.A.1.14.2)	1		
Membrane Transport	ABC transporters		ABC transporter ferric enterobactin	(TC 3.A.1.14.2)	
Ferric enterobactin transport	system permease protein fepG	(TC 3.A.1.14.2)	1		
Membrane Transport	ABC transporters		ABC transporter ferrichrome	(TC 3.A.1.14.3)	
Ferrichrome transport	ATP-binding protein fhuC	(TC 3.A.1.14.3)	8		
Membrane Transport	ABC transporters		ABC transporter glutamine	(TC 3.A.1.3.2)	
Glutamine transport	ATP-binding protein glnQ	(TC 3.A.1.3.2)	1		
Membrane Transport	ABC transporters		ABC transporter glycerol	(TC 3.A.1.1.3)	SN-
glycerol-3-phosphate transport	ATP-binding protein ugpC	(TC 3.A.1.1.3)	1		
Membrane Transport	ABC transporters		ABC transporter glycerol	(TC 3.A.1.1.3)	Glycerol-3-
phosphate ABC transporter,	periplasmic glycerol-3-phosphate-binding protein	(TC 3.A.1.1.3)	1		
Membrane Transport	ABC transporters		ABC transporter heme	(TC3.A.1.107.1)	Heme
exporter protein C	(TC3.A.1.107.1)	4			
Membrane Transport	ABC transporters		ABC transporter heme	(TC3.A.1.107.1)	Heme
exporter protein A	(TC3.A.1.107.1)	3			
Membrane Transport	ABC transporters		ABC transporter heme	(TC3.A.1.107.1)	Heme
exporter protein B	(TC3.A.1.107.1)	2			
Membrane Transport	ABC transporters		ABC transporter L-proline glycine betaine	(TC 3.A.1.12.1)	
3.A.1.12.1)	L-proline Glycine Betaine ABC transport ATP-binding protein proV	(TC 3.A.1.12.1)	4		
Membrane Transport	ABC transporters		ABC transporter maltose	Maltose maltodextrin	
transport ATP-binding protein malk	(TC 3.A.1.12.1)	1			
Membrane Transport	ABC transporters		ABC transporter molybdenum	(TC 3.A.1.8.1)	
Molybdenum transport	system permease protein modB	(TC 3.A.1.8.1)	1		
Membrane Transport	ABC transporters		ABC transporter molybdenum	(TC 3.A.1.8.1)	
Molybdenum transport	ATP-binding protein modC	(TC 3.A.1.8.1)	1		
Membrane Transport	ABC transporters		ABC transporter oligopeptide	(TC 3.A.1.5.1)	
Oligopeptide transport	ATP-binding protein oppF	(TC 3.A.1.5.1)	3		
Membrane Transport	ABC transporters		ABC transporter oligopeptide	(TC 3.A.1.5.1)	
Oligopeptide transport	system permease protein oppC	(TC 3.A.1.5.1)	7		
Membrane Transport	ABC transporters		ABC transporter oligopeptide	(TC 3.A.1.5.1)	
Oligopeptide transport	ATP-binding protein oppD	(TC 3.A.1.5.1)	3		
Membrane Transport	ABC transporters		ABC transporter oligopeptide	(TC 3.A.1.5.1)	
Oligopeptide transport	system permease protein oppB	(TC 3.A.1.5.1)	2		
Membrane Transport	ABC transporters		ABC transporter phosphate	(TC 3.A.1.7.1)	
Phosphate transport	system permease protein pstA	(TC 3.A.1.7.1)	2		
Membrane Transport	ABC transporters		ABC transporter phosphate	(TC 3.A.1.7.1)	
Phosphate transport	ATP-binding protein pstB	(TC 3.A.1.7.1)	1		
Membrane Transport	ABC transporters		ABC transporter polyamine putrescine spermidine	(TC 3.A.1.11.1)	
3.A.1.11.1)	Spermidine Putrescine ABC transporter permease component potB	(TC 3.A.1.11.1)	1		
Membrane Transport	ABC transporters		ABC transporter polyamine putrescine spermidine	(TC 3.A.1.11.1)	
3.A.1.11.1)	Spermidine Putrescine ABC transporter permease component potC	(TC 3.A.1.11.1)	2		
Membrane Transport	ABC transporters		ABC transporter putrescine	(TC 3.A.1.11.2)	
Putrescine transport	system permease protein potH	(TC 3.A.1.11.2)	1		
Membrane Transport	ABC transporters		ABC transporter ribose	(TC 3.A.1.2.1)	Ribose

transport ATP-binding protein rbsA (TC 3.A.1.2.1)	9		
Membrane Transport ABC transporters ABC transporter ribose (TC 3.A.1.2.1)	1		Ribose
transport system permease protein rbsC (TC 3.A.1.2.1)	1		
Membrane Transport ABC transporters CbiQO-type ABC transporter systems	4		Thiamin-
related ABC transporter, ATPase component	4		
Membrane Transport ABC transporters CbiQO-type ABC transporter systems	1		Thiamin-
related ABC transporter, transmembrane component	1		
Membrane Transport ABC transporters CbiQO-type ABC transporter systems	2		bioY-linked
ATPase component CbiO of ABC cassette	2		
Membrane Transport ABC transporters CbiQO-type ABC transporter systems	1		ABC-type
cobalt transport system, ATPase component CbiO and related transporters	1		
Membrane Transport ABC transporters P-type ATPase transporter potassium (TC 3.A.3.7.1)	1		
Potassium-transporting ATPase A chain (EC 3.6.3.12) (TC 3.A.3.7.1)	1		
Membrane Transport ABC transporters Transport of Nickel and Cobalt Urease alpha	9		
subunit (EC 3.5.1.5)	9		
Membrane Transport Uni-, Sym- and Antiporters Sodium Hydrogen Antiporter	4		Na(+) H(+)
antiporter subunit A	4		
Membrane Transport Uni-, Sym- and Antiporters Sodium Hydrogen Antiporter	4		Na(+) H(+)
antiporter subunit B	4		
Membrane Transport Uni-, Sym- and Antiporters Sodium Hydrogen Antiporter	1		Na(+) H(+)
antiporter subunit D	1		
Membrane Transport Uni-, Sym- and Antiporters Sodium Hydrogen Antiporter	3		Na(+) H(+)
antiporter subunit D (TC 2.A.63.1.3)	3		
Membrane Transport Uni-, Sym- and Antiporters Sodium Hydrogen Antiporter	1		Na(+) H(+)
antiporter subunit G	1		
Membrane Transport Uni-, Sym- and Antiporters Sodium Hydrogen Antiporter	1		Na(+) H(+)
antiporter subunit C (TC 2.A.63.1.3)	1		
Membrane Transport Uni-, Sym- and Antiporters Sodium Hydrogen Antiporter	3		Na(+) H(+)
antiporter subunit A (TC 2.A.63.1.3)	3		
Metabolism of aromatic compounds Metabolism of central aromatic intermediates			Catechol
branch of beta-ketoadipate pathway Succinyl-CoA:3-ketoacid-coenzyme A transferase subunit A	2		
(EC 2.8.3.5)	2		
Metabolism of aromatic compounds Metabolism of central aromatic intermediates			Catechol
branch of beta-ketoadipate pathway 3-oxoadipate CoA-transferase subunit B (EC 2.8.3.6)	1		
Metabolism of aromatic compounds Metabolism of central aromatic intermediates			Catechol
branch of beta-ketoadipate pathway Succinyl-CoA:3-ketoacid-coenzyme A transferase subunit B	1		
(EC 2.8.3.5)	1		
Metabolism of aromatic compounds Metabolism of central aromatic intermediates			
Homogentisate pathway of aromatic compound degradation Fumarylacetoacetase (EC 3.7.1.2)	1		
Metabolism of aromatic compounds Metabolism of central aromatic intermediates			
Homogentisate pathway of aromatic compound degradation Aconitate hydratase (EC 4.2.1.3)	19		
Metabolism of aromatic compounds Metabolism of central aromatic intermediates			
Phenylacetate pathway of aromatic compound degradation Phenylacetate-coenzyme A ligase (EC 6.2.1.30)	1		
Metabolism of aromatic compounds Metabolism of central aromatic intermediates			
Phenylacetate pathway of aromatic compound degradation Aldehyde dehydrogenase (EC 1.2.1.3)	5		
Metabolism of aromatic compounds Metabolism of central aromatic intermediates			
Phenylacetate pathway of aromatic compound degradation Enoyl-CoA hydratase (EC 4.2.1.17)	1		
Metabolism of aromatic compounds Metabolism of central aromatic intermediates			
Protocatechuate branch of beta-ketoadipate pathway Succinyl-CoA:3-ketoacid-coenzyme A	2		
transferase subunit A (EC 2.8.3.5)	2		
Metabolism of aromatic compounds Metabolism of central aromatic intermediates			
Protocatechuate branch of beta-ketoadipate pathway 3-oxoadipate CoA-transferase subunit B (EC 2.8.3.6)	1		
Metabolism of aromatic compounds Metabolism of central aromatic intermediates			
Protocatechuate branch of beta-ketoadipate pathway Succinyl-CoA:3-ketoacid-coenzyme A	1		
transferase subunit B (EC 2.8.3.5)	1		
Metabolism of aromatic compounds Peripheral pathways for catabolism of aromatic compounds			
Benzoate catabolism 3-Oxoadipate CoA-transferase subunit B (EC 2.8.3.6)	1		
Metabolism of aromatic compounds Peripheral pathways for catabolism of aromatic compounds			
Benzoate degradation Benzoate transport protein	1		
Metabolism of aromatic compounds Peripheral pathways for catabolism of aromatic compounds			
Biphenyl Degradation 4-hydroxy-2-oxovalerate aldolase (EC 4.1.3.-)	2		
Metabolism of aromatic compounds Peripheral pathways for catabolism of aromatic compounds			
Biphenyl Degradation Acetaldehyde dehydrogenase (EC 1.2.1.10)	2		
Motility and Chemotaxis Chemotaxis in Prokaryota Bacterial Chemotaxis			Dipeptide-binding
ABC transporter, periplasmic substrate-binding component (TC 3.A.1.5.2)	3		
Motility and Chemotaxis Flagellar motility in Prokaryota		Flagellum	Flagellar motor
rotation protein motB	3		
Motility and Chemotaxis Flagellar motility in Prokaryota		Flagellum	RNA polymerase
sigma factor RpoD	1		
Motility and Chemotaxis Flagellar motility in Prokaryota		Flagellum	Flagellar hook-
length control protein fliK	1		
Motility and Chemotaxis Flagellar motility in Prokaryota		Flagellum	Flagellar protein
fliJ	1		
Motility and Chemotaxis Flagellar motility in Prokaryota		Flagellum	Flagellar
regulatory protein fleQ	1		
Motility and Chemotaxis Flagellar motility in Prokaryota		Flagellum	Flagellum-specific
ATP synthase fliI	1		
Motility and Chemotaxis Social motility and nonflagellar swimming in bacteria			Bacterial
motility:Gliding Type II secretory pathway, component PulF/Type 4 fimbrial assembly protein			

pilC 4
 Motility and Chemotaxis Social motility and nonflagellar swimming in bacteria Bacterial
 motility:Gliding Twitching motility protein PilT 3
 Nitrogen Metabolism Allantoin degradation Glycerate kinase (EC 2.7.1.31) 2
 Nitrogen Metabolism Ammonia assimilation Nitrogen regulation protein NR(I) 1
 Nitrogen Metabolism Ammonia assimilation Glutamate synthase [NADPH] small chain (EC
 1.4.1.13) 3
 Nitrogen Metabolism Ammonia assimilation Glutamate synthase [NADPH] large chain (EC
 1.4.1.13) 3
 Nitrogen Metabolism Ammonia assimilation Nitrogen regulatory protein P-II 1
 Respiration Electron accepting reactions Denitrification Cytochrome cd1 nitrite reductase
 (EC:1.7.2.1) 23
 Respiration Electron accepting reactions Denitrification Copper-containing nitrite reductase
 (EC 1.7.2.1) 1
 Nitrogen Metabolism Nitrate and nitrite ammonification Respiratory nitrate
 reductase alpha chain (EC 1.7.99.4) 5
 Nitrogen Metabolism Nitrate and nitrite ammonification Nitrite transporter from
 formate/nitrite family 2
 Nitrogen Metabolism Nitrate and nitrite ammonification Nitrite reductase [NAD(P)H]
 large subunit (EC 1.7.1.4) 1
 Nitrogen Metabolism Nitrate and nitrite ammonification Nitrate/nitrite transporter
 5
 Nitrogen Metabolism Nitrosative stress Nitric oxide-dependent regulator DnrN or
 NorA 1
 Nucleosides and Nucleotides Purines De Novo Purine Biosynthesis
 Phosphoribosylaminoimidazole carboxylase ATPase subunit (EC 4.1.1.21) 2
 Nucleosides and Nucleotides Purines De Novo Purine Biosynthesis Phosphoribosylamine--
 glycine ligase (EC 6.3.4.13) 2
 Nucleosides and Nucleotides Purines De Novo Purine Biosynthesis
 Phosphoribosylformylglycinamide synthase, glutamine amidotransferase subunit (EC 6.3.5.3) 4
 Nucleosides and Nucleotides Purines De Novo Purine Biosynthesis
 Phosphoribosylaminoimidazole-succinocarboxamide synthase (EC 6.3.2.6) 1
 Nucleosides and Nucleotides Purines De Novo Purine Biosynthesis
 Amidophosphoribosyltransferase (EC 2.4.2.14) 4
 Nucleosides and Nucleotides Purines De Novo Purine Biosynthesis
 Phosphoribosylformylglycinamide cyclo-ligase (EC 6.3.3.1) 3
 Nucleosides and Nucleotides Purines De Novo Purine Biosynthesis
 Phosphoribosylaminoimidazolecarboxamide formyltransferase (EC 2.1.2.3) 1
 Nucleosides and Nucleotides Purines De Novo Purine Biosynthesis
 Phosphoribosylformylglycinamide synthase, synthetase subunit (EC 6.3.5.3) 4
 Nucleosides and Nucleotides Purines De Novo Purine Biosynthesis IMP cyclohydrolase (EC
 3.5.4.10) 1
 Nucleosides and Nucleotides Purines De Novo Purine Biosynthesis Adenylosuccinate lyase (EC
 4.3.2.2) 5
 Nucleosides and Nucleotides Purines Purine conversions Deoxyguanosine kinase (EC
 2.7.1.113) 2
 Nucleosides and Nucleotides Purines Purine conversions AMP nucleosidase (EC 3.2.2.4) 3
 Nucleosides and Nucleotides Purines Purine conversions Purine nucleoside phosphorylase (EC
 2.4.2.1) 1
 Nucleosides and Nucleotides Purines Purine conversions Adenylosuccinate synthetase (EC
 6.3.4.4) 4
 Nucleosides and Nucleotides Purines Purine conversions Hypoxanthine-guanine
 phosphoribosyltransferase (EC 2.4.2.8) 3
 Nucleosides and Nucleotides Purines Purine conversions Adenylosuccinate lyase (EC 4.3.2.2)
 5
 Nucleosides and Nucleotides Purines Purine conversions Deoxyadenosine kinase (EC 2.7.1.76)
 2
 Nucleosides and Nucleotides Purines Purine conversions Adenosine deaminase (EC 3.5.4.4)
 1
 Nucleosides and Nucleotides Purines Purine conversions 5'-nucleotidase (EC 3.1.3.5) 2
 Nucleosides and Nucleotides Purines Purine conversions Inosine-5'-monophosphate
 dehydrogenase (EC 1.1.1.205) 1
 Nucleosides and Nucleotides Purines Purine conversions GMP reductase (EC 1.7.1.7) 1
 Nucleosides and Nucleotides Pyrimidines De Novo Pyrimidine Synthesis Dihydroorotate
 dehydrogenase (EC 1.3.3.1) 1
 Nucleosides and Nucleotides Pyrimidines De Novo Pyrimidine Synthesis Aspartate
 carbamoyltransferase (EC 2.1.3.2) 1
 Nucleosides and Nucleotides Pyrimidines De Novo Pyrimidine Synthesis Dihydroorotate
 dehydrogenase electron transfer subunit (EC 1.3.3.1) 5
 Nucleosides and Nucleotides Pyrimidines De Novo Pyrimidine Synthesis Carbamoyl-phosphate
 synthase large chain (EC 6.3.5.5) 16
 Nucleosides and Nucleotides Pyrimidines De Novo Pyrimidine Synthesis Dihydroorotate
 dehydrogenase, catalytic subunit (EC 1.3.3.1) 3
 Nucleosides and Nucleotides Pyrimidines pyrimidine conversions 2',3'-cyclic-nucleotide 2'-
 phosphodiesterase (EC 3.1.4.16) 2
 Nucleosides and Nucleotides Pyrimidines pyrimidine conversions Pyrimidine-nucleoside
 phosphorylase (EC 2.4.2.2) 2
 Nucleosides and Nucleotides Pyrimidines pyrimidine conversions CTP synthase (EC 6.3.4.2)
 4
 Nucleosides and Nucleotides Pyrimidines pyrimidine conversions 5'-nucleotidase (EC
 3.1.3.5) 2

Nucleosides and Nucleotides phosphorylase (EC 2.4.2.1)	Pyrimidines 1	pyrimidine conversions	Purine nucleoside
Nucleosides and Nucleotides deaminase (EC 3.5.4.13)	Pyrimidines 2	pyrimidine conversions	Deoxycytidine triphosphate
Nucleosides and Nucleotides (1.8.1.9)	Pyrimidines 3	pyrimidine conversions	Thioredoxin reductase (EC
Nucleosides and Nucleotides (2.1.1.45)	Pyrimidines 3	pyrimidine conversions	Thymidylate synthase (EC
Nucleosides and Nucleotides (2.7.4.14)	Pyrimidines 1	pyrimidine conversions	Cytidylate kinase (EC
Nucleosides and Nucleotides class Ib (aerobic), alpha subunit (EC 1.17.4.1)	Ribonucleotide reduction (EC 1.17.4.1)	Ribonucleotide reduction	Ribonucleotide reductase of
Nucleosides and Nucleotides class Ia (aerobic), alpha subunit (EC 1.17.4.1)	Ribonucleotide reduction (EC 1.17.4.1)	Ribonucleotide reduction	Ribonucleotide reductase of
Nucleosides and Nucleotides transcriptional regulator NrdR	Ribonucleotide reduction	Ribonucleotide reduction	Ribonucleotide reductase
Nucleosides and Nucleotides class III (anaerobic), activating protein (EC 1.97.1.4)	Ribonucleotide reduction (EC 1.97.1.4)	Ribonucleotide reduction	Ribonucleotide reductase of
Nucleosides and Nucleotides class II (coenzyme B12-dependent) (EC 1.17.4.1)	Ribonucleotide reduction (EC 1.17.4.1)	Ribonucleotide reduction	Ribonucleotide reductase of
Nucleosides and Nucleotides Phosphopentomutase (EC 5.4.2.7)	Ribose and deoxyribose phosphate metabolism	Ribose and deoxyribose phosphate metabolism	
Nucleosides and Nucleotides Transketolase (EC 2.2.1.1)	Ribose and deoxyribose phosphate metabolism	Ribose and deoxyribose phosphate metabolism	
Nucleosides and Nucleotides Deoxyribose-phosphate aldolase (EC 4.1.2.4)	Ribose and deoxyribose phosphate metabolism	Ribose and deoxyribose phosphate metabolism	
Phage	Prophage lysogenic conversion modules	Phage-associated cell wall hydrolase	2
Protein Metabolism	Protein Biosynthesis	Ribosome biogenesis bacterial	Ribosomal-protein-
S5p-alanine acetyltransferase (EC 2.3.1.-)	Protein Biosynthesis	Ribosome biogenesis bacterial	Ribonuclease E (EC
Protein Metabolism (3.1.4.-)	Protein Biosynthesis	Ribosome LSU bacterial	LSU ribosomal protein L15p
Protein Metabolism (L27Ae)	Protein Biosynthesis	Ribosome LSU bacterial	LSU ribosomal protein L18p
Protein Metabolism (L5e)	Protein Biosynthesis	Ribosome LSU bacterial	LSU ribosomal protein L21p
Protein Metabolism 1	Protein Biosynthesis	Ribosome LSU bacterial	LSU ribosomal protein L20p
Protein Metabolism 1	Protein Biosynthesis	Ribosome LSU bacterial	LSU ribosomal protein L2p
Protein Metabolism (L8e)	Protein Biosynthesis	Ribosome LSU bacterial	LSU ribosomal protein L5p
Protein Metabolism (L11e)	Protein Biosynthesis	Ribosome LSU bacterial	LSU ribosomal protein L33p
Protein Metabolism 1	Protein Biosynthesis	Ribosome LSU bacterial	LSU ribosomal protein L9p
Protein Metabolism 1	Protein Biosynthesis	Ribosome SSU bacterial	SSU ribosomal protein S4p
Protein Metabolism (S9e)	Protein Biosynthesis	Ribosome SSU bacterial	SSU ribosomal protein S12p
Protein Metabolism (S23e)	Protein Biosynthesis	Ribosome SSU bacterial	SSU ribosomal protein S13p
Protein Metabolism (S18e)	Protein Biosynthesis	Ribosome SSU bacterial	SSU ribosomal protein S9p
Protein Metabolism (S16e)	Protein Biosynthesis	Ribosome SSU bacterial	SSU ribosomal protein S7p
Protein Metabolism (S5e)	Protein Biosynthesis	Translation factors bacterial	Peptide deformylase
Protein Metabolism (EC 3.5.1.88)	Protein Biosynthesis	Translation factors bacterial	Translation
Protein Metabolism initiation factor	Protein Biosynthesis	Translation factors bacterial	Translation
Protein Metabolism elongation factor Tu	Protein Biosynthesis	Translation factors bacterial	Translation
Protein Metabolism elongation factor P	Protein Biosynthesis	Translation factors bacterial	Translation
Protein Metabolism elongation factor G	Protein Biosynthesis	Translation factors bacterial	Methionine
Protein Metabolism aminopeptidase (EC 3.4.11.18)	Protein Biosynthesis	Translation factors bacterial	Peptide chain
Protein Metabolism release factor 3	Protein Biosynthesis	Translation factors bacterial	Methionyl-tRNA
Protein Metabolism formyltransferase (EC 2.1.2.9)	Protein Biosynthesis	Translation factors bacterial	Peptide chain
Protein Metabolism release factor 2	Protein Biosynthesis	Translation factors bacterial	Ribosome recycling
Protein Metabolism factor 1	Protein Biosynthesis	Translation factors bacterial	Translation
Protein Metabolism initiation factor 3	Protein Biosynthesis	Universal GTPases	GTP-binding and nucleic
Protein Metabolism acid-binding protein YchF	3		

Protein Metabolism particle, subunit Ffh SRP54 (TC 3.A.5.1.1)	Protein Biosynthesis	Universal GTPases	Signal recognition
Protein Metabolism 3	Protein Biosynthesis	Universal GTPases	GTP-binding protein LepA
Protein Metabolism 1	Protein Biosynthesis	Universal GTPases	GTP-binding protein EngB
Protein Metabolism 1	Protein Biosynthesis	Universal GTPases	GTP-binding protein Era 2
Protein Metabolism 1	Protein Biosynthesis	Universal GTPases	GTP-binding protein EngA
Protein Metabolism factor Tu 3	Protein Biosynthesis	Universal GTPases	Translation elongation
Protein Metabolism factor G 1	Protein Biosynthesis	Universal GTPases	Translation elongation
Protein Metabolism 3	Protein Biosynthesis	Universal GTPases	GTP-binding protein HflX
Protein Metabolism factor 2 1	Protein Biosynthesis	Universal GTPases	Translation initiation
Protein Metabolism dioxygenase ferredoxin--NAD(+) reductase component (EC 1.18.1.3)	Protein Degradation	Phenylpropionate Degradation	3-phenylpropionate
Protein Metabolism dioxygenase alpha subunit (EC 1.14.1.-) 2	Protein Degradation	Phenylpropionate Degradation	3-phenylpropionate
Protein Metabolism dioxygenase beta subunit (EC 1.14.1.-) 1	Protein Degradation	Phenylpropionate Degradation	3-phenylpropionate
Protein Metabolism phenylpropionic acid transporter (EC 3.4.11.1) 1	Protein Degradation	Phenylpropionate Degradation	Probable 3-
Protein Metabolism dependent protease La (EC 3.4.21.53) 1	Protein Degradation	Protein degradation	Cytosol aminopeptidase PepA
Protein Metabolism dependent Clp protease ATP-binding subunit clpA 1	Protein Degradation	Proteolysis in bacteria, ATP-dependent	ATP-
Protein Metabolism protein 16	Protein Degradation	Proteolysis in bacteria, ATP-dependent	ATP-
Protein Metabolism (TC 3.A.5.1.1) Ribonuclease P protein component (EC 3.1.26.5) 1	Protein Export and Secretion	General secretory pathway (Sec-SRP) complex	
Protein Metabolism (TC 3.A.5.1.1) Protein-export membrane protein secF (TC 3.A.5.1.1) 1	Protein Export and Secretion	General secretory pathway (Sec-SRP) complex	
Protein Metabolism (TC 3.A.5.1.1) Preprotein translocase secY subunit (TC 3.A.5.1.1) 1	Protein Export and Secretion	General secretory pathway (Sec-SRP) complex	
Protein Metabolism (TC 3.A.5.1.1) Signal recognition particle, subunit Ffh SRP54 (TC 3.A.5.1.1) 5	Protein Export and Secretion	General secretory pathway (Sec-SRP) complex	
Protein Metabolism (TC 3.A.5.1.1) Protein export cytoplasm protein SecA ATPase RNA helicase (TC 3.A.5.1.1) 8	Protein Export and Secretion	General secretory pathway (Sec-SRP) complex	
Protein Metabolism (TC 3.A.5.1.1) Protein-export membrane protein secD (TC 3.A.5.1.1) 2	Protein Export and Secretion	General secretory pathway (Sec-SRP) complex	
Protein Metabolism GroEL 4	Protein Folding GroEL GroES	Heat shock protein 60 family chaperone	
Protein Metabolism GroES 2	Protein Folding GroEL GroES	Heat shock protein 60 family co-chaperone	
Protein Metabolism Deacetylation in Bacteria	Protein Processing and Modification	Protein Acetylation and	
Respiration	Acetate peremase actP 2		
Respiration	ATP synthases FOF1-type ATP synthase ATP synthase alpha chain (EC 3.6.3.14) 2		
Respiration	ATP synthases FOF1-type ATP synthase ATP synthase beta chain (EC 3.6.3.14) 1		
Respiration dehydrogenase, short-chain specific (EC 1.3.99.2) 3	Electron accepting reactions	Anaerobic respiratory reductases	Acyl-CoA
Respiration reductase 3	Electron accepting reactions	Anaerobic respiratory reductases	Ferredoxin
Respiration dimethyl sulfoxide reductase chain A (EC 1.8.99.-) 6	Electron accepting reactions	Anaerobic respiratory reductases	Anaerobic
Respiration reductase beta subunit (EC 1.8.99.1) 1	Electron accepting reactions	Anaerobic respiratory reductases	Sulfite
Respiration oxidase subunit CcoO (EC 1.9.3.1) 1	Electron accepting reactions	Terminal cytochrome C oxidases	Cytochrome c
Respiration oxidase polypeptide I (EC 1.9.3.1) 2	Electron accepting reactions	Terminal cytochrome C oxidases	Cytochrome c
Respiration oxidase subunit CcoN (EC 1.9.3.1) 5	Electron accepting reactions	Terminal cytochrome C oxidases	Cytochrome c
Respiration protein 2	Electron accepting reactions	Terminal cytochrome C oxidases	FixG-related
Respiration bd2, subunit I 3	Electron accepting reactions	Terminal cytochrome oxidases	putative Cytochrome
Respiration binding protein cydC 1	Electron accepting reactions	Terminal cytochrome oxidases	Transport ATP-
Respiration ubiquinol oxidase subunit I (EC 1.10.3.-) 3	Electron accepting reactions	Terminal cytochrome oxidases	Cytochrome d
Respiration bd2, subunit II 1	Electron accepting reactions	Terminal cytochrome oxidases	putative Cytochrome
Respiration binding protein cydD 3	Electron accepting reactions	Terminal cytochrome oxidases	Transport ATP-
Respiration binding protein cydCD 1	Electron accepting reactions	Terminal cytochrome oxidases	Transport ATP-

Respiration hydrogenase beta subunit (EC 1.12.98.1)	1	Electron donating reactions	Coenzyme F420 hydrogenase	Coenzyme F420
Respiration major subunit (EC 1.2.1.2)	1	Electron donating reactions	Formate hydrogenase	Formate dehydrogenase-O,
Respiration transcriptional activator (EC 1.-.-.-)	1	Electron donating reactions	Formate hydrogenase	Formate hydrogenlyase
Respiration transcriptional activator (EC 1.-.-.-)	1	Electron donating reactions	Formate hydrogenase	Hydrogenase-4 component D
Respiration transcriptional activator (EC 1.-.-.-)	1	Electron donating reactions	Formate hydrogenase	Hydrogenase-4
Respiration HoxH (EC 1.12.1.2)	1	Electron donating reactions	Formate hydrogenase	Hydrogenase-4 component F
Respiration HoxU (EC 1.12.1.2)	1	Electron donating reactions	Hydrogenases	NAD-reducing hydrogenase subunit
Respiration nickel incorporation-associated protein HypB	1	Electron donating reactions	Hydrogenases	NAD-reducing hydrogenase subunit
Respiration oxidoreductase chain B (EC 1.6.5.3)	1	Electron donating reactions	NiFe hydrogenase maturation	[NiFe] hydrogenase 75
Respiration oxidoreductase chain G (EC 1.6.5.3)	1	Electron donating reactions	Respiratory Complex I	NADH-ubiquinone
Respiration oxidoreductase chain L (EC 1.6.5.3)	5	Electron donating reactions	Respiratory Complex I	NADH-ubiquinone
Respiration oxidoreductase chain A (EC 1.6.5.3)	2	Electron donating reactions	Respiratory Complex I	NADH ubiquinone
Respiration oxidoreductase chain N (EC 1.6.5.3)	2	Electron donating reactions	Respiratory Complex I	NADH-ubiquinone
Respiration dehydrogenase (EC 1.1.1.6)	3	Electron donating reactions	Respiratory dehydrogenases 1	Glycerol
Respiration phosphate dehydrogenase (EC 1.1.99.5)	2	Electron donating reactions	Respiratory dehydrogenases 1	Aerobic glycerol-3-
Respiration dehydrogenase small subunit (EC 1.4.99.1)	1	Electron donating reactions	Respiratory dehydrogenases 1	D-amino acid
Respiration synthetase (EC 6.2.1.1)	3	Electron donating reactions	Respiratory dehydrogenases 1	Acetyl-coenzyme A
Respiration dehydrogenase (EC 1.1.2.3)	1	Electron donating reactions	Respiratory dehydrogenases 1	L-lactate
Respiration dehydrogenase (EC 1.5.99.8) (Proline oxidase)	1	Electron donating reactions	Respiratory dehydrogenases 1	Proline
Respiration iron-sulfur protein (EC 1.3.99.1)	1	Electron donating reactions	Succinate dehydrogenase	Succinate dehydrogenase
Respiration flavoprotein subunit (EC 1.3.99.1)	4	Electron donating reactions	Succinate dehydrogenase	Fumarate reductase
Respiration flavoprotein subunit (EC 1.3.99.1)	4	Electron donating reactions	Succinate dehydrogenase	Succinate dehydrogenase
Respiration electron carriers	2	Soluble electron carries	Soluble cytochromes and functionally related	
RNA metabolism nucleotidyltransferase (EC 2.7.7.25)	1	RNA processing and modification	Polyadenylation bacterial	tRNA
RNA metabolism hydroperoxide reductase subunit C (EC 1.6.4.-)	3	RNA processing and modification	Queuosine-Archaeosine Biosynthesis	Alkyl
RNA metabolism Biosynthesis QueC ATPase	2	RNA processing and modification	Queuosine-Archaeosine Biosynthesis	Queuosine
RNA metabolism guanine transglycosylase (EC 2.4.2.29)	2	RNA processing and modification	Queuosine-Archaeosine Biosynthesis	tRNA-
RNA metabolism adenosylmethionine:tRNA ribosyltransferase-isomerase (EC 5.-.-.-)	2	RNA processing and modification	Queuosine-Archaeosine Biosynthesis	S-
RNA metabolism (4.2.1.70)	1	RNA processing and modification	tRNA processing	tRNA pseudouridine synthase A (EC
RNA metabolism (2)	2	RNA processing and modification	tRNA processing	tRNA-i(6)A37 methylthiotransferase
RNA metabolism thiouridylyltransferase (EC 2.1.1.61)	2	RNA processing and modification	tRNA processing	tRNA (5-methylaminomethyl-2-
RNA metabolism (2.7.7.25)	1	RNA processing and modification	tRNA processing	tRNA(Ile)-lysidine synthetase 5
RNA metabolism isopentenylpyrophosphate transferase (EC 2.5.1.8)	2	RNA processing and modification	tRNA processing	tRNA nucleotidyltransferase (EC
RNA metabolism (2.1.1.33)	1	RNA processing and modification	tRNA processing	tRNA delta(2)-
RNA metabolism (4.2.1.70)	1	RNA processing and modification	tRNA processing	Ribonuclease BN (EC 3.1.-.-) 1
RNA metabolism (EC 2.7.7.6)	7	RNA polymerase bacterial	Transcription factors bacterial	Transcription termination protein NusA 7
RNA metabolism (EC 2.7.7.6)	3	RNA polymerase bacterial	Transcription factors bacterial	RNA polymerase sporulation specific sigma
RNA metabolism factor SigH	1	Transcription factors bacterial	Transcription factors bacterial	RNA polymerase sporulation specific sigma

RNA metabolism	Transcription factors	bacterial	RNA polymerase sigma factor RpoD	1	
RNA metabolism associated with sigma factor RpoE	Transcription factors	bacterial	Serine protease precursor MucD/AlgY	1	
RNA metabolism	Transcription factors	bacterial	Transcription termination factor Rho	1	
RNA metabolism	Transcription factors	bacterial	Transcription-repair coupling factor	7	
RNA metabolism	Transcription factors	bacterial	RNA polymerase sigma factor RpoH	1	
RNA metabolism termination protein NusA	Transcription factors	bacterial	COG0779: clustered with transcription	2	
RNA metabolism	tRNA aminoacylation		Alanyl-tRNA synthetase (EC 6.1.1.7)	3	
RNA metabolism	tRNA aminoacylation		Valyl-tRNA synthetase (EC 6.1.1.9)	1	
RNA metabolism	tRNA aminoacylation		Methionyl-tRNA synthetase (EC 6.1.1.10)	5	
RNA metabolism	tRNA aminoacylation		Aspartyl-tRNA synthetase (EC 6.1.1.12)	1	
RNA metabolism	tRNA aminoacylation		Tyrosyl-tRNA synthetase (EC 6.1.1.1)	4	
RNA metabolism	tRNA aminoacylation		Glutamyl-tRNA synthetase (EC 6.1.1.18)	2	
RNA metabolism	tRNA aminoacylation		Lysyl-tRNA synthetase (class II) (EC 6.1.1.6)	3	
RNA metabolism	tRNA aminoacylation		Seryl-tRNA synthetase (EC 6.1.1.11)	3	
RNA metabolism	tRNA aminoacylation		Leucyl-tRNA synthetase (EC 6.1.1.4)	7	
RNA metabolism	tRNA aminoacylation		Glycyl-tRNA synthetase beta chain (EC 6.1.1.14)	4	
RNA metabolism	tRNA aminoacylation		Threonyl-tRNA synthetase (EC 6.1.1.3)	3	
RNA metabolism	tRNA aminoacylation		Prolyl-tRNA synthetase (EC 6.1.1.15)	5	
RNA metabolism	tRNA aminoacylation		Glutamyl-tRNA synthetase (EC 6.1.1.17)	3	
RNA metabolism	tRNA aminoacylation		Glycyl-tRNA synthetase alpha chain (EC 6.1.1.14)	2	
RNA metabolism	tRNA aminoacylation		Asparaginyl-tRNA synthetase (EC 6.1.1.22)	1	
RNA metabolism	tRNA aminoacylation		Isoleucyl-tRNA synthetase (EC 6.1.1.5)	2	
RNA metabolism	tRNA aminoacylation		Glycyl-tRNA synthetase (EC 6.1.1.14)	1	
RNA metabolism	tRNA aminoacylation		Cysteinyl-tRNA synthetase (EC 6.1.1.16)	3	
Stress response	Detoxification	D-tyrosyl-tRNA(Tyr) deacylase	D-tyrosyl-tRNA(Tyr) deacylase (EC 3.1.-.-)	1	
Stress response	Oxidative stress	Glutathione Redox Metabolism	Glutathione S-transferase, theta (EC 2.5.1.18)	1	
Stress response	Oxidative stress	Glutathione Redox Metabolism	Tripeptide aminopeptidase (EC EC 3.4.11.4)	2	
Stress response	Oxidative stress	Glutathione Redox Metabolism	Glutathione-dependent formaldehyde dehydrogenase (EC 1.2.1.1)	1	
Stress response	Oxidative stress	Glutathione Redox Metabolism	Glutathione reductase (EC 1.8.1.7)	1	
Stress response	Oxidative stress	Protection from Reactive Oxygen Species	Catalase (EC 1.11.1.6)	4	
Stress response	Oxidative stress	Protection from Reactive Oxygen Species	Superoxide dismutase [Cu-Zn] (EC 1.15.1.1)	1	
Sulfur Metabolism	Inorganic sulfur assimilation	Inorganic Sulfur Assimilation	Sulfite reductase [NADPH] hemoprotein beta-component (EC 1.8.1.2)	1	
Sulfur Metabolism	Inorganic sulfur assimilation	Sulfate assimilation	O-acetylhomoserine sulfhydrylase (EC 2.5.1.49)	2	
Sulfur Metabolism	Inorganic sulfur assimilation	Sulfate assimilation	Sulfite reductase [NADPH] hemoprotein beta-component (EC 1.8.1.2)	1	
Sulfur Metabolism	Inorganic sulfur assimilation	Sulfate assimilation	Sulfite reductase [NADPH] flavoprotein alpha-component (EC 1.8.1.2)	1	
Sulfur Metabolism	Inorganic sulfur assimilation	Sulfate to Sulfide	Sulfate and thiosulfate binding protein cysP	1	
Sulfur Metabolism	Inorganic sulfur assimilation	Sulfate to Sulfide	Sulfate permease	4	
Virulence	Detection	MLST	Guanylate kinase (EC 2.7.4.8)	1	
Virulence	Resistance to Antibiotics		Resistance to fluoroquinolones	DNA gyrase subunit A (EC 5.99.1.3)	3
Virulence	Resistance to Antibiotics		Resistance to fluoroquinolones	DNA gyrase subunit B (EC 5.99.1.3)	3
Virulence	Resistance to Antibiotics		Resistance to fluoroquinolones	Topoisomerase IV subunit B (EC 5.99.1.-)	2
Virulence	Resistance to Antibiotics		Resistance to fluoroquinolones	Topoisomerase IV subunit A (EC 5.99.1.-)	7