



<b>Histidine degradation to glutamate</b>				
histidin ammonia lyase (EC 4.3.1.3)	K337_v1_20957	PSYM_v1_80008	FUSI_v1_460027	-
urocanate hydratase (EC 4.2.1.49)	K337_v1_20351	-	FUSI_v1_640043	-
imidazolonepropionase (EC 3.5.2.7)	K337_v1_20956	-	040; FUSI_v1_680002; FUSI_v1_680003	DESP_v1_850010
formimidoylglutamase (EC 3.5.3.8)	K337_v1_20958	-	-	-
<b>Glutamate degradation via methylaspartate pathway to pyruvate</b>				
methylaspartate mutase, mutE (EC 5.4.99.1)	K337_v1_11676; K337_v1_11678	-	il_v1_940031; FUSI_v1_940032	-
methylaspartate ammonia-lyase (EC 4.3.1.2)	K337_v1_11673	-	-	-
2-methylmalate dehydratase (EC 4.2.1.34)	-	-	-	-
citramalate lyase (EC 4.1.3.22)	-	-	-	-
<b>Glutamate degradation via hydroxyglutarate pathway to butyrate</b>				
glutamate / leucine dehydrogenase (EC 1.4.1.2; EC 1.4.1.3; EC 1.4.1.4)	K337_v1_11103; K337_v1_11104	M_v1_60003; PSYM_v1_2910	FUSI_v1_10079	2_v1_1130001; DESP_v1_180001
2-hydroxyglutarate dehydrogenase (EC 1.1.99.2)	K337_v1_11115	-	FUSI_v1_10080	-
glutaconate CoA-transferase (EC 2.8.3.12)	-	-	-	-
2-hydroxyglutaryl CoA dehydratase (EC 4.2.1.-)	r1_21025; K337_v1_11508; K337_v1_11509	-	-	-
glutaconyl-CoA decarboxylase subunit delta (EC 4.1.1.70)	K337_v1_20059	-	-	-
glutaconyl-CoA decarboxylase subunit gamma (EC 4.1.1.70)	K337_v1_20060	-	FUSI_v1_940037	-
glutaconyl-CoA decarboxylase subunit beta (EC 4.1.1.70)	K337_v1_20061	-	FUSI_v1_940038	-
butyryl-CoA dehydrogenase (EC 1.3.8.1)	K337_v1_30044	-	FUSI_v1_410001	-
butyryl coenzyme A transferase, alpha subunit (EC 2.8.3.8)	K337_v1_10805	-	-	-
butyryl coenzyme A transferase, beta subunit (EC 2.8.3.8)	K337_v1_10806	-	-	-
<b>Asparagin degradation to aspartate</b>				
asparaginase (EC 3.5.1.1)	K337_v1_20898	M_v1_100035; PSYM_v1_100	FUSI_v1_280010	DESP_v1_1280014
<b>L-Homocysteine degradation to cysteine and L-cysteine degradation to pyruvate</b>				
cystathionine β-synthase (EC 4.2.1.22)	-	PSYM_v1_2510003	il_v1_150018; FUSI_v1_111	-
cystathionine gamma-lyase (EC 4.4.1.1) / cysteine synthase (EC 2.5.1.47)	K337_v1_11683; K337_v1_20987	M_v1_660011; PSYM_v1_410	FUSI_v1_460004	DESP_v1_220021
<b>Tryptophane degradation to pyruvate</b>				
tryptophanase / L-cysteine desulfhydrase, PLP-dependent (EC 4.1.99.1)	K337_v1_20947	-	-	-
<b>L-Serine degradation to pyruvate / Threonine degradation (I) to 2-oxobutanoate</b>				
L-serine ammonia-lyase (EC 4.3.1.17) / threonine ammonia-lyase (EC 4.3.1.19)	K337_v1_10253; K337_v1_11287	M_v1_590011; PSYM_v1_120011; PSYM_v1_120012	FUSI_v1_630018; FUSP_v1_1300002; FUSP_v1_1300003	DESP_v1_510001
<b>Alanine degradation to pyruvate</b>				
alanine dehydrogenase (EC 1.4.1.1)	K337_v1_11051; K337_v1_11052	PSYM_v1_480006	-	DESP_v1_20046
<b>Methionine degradation to 2-oxobutanoate and methanethiol</b>				
methionine gamma-lyase (EC 4.4.1.11)	r1_10331; K337_v1_11588; K337_v1_11589	PSYM_v1_20036	005; FUSI_v1_560010; FUSI_v1_560011	-
<b>Threonine degradation (II) to glycine and acetyl-CoA</b>				
L-threonine 3-dehydrogenase (EC 1.1.1.103)	-	PSYM_v1_2590001	FUSI_v1_560008	DESP_v1_180022
glycine C-acetyltransferase (EC 2.3.1.29)	-	PSYM_v1_2590002	FUSI_v1_520059	xDESP_v1_180021
<b>Threonine degradation (IV) to glycine and acetyl-CoA</b>				
low specificity L-threonine aldolase (EC 4.1.2.5)	K337_v1_11380	-	001; FUSI_v1_800055; FUSI_v1_800056	DESP_v1_280002
iron-type aldehyde-alcohol dehydrogenase (NAD <sup>+</sup> ) (EC 1.2.1.10/EC 1.1.1.1)	K337_v1_20115	-	il_v1_540069; FUSI_v1_670010; FUSI_v1_670011	DESP_v1_910009; DESP_v1_910010
<b>Arginine degradation (III) to putrescine</b>				
arginine decarboxylase (EC 4.1.1.19)	K337_v1_12041	-	FUSI_v1_1250057	-
agmatinase (EC 3.5.3.11)	K337_v1_12038	-	-	-
<b>Arginine degradation (V) to L-ornithine and CO<sub>2</sub> (deiminase pw)</b>				
arginine deaminase (EC 2.5.3.6)	-	-	FUSI_v1_270051	-
ornithine carbonyltransferase (EC 2.1.3.3)	K337_v1_11897	PSYM_v1_210021	il_v1_270052; FUSI_v1_111	DESP_v1_880023
carbamate kinase (EC 2.7.2.2)	-	PSYM_v1_500009	il_v1_420066; FUSI_v1_840	-
<b>Lysine degradation to butyrate and acetate</b>				
lysine 2,3-aminomutase (EC 5.4.3.2)	K337_v1_10812	PSYM_v1_780016	-	20011; DESP_v1_10005; DESP_v1_10006
lysine 5,6-aminomutase (EC 5.4.3.3)	K337_v1_10808; K337_v1_10809	-	-	-
L-erythro-3,5-diaminohexanoate dehydrogenase (EC 1.4.1.11)	K337_v1_10813	-	-	-
3-keto-5-aminohexanoate cleavage enzyme	K337_v1_10814	-	-	-
3-aminobutyryl-CoA ammonia-lyase (EC 4.3.1.14)	K337_v1_10815	-	-	-
acyl-CoA dehydrogenase (EC 1.3.8.1)	K337_v1_30044	-	-	0011; DESP_v1_1600001; DESP_v1_1600002
butyrate—acetoacetate CoA-transferase (EC 2.8.3.9)	-	-	-	-
acetyl-CoA acetyltransferase (EC 2.3.1.9)	K337_v1_30048	-	-	008; DESP_v1_1000008; DESP_v1_1000009
<b>Glycine cleavage complex</b>				
glycine dehydrogenase (decarboxylating) (EC 1.4.4.2)	r1_20307; K337_v1_20308; K337_v1_20309	PSYM_v1_420003	il_v1_650008; FUSI_v1_650009	DESP_v1_20041; DESP_v1_20042
aminomethyltransferase (EC 2.1.2.10)	K337_v1_20310	PSYM_v1_420003	il_v1_650008; FUSI_v1_650009	DESP_v1_20041; DESP_v1_20042

dihydrolipoyl dehydrogenase (EC 1.8.1.4)	K337_v1_11268; K337_v1_20310	PSYM_v1_420003	006; FUSI_v1_650007; FUSI_042; DESP_v1_20045; DESP_v1_120019	-
<b>branched-chain <math>\alpha</math>-keto acid dehydrogenase complex</b>				
2-keto-isovalerate dehydrogenase (EC 1.2.4.4)	-	-	FUSI_v1_810055	-
dihydrolipoyllysine-residue (EC 2.3.1.168)	-	-	FUSI_v1_810055	-
dihydrolipoyl dehydrogenase (EC 1.8.1.4)	-	-	_v1_1010005; FUSI_v1_111	-
<b>Aminotransferases</b>				
aminotransferase class I and II	K337_v1_10796	-	il_v1_410019; FUSI_v1_890	-
aminotransferase class III	-	-	FUSI_v1_640091	-
aromatic acid aminotransferase (EC 2.6.1.57)	-	-	SI_v1_860012; FUSI_v1_10	-
aspartate aminotransferase (EC 2.6.1.1)	K337_v1_12185	M_v1_1700002; PSYM_v1_106	SI_v1_220004; FUSI_v1_20	DESP_v1_120019
branched-chain amino transferase (EC:2.6.1.42)	K337_v1_11732; K337_v1_20081	-	il_v1_840093; FUSI_v1_620	DESP_v1_1080001
histidinol-phosphate aminotransferase (EC 2.6.1.9)	-	v1_3080002; PSYM_v1_11600	FUSI_v1_360042	DESP_v1_1210008
alanine transaminase (EC 2.6.1.2)	-	PSYM_v1_760004	-	-
alanine--glyoxylate transaminase (EC 2.6.1.44)	K337_v1_20164	-	-	-
acetylornithine aminotransferase (EC 2.6.1.11)	-	PSYM_v1_80040	SI_v1_10046; FUSI_v1_300	DESP_v1_880024
<b>Beta-oxidation of long-chain fatty acids</b>				
Long-chain acyl-CoA synthetase (EC 6.2.1.3 / EC 6.2.1.-) (CoA-ligase)	K337_v1_10867	M_v1_2450001; PSYM_v1_41	-	014; DESP_v1_450036; DESP_v1_13; DESP_v1_1600001; DESP_v1_1240008
acyl-CoA dehydrogenase (EC 1.3.8.-)	-	PSYM_v1_1300009	FUSI_v1_410001	-
fused enoyl-CoA hydratase/isomerase ; 3-hydroxyacyl-CoA dehydrogenase (EC 4.2.1.17, EC 5.3.3.8, EC 5.1.2.3, EC 1.1.1.35)	-	PSYM_v1_3780002	-	-
enoyl-CoA hydratase/isomerase (EC 4.2.1.17)	-	PSYM_v1_2230002	-	0008; DESP_v1_290019; DESP_v1_1240008
3-hydroxyacyl-CoA dehydrogenase (EC 1.1.1.35)	-	-	-	P_v1_2710002; DESP_v1_500016
acyl-CoA thiolase (acetyl-CoA transferase) (EC 2.3.1.16)	-	M_v1_3630003; PSYM_v1_378	-	-
<b>Glycerol degradation</b>				
glycerol-3-phosphate transporter	K337_v1_10282	-	FUSI_v1_10096	-
glycerol facilitator	K337_v1_10202	-	FUSI_v1_810044	-
glycerol kinase (sn-glycerol-3-phosphate generating) (EC 2.7.1.30)	K337_v1_10203	-	FUSI_v1_810043	DESP_v1_1420006
glycerol-3-phosphate dehydrogenase (EC 1.1.5.3)	K337_v1_11183; K337_v1_12015	-	r1_520017; FUSI_v1_96000	DESP_v1_1240008
<b>Glycolysis</b>	present	present	present	present
<b>Lactate degradation to pyruvate (reversible except for LUD-type L-lactate dehydrogenase)</b>				
L-lactate permease, LutP and LctP	K337_v1_21046	-	FUSI_v1_1110024	P_v1_620009; DESP_v1_249
L-lactate, D-lactate, and/or glycolate dehydrogenase, GlcD	K337_v1_21047	-	l_v1_430010; FUSI_v1_111	0008; DESP_v1_70033; DESP_v1_1240008
L-lactate, D-lactate, and/or glycolate dehydrogenase, GlcF	-	-	-	SP_v1_620007; DESP_v1_70
D-lactate dehydrogenase (cytochrome) (EC 1.1.2.4)	-	-	FUSI_v1_1210024;	-
L-lactate dehydrogenase (EC 1.1.1.27)	-	-	FUSI_v1_460018	-
D-lactate dehydrogenase (EC 1.1.1.28)	K337_v1_11115	PSYM_v1_50008	FUSI_v1_10080	-
L-lactate dehydrogenase (EC 1.1.2.3)	-	-	-	-
LUD-type L-lactate dehydrogenase, LutABC (EC 1.1.-.-)	-	-	-	0001, DESP_v1_450002, DESP_v1_1240008
<b>Butyrate degradation to butyryl-CoA (reversible)</b>				
butyrate kinase (EC 2.7.2.7)	K337_v1_11804	-	0033; FUSI_v1_520026; FU	DESP_v1_480015
phosphate butyryltransferase (EC 2.3.1.19)	K337_v1_11805	-	0032; FUSI_v1_520025; FU	DESP_v1_480016
<b>Butyrate degradation to butyryl-CoA like in Schmidt et al., 2013 (continues with classic beta-oxidation)</b>				
butanoate CoA-transferase (EC 2.8.3.-)	-	-	-	DESP_v1_1500004
<b>Formate degradation to CO2 and H+</b>				
formate dehydrogenase accessory protein, FdhE	-	-	-	DESP_v1_2210006
formate dehydrogenase alpha subunit, FdhA	-	-	-	DESP_v1_2210007/8
formate dehydrogenase beta subunit, FdhB	-	-	-	DESP_v1_2210009
<b>iso-butyrate isomerization to butryl-CoA</b>				
cob(I)alamin adenosyltransferase	K337_v1_20070	PSYM_v1_200016	FUSI_v1_1080006	P_v1_1080011; DESP_v1_30
isobutyryl-CoA mutase, N-terminal domain subunit	-	-	FUSI_v1_940031	-
isobutyryl-CoA mutase, C-terminal domain subunit (cobalamin B12-binding domain protein)	-	-	FUSI_v1_940032	-
LAO/AO transport system ATPase, MeaB-like protein	-	-	FUSI_v1_940033	-
<b>Propionate degradation to succinyl-CoA (reversible)</b>				
propionyl-CoA carboxylase, gamma subunit (EC 6.4.1.3)	-	-	FUSI_v1_940035	DESP_v1_1040006
propionyl-CoA carboxylase, beta subunit (EC 6.4.1.3)	-	-	FUSI_v1_940037	DESP_v1_1040008
acetyl-CoA carboxylase, gamma subunit (EC 6.4.1.2) / propionyl-CoA carboxylase, alpha subunit (EC 6.4.1.3)	K337_v1_10646	-	FUSI_v1_520003/4	-
acetyl-CoA carboxylase, beta subunit (EC 6.4.1.2) / propionyl-CoA carboxylase, gamma subunit (EC 6.4.1.3)	K337_v1_10913	-	FUSI_v1_520002	-
methylmalonyl-CoA epimerase (EC 5.1.99.1)	-	-	FUSI_v1_940034	-
methylmalonyl-CoA mutase accessory protein	-	-	FUSI_v1_940033	-
methylmalonyl-CoA mutase (EC 5.4.99.2)	-	-	FUSI_v1_940031/2	-

**TCA cycle**

citrate synthase (EC 2.3.3.1)	-	PSYM_v1_30012	FUSI_v1_800040	SP_v1_90043; DESP_v1_160
aconitate hydratase (EC 4.2.1.3)	-	M_v1_2890003; PSYM_v1_128	FUSI_v1_800038	42; DESP_v1_1190001; DESI
isocitrate dehydrogenase (NAD+) (EC 1.1.1.41) / isocitrate dehydrogenase (NADP+) (EC 1.1.1.42)	-	PSYM_v1_2270005	FUSI_v1_800039	DESP_v1_2350002
2-oxoglutarate decarboxylase, thiamin-requiring (EC 1.2.4.2) [2-oxoglutarate dehydrogenase complex]	-	PSYM_v1_30006	-	-
dihydrolipoamide succinyltransferase (EC 2.3.1.61) [2-oxoglutarate dehydrogenase complex]	-	PSYM_v1_30005	FUSI_v1_1170017	-
lipoamide dehydrogenase (EC 1.8.1.4) [2-oxoglutarate dehydrogenase complex]	K337_v1_11268	PSYM_v1_420003	018; FUSI_v1_1010005; FU_v1_20045; DESP_v1_86001	-
succinyl-CoA synthetase, alpha chain (EC 6.2.1.5)	-	YM_v1_30002; PSYM_v1_30003	-	DESP_v1_2040003
succinyl-CoA synthetase, beta chain (EC 6.2.1.5)	-	PSYM_v1_30004	-	DESP_v1_2040005
succinate dehydrogenase (EC 1.3.5.1)	-	YM_v1_30008; PSYM_v1_300	FUSI_v1_1290010	P_v1_2040002; DESP_v1_165
fumarate hydratase class I (EC 4.2.1.2)	K337_v1_11158/9; K337_v1_20911/2	PSYM_v1_1700003	_v1_1250059; FUSI_v1_12	P_v1_1020008; DESP_v1_226
malate dehydrogenase (EC 1.1.1.37) / Malate dehydrogenase (oxaloacetate-decarboxylating) (NADP(+)) (EC 1.1.1.40)	-	M_v1_570011; PSYM_v1_381	-	DESP_v1_230006

**ferredoxin oxidoreductases**

2-oxoglutarate ferredoxin oxidoreductase subunit alpha (EC 1.2.7.3) (KOR)	-	PSYM_v1_510008	029; FUSI_v1_1210029; FU:PS_v1_690022; DESP_v1_96
2-oxoglutarate ferredoxin oxidoreductase subunit beta (EC 1.2.7.3) (KOR)	-	PSYM_v1_510009	030; FUSI_v1_1210028; FU:0004; DESP_v1_690021; DES
2-oxoglutarate ferredoxin oxidoreductase subunit gamma (EC 1.2.7.3) (KOR)	-	-	031; FUSI_v1_1210027; FU: DESP_v1_2130005
2-oxoglutarate ferredoxin oxidoreductase subunit delta (EC 1.2.7.3) (KOR)	-	-	L_v1_520028; FUSI_v1_121 DESP_v1_2130002
pyruvate/ketoisovalerate oxidoreductase, delta subunit, putative (EC 1.2.7.1/ EC 1.2.7.7) (POR/VOR)	K337_v1_10071	-	SI_v1_10160; FUSI_v1_101 DESP_v1_1080004
pyruvate/ketoisovalerate oxidoreductase, alpha subunit (EC 1.2.7.1/ EC 1.2.7.7) (POR/VOR)	K337_v1_10072	PSYM_v1_2910001	SI_v1_10161; FUSI_v1_101 DESP_v1_1080005
pyruvate/ketoisovalerate oxidoreductase, beta subunit (EC 1.2.7.1/ EC 1.2.7.7) (POR/VOR)	K337_v1_10073	-	SI_v1_10162; FUSI_v1_101 DESP_v1_1080006
pyruvate/ketoisovalerate oxidoreductase, gamma subunit (EC 1.2.7.1/ EC 1.2.7.7) (POR/VOR)	K337_v1_10074	PSYM_v1_2910002	SI_v1_10159; FUSI_v1_101 DESP_v1_1080003
tungsten-containing aldehyde:ferredoxin oxidoreductase (EC 1.2.7.5) (AOR)	K337_v1_10511	-	FUSI_v1_1110012
pyruvate-flavodoxin oxidoreductase (EC 1.2.7.-) (PFOR)	K337_v1_11862	M_v1_2050003; PSYM_v1_253	FUSI_v1_120078
indolepyruvate:ferredoxin oxidoreductase (IOR) subunit $\alpha$ (EC 1.2.7.8)	-	-	FUSI_v1_800015
indolepyruvate:ferredoxin oxidoreductase (IOR) subunit $\beta$ (EC 1.2.7.8)	-	-	FUSI_v1_800014

**Oxobutanoate/pyruvate degradation to propionate/acetate (via propionyl/acetyl-P intermediate)**

2-ketobutyrate/pyruvate-formate lyase I (EC 2.3.1.54)	K337_v1_11221	PSYM_v1_2190001	FUSI_v1_480003	DESP_v1_550004
phosphate acetyltransferase (EC 2.3.1.8)	K337_v1_11864	PSYM_v1_120027	FUSI_v1_640081	P_v1_960006; DESP_v1_128
acetate kinase A and propionate kinase 2 (EC 2.7.2.1)	K337_v1_11863	PSYM_v1_120028	FUSI_v1_320010	DESP_v1_1280030

**Pyruvate dehydrogenase complex, conversion of pyruvate to acetyl-CoA**

pyruvate dehydrogenase E1 component alpha subunit (EC 1.2.4.1)	K337_v1_11265	M_v1_420001; PSYM_v1_140	FUSI_v1_810058	-
pyruvate dehydrogenase E1 component beta subunit (EC 1.2.4.1)	K337_v1_11266	PSYM_v1_2320002	FUSI_v1_810057	-
dihydrolipoyllysine-residue acetyltransferase (EC 2.3.1.12)	K337_v1_11267	M_v1_2320003; PSYM_v1_421	v1_810056; FUSI_v1_117	-
dihydrolipoyl dehydrogenase (EC 1.8.1.4)	K337_v1_11268	PSYM_v1_420003	018; FUSI_v1_1010005; FU_v1_20045; DESP_v1_86001	-

**Acetate production from acetyl-CoA or reverse**

acetyl-CoA synthetase bifunctional acetate—CoA / propionate—CoA ligase (AMP-forming) (EC 6.2.1.1/17)	-	M_v1_1400002; PSYM_v1_45	-	-
acetate—CoA ligase (ADP-forming) (EC 6.2.1.13)	-	-	-	-

**pyruvate to oxalacetate**

pyruvate carboxylase (EC 6.4.1.1)	K337_v1_20163	-	FUSI_v1_1200032	-
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**Sulfur cycling genes**

adenylyl-sulfate reductase, AprB (EC 1.8.99.2)	-	-	-	DESP_v1_120032
adenylyl-sulfate reductase, AprA (EC 1.8.99.2)	-	-	-	DESP_v1_120031
quinone-interacting membrane-bound oxidoreductase complex, QmoA	-	-	-	DESP_v1_120030
quinone-interacting membrane-bound oxidoreductase complex, QmoB	-	-	-	DESP_v1_120029
quinone-interacting membrane-bound oxidoreductase complex, QmoC	-	-	-	DESP_v1_120028
sulfate adenylyltransferase, Sat (EC 2.7.7.4)	-	-	-	DESP_v1_120027
dissimilatory sulfite reductase, DsrA (EC 1.8.99.5)	-	-	-	DESP_v1_100003
dissimilatory sulfite reductase, DsrB (EC 1.8.99.5)	-	-	-	DESP_v1_100002
probable regulatory protein, DsrD	-	-	-	DESP_v1_100001
dissimilatory sulfite reductase, DsrC (EC 1.8.99.5)	-	-	-	DESP_v1_160016
putative component of dissimilatory sulfate reduction system, DsrT	-	-	-	DESP_v1_50034
sulfite reduction-associated membrane complex ([DsrC]-trisulfide reductase), DsrM (1.8.5.M1)	-	-	-	DESP_v1_50033
sulfite reduction-associated membrane complex ([DsrC]-trisulfide reductase), DsrK (1.8.5.M1)	-	-	-	DESP_v1_50032
sulfite reduction-associated membrane complex ([DsrC]-trisulfide reductase), DsrJ (1.8.5.M1)	-	-	-	DESP_v1_50031
sulfite reduction-associated membrane complex ([DsrC]-trisulfide reductase), DsrO (1.8.5.M1)	-	-	-	DESP_v1_50030
sulfite reduction-associated membrane complex ([DsrC]-trisulfide reductase), DsrP (1.8.5.M1)	-	-	-	DESP_v1_50029
probable siroheme amidase, DsrN (EC 6.3.5.M1)	-	-	-	DESP_v1_1190011
soluble inorganic pyrophosphatase (sPPase) (EC 3.6.1.1)	K337_v1_11979	PSYM_v1_310018	-	DESP_v1_30033
adenylate kinase (EC 2.7.4.3)	K337_v1_30030	PSYM_v1_440003	FUSI_v1_940095	DESP_v1_1090008

Anaerobic sulfite reductase, subunit A (EC 1.8.1.-)	K337_v1_20489; K337_v1_20742	-	-	-
Anaerobic sulfite reductase, subunit B (EC 1.8.1.-)	K337_v1_20488; K337_v1_20741	-	-	-
Anaerobic sulfite reductase, subunit C (EC 1.8.1.-)	K337_v1_20487; K337_v1_20740	-	-	-
<b>Nitrate reduction to ammonium (DNRA)</b>				
periplasmic nitrate reductase, large subunit, NapA	-	M_v1_295000; PSYM_v1_274	-	-
periplasmic nitrate reductase, electron transfer subunit, NapB	-	PSYM_v1_2740004	-	-
periplasmic nitrate reductase, cytochrome c-type, NapC	-	PSYM_v1_2740003	-	-
periplasmic nitrate reductase, chaperone, NapD	-	PSYM_v1_2950002	-	-
periplasmic nitrate reductase, ferredoxin-type protein, NapF	-	PSYM_v1_2950003	-	-
periplasmic nitrate reductase, ferredoxin-type protein, NapG	-	PSYM_v1_2740006	-	-
periplasmic nitrate reductase, ferredoxin-type protein, NapH	-	PSYM_v1_2740005	-	-
formate-dependent nitrite reductase, cytochrome c552, NrfA	-	-	-	-
formate-dependent nitrite reductase, cytochrome c-type protein, NrfB	-	-	-	-
formate-dependent nitrite reductase, 4Fe4S subunit, NrfC	-	PSYM_v1_150004	-	-
formate-dependent nitrite reductase, membrane subunit, NrfD	-	PSYM_v1_150005	-	-
<b>Fumarate reduction</b>				
fumarate reductase, flavoprotein subunit	-	PSYM_v1_1240008	-	-
fumarate reductase iron-sulfur subunit	-	PSYM_v1_1240007	-	-
fumarate reductase, subunit C	-	PSYM_v1_1240006	-	-
fumarate reductase, D subunit	-	PSYM_v1_1240005	-	-
<b>Oxygen respiration</b>				
cbb3-type cytochrome c oxidase (EC 1.9.3.1)	-	PSYM_v1_70014; PSYM_v1_700	-	-
cytochrome bd-type oxidase	-	PSYM_v1_180033; PSYM_v1_180	-	P_v1_4300221; DESP_v1_430
cytochrome-c oxidase	-	-	-	PSYM_v1_460010; DESP_v1_460
<b>Type I SS</b>				
TolC	-	PSYM_v1_3060001	-	DESP_v1_360002
HlyD	-	PSYM_v1_3060002	-	-
HlyB	-	PSYM_v1_3060003	-	-
<b>Type II SS (general secretion pathway protein, gspD-N)</b>				
GspC	-	PSYM_v1_50014	-	DESP_v1_640009
GspD	K337_v1_10274	PSYM_v1_50015	-	DESP_v1_640008
GspE	-	PSYM_v1_50016	-	DESP_v1_640007
GspF	-	PSYM_v1_50017	-	DESP_v1_2030004
GspG	-	PSYM_v1_50018	-	DESP_v1_640017
GspH	-	PSYM_v1_50019	-	-
GspI	-	PSYM_v1_50020	-	DESP_v1_640015
GspJ	-	PSYM_v1_50022	-	DESP_v1_640014
GspK	-	PSYM_v1_50023	-	DESP_v1_640013
GspL	-	PSYM_v1_50024	-	DESP_v1_640012
GspM	-	PSYM_v1_50025	-	DESP_v1_640011
GspN	-	PSYM_v1_50026	-	DESP_v1_640010
<b>Twin arginine translocation</b>				
TatA	-	PSYM_v1_2920002	-	DESP_v1_130035
TatB	-	PSYM_v1_2920003	-	DESP_v1_400009
TatC	-	PSYM_v1_2920004	-	DESP_v1_400010
TatD (not needed, e.g. . Goosens et al. 2014: TAT system)	-	PSYM_v1_2920005	-	-
<b>Sec pathway</b>				
SecA	K337_v1_11974	PSYM_v1_530006	FUSI_v1_940046	DESP_v1_610007
SecB	-	PSYM_v1_30031	-	-
SecF	K337_v1_10344	PSYM_v1_1420009; PSYM_v1_242	FUSI_v1_180008	DESP_v1_340009
SecD	K337_v1_10343	PSYM_v1_1420010; PSYM_v1_242	FUSI_v1_180009	DESP_v1_340010
YajC	K337_v1_12023	PSYM_v1_2420003	FUSI_v1_180012	DESP_v1_340011
SecE	K337_v1_10236	PSYM_v1_230024	FUSI_v1_940061	DESP_v1_930004
SecG	K337_v1_10735	PSYM_v1_1410004	FUSI_v1_690027	DESP_v1_1070001
SecY	K337_v1_10010	PSYM_v1_110032	FUSI_v1_940094	DESP_v1_350007
YidC	K337_v1_10153	PSYM_v1_80033	FUSI_v1_230014	DESP_v1_100022
Ffh	K337_v1_10560	PSYM_v1_270001	FUSI_v1_320018	DESP_v1_30048
FstY	K337_v1_11865	PSYM_v1_940007	FUSI_v1_320016	DESP_v1_20037
<b>Type IV SS</b>				

VirB2	K337_v1_20573	-	-	-
VirB8	K337_v1_20574	-	-	-
VirB9	K337_v1_20575	-	-	-
VirB10	K337_v1_20576	-	-	-
VirD4	K337_v1_20580	-	-	-
VirB11	K337_v1_20582	-	-	-
VirB3	K337_v1_20583	-	-	-
VirB4	K337_v1_20584	-	-	-
VirB5	K337_v1_20585	-	-	-
VirB6	K337_v1_20586	-	-	-
VirB1	-	-	-	-
VirB7	-	-	-	-
<b>Type V SS</b>				
Type Va	v1_10452; K337_v1_11022;K337_v1/M_v1_90026;PSYM_v1_2620	-	-	-
Type Vb	K337_v1_11330	-	-	-
Type Vc	v1_11400; K337_v1_11743;K337_v1_	-	-	-