Supplementary file with: **Comparative genomics of chytrid fungi reveal insights into the obligate biotrophic and pathogenic lifestyle of *Synchytrium endobioticum***

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Supplementary file 3: KEGG pathway analysis

Chytridiomycota versus Ascomycota and Basidiomycota

The following color codes are used:

🟩	Present in ≥1 in all groups: Obligate biotrophic chytrid (Obl_Chyt), Culturable chytrid (Cult_Chyt), Culturable control species (Cult_CTRL), and Obligate or facultative biotrophic Control species (Obl_CTRL)
🟧	Absent in both Obl_Chyt *and* all Obl_CTRL, *but* present both in ≥1 Cult_Chyt *and* ≥1 Cult_CTRL
🟦	Present in ≥1 Obl_Chyt *and* ≥1 Obl_CTRL, *but* absent in all Cult_Chyt *and* Cult_CTRL
🟪	Present in ≥1 in all groups *except* Obl_Chyt
🟦	Present in ≥1 Obl_Chyt, *but* absent in all other groups (Cult_Chyt, Cult_CTRL, Obl_CTRL)
⬜	Present in ≥1 in any specimen included, but not following the grouping as described above

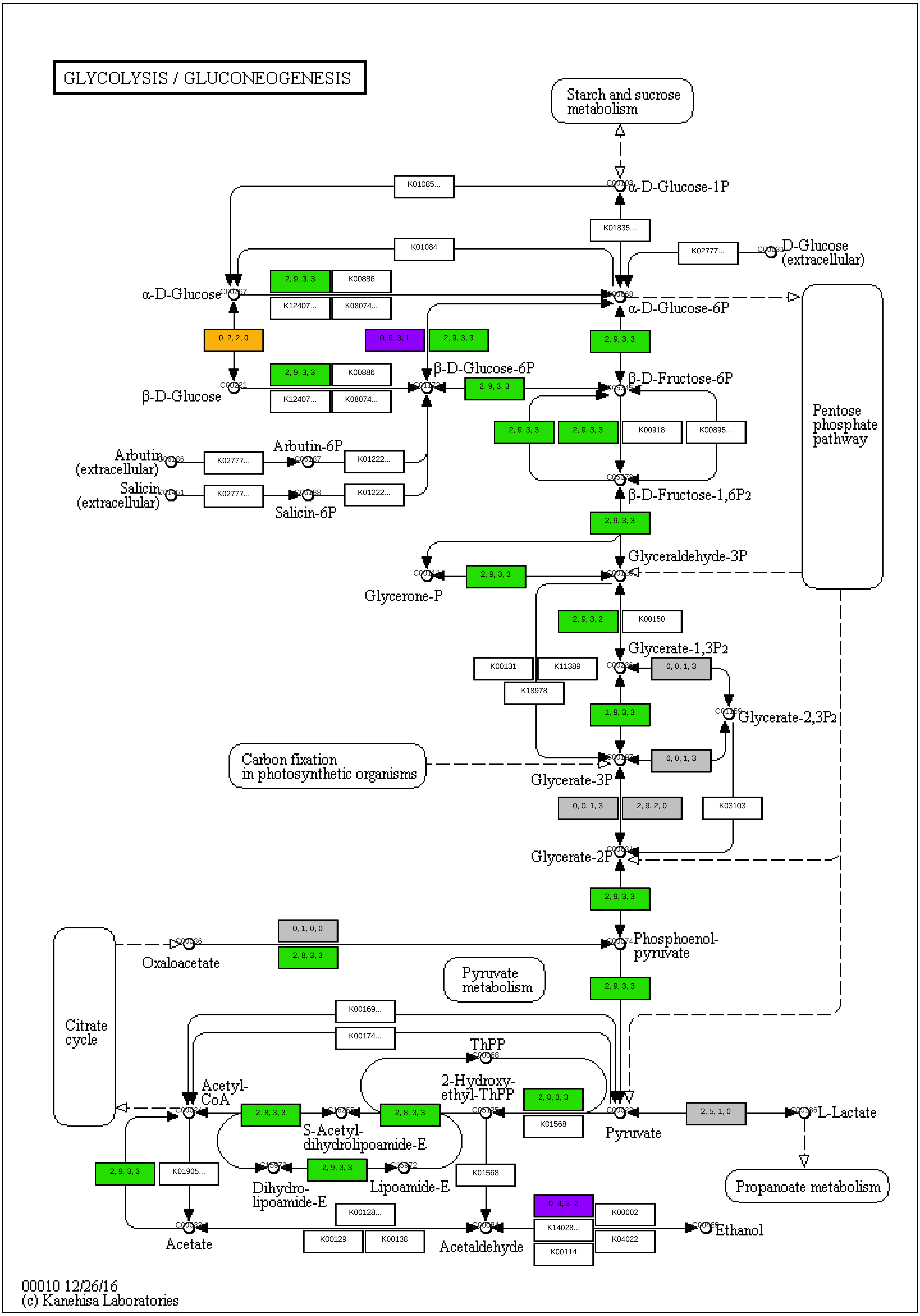
Numerical values in colored boxed {a, b, c, d} represent the number of Obl_Chyt strains (a, max = 2), Cult_Chyt strains (b, max = 9), Cult_CTRL strains (c, max = 3) and Obl_CTRL strains (d, max = 3) for which a element was predicted by Interproscan.

Species and strains included

Obl_Chyt:	***Synchytrium endobioticum* LEV6574** ***Synchytrium endobioticum* MB42**
Cult_Chyt:	***Batrachochytrium dendrobatidis* JAM81** ***Batrachochytrium dendrobatidis* JEL423** ***Chytridium confervae* CBS 675.73** ***Gonapodya prolifera* JEL478** ***Homolaphlyctis polyrhiza* JEL142** ***Powellomyces hirtus* CBS 809.83** ***Spizellomyces palustris*(= *Phlyctochytrium palustre*) CBS 455.65** ***Spizellomyces punctatus* DAOM BR117** ***Synchytrium microbalum* JEL517**
Cult_CTRL:	***Saccharomyces cerevisiae* (SCE)** ***Cryptococcus neoformans* (CNE)** ***Neurospora crassa* (NCR)**
Obl_CTRL:	***Ustilago maydis* (UMA)** ***Melamspora larici-populina* (MLR)** ***Puccinia graminis* f.sp. *tritici* (PGR)**

1. Carbohydrate metabolism

MAP	PATHWAY
10	Glycolysis / Gluconeogenesis
20	Citrate cycle (TCA cycle)
30	Pentose phosphate pathway
40	Pentose and glucuronate interconversions
51	Fructose and mannose metabolism
52	Galactose metabolism
53	Ascorbate and aldarate metabolism
500	Starch and sucrose metabolism
520	Amino sugar and nucleotide sugar metabolism
562	Inositol phosphate metabolism
620	Pyruvate metabolism
630	Glyoxylate and dicarboxylate metabolism
640	Propanoate metabolism
650	Butanoate metabolism
660	C5-Branched dibasic acid metabolism


GLYCOLYSIS / GLUCONEOGENESIS
Starch and sucrose metabolism
K01085...
C00103
α-D-Glucose-1P
K01835...
K01084
K02777...
C00031
D-Glucose (extracellular)
2, 9, 3, 3
K00886
K12407...
K08074...
α-D-Glucose
C00267
C00668
α-D-Glucose-6P
0, 2, 2, 0
0, 6, 3, 1
2, 9, 3, 3
2, 9, 3, 3
β-D-Glucose-6P
2, 9, 3, 3
K00886
K12407...
K08074...
β-D-Glucose
C00221
C01172
2, 9, 3, 3
β-D-Fructose-6P
C05345
Pentose phosphate pathway
2, 9, 3, 3
2, 9, 3, 3
K00918
K00895...
Arbutin-6P
Arbutin (extracellular)
C06186
K02777...
C06187
K01222...
Salicin (extracellular)
C01451
K02777...
C06188
K01222...
Salicin-6P
C05378
β-D-Fructose-1,6P2
2, 9, 3, 3
Glyceraldehyde-3P
C00111
2, 9, 3, 3
C00118
Glycerone-P
2, 9, 3, 2
K00150
Glycerate-1,3P2
K00131
K11389
C00236
0, 0, 1, 3
K18978
C01159
Glycerate-2,3P2
1, 9, 3, 3
Carbon fixation in photosynthetic organisms
C00197
0, 0, 1, 3
Glycerate-3P
0, 0, 1, 3
2, 9, 2, 0
K03103
Glycerate-2P
C00631
2, 9, 3, 3
0, 1, 0, 0
Citrate cycle
C00036
Oxaloacetate
2, 8, 3, 3
C00074
Phosphoenol-pyruvate
Pyruvate metabolism
2, 9, 3, 3
K00169...
K00174...
ThPP
C00068
2-Hydroxy-ethyl-ThPP
Acetyl-CoA
C00024
2, 8, 3, 3
C16255
2, 8, 3, 3
C05125
2, 8, 3, 3
K01568
C00022
Pyruvate
2, 5, 1, 0
C00186
L-Lactate
S-Acetyl-dihydrolipoamide-E
2, 9, 3, 3
K01905...
C15973
2, 9, 3, 3
C15972
Dihydro-lipoamide-E
Lipoamide-E
K01568
Propanoate metabolism
0, 8, 3, 2
K00002
C00033
K00128...
C00084
K14028...
C00469
Ethanol
Acetate
K00129
K00138
Acetaldehyde
K00114
K04022
00010 12/26/16
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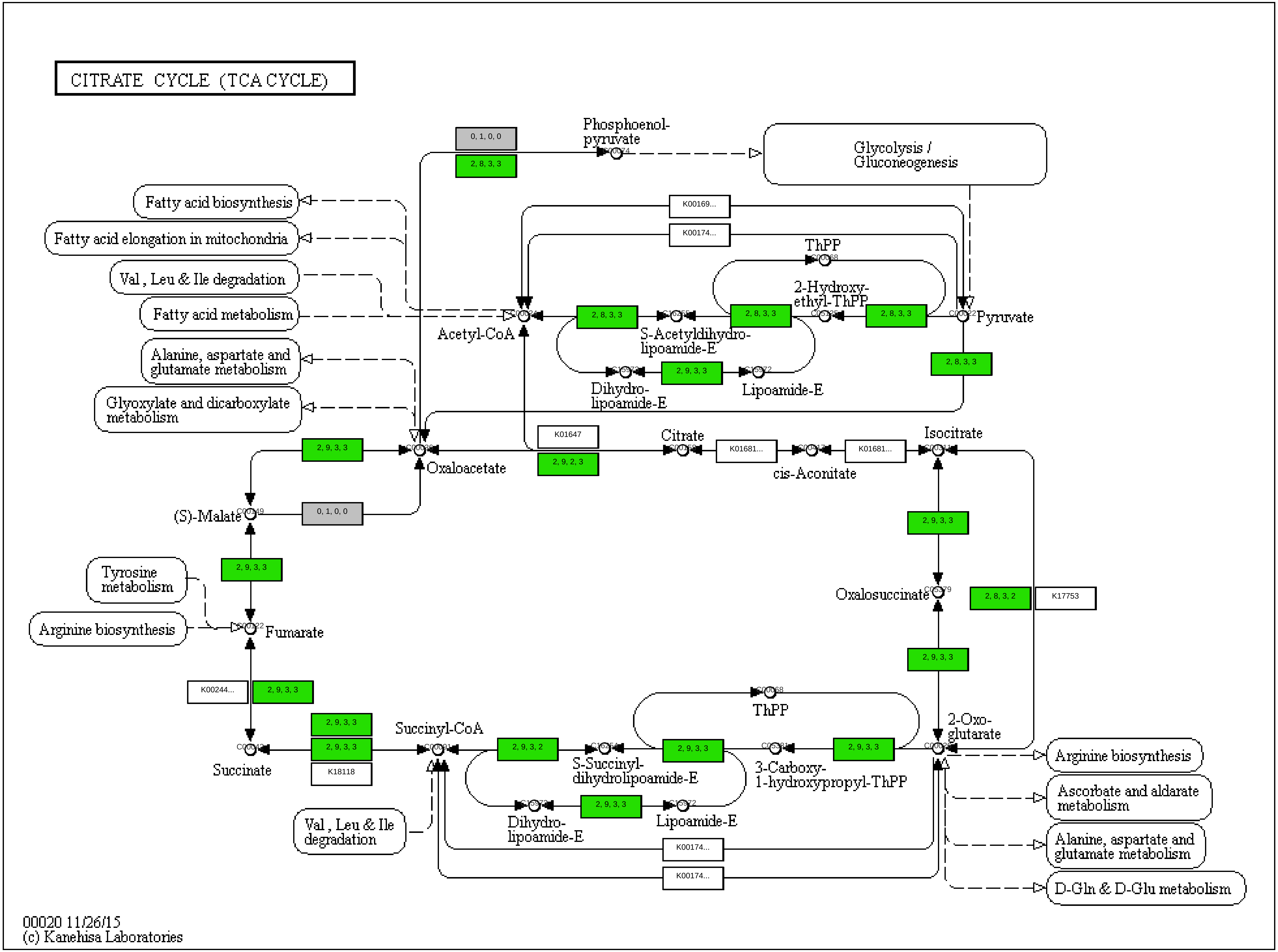
CITRATE CYCLE (TCA CYCLE)
Phosphoenol-pyruvate
C00074
0, 1, 0, 0
2, 8, 3, 3
Glycolysis / Gluconeogenesis
Fatty acid biosynthesis
Fatty acid elongation in mitochondria
Val , Leu & Ile degradation
Fatty acid metabolism
Alanine, aspartate and glutamate metabolism
Glyoxylate and dicarboxylate metabolism
K00169...
K00174...
ThPP
C00068
2-Hydroxy-ethyl-ThPP
C05125
C00024
Acetyl-CoA
2, 8, 3, 3
C16255
S-Acetyldihydro-lipoamide-E
2, 8, 3, 3
2, 8, 3, 3
C00022
Pyruvate
2, 8, 3, 3
C15973
2, 9, 3, 3
C15972
Dihydro-lipoamide-E
Lipoamide-E
K01647
2, 9, 2, 3
Citrate
C00158
K01681...
C00417
K01681...
cis-Aconitate
Isocitrate
C00311
2, 9, 3, 3
C00036
Oxaloacetate
(S)-Malate
C00149
0, 1, 0, 0
2, 9, 3, 3
2, 9, 3, 3
Tyrosine metabolism
Arginine biosynthesis
C00122
Fumarate
K00244...
2, 9, 3, 3
2, 9, 3, 3
Oxalosuccinate
C05379
2, 8, 3, 2
K17753
2, 9, 3, 3
C00042
Succinate
2, 9, 3, 3
2, 9, 3, 3
K18118
Succinyl-CoA
C00091
2, 9, 3, 2
C16254
S-Succinyl-dihydrolipoamide-E
C00068
ThPP
2, 9, 3, 3
C05381
3-Carboxy-1-hydroxypropyl-ThPP
2, 9, 3, 3
2-Oxo-glutarate
C00026
C15973
2, 9, 3, 3
C15972
Dihydro-lipoamide-E
Lipoamide-E
Val , Leu & Ile degradation
K00174...
K00174...
Arginine biosynthesis
Ascorbate and aldarate metabolism
Alanine, aspartate and glutamate metabolism
D-Gln & D-Glu metabolism
00020 11/26/15
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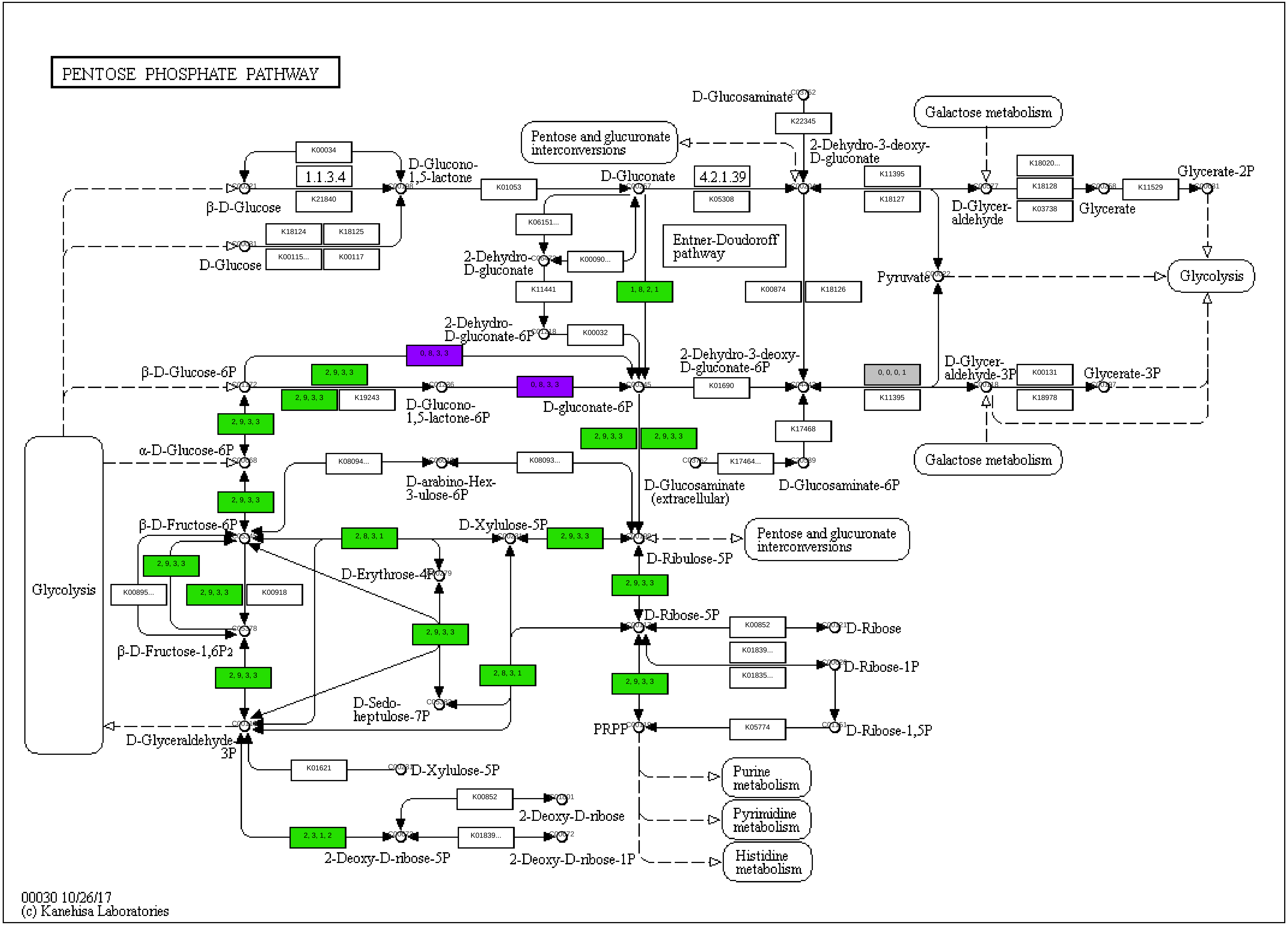

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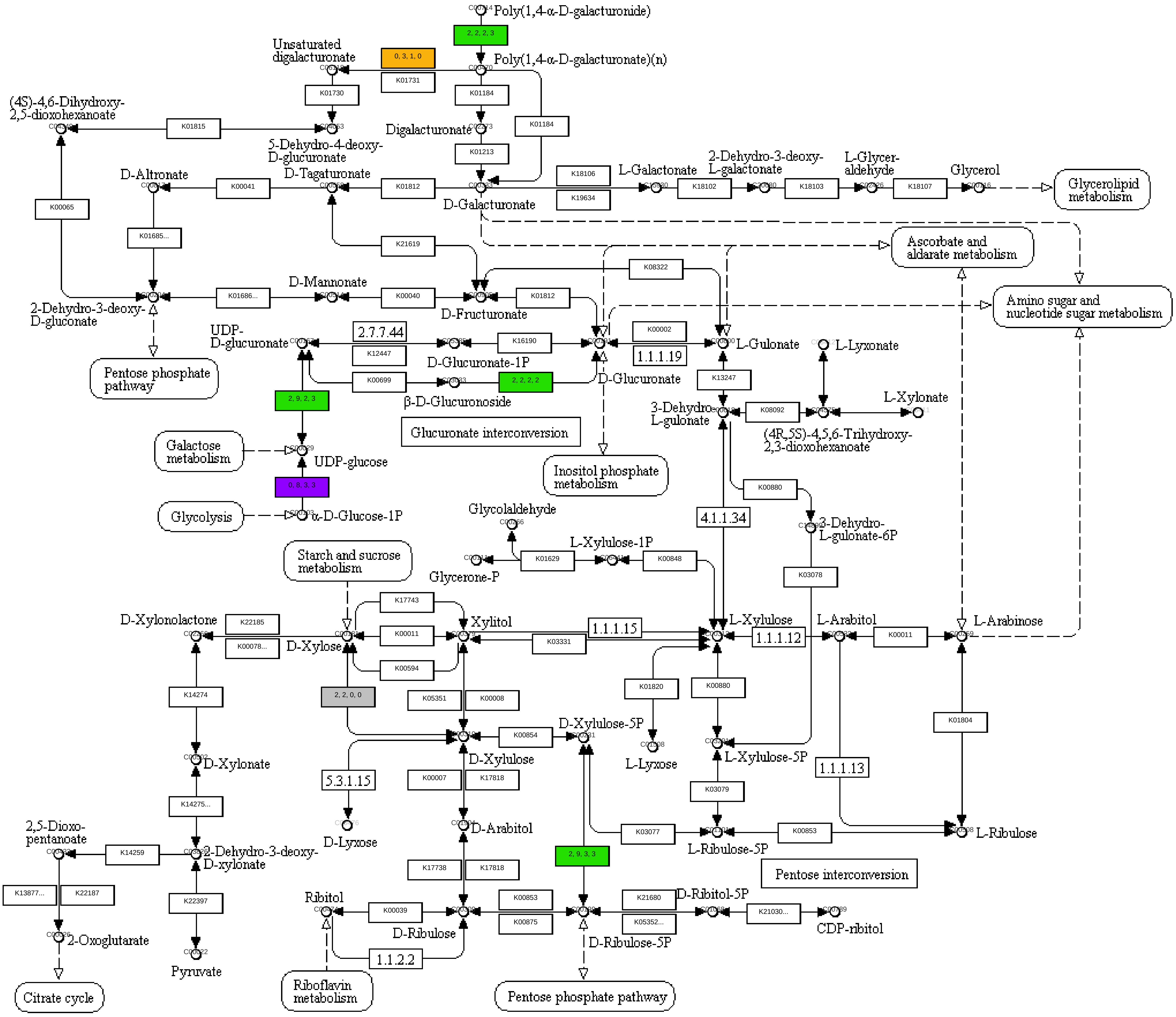
PENTOSE AND GLUCURONATE INTERCONVERSIONS



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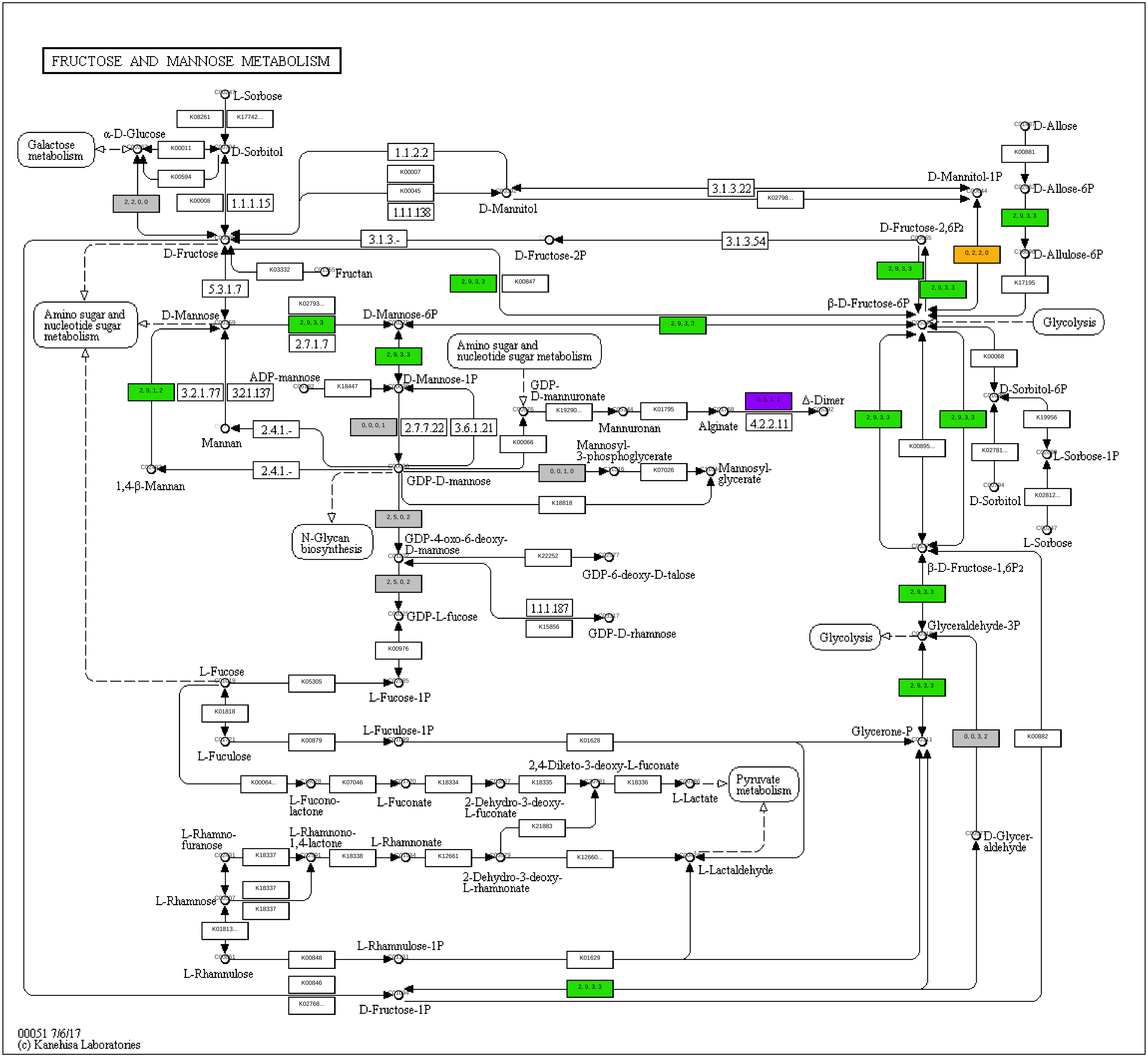
FRUCTOSE AND MANNOSE METABOLISM
L-Sorbose
K08261
K17742...
Galactose metabolism
α-D-Glucose
K00011
D-Sorbitol
K00594
2, 2, 0, 0
K00008
1.1.1.15
1.1.2.2
K00007
K00045
1.1.1.138
D-Mannitol
3.1.3.22
K02798...
D-Mannitol-1P
D-Allose
K00881
D-Allose-6P
2, 9, 3, 3
0, 2, 2, 0
D-Allulose-6P
K17195
3.1.3.-
D-Fructose-2P
3.1.3.54
D-Fructose-2,6P2
D-Fructose
K03332
Fructan
5.3.1.7
2, 9, 3, 3
K00847
2, 9, 3, 3
2, 9, 3, 3
β-D-Fructose-6P
Amino sugar and nucleotide sugar metabolism
D-Mannose
K02793...
2, 9, 3, 3
2.7.1.7
D-Mannose-6P
2, 9, 3, 3
Glycolysis
2, 9, 3, 3
Amino sugar and nucleotide sugar metabolism
K00068
2, 9, 1, 2
3.2.1.77
3.2.1.137
ADP-mannose
K18447
D-Mannose-1P
GDP-D-mannuronate
K19290...
Mannuronan
K01795
Alginate
0, 5, 1, 1
4.2.2.11
Δ-Dimer
D-Sorbitol-6P
2, 9, 3, 3
2, 9, 3, 3
K19956
0, 0, 0, 1
2.7.7.22
3.6.1.21
Mannan
2.4.1.-
K00066
Mannosyl-3-phosphoglycerate
K00895...
K02781...
L-Sorbose-1P
1,4-β-Mannan
2.4.1.-
GDP-D-mannose
0, 0, 1, 0
K07026
Mannosyl-glycerate
D-Sorbitol
K02812...
K18818
2, 5, 0, 2
N-Glycan biosynthesis
GDP-4-oxo-6-deoxy-D-mannose
K22252
GDP-6-deoxy-D-talose
L-Sorbose
β-D-Fructose-1,6P2
2, 5, 0, 2
1.1.1.187
K15856
GDP-D-rhamnose
GDP-L-fucose
2, 9, 3, 3
Glyceraldehyde-3P
Glycolysis
K00976
L-Fucose
K05305
L-Fucose-1P
2, 9, 3, 3
K01818
L-Fuculose-1P
K00879
K01628
Glycerone-P
0, 0, 3, 2
K00882
L-Fuculose
2,4-Diketo-3-deoxy-L-fuconate
K00064...
K07046
K18334
K18335
K18336
Pyruvate metabolism
L-Fucono-lactone
L-Fuconate
2-Dehydro-3-deoxy-L-fuconate
L-Lactate
K21883
L-Rhamno-furanose
K18337
L-Rhamnono-1,4-lactone
K18338
L-Rhamnonate
K12661
K12660...
D-Glycer-aldehyde
K18337
K18337
2-Dehydro-3-deoxy-L-rhamnonate
L-Lactaldehyde
L-Rhamnose
K01813...
L-Rhamnulose-1P
K00848
K01629
L-Rhamnulose
K00846
2, 9, 3, 3
K02768...
D-Fructose-1P
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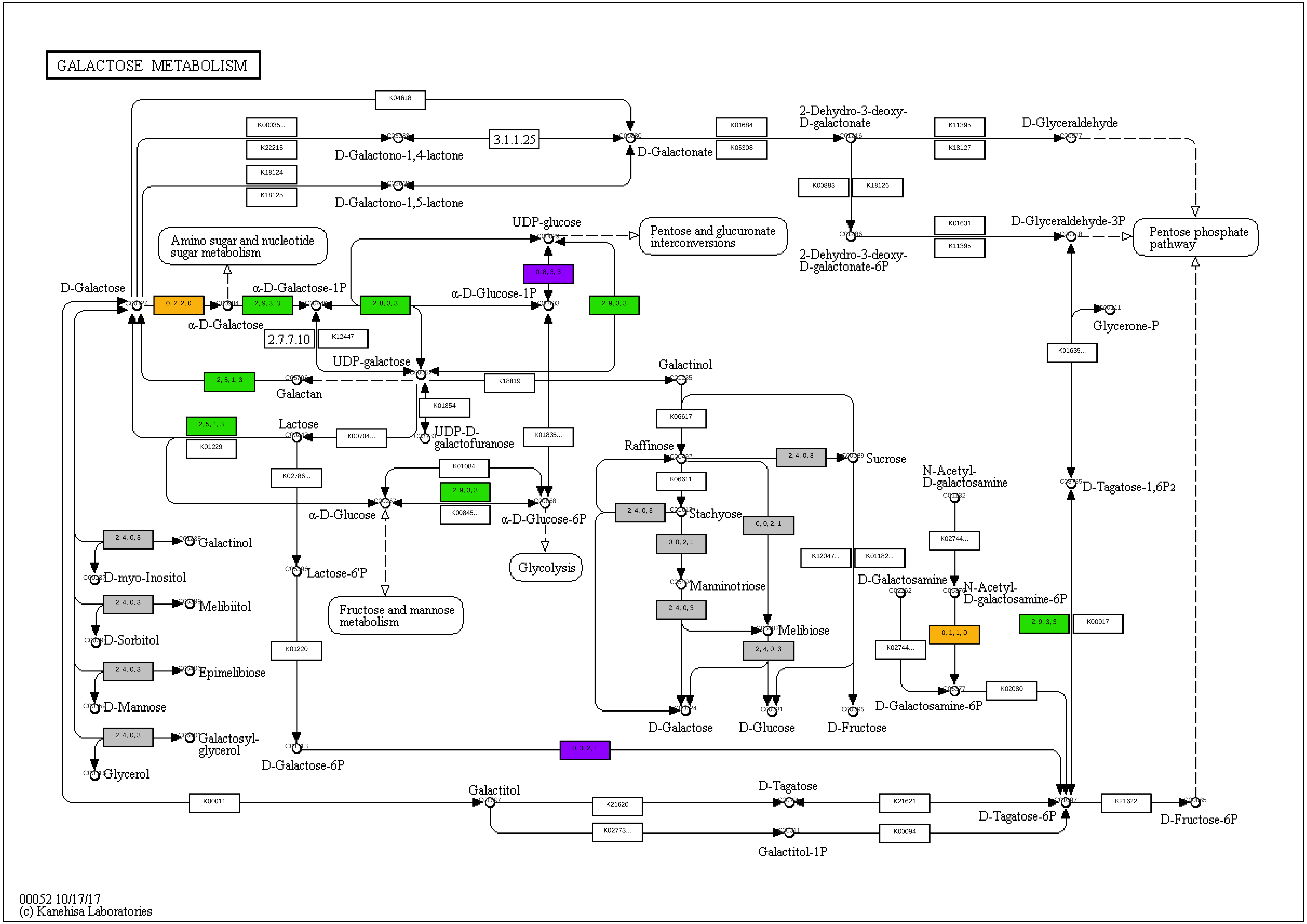
GALACTOSE METABOLISM
K04618
K00035...
K22215
K18124
K18125
D-Galactono-1,4-lactone
D-Galactono-1,5-lactone
3.1.1.25
D-Galactonate
K01684
K05308
2-Dehydro-3-deoxy-D-galactonate
K11395
K18127
D-Glyceraldehyde
K00883
K18126
K01631
K11395
D-Glyceraldehyde-3P
2-Dehydro-3-deoxy-D-galactonate-6P
Pentose phosphate pathway
UDP-glucose
Pentose and glucuronate interconversions
Amino sugar and nucleotide sugar metabolism
0, 8, 3, 3
D-Galactose
0, 2, 2, 0
2, 9, 3, 3
α-D-Galactose-1P
2, 8, 3, 3
α-D-Glucose-1P
2, 9, 3, 3
α-D-Galactose
2.7.7.10
K12447
UDP-galactose
2, 5, 1, 3
Galactan
K18819
Galactinol
K01854
K01635...
Glycerone-P
2, 5, 1, 3
K01229
Lactose
K00704...
UDP-D-galactofuranose
K01835...
K06617
Raffinose
2, 4, 0, 3
Sucrose
K02786...
K01084
2, 9, 3, 3
K00845...
α-D-Glucose
α-D-Glucose-6P
K06611
2, 4, 0, 3
Stachyose
0, 0, 2, 1
N-Acetyl-D-galactosamine
D-Tagatose-1,6P2
2, 4, 0, 3
Galactinol
D-myo-Inositol
Glycolysis
0, 0, 2, 1
K12047...
K01182...
K02744...
Lactose-6P
Manninotriose
D-Galactosamine
N-Acetyl-D-galactosamine-6P
2, 4, 0, 3
Melibiitol
D-Sorbitol
Fructose and mannose metabolism
2, 4, 0, 3
Melibiose
2, 9, 3, 3
K00917
K01220
2, 4, 0, 3
0, 1, 1, 0
K02744...
2, 4, 0, 3
Epimelibiose
D-Mannose
K02080
D-Galactosamine-6P
D-Galactose
D-Glucose
D-Fructose
2, 4, 0, 3
Galactosyl-glycerol
Glycerol
0, 3, 2, 1
D-Galactose-6P
K00011
Galactitol
K21620
D-Tagatose
K21621
K21622
D-Tagatose-6P
D-Fructose-6P
K02773...
K00094
Galactitol-1P
00052 10/17/17
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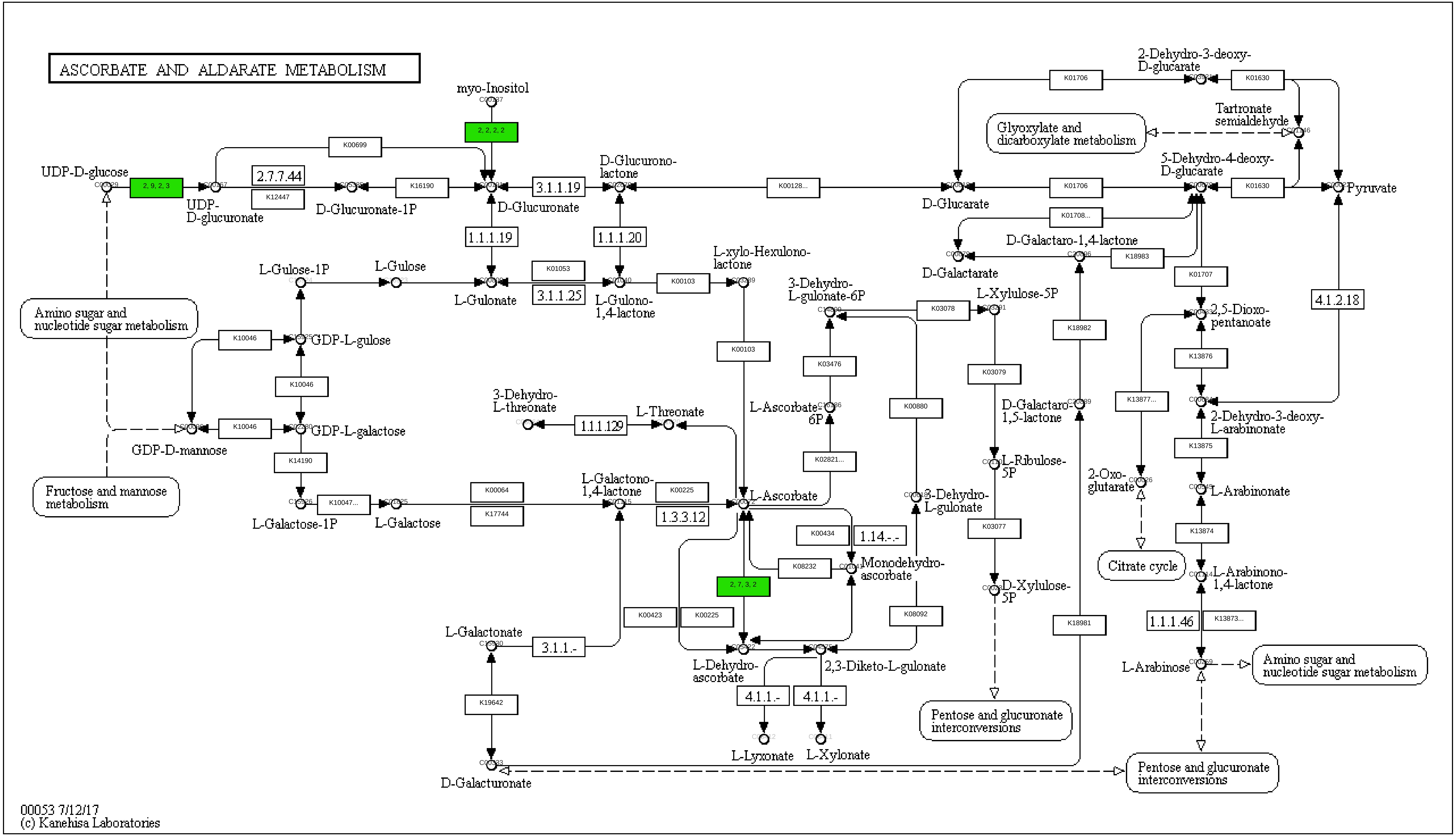
ASCORBATE AND ALDARATE METABOLISM
myo-Inositol
2, 2, 2, 2
K00699
UDP-D-glucose
2, 9, 2, 3
UDP-D-glucuronate
2.7.7.44
K12447
D-Glucuronate-1P
K16190
D-Glucuronate
3.1.1.19
D-Glucurono-lactone
K00128...
D-Glucarate
K01706
5-Dehydro-4-deoxy-D-glucarate
K01630
Pyruvate
2-Dehydro-3-deoxy-D-glucarate
Tartronate semialdehyde
Glyoxylate and dicarboxylate metabolism
K01708...
D-Galactaro-1,4-lactone
K18983
D-Galactarate
K01707
4.1.2.18
2,5-Dioxo-pentanoate
K13876
K13877...
2-Dehydro-3-deoxy-L-arabinonate
K13875
L-Arabinonate
K13874
2-Oxo-glutarate
Citrate cycle
L-Arabinono-1,4-lactone
1.1.1.46
K13873...
L-Arabinose
Amino sugar and nucleotide sugar metabolism
Pentose and glucuronate interconversions
1.1.1.19
1.1.1.20
L-Gulose-1P
L-Gulose
L-Gulonate
K01053
3.1.1.25
L-Gulono-1,4-lactone
K00103
L-xylo-Hexulono-lactone
3-Dehydro-L-gulonate-6P
K03078
L-Xylulose-5P
K18982
K03476
K00880
K03079
D-Galactaro-1,5-lactone
L-Ribulose-5P
L-Ascorbate 6P
K02821...
3-Dehydro-L-gulonate
K03077
D-Xylulose-5P
K18981
Amino sugar and nucleotide sugar metabolism
K10046
GDP-L-gulose
K10046
K10046
GDP-D-mannose
GDP-L-galactose
K14190
Fructose and mannose metabolism
L-Galactose-1P
K10047...
L-Galactose
K00064
K17744
L-Galactono-1,4-lactone
K00225
1.3.3.12
3-Dehydro-L-threonate
1.1.1.129
L-Threonate
L-Ascorbate
K00434
1.14.-.-
K08232
Monodehydro-ascorbate
2, 7, 3, 2
K08092
K00423
K00225
L-Galactonate
3.1.1.-
L-Dehydro-ascorbate
2,3-Diketo-L-gulonate
4.1.1.-
4.1.1.-
L-Lyxonate
L-Xylonate
K19642
D-Galacturonate
Pentose and glucuronate interconversions
00053 7/12/17
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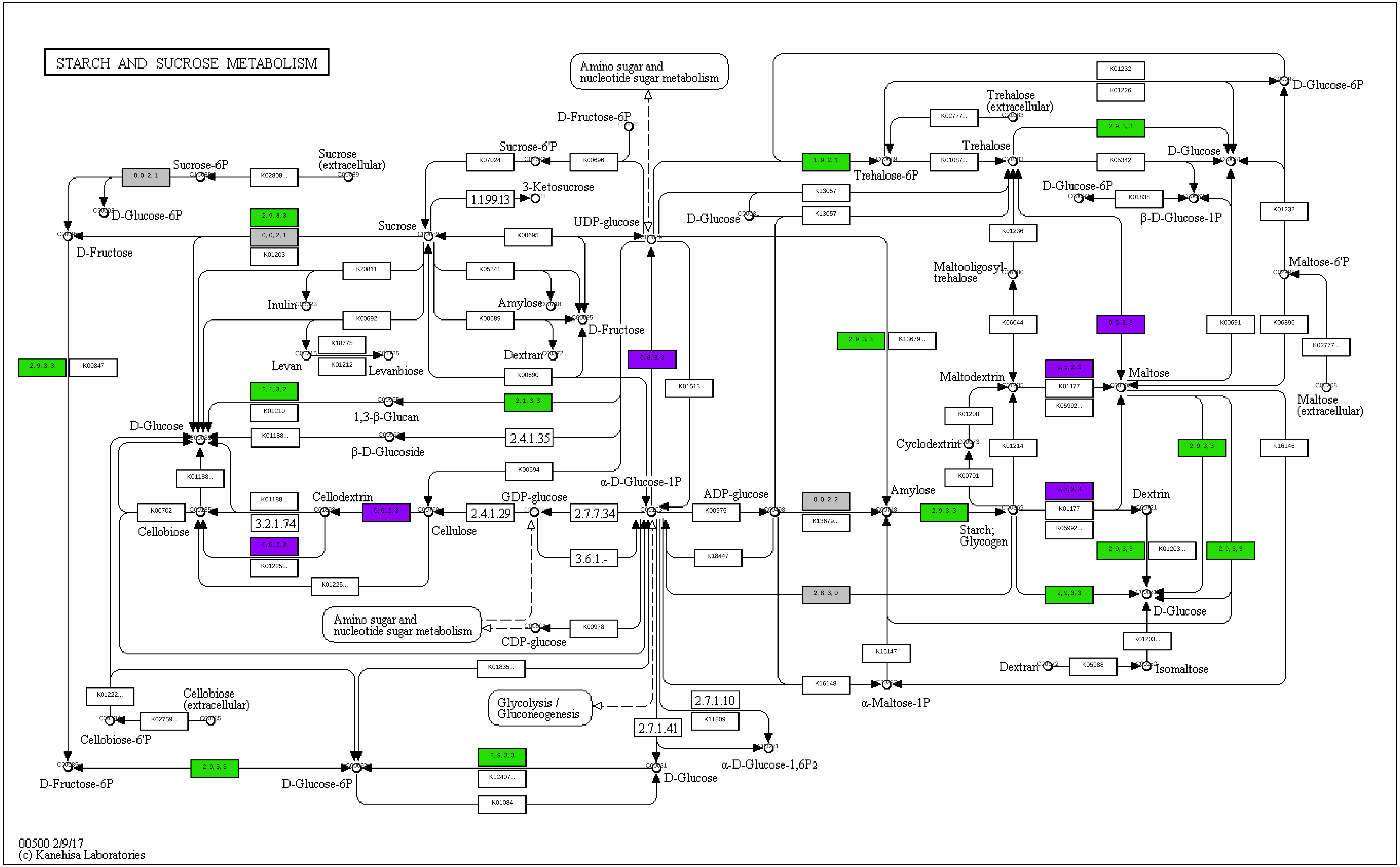
STARCH AND SUCROSE METABOLISM
Amino sugar and nucleotide sugar metabolism
D-Fructose-6P
Sucrose-6'P
Sucrose-6P
Sucrose (extracellular)
K07024
K00696
K02808...
0, 0, 2, 1
D-Glucose-6P
1.1.99.13
3-Ketosucrose
2, 9, 3, 3
0, 0, 2, 1
K01203
Sucrose
K00695
UDP-glucose
D-Fructose
K20811
K05341
Inulin
Amylose
K00692
K00689
D-Fructose
K18775
Levan
Levanbiose
K01212
Dextran
K00690
2, 9, 3, 3
K00847
2, 1, 3, 2
K01210
2, 1, 3, 3
1,3-β-Glucan
0, 8, 3, 3
K01513
D-Glucose
K01188...
2.4.1.35
β-D-Glucoside
K01188...
K00694
K00702
Cellobiose
K01188...
Cellodextrin
0, 6, 2, 3
3.2.1.74
0, 6, 2, 3
K01225...
K01225...
2.4.1.29
GDP-glucose
Cellulose
2.7.7.34
3.6.1.-
α-D-Glucose-1P
Amino sugar and nucleotide sugar metabolism
K00978
CDP-glucose
K01835...
K01222...
Cellobiose (extracellular)
K02759...
Cellobiose-6'P
Glycolysis / Gluconeogenesis
2.7.1.41
2.7.1.10
K11809
α-D-Glucose-1,6P2
D-Fructose-6P
2, 9, 3, 3
D-Glucose-6P
2, 9, 3, 3
K12407...
K01084
D-Glucose
K01232
K01226
D-Glucose-6P
Trehalose (extracellular)
K02777...
2, 9, 3, 3
Trehalose
1, 9, 2, 1
Trehalose-6P
K01087...
K05342
D-Glucose
K13057
K13057
D-Glucose
D-Glucose-6P
K01838
β-D-Glucose-1P
K01232
K01236
Maltooligosyl-trehalose
Maltose-6'P
K06044
0, 5, 2, 3
K00691
K06896
2, 9, 3, 3
K13679...
K02777...
Maltodextrin
0, 5, 2, 3
K01177
K05992...
Maltose
Maltose (extracellular)
K01208
Cyclodextrin
K01214
2, 9, 3, 3
K16146
K00701
Amylose
ADP-glucose
K00975
0, 0, 2, 2
K13679...
2, 9, 3, 3
0, 5, 2, 3
K01177
K05992...
Dextrin
Starch; Glycogen
K18447
2, 9, 3, 3
K01203...
2, 9, 3, 3
2, 8, 3, 0
2, 9, 3, 3
D-Glucose
K16147
K01203...
Dextran
K05988
Isomaltose
K16148
α-Maltose-1P
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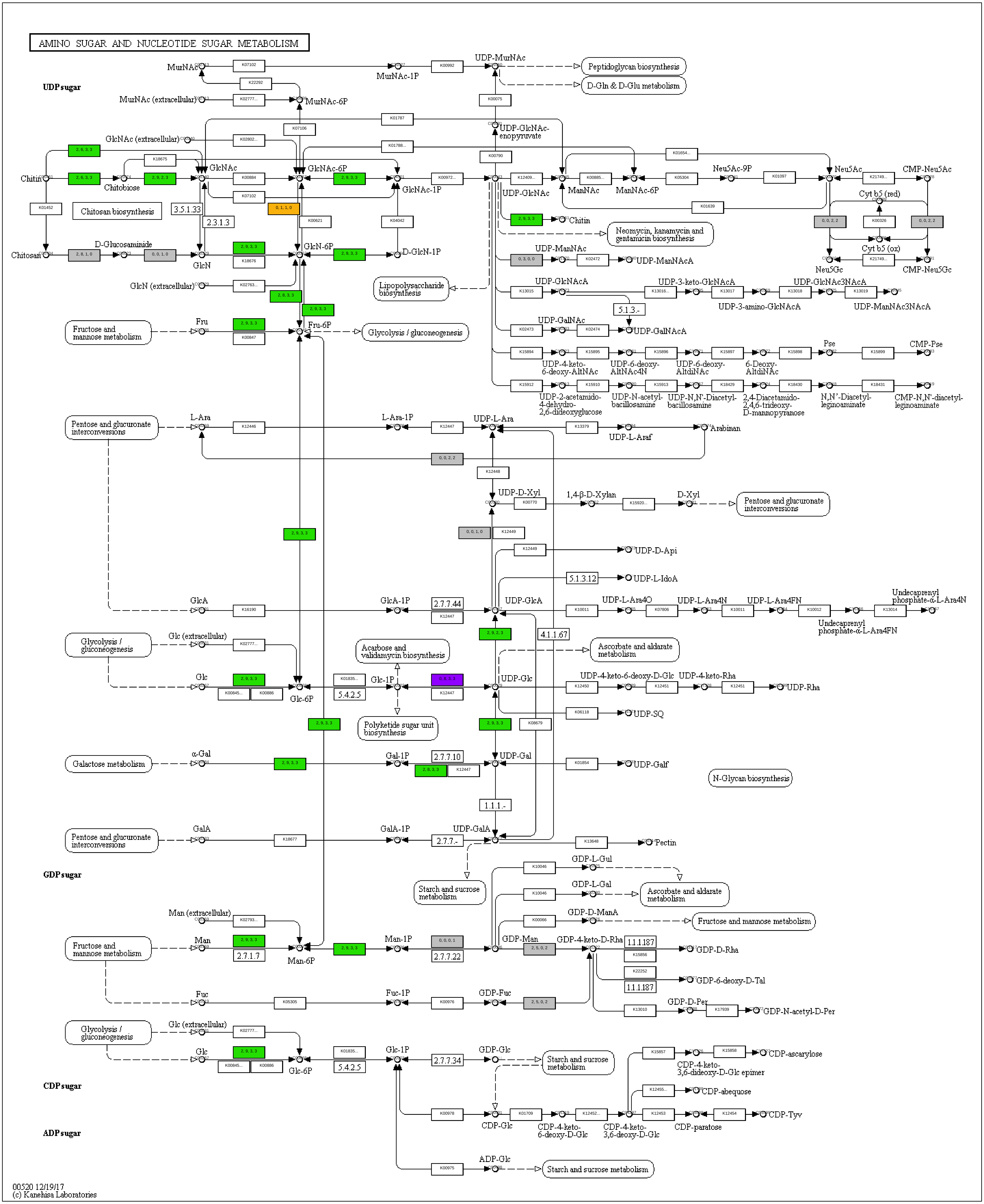
AMINO SUGAR AND NUCLEOTIDE SUGAR METABOLISM
UDP sugar
GDP sugar
CDP sugar
ADP sugar
MurNAc
MurNAc (extracellular)
MurNAc-6P
MurNAc-1P
UDP-MurNAc
Peptidoglycan biosynthesis
D-Gln & D-Glu metabolism
UDP-GlcNAc-enopyruvate
GlcNAc (extracellular)
GlcNAc
GlcNAc-6P
GlcNAc-1P
UDP-GlcNAc
Chitin
Chitobiose
Chitosan biosynthesis
3.5.1.33
2.3.1.3
Chitosan
D-Glucosaminide
GlcN
GlcN-6P
D-GlcN-1P
GlcN (extracellular)
ManNAc
ManNAc-6P
Neu5Ac-9P
Neu5Ac
CMP-Neu5Ac
Cyt b5 (red)
Cyt b5 (ox)
Neu5Gc
CMP-Neu5Gc
Neomycin, kanamycin and gentamicin biosynthesis
Lipopolysaccharide biosynthesis
UDP-ManNAc
UDP-ManNAcA
UDP-GlcNAcA
UDP-3-keto-GlcNAcA
UDP-GlcNAc3NAcA
UDP-3-amino-GlcNAcA
UDP-ManNAc3NAcA
5.1.3.-
UDP-GalNAc
UDP-GalNAcA
Pse
CMP-Pse
UDP-4-keto-6-deoxy-AltNAc
UDP-6-deoxy-AltNAc4N
UDP-6-deoxy-AltdiNAc
6-Deoxy-AltdiNAc
UDP-2-acetamido-4-dehydro-2,6-dideoxyglucose
UDP-N-acetyl-bacillosamine
UDP-N,N'-Diacetyl-bacillosamine
2,4-Diacetamido-2,4,6-trideoxy-D-mannopyranose
N,N'-Diacetyl-legionaminate
CMP-N,N'-diacetyl-legionaminate
Fructose and mannose metabolism
Fru
Fru-6P
Glycolysis / gluconeogenesis
Pentose and glucuronate interconversions
L-Ara
L-Ara-1P
UDP-L-Ara
UDP-L-Araf
Arabinan
UDP-D-Xyl
1,4-β-D-Xylan
D-Xyl
UDP-D-Api
5.1.3.12
UDP-L-IdoA
GlcA
GlcA-1P
2.7.7.44
UDP-GlcA
UDP-L-Ara4O
UDP-L-Ara4N
UDP-L-Ara4FN
Undecaprenyl phosphate-α-L-Ara4N
Undecaprenyl phosphate-α-L-Ara4FN
4.1.1.67
Ascorbate and aldarate metabolism
Glc (extracellular)
Glc
Glc-6P
Glc-1P
5.4.2.5
Acarbose and validamycin biosynthesis
Polyketide sugar unit biosynthesis
UDP-Glc
UDP-4-keto-6-deoxy-D-Glc
UDP-4-keto-Rha
UDP-Rha
UDP-SQ
Galactose metabolism
α-Gal
Gal-1P
2.7.7.10
UDP-Gal
UDP-Galf
N-Glycan biosynthesis
1.1.1.-
GalA
GalA-1P
2.7.7.-
UDP-GalA
Pectin
Starch and sucrose metabolism
GDP-L-Gul
GDP-L-Gal
GDP-D-ManA
Man (extracellular)
Man
2.7.1.7
Man-6P
Man-1P
2.7.7.22
GDP-Man
GDP-4-keto-D-Rha
1.1.1.187
GDP-D-Rha
GDP-6-deoxy-D-Tal
GDP-D-Per
GDP-N-acetyl-D-Per
Fuc
Fuc-1P
GDP-Fuc
2.7.7.34
GDP-Glc
CDP-Glc
CDP-4-keto-6-deoxy-D-Glc
CDP-4-keto-3,6-dideoxy-D-Glc
CDP-4-keto-3,6-dideoxy-D-Glc epimer
CDP-ascarylose
CDP-abequose
CDP-paratose
CDP-Tyv
ADP-Glc
2.6.3.3
2.9.2.3
2.9.3.3
2.8.1.0
0.0.1.0
0.1.1.0
2.8.3.3
0.0.2.2
0.3.0.0
0.0.0.1
2.5.0.2
K07102
K00992
K22292
K02777...
K07106
K01787
K02802...
K01788...
K18675
K00884
K00972...
K12409...
K00885...
K05304
K01097
K21749...
K00075
K00790
K01654...
K01639
K00326
K01452
K00621
K04042
K18676
K02763...
K00847
K02472
K13015
K13016...
K13017
K13018
K13019
K02473
K02474
K15894
K15895
K15896
K15897
K15898
K15899
K15912
K15910
K15913
K18429
K18430
K18431
K12446
K12447
K13379
K12448
K00770
K15920...
K12449
K16190
K10011
K07806
K10012
K13014
K01835...
K00845...
K00886
K12450
K12451
K06118
K08679
K01854
K18677
K13648
K10046
K00066
K15856
K22252
K13010
K17939
K02793...
K05305
K00976
K15857
K15858
K12455...
K12452...
K12453
K12454
K00978
K01709
K00975
00520 12/19/17
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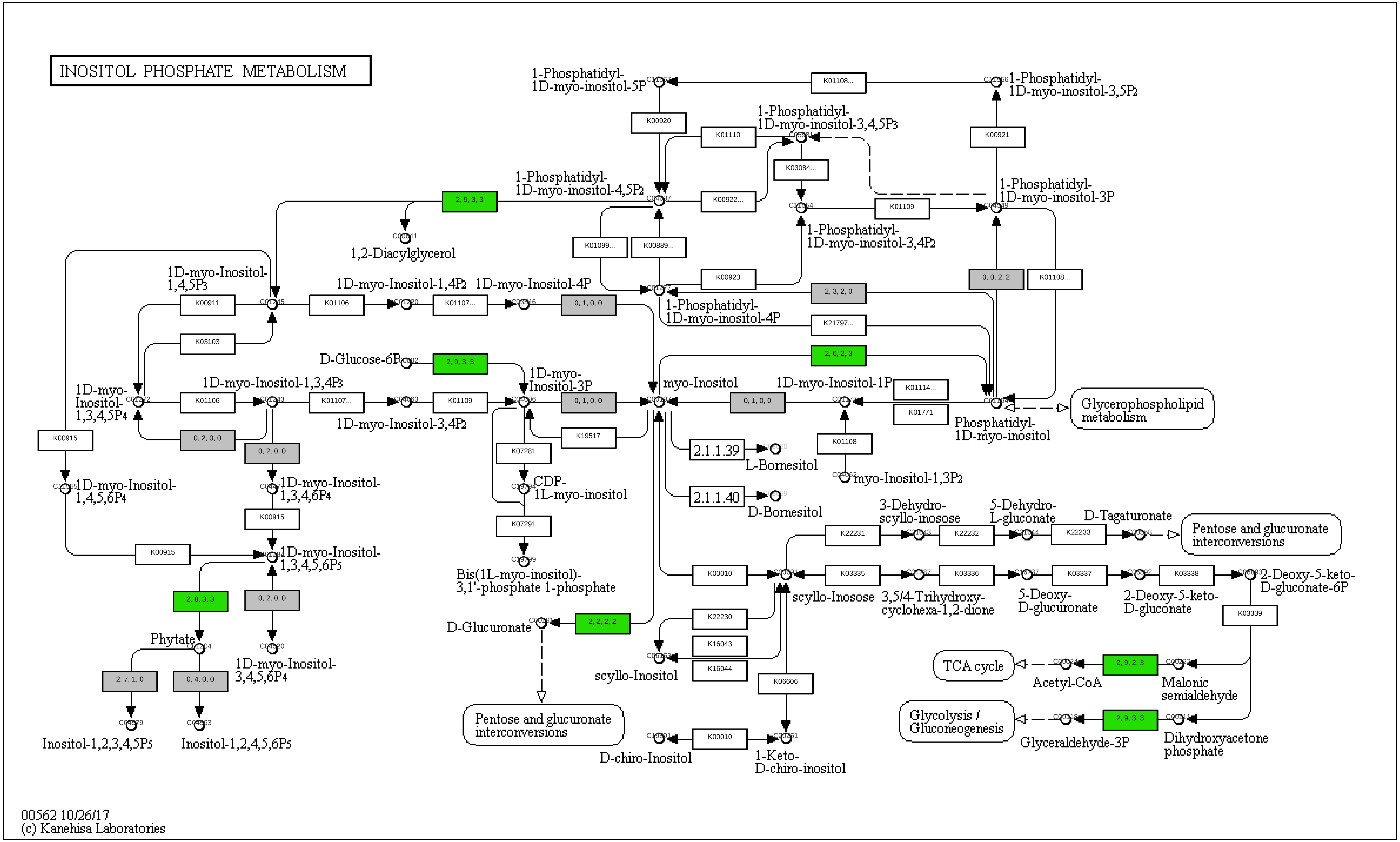
INOSITOL PHOSPHATE METABOLISM
1-Phosphatidyl-1D-myo-inositol-5P
K01108...
1-Phosphatidyl-1D-myo-inositol-3,5P2
K00920
K01110
1-Phosphatidyl-1D-myo-inositol-3,4,5P3
K00921
K03084...
1-Phosphatidyl-1D-myo-inositol-4,5P2
2, 9, 3, 3
K00922...
1-Phosphatidyl-1D-myo-inositol-3P
K01109
1,2-Diacylglycerol
1-Phosphatidyl-1D-myo-inositol-3,4P2
K01099...
K00889...
1D-myo-Inositol-1,4,5P3
1D-myo-Inositol-1,4P2
1D-myo-Inositol-4P
K00923
0, 0, 2, 2
K01108...
2, 3, 2, 0
K00911
K01106
K01107...
0, 1, 0, 0
1-Phosphatidyl-1D-myo-inositol-4P
K21797...
K03103
D-Glucose-6P
2, 9, 3, 3
2, 6, 2, 3
1D-myo-Inositol-3P
myo-Inositol
1D-myo-Inositol-1P
K01114...
1D-myo-Inositol-1,3,4,5P4
1D-myo-Inositol-1,3,4P3
K01106
K01107...
K01109
0, 1, 0, 0
0, 1, 0, 0
K01771
Glycerophospholipid metabolism
Phosphatidyl-1D-myo-inositol
1D-myo-Inositol-3,4P2
K00915
0, 2, 0, 0
0, 2, 0, 0
K19517
K07281
K01108
2.1.1.39
L-Bornesitol
myo-Inositol-1,3P2
1D-myo-Inositol-1,4,5,6P4
1D-myo-Inositol-1,3,4,6P4
CDP-1L-myo-inositol
2.1.1.40
D-Bornesitol
K00915
K07291
3-Dehydro-scyllo-inosose
5-Dehydro-L-gluconate
D-Tagaturonate
K22231
K22232
K22233
Pentose and glucuronate interconversions
K00915
1D-myo-Inositol-1,3,4,5,6P5
Bis(1L-myo-inositol)-3,1'-phosphate 1-phosphate
K00010
K03335
K03336
K03337
K03338
2-Deoxy-5-keto-D-gluconate-6P
2, 8, 3, 3
0, 2, 0, 0
scyllo-Inosose
3,5/4-Trihydroxy-cyclohexa-1,2-dione
5-Deoxy-D-glucuronate
2-Deoxy-5-keto-D-gluconate
K03339
D-Glucuronate
2, 2, 2, 2
K22230
Phytate
K16043
TCA cycle
2, 9, 2, 3
1D-myo-Inositol-3,4,5,6P4
scyllo-Inositol
K16044
Acetyl-CoA
Malonic semialdehyde
2, 7, 1, 0
0, 4, 0, 0
K06606
Glycolysis / Gluconeogenesis
2, 9, 3, 3
Pentose and glucuronate interconversions
K00010
Inositol-1,2,3,4,5P5
Inositol-1,2,4,5,6P5
D-chiro-Inositol
1-Keto-D-chiro-inositol
Glyceraldehyde-3P
Dihydroxyacetone phosphate
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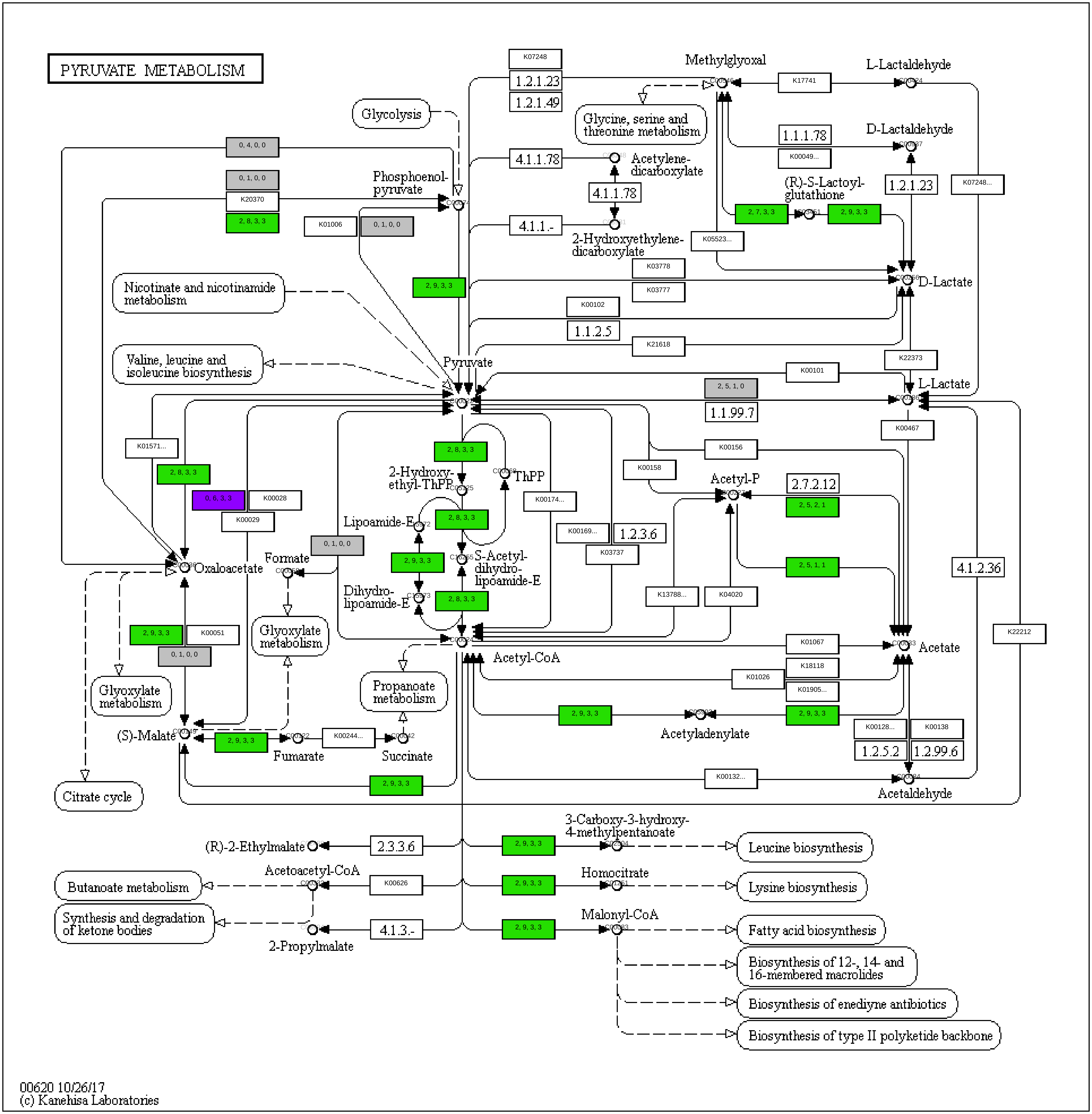
PYRUVATE METABOLISM
Glycolysis
K07248
1.2.1.23
1.2.1.49
Methylglyoxal
K17741
L-Lactaldehyde
Glycine, serine and threonine metabolism
1.1.1.78
K00049...
D-Lactaldehyde
0, 4, 0, 0
0, 1, 0, 0
K20370
2, 8, 3, 3
Phosphoenol-pyruvate
4.1.1.78
Acetylene-dicarboxylate
4.1.1.78
(R)-S-Lactoyl-glutathione
1.2.1.23
K07248...
2, 7, 3, 3
2, 9, 3, 3
K01006
0, 1, 0, 0
4.1.1.-
2-Hydroxyethylene-dicarboxylate
K05523...
K03778
2, 9, 3, 3
K03777
D-Lactate
Nicotinate and nicotinamide metabolism
K00102
1.1.2.5
K21618
Valine, leucine and isoleucine biosynthesis
Pyruvate
K22373
K00101
L-Lactate
2, 5, 1, 0
1.1.99.7
K00467
K01571...
2, 8, 3, 3
2-Hydroxy-ethyl-ThPP
ThPP
K00156
K00158
0, 6, 3, 3
K00028
K00029
Lipoamide-E
2, 8, 3, 3
K00174...
Acetyl-P
2.7.2.12
2, 5, 2, 1
0, 1, 0, 0
K00169...
1.2.3.6
2, 9, 3, 3
S-Acetyl-dihydro-lipoamide-E
K03737
Oxaloacetate
Formate
4.1.2.36
2, 5, 1, 1
Dihydro-lipoamide-E
2, 8, 3, 3
K13788...
K04020
Glyoxylate metabolism
2, 9, 3, 3
K00051
0, 1, 0, 0
K22212
K01067
Acetate
Acetyl-CoA
Glyoxylate metabolism
Propanoate metabolism
K18118
K01026
K01905...
2, 9, 3, 3
2, 9, 3, 3
Acetyladenylate
K00128...
K00138
1.2.5.2
1.2.99.6
(S)-Malate
2, 9, 3, 3
Fumarate
K00244...
Succinate
K00132...
Acetaldehyde
Citrate cycle
2, 9, 3, 3
3-Carboxy-3-hydroxy-4-methylpentanoate
(R)-2-Ethylmalate
2.3.3.6
2, 9, 3, 3
Leucine biosynthesis
Acetoacetyl-CoA
Butanoate metabolism
K00626
2, 9, 3, 3
Homocitrate
Lysine biosynthesis
Synthesis and degradation of ketone bodies
4.1.3.-
2, 9, 3, 3
Malonyl-CoA
Fatty acid biosynthesis
2-Propylmalate
Biosynthesis of 12-, 14- and 16-membered macrolides
Biosynthesis of enediyne antibiotics
Biosynthesis of type II polyketide backbone
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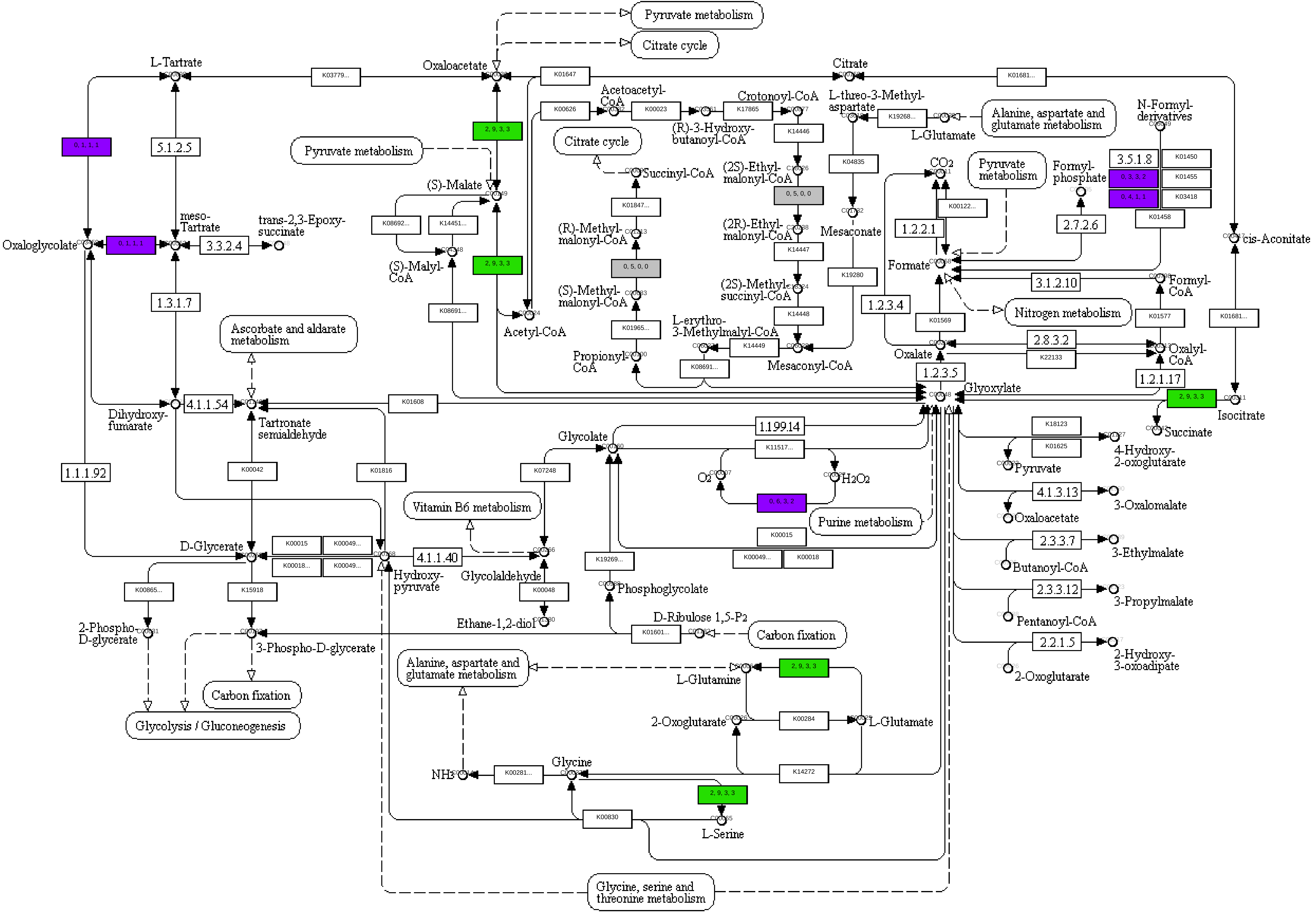
GLYOXYLATE AND DICARBOXYLATE METABOLISM



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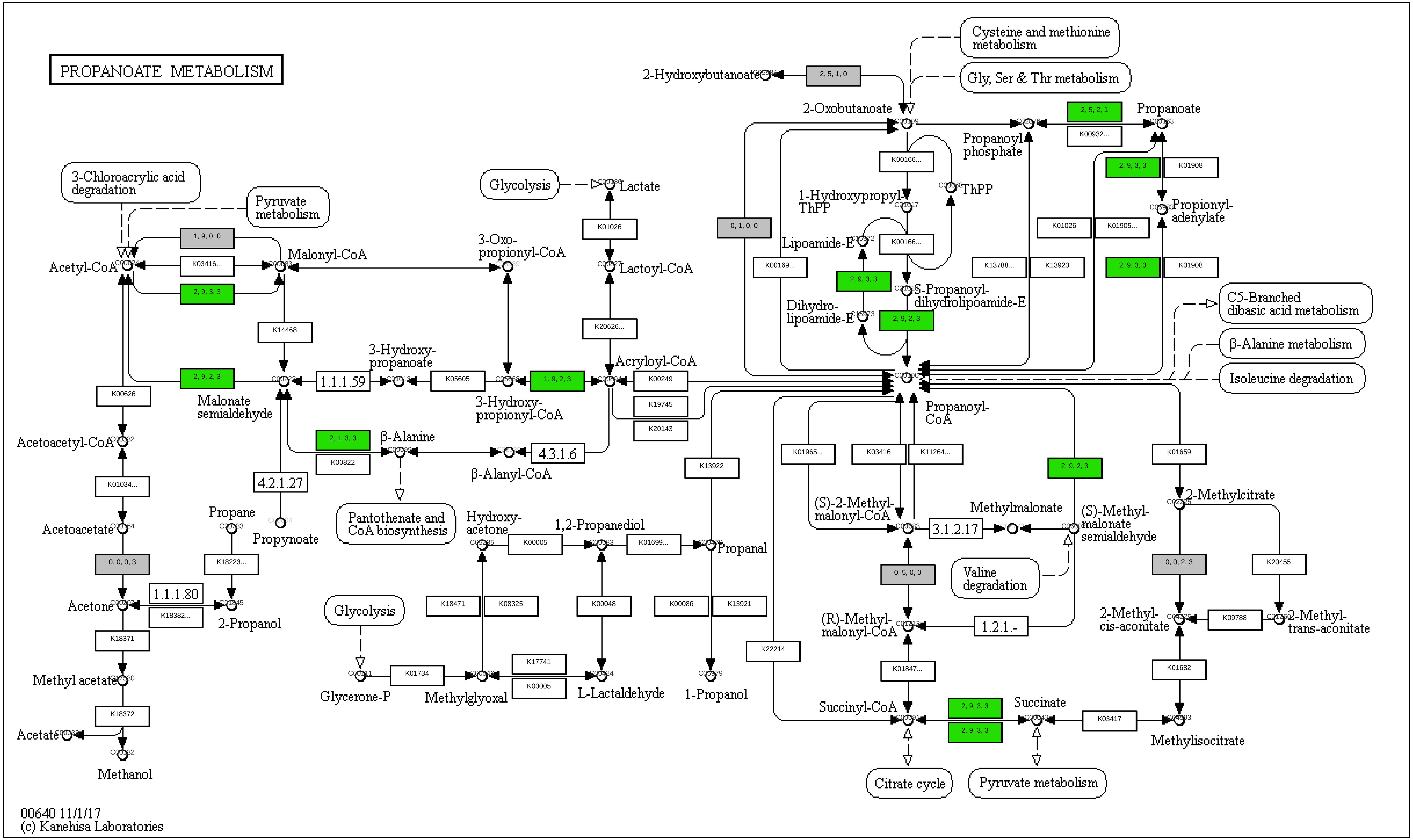
PROPANOATE METABOLISM
Cysteine and methionine metabolism
Gly, Ser & Thr metabolism
2-Hydroxybutanoate
2, 5, 1, 0
2-Oxobutanoate
Propanoate
2, 5, 2, 1
K00932...
Propanoyl phosphate
K00166...
1-Hydroxypropyl-ThPP
ThPP
K00166...
Lipoamide-E
0, 1, 0, 0
K00169...
2, 9, 3, 3
S-Propanoyl-dihydrolipoamide-E
Dihydro-lipoamide-E
2, 9, 2, 3
2, 9, 3, 3
K01908
Propionyl-adenylate
K01026
K01905...
K13788...
K13923
2, 9, 3, 3
K01908
C5-Branched dibasic acid metabolism
β-Alanine metabolism
Isoleucine degradation
3-Chloroacrylic acid degradation
Pyruvate metabolism
Glycolysis
Lactate
K01026
Lactoyl-CoA
K20626...
Acryloyl-CoA
K00249
K19745
K20143
1, 9, 0, 0
K03416...
2, 9, 3, 3
Acetyl-CoA
Malonyl-CoA
3-Oxo-propionyl-CoA
K14468
2, 9, 2, 3
K00626
Malonate semialdehyde
1.1.1.59
3-Hydroxy-propanoate
K05605
1, 9, 2, 3
3-Hydroxy-propionyl-CoA
Propanoyl-CoA
2, 1, 3, 3
K00822
β-Alanine
4.3.1.6
β-Alanyl-CoA
4.2.1.27
Propynoate
Pantothenate and CoA biosynthesis
Acetoacetyl-CoA
K01034...
Acetoacetate
0, 0, 0, 3
Acetone
1.1.1.80
K18382...
2-Propanol
Propane
K18223...
K18371
Methyl acetate
K18372
Acetate
Methanol
Hydroxy-acetone
K00005
1,2-Propanediol
K01699...
Propanal
K13922
K18471
K08325
K00048
K00086
K13921
Glycolysis
Glycerone-P
K01734
Methylglyoxal
K17741
K00005
L-Lactaldehyde
1-Propanol
K01965...
K03416
K11264...
2, 9, 2, 3
K01659
(S)-2-Methyl-malonyl-CoA
3.1.2.17
Methylmalonate
(S)-Methyl-malonate semialdehyde
2-Methylcitrate
0, 5, 0, 0
Valine degradation
(R)-Methyl-malonyl-CoA
1.2.1.-
0, 0, 2, 3
K20455
2-Methyl-cis-aconitate
K09788
2-Methyl-trans-aconitate
K22214
K01847...
K01682
Succinyl-CoA
2, 9, 3, 3
2, 9, 3, 3
Succinate
K03417
Methylisocitrate
Citrate cycle
Pyruvate metabolism
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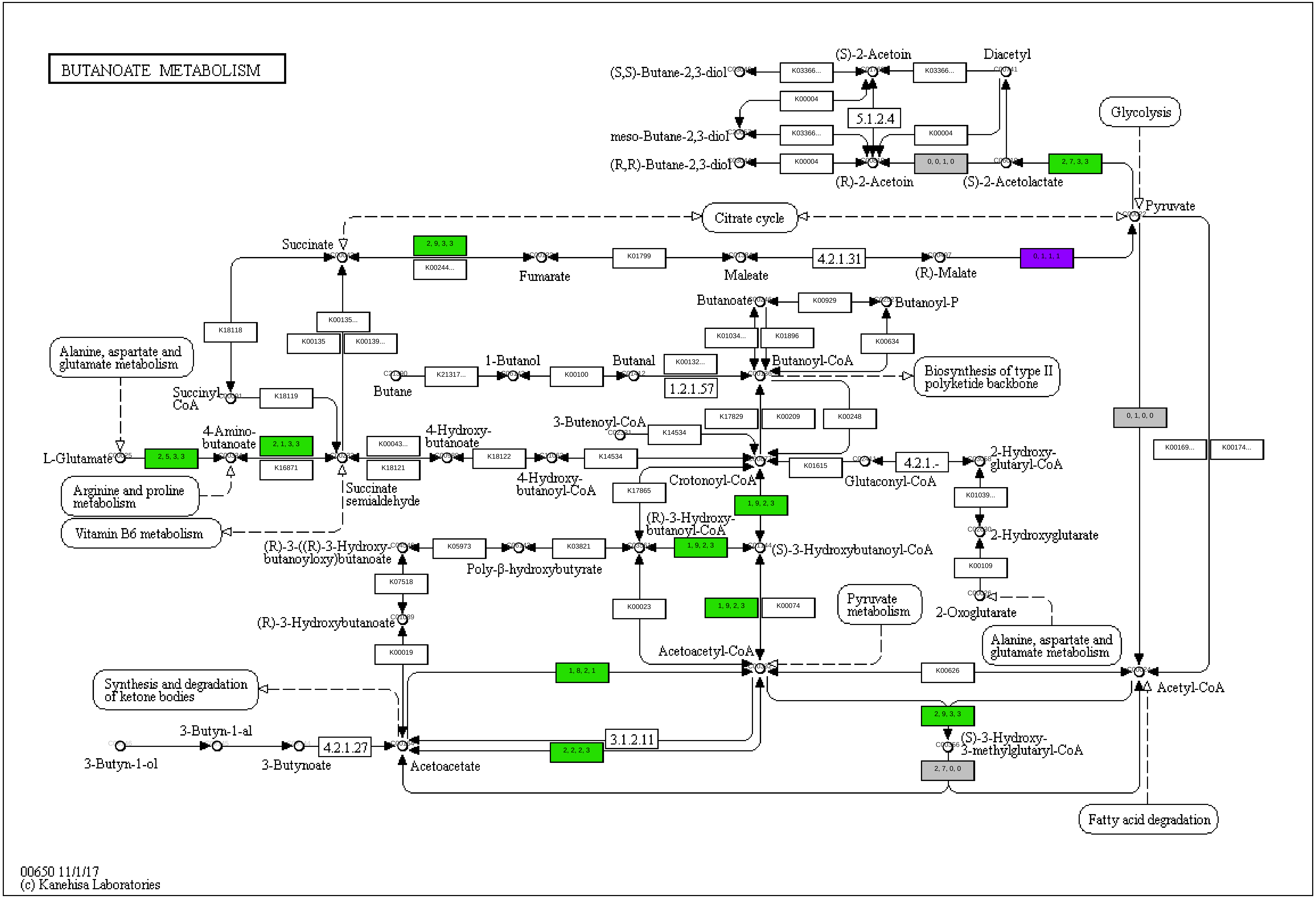
BUTANOATE METABOLISM
(S,S)-Butane-2,3-diol
K03366...
(S)-2-Acetoin
K03366...
Diacetyl
K00004
5.1.2.4
meso-Butane-2,3-diol
K03366...
K00004
(R,R)-Butane-2,3-diol
K00004
0, 0, 1, 0
2, 7, 3, 3
(R)-2-Acetoin
(S)-2-Acetolactate
Glycolysis
Pyruvate
Citrate cycle
Succinate
2, 9, 3, 3
K00244...
Fumarate
K01799
Maleate
4.2.1.31
(R)-Malate
0, 1, 1, 1
Butanoate
K00929
Butanoyl-P
K18118
K00135...
K00135
K00139...
K01034...
K01896
K00634
Alanine, aspartate and glutamate metabolism
Butane
K21317...
1-Butanol
K00100
Butanal
K00132...
1.2.1.57
Butanoyl-CoA
Biosynthesis of type II polyketide backbone
Succinyl-CoA
K18119
3-Butenoyl-CoA
K17829
K00209
K00248
0, 1, 0, 0
K14534
4-Amino-butanoate
2, 1, 3, 3
K00043...
4-Hydroxy-butanoate
L-Glutamate
2, 5, 3, 3
K16871
K18121
K18122
K14534
K01615
4.2.1.-
2-Hydroxy-glutaryl-CoA
K00169...
K00174...
Arginine and proline metabolism
Succinate semialdehyde
4-Hydroxy-butanoyl-CoA
Crotonoyl-CoA
Glutaconyl-CoA
K17865
1, 9, 2, 3
K01039...
Vitamin B6 metabolism
(R)-3-Hydroxy-butanoyl-CoA
2-Hydroxyglutarate
(R)-3-((R)-3-Hydroxy-butanoyloxy)butanoate
K05973
K03821
1, 9, 2, 3
(S)-3-Hydroxybutanoyl-CoA
Poly-β-hydroxybutyrate
K00109
K07518
K00023
1, 9, 2, 3
K00074
Pyruvate metabolism
2-Oxoglutarate
(R)-3-Hydroxybutanoate
Alanine, aspartate and glutamate metabolism
K00019
Acetoacetyl-CoA
Synthesis and degradation of ketone bodies
1, 8, 2, 1
K00626
Acetyl-CoA
2, 9, 3, 3
3-Butyn-1-al
4.2.1.27
3.1.2.11
2, 2, 2, 3
(S)-3-Hydroxy-3-methylglutaryl-CoA
3-Butyn-1-ol
3-Butynoate
Acetoacetate
2, 7, 0, 0
Fatty acid degradation
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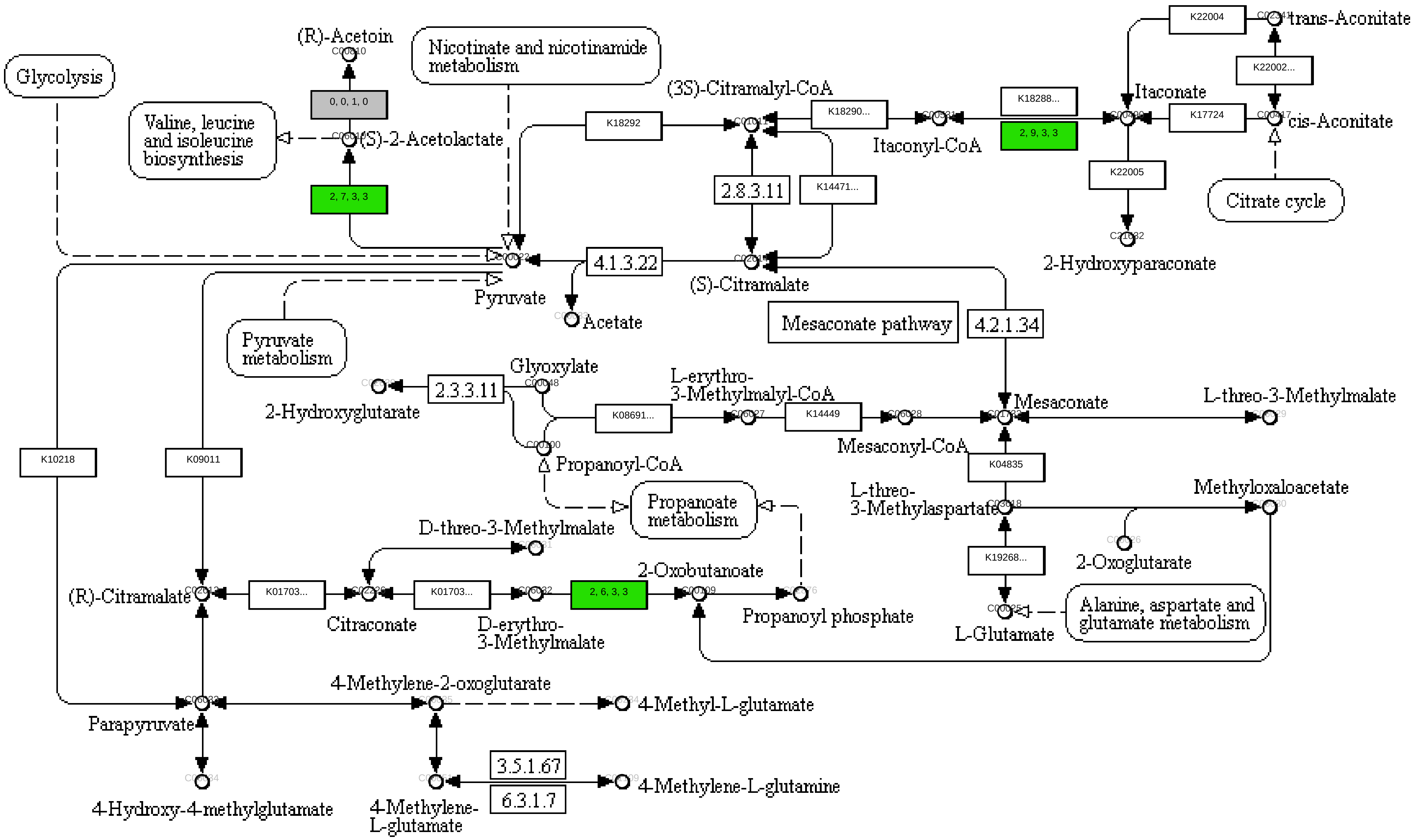
C$_5$-BRANCHED DIBASIC ACID METABOLISM



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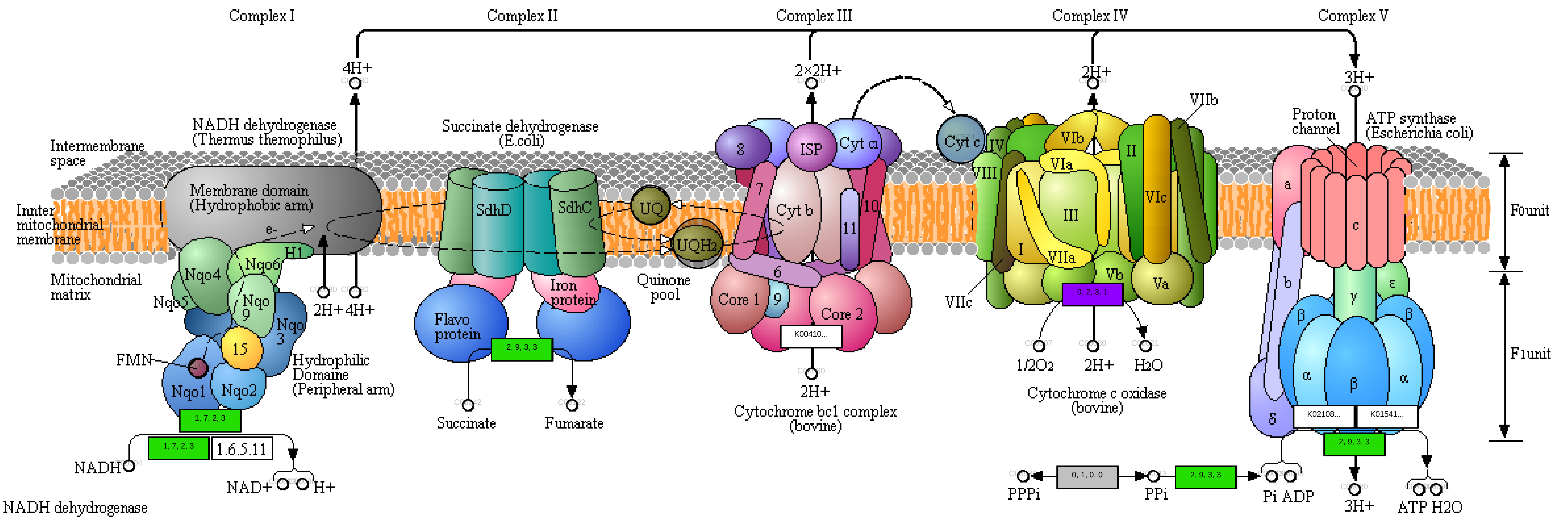
2. Energy metabolism

MAP	PATHWAY
190	Oxidative phosphorylation
680	Methane metabolism
910	Nitrogen metabolism
920	Sulfur metabolism

OXIDATIVE PHOSPHORYLATION



NADH dehydrogenase

E	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3										
E	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	K03937	K03938	K03939	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	K03944						
B/A	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3			
B/A	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3	1, 7, 2, 3
E	K03945	K03946	K03947	K03948	K03949	K03950	K03951	K03952	K03953	K03954	K03955	K03956	K11352	K11353			
E	K03957	K03958	K03959	K03960	K03961	K03962	K03963	K03964	K03965	K03966	K11351	K03967	K03968				

Succinate dehydrogenase / Fumarate reductase

E	K00236	K00237	2, 9, 3, 3	2, 9, 3, 3		
B/A	K00241	K00242...	2, 9, 3, 3	2, 9, 3, 3		
			K00244	K00245	K00246	K00247

Cytochrome c reductase

E/B/A	2, 9, 3, 3	K00410...	K00410...						
E				K00414	K00415	K00416	K00417	K00418	K00419	K00420

Cytochrome c oxidase

E	K02257		K02262	0, 2, 3, 1	K02261	K02263	K02264	K02265	K02266	K02267	K02268	K02269...	K02271	K02272	K02273	
B/A	K02257	K02300	K02299	K02298	K02297											
		0, 2, 3, 1	0, 2, 3, 1	0, 2, 3, 1	0, 2, 3, 1											
		K02829	K02828	K02827	K02826											

E/B/A		
K02258	K02259	K02260

Cytochrome c oxidase , cbb3-type

B	0, 2, 3, 1	K00405...	K00407	K00406

Cytochrome bd complex

B/A	K00425	K00426

F-type ATPase (Bacteria)

2, 9, 3, 3	2, 9, 3, 3	K02115	K02113	K02114
K02108	K02109	K02110		

F-type ATPase (Eukaryotes)

K02132	2, 9, 3, 3	K02136	K02134	K02135	
K02137	K02126	K02127	K02128	K02138	K02129...
K02130...	K02140	K02131...	K02142	K02143	K02125

V/A-type ATPase (Bacteria, Archaeas)

2, 9, 3, 3	K02118	K02119	K02120	K02121	K02122	K02107
K02123	K02124					

V-type ATPase (Eukaryotes)

2, 9, 3, 3	K02147	K02148	K02149	K02150	K02151	K02152	K02144
K02154	K02155...	K02146	K02153	K03662			

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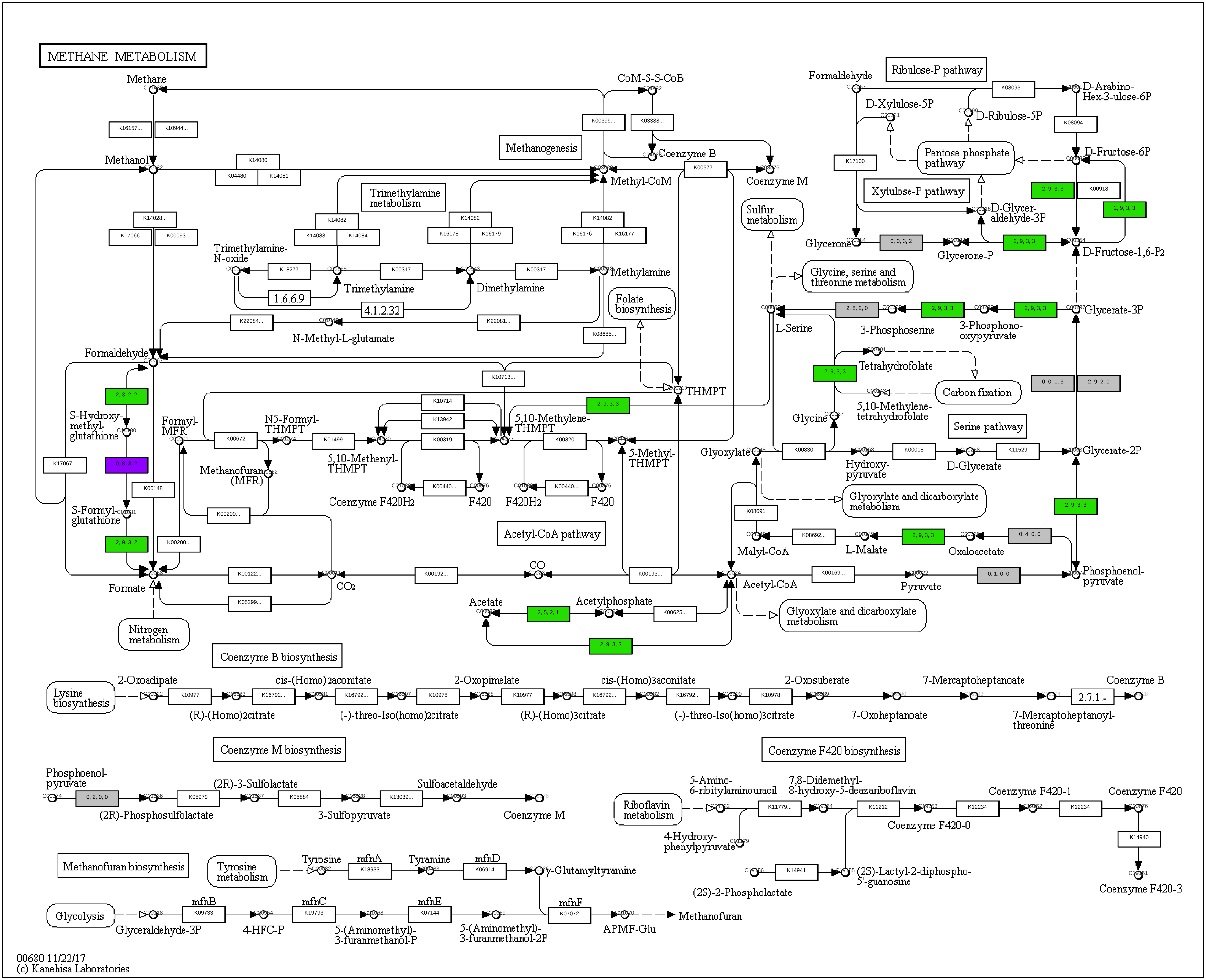
METHANE METABOLISM
Methane
K16157...
K10944...
Methanol
K14080
K04480
K14081
K14028...
K17066
K00093
CoM-S-S-CoB
K00399...
K03388...
Coenzyme B
K00577...
Methyl-CoM
Coenzyme M
Methanogenesis
Trimethylamine metabolism
K14082
K14083
K14084
K16178
K16179
K16176
K16177
Trimethylamine-N-oxide
K18277
K00317
Trimethylamine
Dimethylamine
Methylamine
1.6.6.9
4.1.2.32
Folate biosynthesis
Sulfur metabolism
K22084...
K22081...
N-Methyl-L-glutamate
K08685...
Formaldehyde
2, 3, 2, 2
S-Hydroxy-methyl-glutathione
K17067...
0, 8, 3, 2
K00148
S-Formyl-glutathione
2, 9, 3, 2
K00200...
Formyl-MFR
K00672
Methanofuran (MFR)
K00200...
N5-Formyl-THMPT
K01499
5,10-Methenyl-THMPT
K10714
K13942
K00319
K10713...
5,10-Methylene-THMPT
K00320
5-Methyl-THMPT
THMPT
2, 9, 3, 3
K00440...
Coenzyme F420H2
F420
F420H2
F420
Acetyl-CoA pathway
K00122...
K05299...
Formate
CO2
K00192...
CO
K00193...
Nitrogen metabolism
Acetate
2, 5, 2, 1
Acetylphosphate
K00625...
2, 9, 3, 3
Acetyl-CoA
Glyoxylate and dicarboxylate metabolism
Formaldehyde
Ribulose-P pathway
K08093...
D-Arabino-Hex-3-ulose-6P
D-Xylulose-5P
D-Ribulose-5P
K08094...
Pentose phosphate pathway
D-Fructose-6P
K17100
Xylulose-P pathway
2, 9, 3, 3
K00918
2, 9, 3, 3
D-Glycer-aldehyde-3P
Glycerone
0, 0, 3, 2
Glycerone-P
2, 9, 3, 3
D-Fructose-1,6-P2
Glycine, serine and threonine metabolism
2, 8, 2, 0
2, 9, 3, 3
2, 9, 3, 3
Glycerate-3P
L-Serine
3-Phosphoserine
3-Phosphono-oxypyruvate
Tetrahydrofolate
2, 9, 3, 3
Carbon fixation
0, 0, 1, 3
2, 9, 2, 0
Glycine
5,10-Methylene-tetrahydrofolate
Serine pathway
Glyoxylate
K00830
K00018
K11529
Glycerate-2P
Hydroxy-pyruvate
D-Glycerate
Glyoxylate and dicarboxylate metabolism
K08691
2, 9, 3, 3
K08692...
2, 9, 3, 3
0, 4, 0, 0
Malyl-CoA
L-Malate
Oxaloacetate
K00169...
0, 1, 0, 0
Pyruvate
Phosphoenol-pyruvate
Coenzyme B biosynthesis
Lysine biosynthesis
2-Oxoadipate
K10977
K16792...
cis-(Homo)2aconitate
K16792...
2-Oxopimelate
K10978
K10977
cis-(Homo)3aconitate
K16792...
K16792...
2-Oxosuberate
K10978
7-Mercaptoheptanoate
Coenzyme B
2.7.1.-
(R)-(Homo)2citrate
(-)-threo-Iso(homo)2citrate
(R)-(Homo)3citrate
(-)-threo-Iso(homo)3citrate
7-Oxoheptanoate
7-Mercaptoheptanoyl-threonine
Coenzyme M biosynthesis
Coenzyme F420 biosynthesis
Phosphoenol-pyruvate
0, 2, 0, 0
K05979
(2R)-3-Sulfolactate
K05884
Sulfoacetaldehyde
K13039...
(2R)-Phosphosulfolactate
3-Sulfopyruvate
Coenzyme M
Riboflavin metabolism
5-Amino-6-ribitylaminouracil
7,8-Didemethyl-8-hydroxy-5-deazariboflavin
K11779...
K11212
Coenzyme F420-1
K12234
K12234
Coenzyme F420
4-Hydroxy-phenylpyruvate
Coenzyme F420-0
K14940
K14941
(2S)-Lactyl-2-diphospho-5'-guanosine
(2S)-2-Phospholactate
Coenzyme F420-3
Methanofuran biosynthesis
Tyrosine metabolism
Tyrosine
mfnA
K18933
Tyramine
mfnD
K06914
γ-Glutamyltyramine
Glycolysis
mfnB
K09733
mfnC
K19793
mfnE
K07144
mfnF
K07072
Methanofuran
Glyceraldehyde-3P
4-HFC-P
5-(Aminomethyl)-3-furanmethanol-P
5-(Aminomethyl)-3-furanmethanol-2P
APMF-Glu
00680 11/22/17
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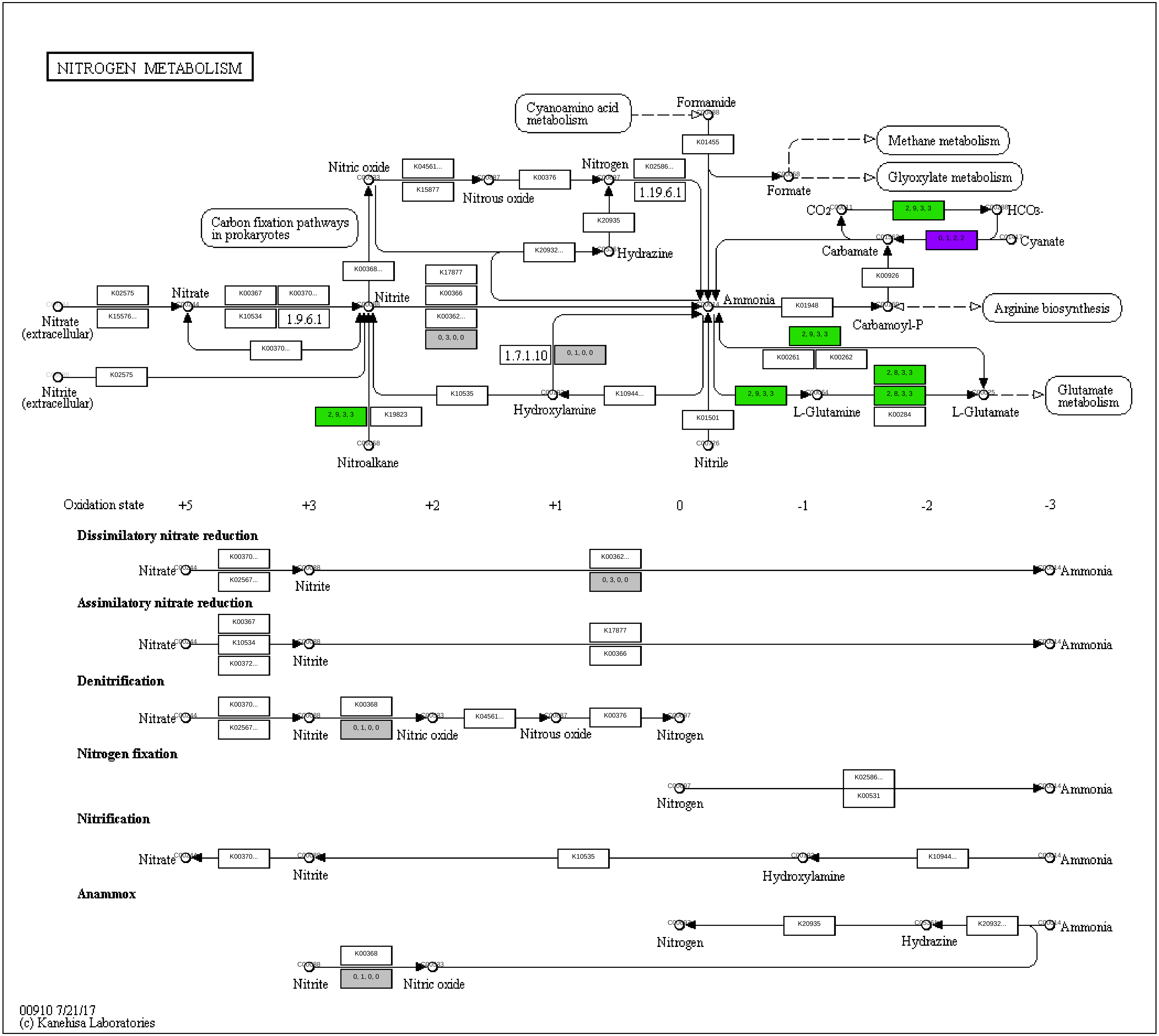
NITROGEN METABOLISM
Cyanoamino acid metabolism
Formamide
C00488
K01455
Methane metabolism
Glyoxylate metabolism
Formate
C00058
Nitric oxide
C00533
K04561...
K15877
C00887
Nitrous oxide
K00376
Nitrogen
C00697
K02586...
1.19.6.1
K20935
K20932...
C05361
Hydrazine
CO2
C00011
2, 9, 3, 3
C00288
HCO3-
Carbamate
C01563
0, 1, 2, 2
C01417
Cyanate
Carbon fixation pathways in prokaryotes
K00368...
K17877
K00366
K00362...
0, 3, 0, 0
K00926
Ammonia
C00014
K01948
C00169
Carbamoyl-P
Arginine biosynthesis
C00244
K02575
K15576...
Nitrate
Nitrate (extracellular)
K00367
K00370...
K10534
1.9.6.1
Nitrite
C00088
K00370...
K02575
Nitrite (extracellular)
2, 9, 3, 3
K00261
K00262
1.7.1.10
0, 1, 0, 0
2, 8, 3, 3
K10535
C00192
Hydroxylamine
K10944...
2, 9, 3, 3
C00064
L-Glutamine
2, 8, 3, 3
K00284
C00025
L-Glutamate
Glutamate metabolism
2, 9, 3, 3
K19823
C06068
Nitroalkane
K01501
C00726
Nitrile
Oxidation state
+5
+3
+2
+1
0
-1
-2
-3
Dissimilatory nitrate reduction
Nitrate
C00244
K00370...
K02567...
C00088
Nitrite
K00362...
0, 3, 0, 0
C00014
Ammonia
Assimilatory nitrate reduction
Nitrate
C00244
K00367
K10534
K00372...
C00088
Nitrite
K17877
K00366
C00014
Ammonia
Denitrification
Nitrate
C00244
K00370...
K02567...
C00088
Nitrite
K00368
0, 1, 0, 0
C00533
Nitric oxide
K04561...
C00887
Nitrous oxide
K00376
C00697
Nitrogen
Nitrogen fixation
C00697
Nitrogen
K02586...
K00531
C00014
Ammonia
Nitrification
Nitrate
C00244
K00370...
C00088
Nitrite
K10535
C00192
Hydroxylamine
K10944...
C00014
Ammonia
Anammox
C00697
Nitrogen
K20935
C05361
Hydrazine
K20932...
C00014
Ammonia
C00088
Nitrite
K00368
0, 1, 0, 0
C00533
Nitric oxide
00910 7/21/17
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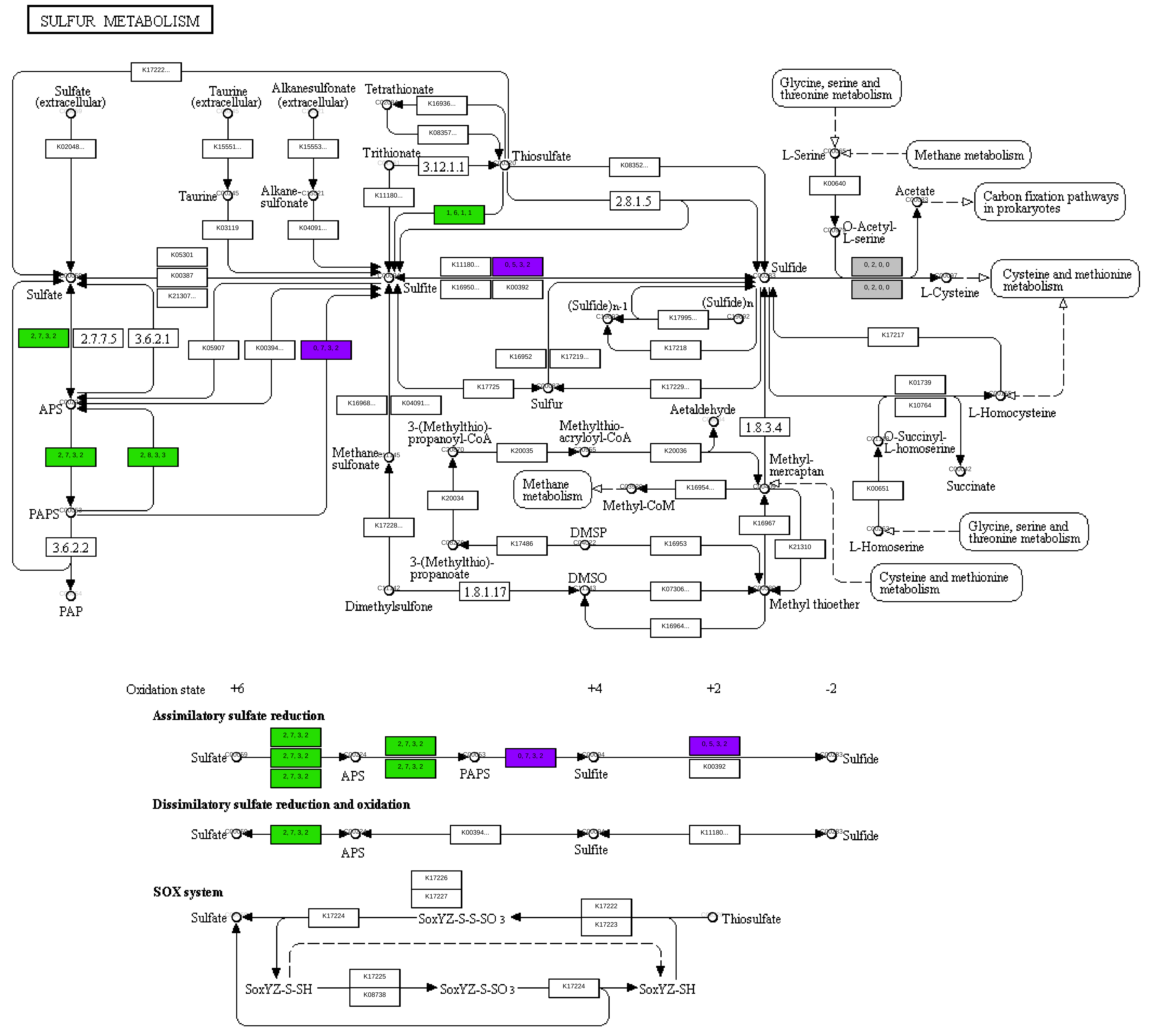

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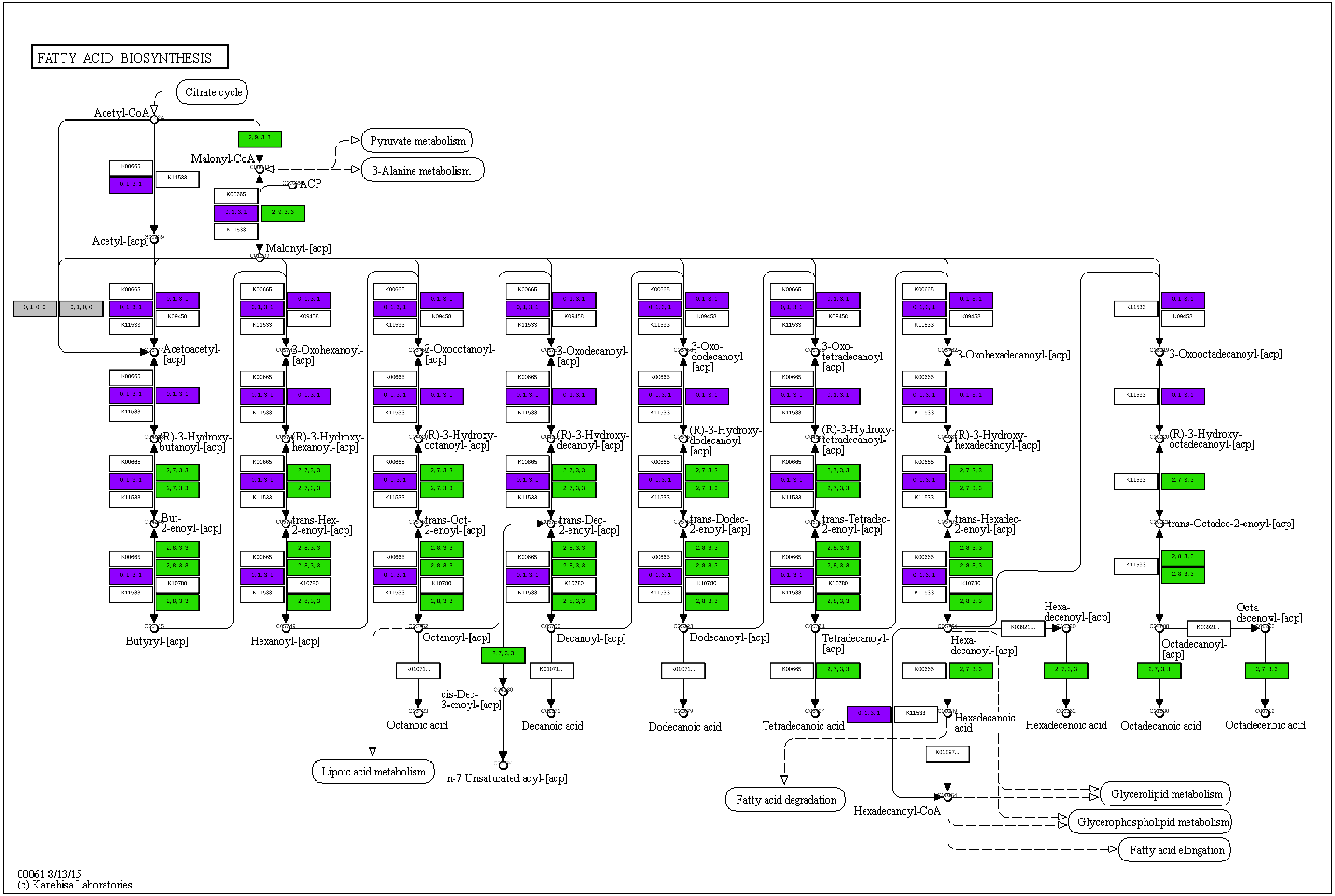
3. Lipid metabolism

MAP	PATHWAY
61	Fatty acid biosynthesis
62	Fatty acid elongation
71	Fatty acid degradation
72	Synthesis and degradation of ketone bodies
100	Steroid biosynthesis
561	Glycerolipid metabolism
564	Glycerophospholipid metabolism
565	Ether lipid metabolism
590	Arachidonic acid metabolism
592	alpha-Linolenic acid metabolism
600	Sphingolipid metabolism


FATTY ACID BIOSYNTHESIS
Citrate cycle
Acetyl-CoA
Malonyl-CoA
ACP
Pyruvate metabolism
β-Alanine metabolism
2, 9, 3, 3
K00665
0, 1, 3, 1
K11533
Acetyl-[acp]
Malonyl-[acp]
0, 1, 0, 0
K09458
K10780
2, 7, 3, 3
2, 8, 3, 3
Acetoacetyl-[acp]
3-Oxohexanoyl-[acp]
3-Oxooctanoyl-[acp]
3-Oxodecanoyl-[acp]
3-Oxo-dodecanoyl-[acp]
3-Oxo-tetradecanoyl-[acp]
3-Oxohexadecanoyl-[acp]
3-Oxooctadecanoyl-[acp]
(R)-3-Hydroxy-butanoyl-[acp]
(R)-3-Hydroxy-hexanoyl-[acp]
(R)-3-Hydroxy-octanoyl-[acp]
(R)-3-Hydroxy-decanoyl-[acp]
(R)-3-Hydroxy-dodecanoyl-[acp]
(R)-3-Hydroxy-tetradecanoyl-[acp]
(R)-3-Hydroxy-hexadecanoyl-[acp]
(R)-3-Hydroxy-octadecanoyl-[acp]
But-2-enoyl-[acp]
trans-Hex-2-enoyl-[acp]
trans-Oct-2-enoyl-[acp]
trans-Dec-2-enoyl-[acp]
trans-Dodec-2-enoyl-[acp]
trans-Tetradec-2-enoyl-[acp]
trans-Hexadec-2-enoyl-[acp]
trans-Octadec-2-enoyl-[acp]
Butyryl-[acp]
Hexanoyl-[acp]
Octanoyl-[acp]
Decanoyl-[acp]
Dodecanoyl-[acp]
Tetradecanoyl-[acp]
Hexadecanoyl-[acp]
Hexa-decenoyl-[acp]
Octadecanoyl-[acp]
Octa-decenoyl-[acp]
K03921...
K01071...
K01897...
cis-Dec-3-enoyl-[acp]
Octanoic acid
Decanoic acid
Dodecanoic acid
Tetradecanoic acid
Hexadecanoic acid
Hexadecenoic acid
Octadecanoic acid
Octadecenoic acid
n-7 Unsaturated acyl-[acp]
Lipoic acid metabolism
Fatty acid degradation
Hexadecanoyl-CoA
Glycerolipid metabolism
Glycerophospholipid metabolism
Fatty acid elongation
00061 8/13/15
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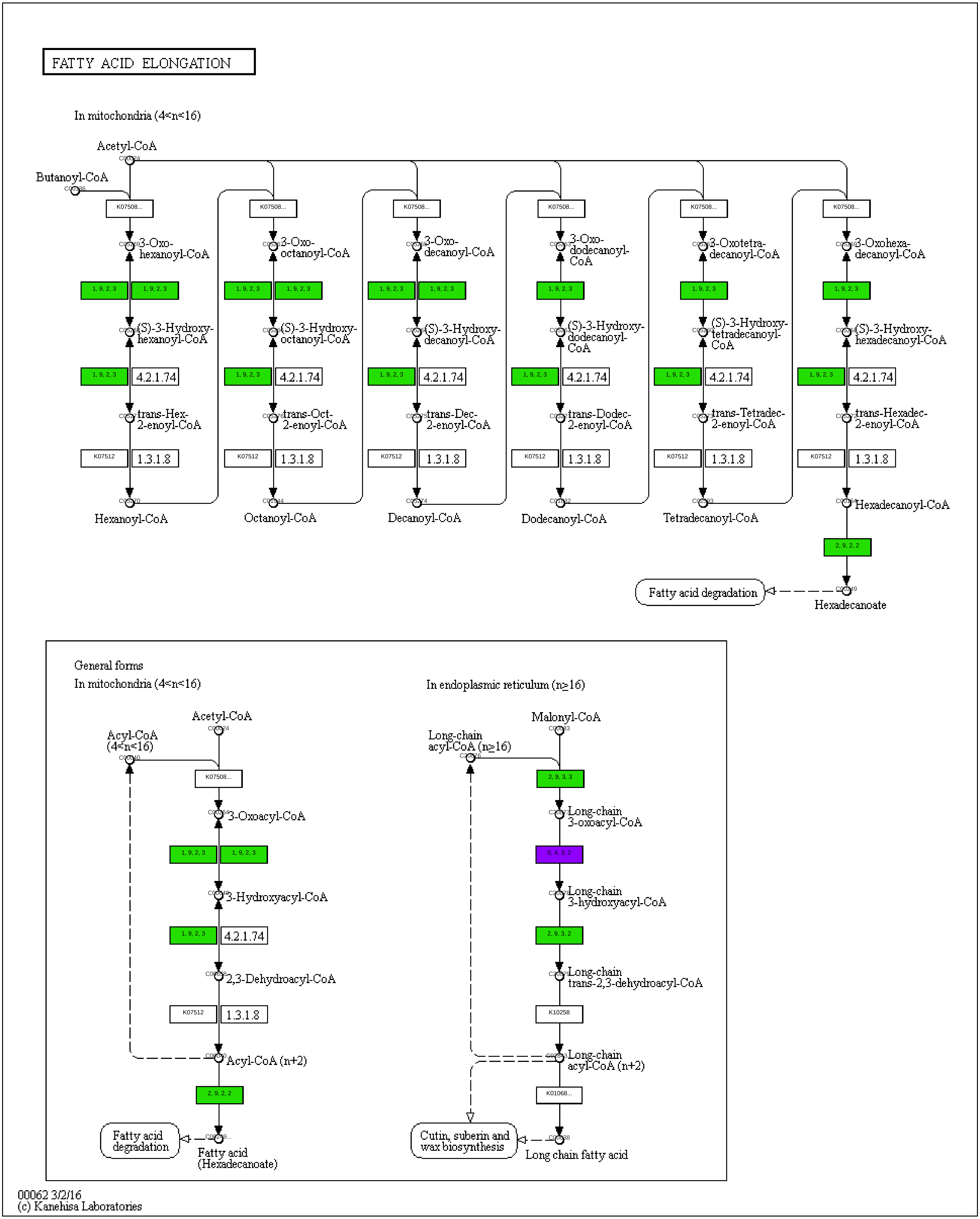
FATTY ACID ELONGATION
In mitochondria (4<n<16)
Acetyl-CoA
Butanoyl-CoA
K07508...
3-Oxo-hexanoyl-CoA
3-Oxo-octanoyl-CoA
3-Oxo-decanoyl-CoA
3-Oxo-dodecanoyl-CoA
3-Oxotetra-decanoyl-CoA
3-Oxohexa-decanoyl-CoA
1, 9, 2, 3
(S)-3-Hydroxy-hexanoyl-CoA
(S)-3-Hydroxy-octanoyl-CoA
(S)-3-Hydroxy-decanoyl-CoA
(S)-3-Hydroxy-dodecanoyl-CoA
(S)-3-Hydroxy-tetradecanoyl-CoA
(S)-3-Hydroxy-hexadecanoyl-CoA
4.2.1.74
trans-Hex-2-enoyl-CoA
trans-Oct-2-enoyl-CoA
trans-Dec-2-enoyl-CoA
trans-Dodec-2-enoyl-CoA
trans-Tetradec-2-enoyl-CoA
trans-Hexadec-2-enoyl-CoA
K07512
1.3.1.8
Hexanoyl-CoA
Octanoyl-CoA
Decanoyl-CoA
Dodecanoyl-CoA
Tetradecanoyl-CoA
Hexadecanoyl-CoA
2, 9, 2, 2
Fatty acid degradation
Hexadecanoate
General forms
In mitochondria (4<n<16)
In endoplasmic reticulum (n≥16)
Acetyl-CoA
Acyl-CoA (4<n<16)
K07508...
3-Oxoacyl-CoA
1, 9, 2, 3
3-Hydroxyacyl-CoA
4.2.1.74
2,3-Dehydroacyl-CoA
K07512
1.3.1.8
Acyl-CoA (n+2)
2, 9, 2, 2
Fatty acid degradation
Fatty acid (Hexadecanoate)
Malonyl-CoA
Long-chain acyl-CoA (n≥16)
2, 9, 3, 3
Long-chain 3-oxoacyl-CoA
0, 4, 3, 2
Long-chain 3-hydroxyacyl-CoA
2, 9, 3, 2
Long-chain trans-2,3-dehydroacyl-CoA
K10258
Long-chain acyl-CoA (n+2)
K01068...
Cutin, suberin and wax biosynthesis
Long chain fatty acid
00062 3/2/16
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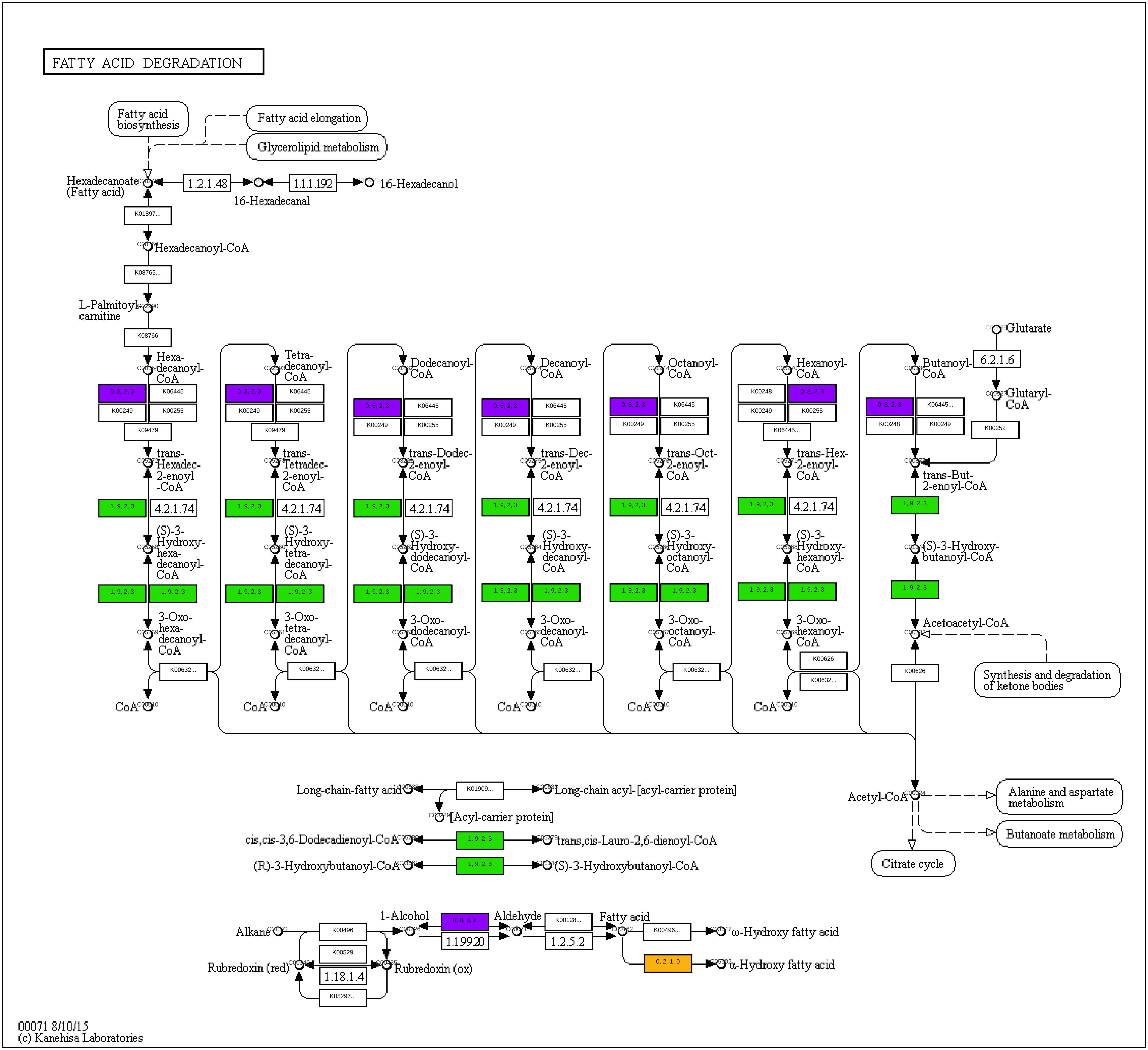FATTY ACID DEGRADATION
Fatty acid biosynthesis
Fatty acid elongation
Glycerolipid metabolism
Hexadecanoate (Fatty acid)
1.2.1.48
16-Hexadecanal
1.1.1.192
16-Hexadecanol
K01897...
Hexadecanoyl-CoA
K08765...
L-Palmitoyl-carnitine
K08766
Hexa-decanoyl-CoA
Tetra-decanoyl-CoA
Dodecanoyl-CoA
Decanoyl-CoA
Octanoyl-CoA
Hexanoyl-CoA
Butanoyl-CoA
Glutarate
6.2.1.6
Glutaryl-CoA
K00252
0, 8, 2, 3
K06445
K00249
K00255
K09479
K00248
K06445...
trans-Hexadec-2-enoyl-CoA
trans-Tetradec-2-enoyl-CoA
trans-Dodec-2-enoyl-CoA
trans-Dec-2-enoyl-CoA
trans-Oct-2-enoyl-CoA
trans-Hex-2-enoyl-CoA
trans-But-2-enoyl-CoA
1, 9, 2, 3
4.2.1.74
(S)-3-Hydroxy-hexa-decanoyl-CoA
(S)-3-Hydroxy-tetra-decanoyl-CoA
(S)-3-Hydroxy-dodecanoyl-CoA
(S)-3-Hydroxy-decanoyl-CoA
(S)-3-Hydroxy-octanoyl-CoA
(S)-3-Hydroxy-hexanoyl-CoA
(S)-3-Hydroxy-butanoyl-CoA
3-Oxo-hexa-decanoyl-CoA
3-Oxo-tetra-decanoyl-CoA
3-Oxo-dodecanoyl-CoA
3-Oxo-decanoyl-CoA
3-Oxo-octanoyl-CoA
3-Oxo-hexanoyl-CoA
Acetoacetyl-CoA
K00632...
K00626
CoA
Synthesis and degradation of ketone bodies
Acetyl-CoA
Alanine and aspartate metabolism
Butanoate metabolism
Citrate cycle
Long-chain-fatty acid
K01909...
Long-chain acyl-[acyl-carrier protein]
[Acyl-carrier protein]
cis,cis-3,6-Dodecadienoyl-CoA
trans,cis-Lauro-2,6-dienoyl-CoA
(R)-3-Hydroxybutanoyl-CoA
(S)-3-Hydroxybutanoyl-CoA
Alkane
K00496
K00529
1.18.1.4
K05297...
Rubredoxin (red)
Rubredoxin (ox)
1-Alcohol
0, 8, 3, 2
1.1.99.20
Aldehyde
K00128...
1.2.5.2
Fatty acid
K00496...
ω-Hydroxy fatty acid
0, 2, 1, 0
α-Hydroxy fatty acid
00071 8/10/15
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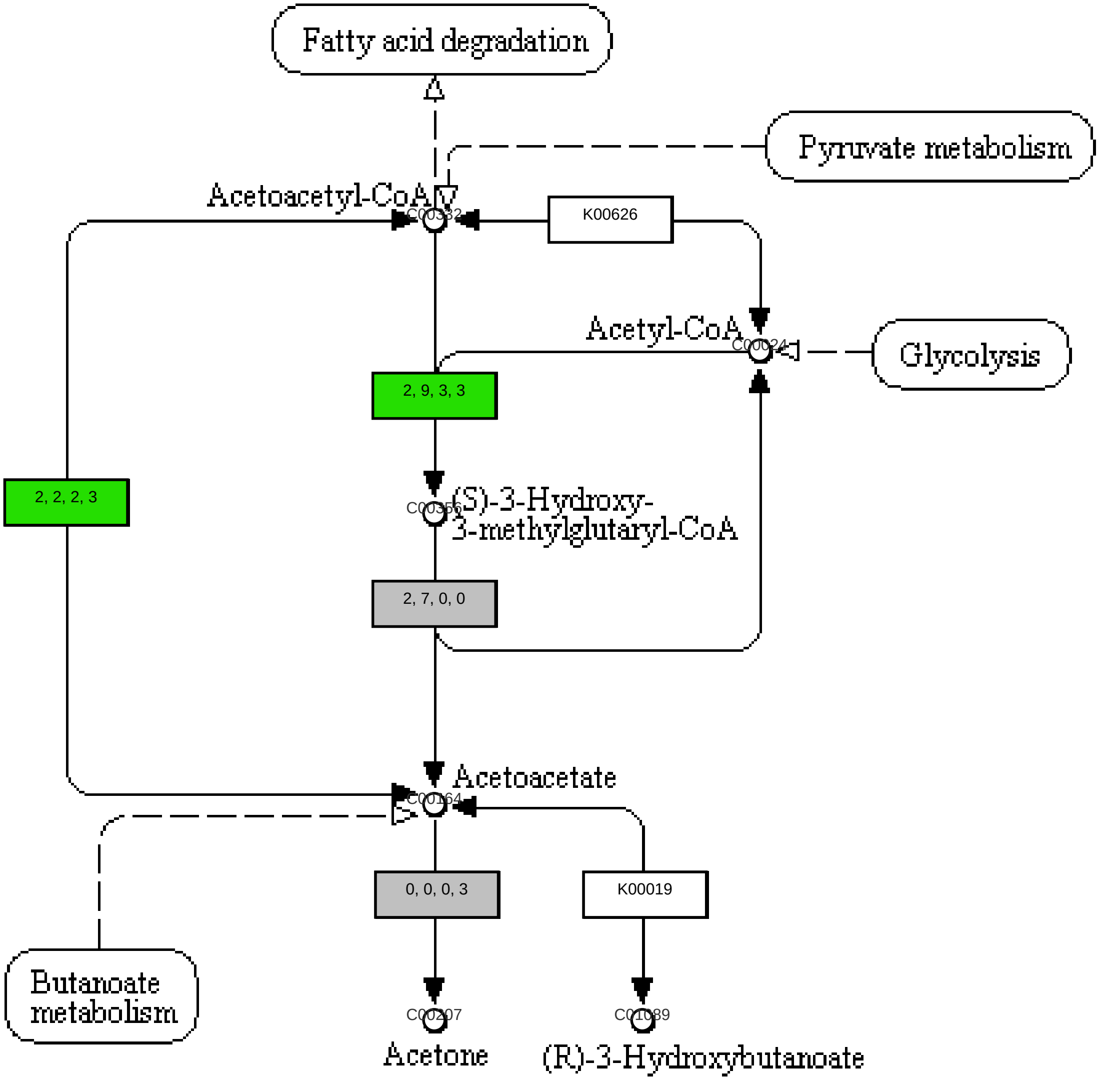
SYNTHESIS AND DEGRADATION OF KETONE BODIES



00072 8/30/13
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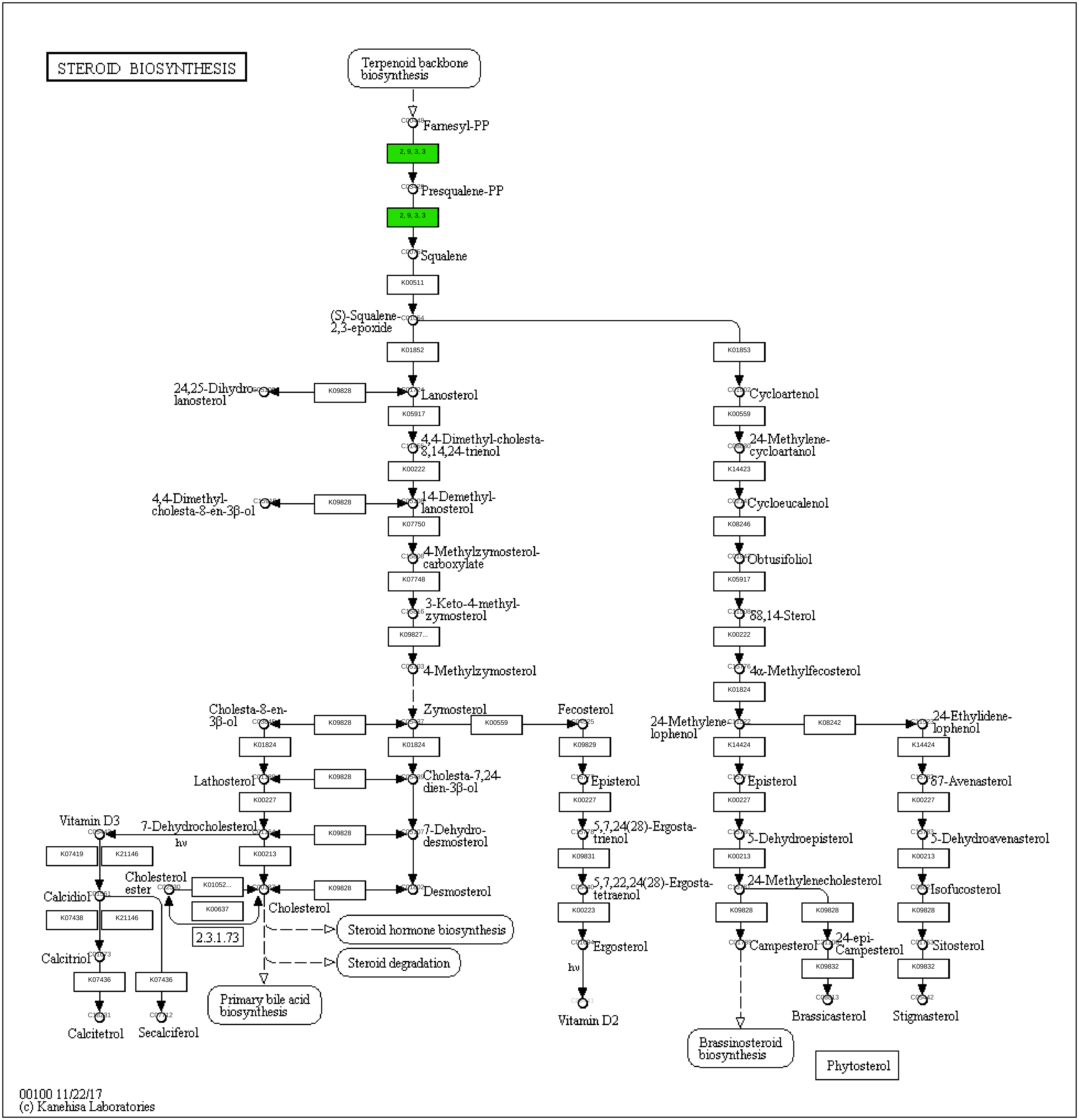
STEROID BIOSYNTHESIS
Terpenoid backbone biosynthesis
Farnesyl-PP
2, 9, 3, 3
Presqualene-PP
2, 9, 3, 3
Squalene
K00511
(S)-Squalene-2,3-epoxide
K01852
K01853
24,25-Dihydrolanosterol
K09828
Lanosterol
Cycloartenol
K05917
K00559
4,4-Dimethyl-cholesta-8,14,24-trienol
24-Methylene-cycloartanol
K00222
K14423
4,4-Dimethyl-cholesta-8-en-3β-ol
K09828
14-Demethyl-lanosterol
Cycloeucalenol
K07750
K08246
4-Methylzymosterol-carboxylate
Obtusifoliol
K07748
K05917
3-Keto-4-methyl-zymosterol
δ8,14-Sterol
K09827...
K00222
4-Methylzymosterol
4α-Methylfecosterol
K01824
Cholesta-8-en-3β-ol
K09828
Zymosterol
K00559
Fecosterol
24-Methylene-lophenol
K08242
24-Ethylidene-lophenol
K01824
K01824
K09829
K14424
K14424
Lathosterol
K09828
Cholesta-7,24-dien-3β-ol
Episterol
Episterol
δ7-Avenasterol
K00227
K00227
K00227
K00227
Vitamin D3
7-Dehydrocholesterol
K09828
7-Dehydro-desmosterol
5,7,24(28)-Ergosta-trienol
5-Dehydroepisterol
5-Dehydroavenasterol
hν
K07419
K21146
K00213
K09831
K00213
K00213
Cholesterol ester
K01052...
K09828
Desmosterol
5,7,22,24(28)-Ergosta-tetraenol
24-Methylenecholesterol
Isofucosterol
Calcidiol
K00637
Cholesterol
K00223
K09828
K09828
K09828
K07438
K21146
2.3.1.73
Steroid hormone biosynthesis
Ergosterol
24-epi-Campesterol
Campesterol
Sitosterol
Calcitriol
Steroid degradation
hν
K09832
K09832
K07436
K07436
Primary bile acid biosynthesis
Calcitetrol
Secalciferol
Vitamin D2
Brassicasterol
Stigmasterol
Brassinosteroid biosynthesis
Phytosterol
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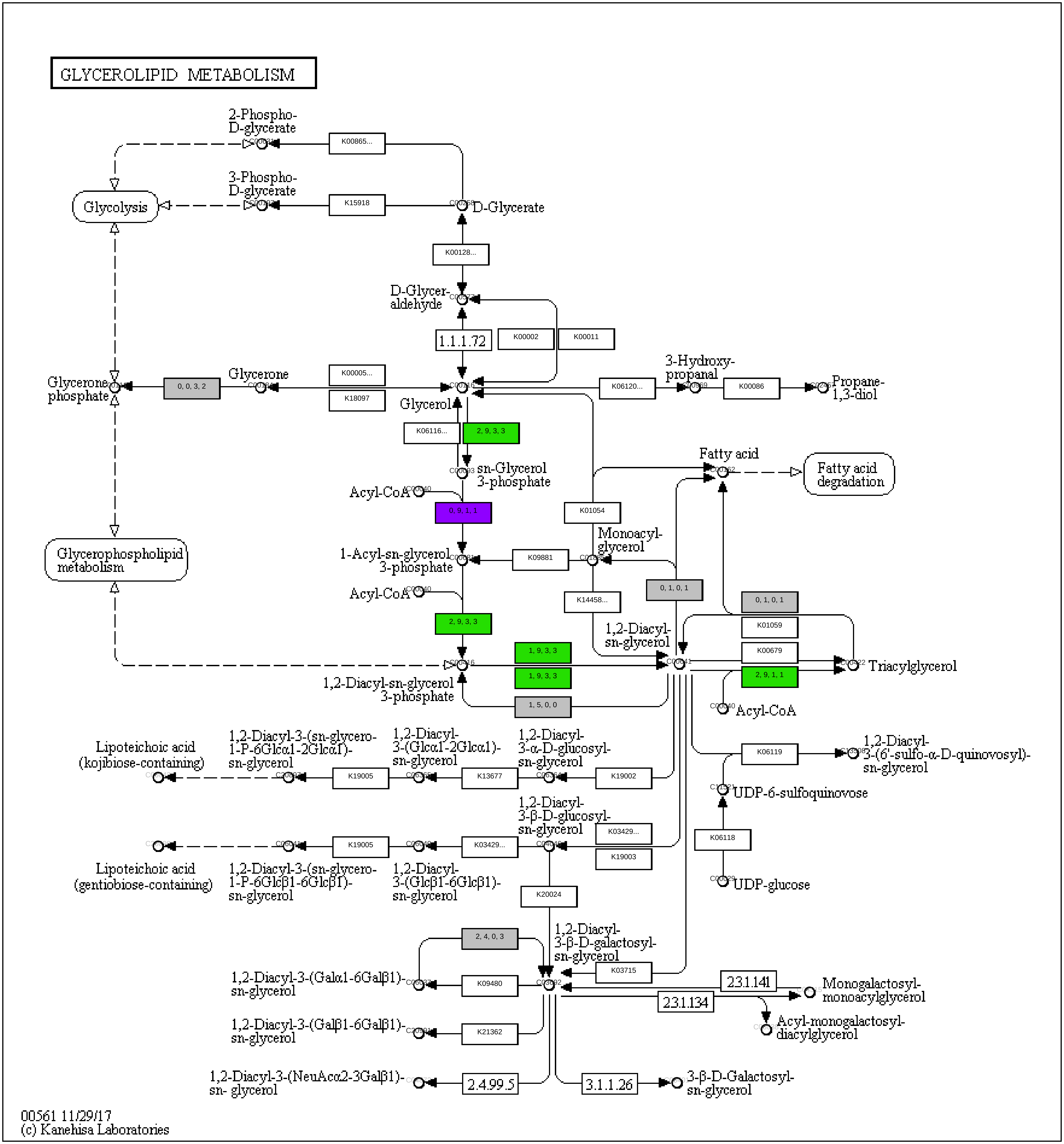
GLYCEROLIPID METABOLISM
2-Phospho-D-glycerate
K00865...
3-Phospho-D-glycerate
K15918
Glycolysis
C00258
D-Glycerate
K00128...
D-Glycer-aldehyde
1.1.1.72
K00002
K00011
Glycerone phosphate
0, 0, 3, 2
Glycerone
K00005...
K18097
Glycerol
K06120...
3-Hydroxy-propanal
K00086
Propane-1,3-diol
K06116...
2, 9, 3, 3
sn-Glycerol 3-phosphate
Acyl-CoA
0, 9, 1, 1
Fatty acid
Fatty acid degradation
K01054
Monoacyl-glycerol
Glycerophospholipid metabolism
1-Acyl-sn-glycerol 3-phosphate
K09881
0, 1, 0, 1
K14458...
Acyl-CoA
0, 1, 0, 1
2, 9, 3, 3
1,2-Diacyl-sn-glycerol
K01059
1, 9, 3, 3
K00679
1, 9, 3, 3
C00641
Triacylglycerol
2, 9, 1, 1
1,2-Diacyl-sn-glycerol 3-phosphate
1, 5, 0, 0
Acyl-CoA
Lipoteichoic acid (kojibiose-containing)
1,2-Diacyl-3-(sn-glycero-1-P-6Glcα1-2Glcα1)-sn-glycerol
1,2-Diacyl-3-(Glcα1-2Glcα1)-sn-glycerol
1,2-Diacyl-3-α-D-glucosyl-sn-glycerol
K06119
1,2-Diacyl-3-(6'-sulfo-α-D-quinovosyl)-sn-glycerol
K19005
K13677
K19002
UDP-6-sulfoquinovose
1,2-Diacyl-3-β-D-glucosyl-sn-glycerol
K03429...
K19005
K03429...
K19003
K06118
Lipoteichoic acid (gentiobiose-containing)
1,2-Diacyl-3-(sn-glycero-1-P-6Glcβ1-6Glcβ1)-sn-glycerol
1,2-Diacyl-3-(Glcβ1-6Glcβ1)-sn-glycerol
UDP-glucose
K20024
2, 4, 0, 3
1,2-Diacyl-3-β-D-galactosyl-sn-glycerol
1,2-Diacyl-3-(Galα1-6Galβ1)-sn-glycerol
K09480
K03715
2.3.1.141
Monogalactosyl-monoacylglycerol
2.3.1.134
Acyl-monogalactosyl-diacylglycerol
1,2-Diacyl-3-(Galβ1-6Galβ1)-sn-glycerol
K21362
1,2-Diacyl-3-(NeuAcα2-3Galβ1)-sn- glycerol
2.4.99.5
3.1.1.26
3-β-D-Galactosyl-sn-glycerol
00561 11/29/17
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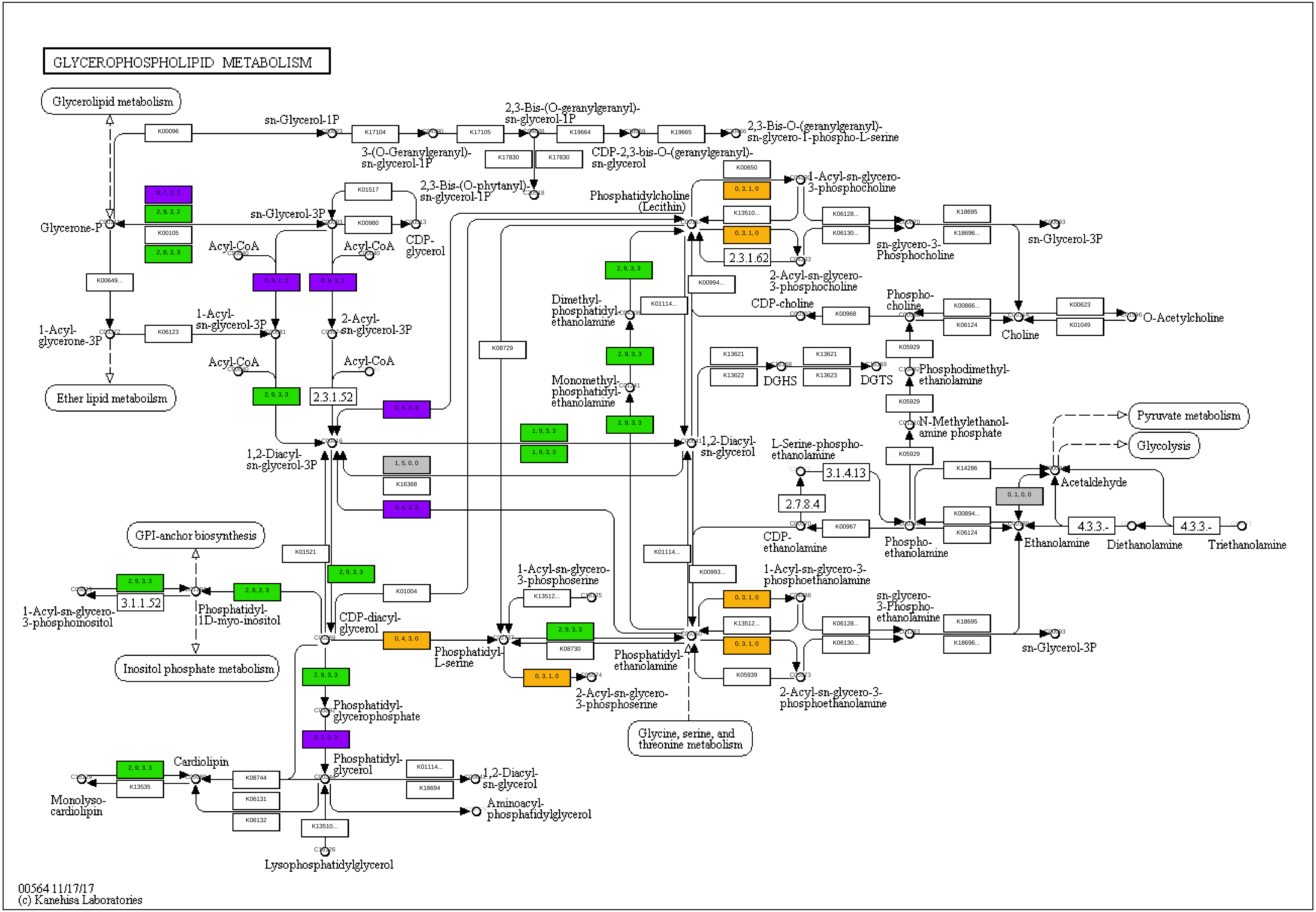
GLYCEROPHOSPHOLIPID METABOLISM
Glycerolipid metabolism
Ether lipid metaboilsm
GPI-anchor biosynthesis
Inositol phosphate metabolism
Glycine, serine, and threonine metabolism
Pyruvate metabolism
Glycolysis
Glycerone-P
1-Acyl-glycerone-3P
sn-Glycerol-1P
sn-Glycerol-3P
3-(O-Geranylgeranyl)-sn-glycerol-1P
2,3-Bis-(O-geranylgeranyl)-sn-glycerol-1P
2,3-Bis-O-(geranylgeranyl)-sn-glycero-1-phospho-L-serine
CDP-2,3-bis-O-(geranylgeranyl)-sn-glycerol
2,3-Bis-(O-phytanyl)-sn-glycerol-1P
CDP-glycerol
Acyl-CoA
1-Acyl-sn-glycerol-3P
2-Acyl-sn-glycerol-3P
1,2-Diacyl-sn-glycerol-3P
Phosphatidylcholine (Lecithin)
1-Acyl-sn-glycero-3-phosphocholine
2-Acyl-sn-glycero-3-phosphocholine
sn-glycero-3-Phosphocholine
CDP-choline
Phosphocholine
Choline
O-Acetylcholine
Dimethyl-phosphatidylethanolamine
Monomethyl-phosphatidylethanolamine
1,2-Diacyl-sn-glycerol
DGHS
DGTS
Phosphodimethyl-ethanolamine
N-Methylethanolamine phosphate
L-Serine-phosphoethanolamine
Acetaldehyde
CDP-ethanolamine
Phosphoethanolamine
Ethanolamine
Diethanolamine
Triethanolamine
1-Acyl-sn-glycero-3-phosphoserine
2-Acyl-sn-glycero-3-phosphoserine
1-Acyl-sn-glycero-3-phosphoethanolamine
2-Acyl-sn-glycero-3-phosphoethanolamine
sn-glycero-3-Phosphoethanolamine
Phosphatidyl-L-serine
Phosphatidylethanolamine
CDP-diacylglycerol
1-Acyl-sn-glycero-3-phosphoinositol
Phosphatidyl-1D-myo-inositol
Phosphatidylglycerophosphate
Phosphatidylglycerol
Cardiolipin
Monolysocardiolipin
Lysophosphatidylglycerol
Aminoacyl-phosphatidylglycerol
K00096
K17104
K17105
K19664
K19665
K17830
K17830
K01517
K00980
0, 7, 3, 2
2, 9, 3, 2
K00105
2, 8, 3, 3
K00649...
K06123
0, 9, 1, 1
0, 9, 1, 1
2, 9, 3, 3
2.3.1.52
0, 4, 3, 3
K00650
0, 3, 1, 0
K13510...
0, 3, 1, 0
2.3.1.62
K06128...
K06130...
K18695
K18696...
K00994...
K01114...
K00968
K00866...
K06124
K00623
K01049
2, 9, 3, 3
2, 9, 3, 3
2, 9, 3, 3
K08729
1, 9, 3, 3
1, 9, 3, 3
K13621
K13622
K13621
K13623
K05929
K05929
K05929
3.1.4.13
2.7.8.4
K14286
0, 1, 0, 0
K00894...
K06124
K00967
4.3.3.-
4.3.3.-
1, 5, 0, 0
K16368
0, 4, 3, 3
K01521
2, 9, 3, 3
K01004
K01114...
K00993...
K13512...
0, 3, 1, 0
K13512...
0, 3, 1, 0
K06128...
K06130...
K18695
K18696...
K05939
2, 9, 3, 3
K08730
0, 3, 1, 0
0, 4, 3, 0
2, 9, 3, 3
3.1.1.52
2, 6, 2, 3
2, 9, 3, 3
0, 7, 3, 3
2, 9, 3, 3
K13535
K08744
K06131
K06132
K01114...
K18694
K13510...
00564 11/17/17
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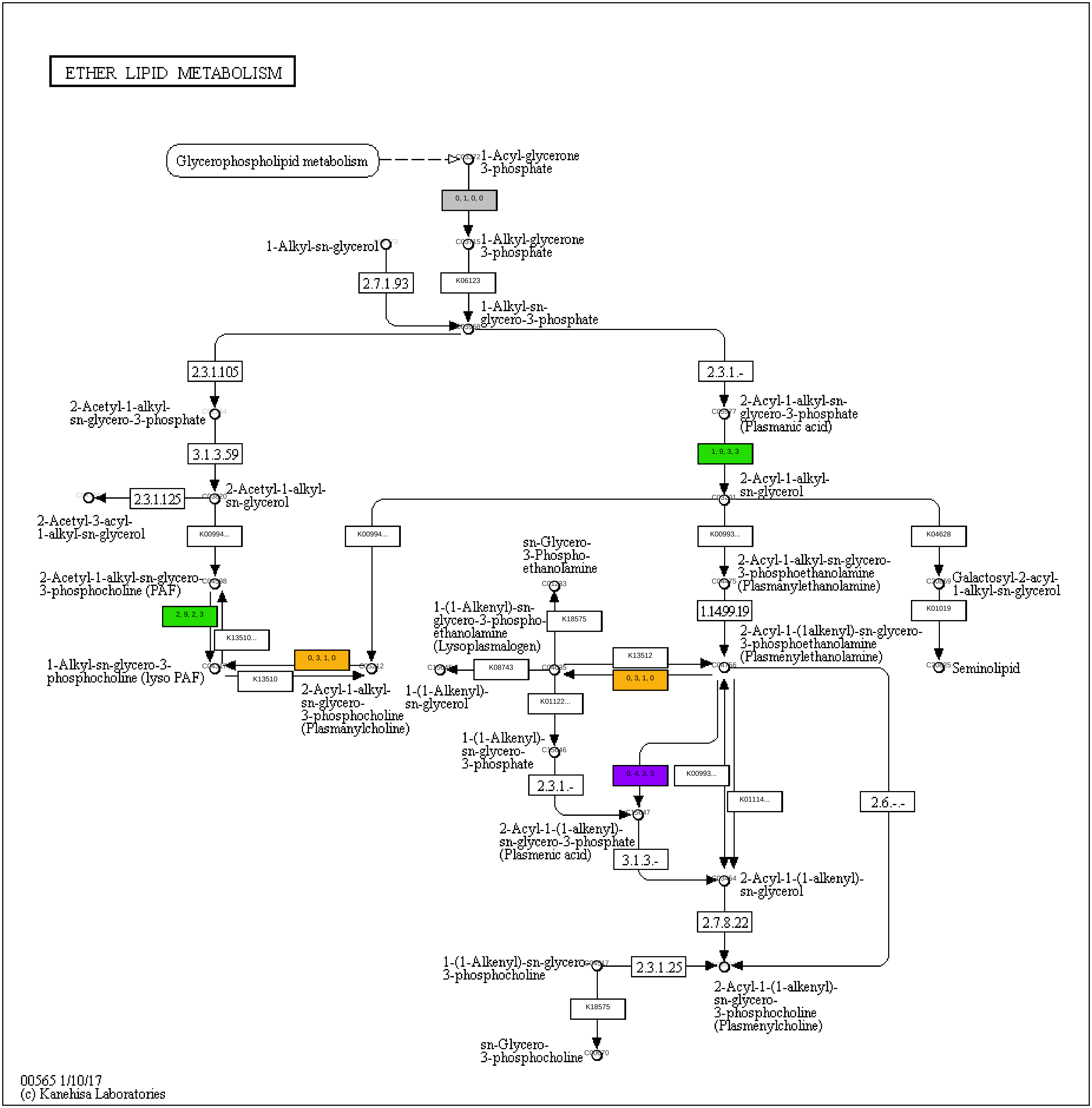
ETHER LIPID METABOLISM
Glycerophospholipid metabolism
1-Acyl-glycerone 3-phosphate
0, 1, 0, 0
1-Alkyl-sn-glycerol
1-Alkyl-glycerone 3-phosphate
2.7.1.93
K06123
1-Alkyl-sn-glycero-3-phosphate
2.3.1.105
2.3.1.-
2-Acetyl-1-alkyl-sn-glycero-3-phosphate
2-Acyl-1-alkyl-sn-glycero-3-phosphate (Plasmanic acid)
3.1.3.59
1, 9, 3, 3
2.3.1.125
2-Acetyl-1-alkyl-sn-glycerol
2-Acyl-1-alkyl-sn-glycerol
2-Acetyl-3-acyl-1-alkyl-sn-glycerol
K00994...
K00994...
K00993...
K04628
sn-Glycero-3-Phospho-ethanolamine
2-Acetyl-1-alkyl-sn-glycero-3-phosphocholine (PAF)
2-Acyl-1-alkyl-sn-glycero-3-phosphoethanolamine (Plasmanylethanolamine)
Galactosyl-2-acyl-1-alkyl-sn-glycerol
2, 9, 2, 3
K13510...
K18575
1-(1-Alkenyl)-sn-glycero-3-phospho-ethanolamine (Lysoplasmalogen)
1.14.99.19
K01019
2-Acyl-1-(1alkenyl)-sn-glycero-3-phosphoethanolamine (Plasmenylethanolamine)
0, 3, 1, 0
K13512
1-Alkyl-sn-glycero-3-phosphocholine (lyso PAF)
K13510
K08743
0, 3, 1, 0
Seminolipid
2-Acyl-1-alkyl-sn-glycero-3-phosphocholine (Plasmanylcholine)
1-(1-Alkenyl)-sn-glycerol
K01122...
1-(1-Alkenyl)-sn-glycero-3-phosphate
0, 4, 3, 3
K00993...
K01114...
2.3.1.-
2.6.-.-
2-Acyl-1-(1-alkenyl)-sn-glycero-3-phosphate (Plasmenic acid)
3.1.3.-
2-Acyl-1-(1-alkenyl)-sn-glycerol
2.7.8.22
1-(1-Alkenyl)-sn-glycero-3-phosphocholine
2.3.1.25
2-Acyl-1-(1-alkenyl)-sn-glycero-3-phosphocholine (Plasmenylcholine)
K18575
sn-Glycero-3-phosphocholine
00565 1/10/17
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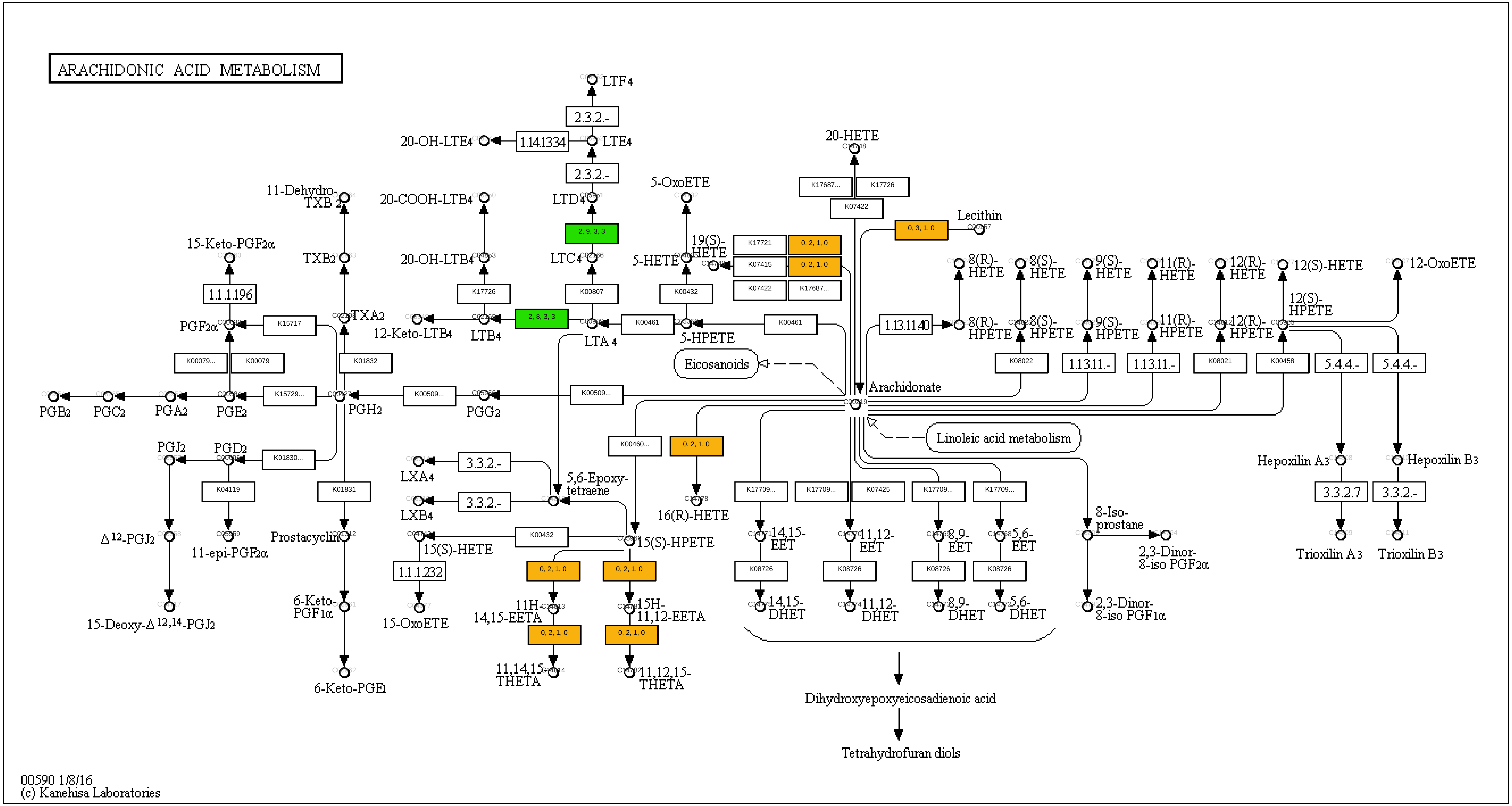
ARACHIDONIC ACID METABOLISM
LTF4
2.3.2.-
20-OH-LTE4
1.14.13.34
LTE4
2.3.2.-
11-Dehydro-TXB 2
20-COOH-LTB4
LTD4
5-OxoETE
20-HETE
K17687...
K17726
K07422
Lecithin
0, 3, 1, 0
2, 9, 3, 3
15-Keto-PGF2α
TXB2
20-OH-LTB4
LTC4
5-HETE
19(S)-HETE
K17721
0, 2, 1, 0
K07415
0, 2, 1, 0
K07422
K17687...
8(R)-HETE
8(S)-HETE
9(S)-HETE
11(R)-HETE
12(R)-HETE
12(S)-HETE
12-OxoETE
1.1.1.196
K17726
K00807
K00432
12(S)-HPETE
PGF2α
K15717
TXA2
12-Keto-LTB4
LTB4
2, 8, 3, 3
LTA 4
K00461
5-HPETE
K00461
1.13.11.40
8(R)-HPETE
8(S)-HPETE
9(S)-HPETE
11(R)-HPETE
12(R)-HPETE
K00079...
K00079
K01832
Eicosanoids
K08022
1.13.11.-
1.13.11.-
K08021
K00458
5.4.4.-
5.4.4.-
PGB2
PGC2
PGA2
PGE2
K15729...
PGH2
K00509...
PGG2
K00509...
Arachidonate
C00219
K00460...
0, 2, 1, 0
Linoleic acid metabolism
PGJ2
PGD2
K01830...
3.3.2.-
LXA4
5,6-Epoxy-tetraene
Hepoxilin A3
Hepoxilin B3
K04119
K01831
3.3.2.-
LXB4
16(R)-HETE
K17709...
K17709...
K07425
K17709...
K17709...
3.3.2.7
3.3.2.-
Δ12-PGJ2
11-epi-PGF2α
Prostacyclin
K00432
15(S)-HETE
15(S)-HPETE
14,15-EET
11,12-EET
8,9-EET
5,6-EET
8-Iso-prostane
2,3-Dinor-8-iso PGF2α
Trioxilin A3
Trioxilin B3
1.11.1.22
0, 2, 1, 0
0, 2, 1, 0
K08726
K08726
K08726
K08726
6-Keto-PGF1α
15-OxoETE
11H-14,15-EETA
15H-11,12-EETA
14,15-DHET
11,12-DHET
8,9-DHET
5,6-DHET
2,3-Dinor-8-iso PGF1α
15-Deoxy-Δ12,14-PGJ2
0, 2, 1, 0
0, 2, 1, 0
6-Keto-PGE1
11,14,15-THETA
11,12,15-THETA
Dihydroxyepoxyeicosadienoic acid
Tetrahydrofuran diols
00590 1/8/16
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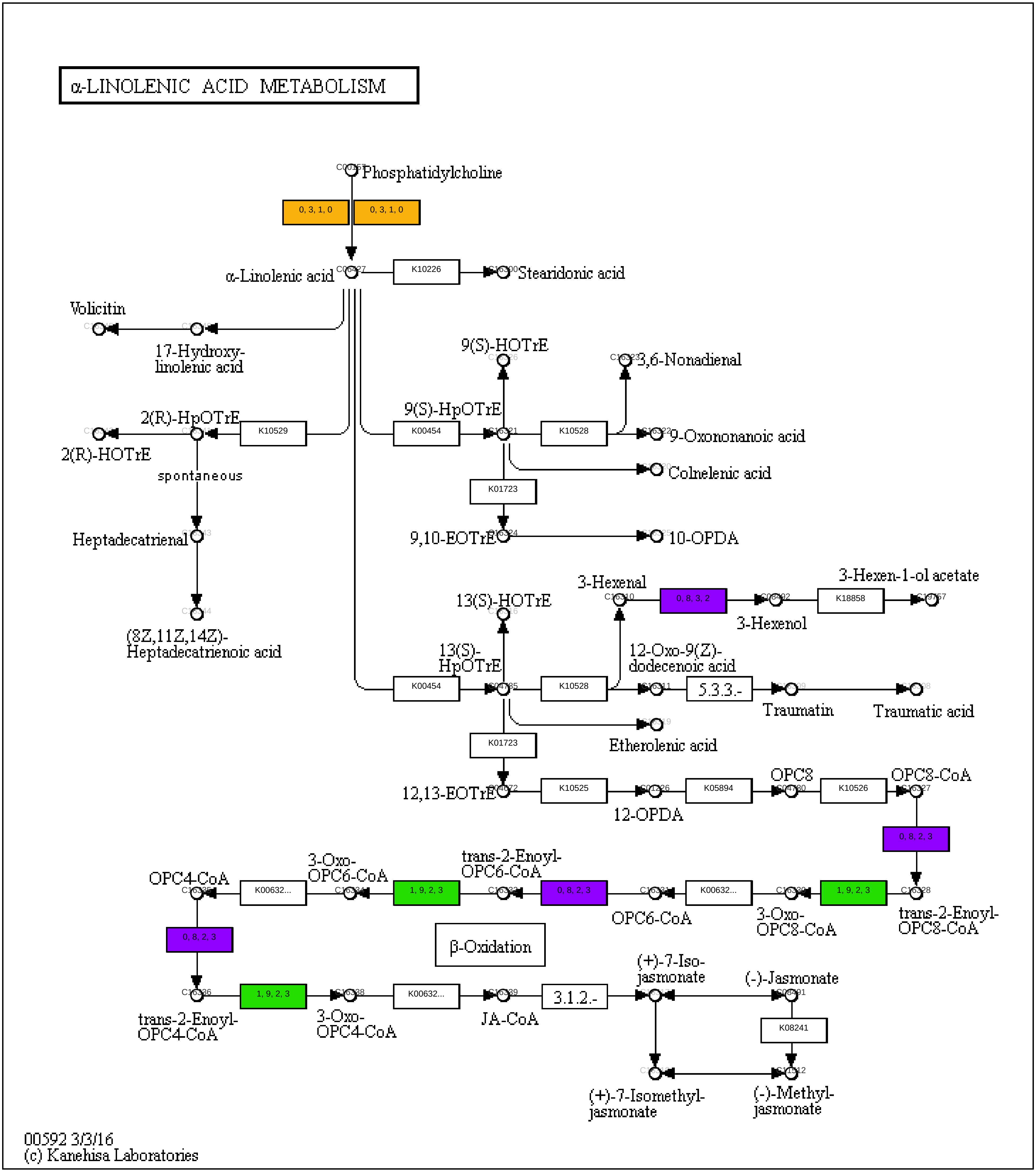
α-LINOLENIC ACID METABOLISM
C00157 Phosphatidylcholine
0, 3, 1, 0
0, 3, 1, 0
α-Linolenic acid C06427
K10226
C16300 Stearidonic acid
Volicitin
17-Hydroxy-linolenic acid
9(S)-HOTrE
C16323 3,6-Nonadienal
2(R)-HpOTrE
K10529
2(R)-HOTrE
spontaneous
9(S)-HpOTrE
K00454
C16321
K10528
C16322 9-Oxononanoic acid
Colnelenic acid
K01723
9,10-EOTrE C16324
10-OPDA
Heptadecatrienal
(8Z,11Z,14Z)-Heptadecatrienoic acid
3-Hexenal C16310
0, 8, 3, 2
C08492
3-Hexenol
K18858
3-Hexen-1-ol acetate C19757
13(S)-HOTrE
13(S)-HpOTrE
K00454
C04785
K10528
12-Oxo-9(Z)-dodecenoic acid
C16311
5.3.3.-
Traumatin
Traumatic acid
Etherolenic acid
K01723
12,13-EOTrE C04672
K10525
C01226
12-OPDA
K05894
OPC8 C04780
K10526
OPC8-CoA C16327
0, 8, 2, 3
C16328 trans-2-Enoyl-OPC8-CoA
1, 9, 2, 3
C16330 3-Oxo-OPC8-CoA
K00632...
C16331 OPC6-CoA
0, 8, 2, 3
C16332 trans-2-Enoyl-OPC6-CoA
1, 9, 2, 3
C16334 3-Oxo-OPC6-CoA
K00632...
OPC4-CoA C16335
0, 8, 2, 3
β-Oxidation
C16336 trans-2-Enoyl-OPC4-CoA
1, 9, 2, 3
C16338 3-Oxo-OPC4-CoA
K00632...
C16339 JA-CoA
3.1.2.-
(+)-7-Iso-jasmonate
(-)-Jasmonate C08491
K08241
(+)-7-Isomethyl-jasmonate
C11512 (-)-Methyl-jasmonate
00592 3/3/16
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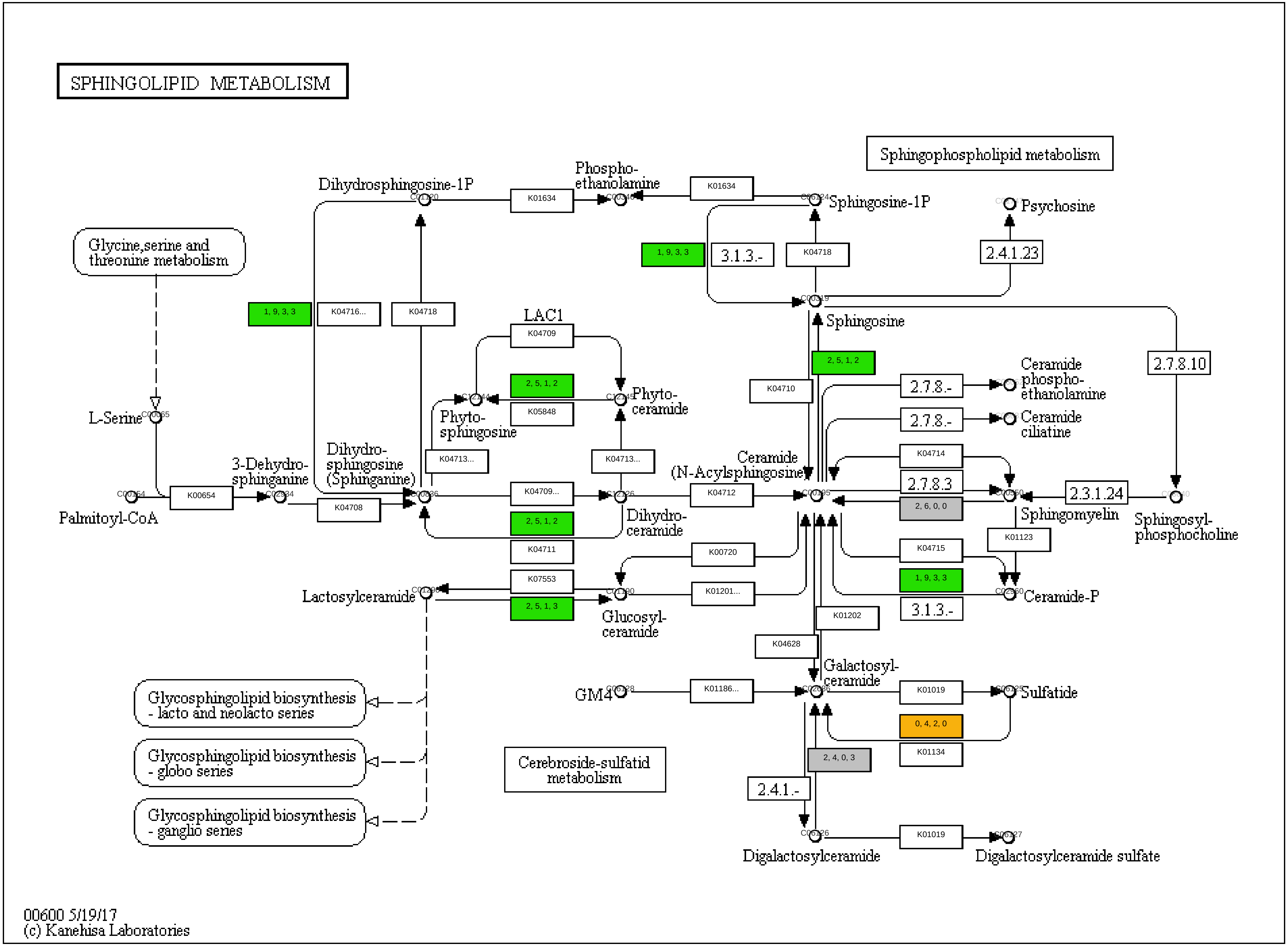

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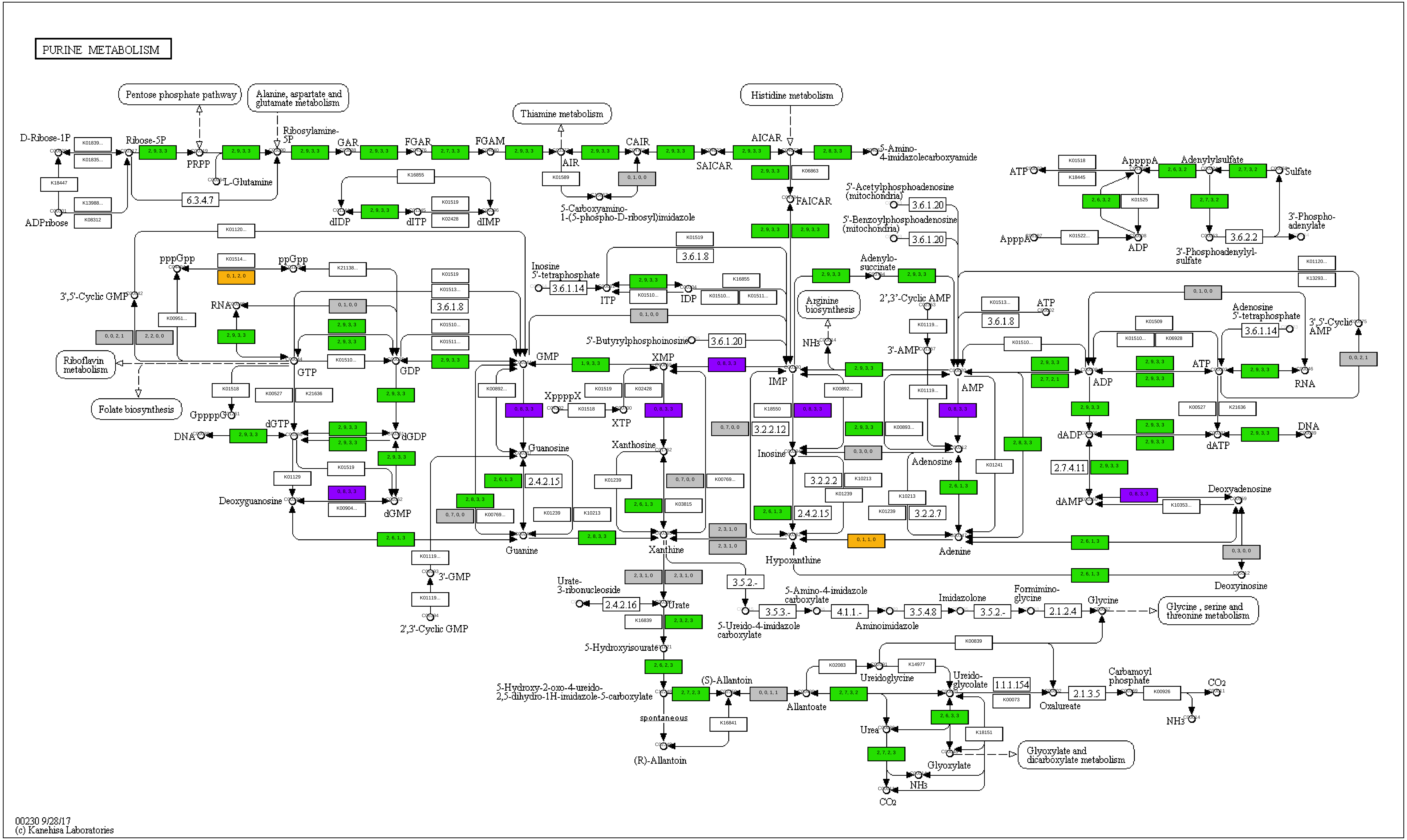
4. Nucleotide metabolism

MAP	PATHWAY
230	Purine metabolism
240	Pyrimidine metabolism


PURINE METABOLISM
Pentose phosphate pathway
Alanine, aspartate and glutamate metabolism
Thiamine metabolism
Histidine metabolism
D-Ribose-1P
Ribose-5P
PRPP
Ribosylamine-5P
GAR
FGAR
FGAM
AIR
CAIR
SAICAR
AICAR
5-Amino-4-imidazolecarboxyamide
FAICAR
L-Glutamine
ADPribose
6.3.4.7
dIDP
dITP
dIMP
5-Carboxyamino-1-(5-phospho-D-ribosyl)imidazole
5'-Acetylphosphoadenosine (mitochondria)
5'-Benzoylphosphoadenosine (mitochondria)
3.6.1.20
ATP
ApppA
Adenylylsulfate
Sulfate
ADP
AppppA
3'-Phosphoadenylyl-sulfate
3'-Phospho-adenylate
3.6.2.2
pppGpp
ppGpp
3',5'-Cyclic GMP
RNA
Riboflavin metabolism
Folate biosynthesis
GTP
GDP
GMP
GppppG
dGTP
dGDP
dGMP
DNA
Deoxyguanosine
Guanosine
Guanine
3'-GMP
2',3'-Cyclic GMP
3.6.1.8
Inosine 5'-tetraphosphate
3.6.1.14
ITP
IDP
3.6.1.8
5'-Butyrylphosphoinosine
3.6.1.20
XMP
XppppX
XTP
Xanthosine
Xanthine
2.4.2.15
Arginine biosynthesis
NH3
Adenylo-succinate
2',3'-Cyclic AMP
3'-AMP
IMP
AMP
3.2.2.12
Inosine
Adenosine
3.2.2.2
2.4.2.15
3.2.2.7
Hypoxanthine
Adenine
ATP
3.6.1.8
Adenosine 5'-tetraphosphate
3.6.1.14
3',5'-Cyclic AMP
ADP
ATP
RNA
dADP
dATP
DNA
2.7.4.11
dAMP
Deoxyadenosine
Deoxyinosine
Urate-3-ribonucleoside
2.4.2.16
Urate
3.5.2.-
5-Amino-4-imidazole carboxylate
3.5.3.-
4.1.1.-
Aminoimidazole
3.5.4.8
Imidazolone
3.5.2.-
Formimino-glycine
2.1.2.4
Glycine
Glycine, serine and threonine metabolism
5-Ureido-4-imidazole carboxylate
5-Hydroxyisourate
5-Hydroxy-2-oxo-4-ureido-2,5-dihydro-1H-imidazole-5-carboxylate
(S)-Allantoin
spontaneous
(R)-Allantoin
Allantoate
Ureidoglycine
Ureido-glycolate
1.1.1.154
Oxalureate
2.1.3.5
Carbamoyl phosphate
CO2
NH3
Urea
Glyoxylate
Glyoxylate and dicarboxylate metabolism
CO2
NH3
00230 9/28/17
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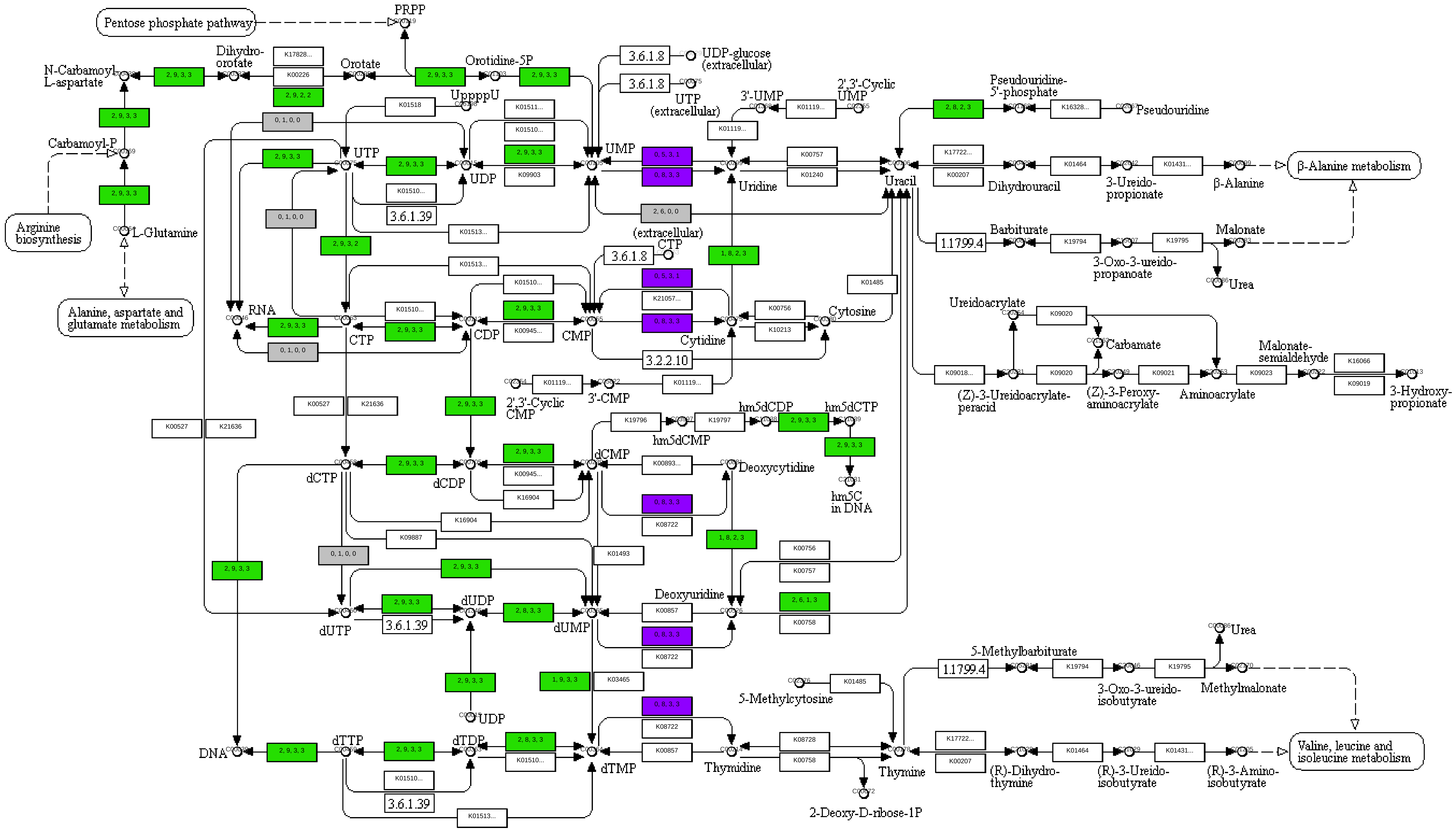
PYRIMIDINE METABOLISM



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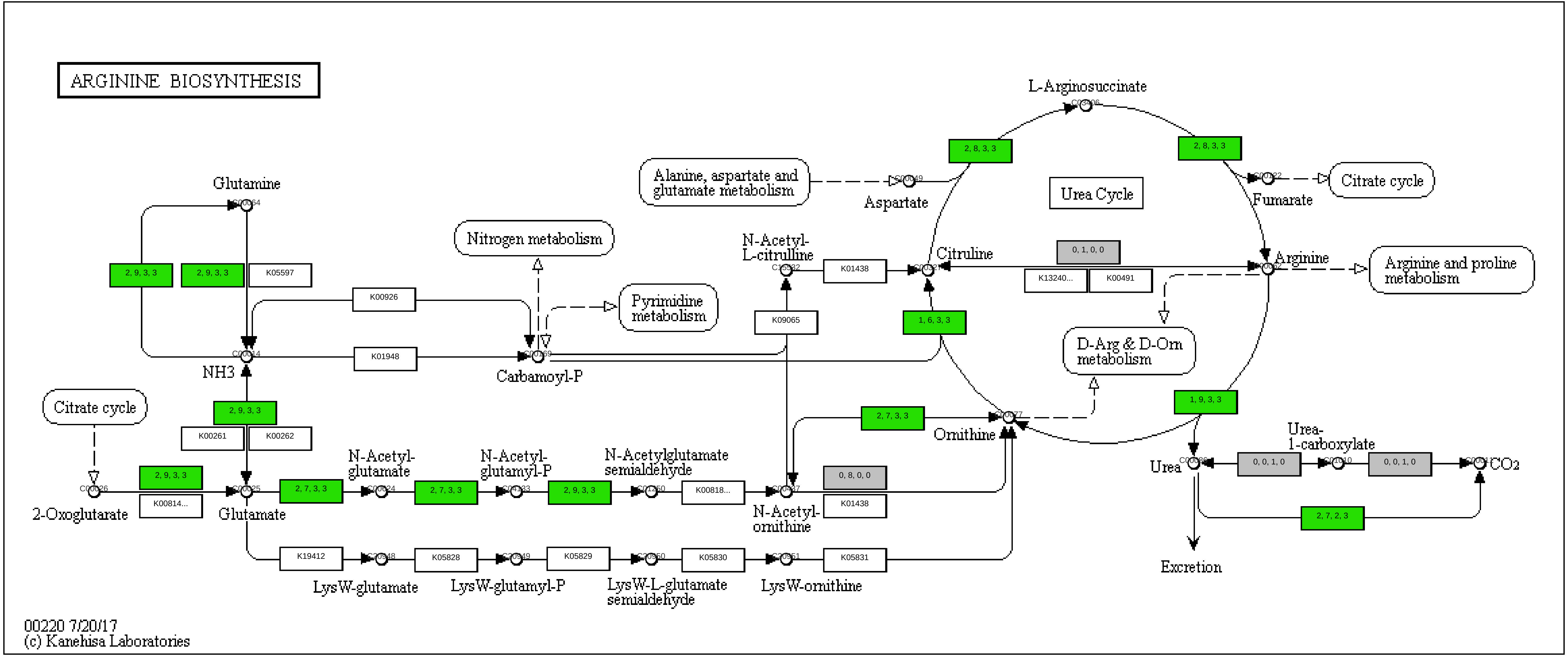
5. Amino Acid metabolism

MAP	PATHWAY
220	Arginine biosynthesis
250	Alanine, aspartate and glutamate metabolism
260	Glycine, serine and threonine metabolism
270	Cysteine and methionine metabolism
280	Valine, leucine and isoleucine degradation
290	Valine, leucine and isoleucine biosynthesis
300	Lysine biosynthesis
310	Lysine degradation
330	Arginine and proline metabolism
340	Histidine metabolism
350	Tyrosine metabolism
360	Phenylalanine metabolism
380	Tryptophan metabolism
400	Phenylalanine, tyrosine and tryptophan biosynthesis


ARGININE BIOSYNTHESIS
Glutamine
C00064
2, 9, 3, 3
2, 9, 3, 3
K05597
K00926
K01948
C00014
NH3
Nitrogen metabolism
Pyrimidine metabolism
C00169
Carbamoyl-P
2, 9, 3, 3
K00261
K00262
Citrate cycle
2, 9, 3, 3
K00814...
C00026
2-Oxoglutarate
C00025
Glutamate
2, 7, 3, 3
N-Acetyl-glutamate
C00624
2, 7, 3, 3
N-Acetyl-glutamyl-P
C04133
2, 9, 3, 3
N-Acetylglutamate semialdehyde
C01250
K00818...
C00437
N-Acetyl-ornithine
0, 8, 0, 0
K01438
K19412
C20948
LysW-glutamate
K05828
C20949
LysW-glutamyl-P
K05829
C20950
LysW-L-glutamate semialdehyde
K05830
C20951
LysW-ornithine
K05831
N-Acetyl-L-citrulline
C15532
K01438
K09065
Alanine, aspartate and glutamate metabolism
C00049
Aspartate
2, 8, 3, 3
L-Arginosuccinate
C03406
2, 8, 3, 3
C00122
Fumarate
Citrate cycle
Urea Cycle
Citruline
C00327
0, 1, 0, 0
K13240...
K00491
1, 6, 3, 3
Arginine
C00062
Arginine and proline metabolism
D-Arg & D-Orn metabolism
2, 7, 3, 3
C00077
Ornithine
1, 9, 3, 3
Urea
C00086
0, 0, 1, 0
Urea-1-carboxylate
C01010
0, 0, 1, 0
C00011
CO2
2, 7, 2, 3
Excretion
00220 7/20/17
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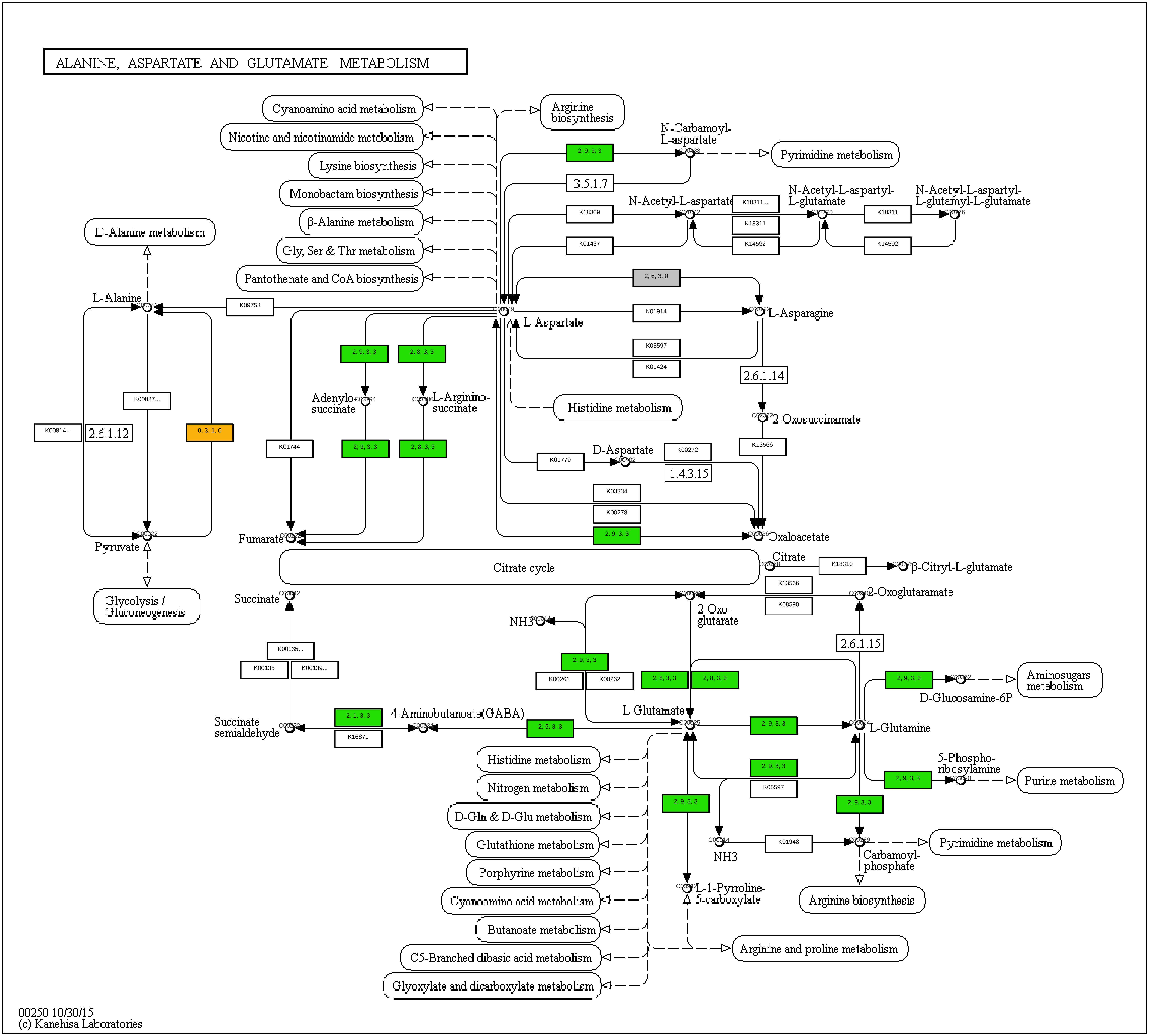
ALANINE, ASPARTATE AND GLUTAMATE METABOLISM
Cyanoamino acid metabolism
Nicotine and nicotinamide metabolism
Lysine biosynthesis
Monobactam biosynthesis
β-Alanine metabolism
Gly, Ser & Thr metabolism
Pantothenate and CoA biosynthesis
Arginine biosynthesis
D-Alanine metabolism
N-Carbamoyl-L-aspartate
Pyrimidine metabolism
2, 9, 3, 3
3.5.1.7
N-Acetyl-L-aspartate
N-Acetyl-L-aspartyl-L-glutamate
N-Acetyl-L-aspartyl-L-glutamyl-L-glutamate
K18309
K18311...
K18311
K14592
K01437
K18311
K14592
2, 6, 3, 0
L-Alanine
K09758
L-Aspartate
K01914
L-Asparagine
K05597
K01424
2.6.1.14
2, 9, 3, 3
2, 8, 3, 3
Adenylo-succinate
L-Argino-succinate
K00827...
K00814...
2.6.1.12
0, 3, 1, 0
K01744
2, 9, 3, 3
2, 8, 3, 3
Histidine metabolism
2-Oxosuccinamate
K13566
D-Aspartate
K01779
K00272
1.4.3.15
K03334
K00278
2, 9, 3, 3
Fumarate
Pyruvate
Oxaloacetate
Glycolysis / Gluconeogenesis
Citrate cycle
Citrate
K18310
β-Citryl-L-glutamate
K13566
K08590
2-Oxoglutaramate
Succinate
NH3
2-Oxo-glutarate
2.6.1.15
2, 9, 3, 3
K00261
K00262
2, 8, 3, 3
2, 8, 3, 3
K00135...
K00135
K00139...
2, 9, 3, 3
Aminosugars metabolism
D-Glucosamine-6P
Succinate semialdehyde
2, 1, 3, 3
K16871
4-Aminobutanoate(GABA)
2, 5, 3, 3
L-Glutamate
2, 9, 3, 3
L-Glutamine
5-Phospho-ribosylamine
2, 9, 3, 3
Purine metabolism
Histidine metabolism
Nitrogen metabolism
D-Gln & D-Glu metabolism
Glutathione metabolism
Porphyrine metabolism
Cyanoamino acid metabolism
Butanoate metabolism
C5-Branched dibasic acid metabolism
Glyoxylate and dicarboxylate metabolism
2, 9, 3, 3
K05597
2, 9, 3, 3
2, 9, 3, 3
NH3
K01948
Carbamoyl-phosphate
Pyrimidine metabolism
Arginine biosynthesis
L-1-Pyrroline-5-carboxylate
Arginine and proline metabolism
00250 10/30/15
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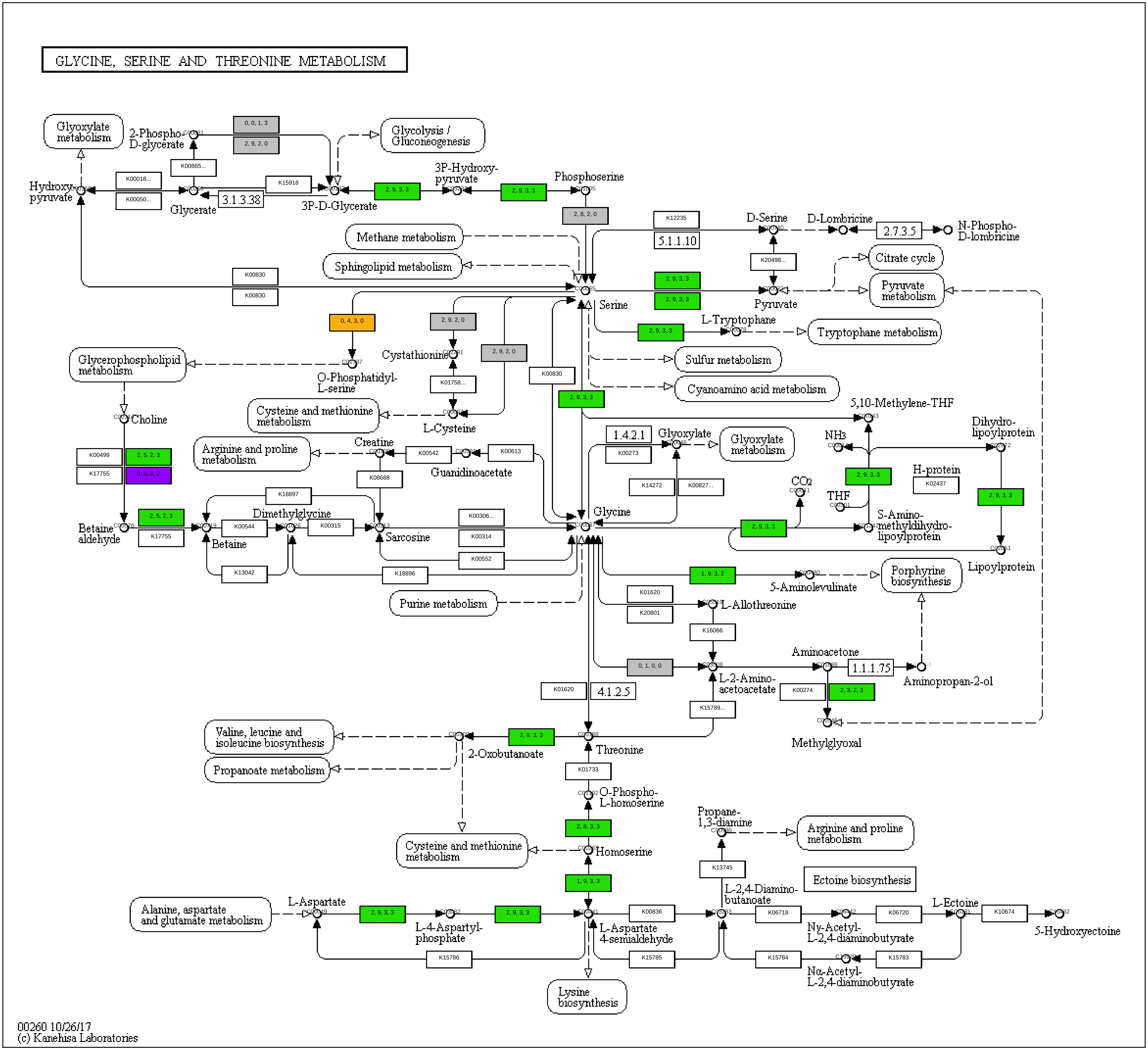
GLYCINE, SERINE AND THREONINE METABOLISM
Glyoxylate metabolism
2-Phospho-D-glycerate
0, 0, 1, 3
2, 9, 2, 0
Glycolysis / Gluconeogenesis
K00865...
K00018...
K00050...
K15918
3.1.3.38
Hydroxy-pyruvate
Glycerate
3P-D-Glycerate
2, 9, 3, 3
3P-Hydroxy-pyruvate
2, 9, 3, 3
Phosphoserine
2, 8, 2, 0
K12235
5.1.1.10
D-Serine
D-Lombricine
2.7.3.5
N-Phospho-D-lombricine
Methane metabolism
Sphingolipid metabolism
K20498...
Citrate cycle
K00830
K00830
2, 9, 3, 3
2, 9, 3, 3
Pyruvate metabolism
Serine
Pyruvate
0, 4, 3, 0
2, 9, 2, 0
2, 9, 2, 0
L-Tryptophane
2, 9, 3, 3
Tryptophane metabolism
Glycerophospholipid metabolism
O-Phosphatidyl-L-serine
Cystathionine
K01758...
K00830
Sulfur metabolism
Cyanoamino acid metabolism
2, 9, 3, 3
Choline
Cysteine and methionine metabolism
L-Cysteine
5,10-Methylene-THF
Dihydro-lipoylprotein
Creatine
1.4.2.1
Glyoxylate
Glyoxylate metabolism
NH3
K00499
2, 5, 2, 3
K17755
0, 8, 3, 2
Arginine and proline metabolism
K00542
K00613
K00273
2, 9, 3, 3
H-protein
K02437
Guanidinoacetate
K08688
K14272
K00827...
CO2
THF
2, 9, 3, 3
K18897
Dimethylglycine
Glycine
S-Amino-methyldihydro-lipoylprotein
Betaine aldehyde
2, 5, 2, 3
K00544
K00315
K00306...
K00314
K00552
2, 9, 3, 3
K17755
Betaine
Sarcosine
Lipoylprotein
K13042
K18896
1, 9, 3, 2
5-Aminolevulinate
Porphyrine biosynthesis
Purine metabolism
K01620
K20801
L-Allothreonine
K16066
Aminoacetone
0, 1, 0, 0
1.1.1.75
Aminopropan-2-ol
L-2-Amino-acetoacetate
K01620
4.1.2.5
K00274
2, 3, 2, 3
K15789...
Methylglyoxal
Valine, leucine and isoleucine biosynthesis
2, 9, 3, 3
2-Oxobutanoate
Threonine
Propanoate metabolism
K01733
O-Phospho-L-homoserine
2, 8, 3, 3
Propane-1,3-diamine
Arginine and proline metabolism
Cysteine and methionine metabolism
Homoserine
K13745
Ectoine biosynthesis
1, 9, 3, 3
L-2,4-Diamino-butanoate
Alanine, aspartate and glutamate metabolism
L-Aspartate
2, 9, 3, 3
2, 9, 3, 3
K00836
K06718
K06720
L-Ectoine
K10674
L-4-Aspartyl-phosphate
L-Aspartate 4-semialdehyde
Nγ-Acetyl-L-2,4-diaminobutyrate
5-Hydroxyectoine
K15786
K15785
K15784
K15783
Nα-Acetyl-L-2,4-diaminobutyrate
Lysine biosynthesis
00260 10/26/17
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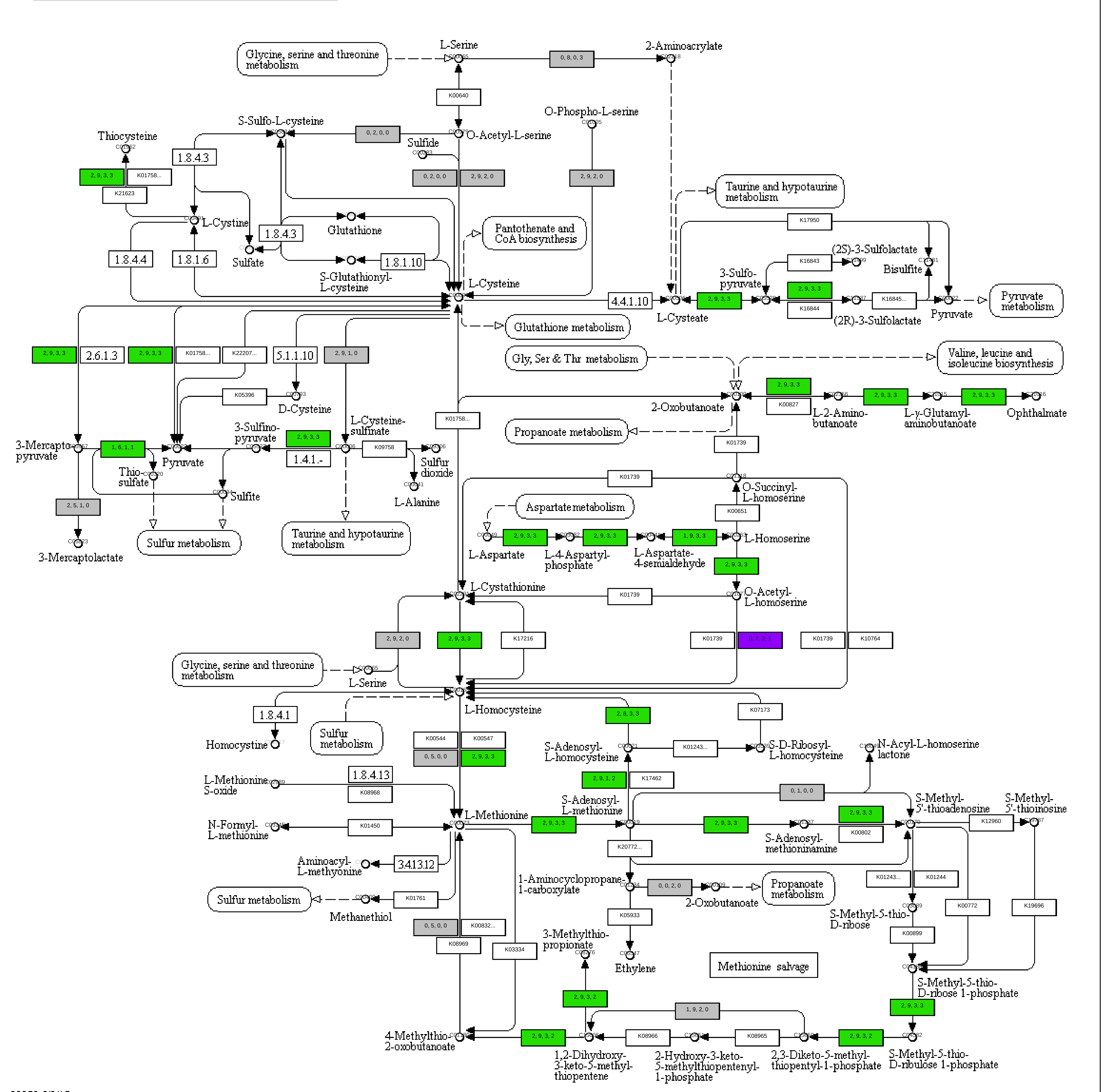
CYSTEINE AND METHIONINE METABOLISM



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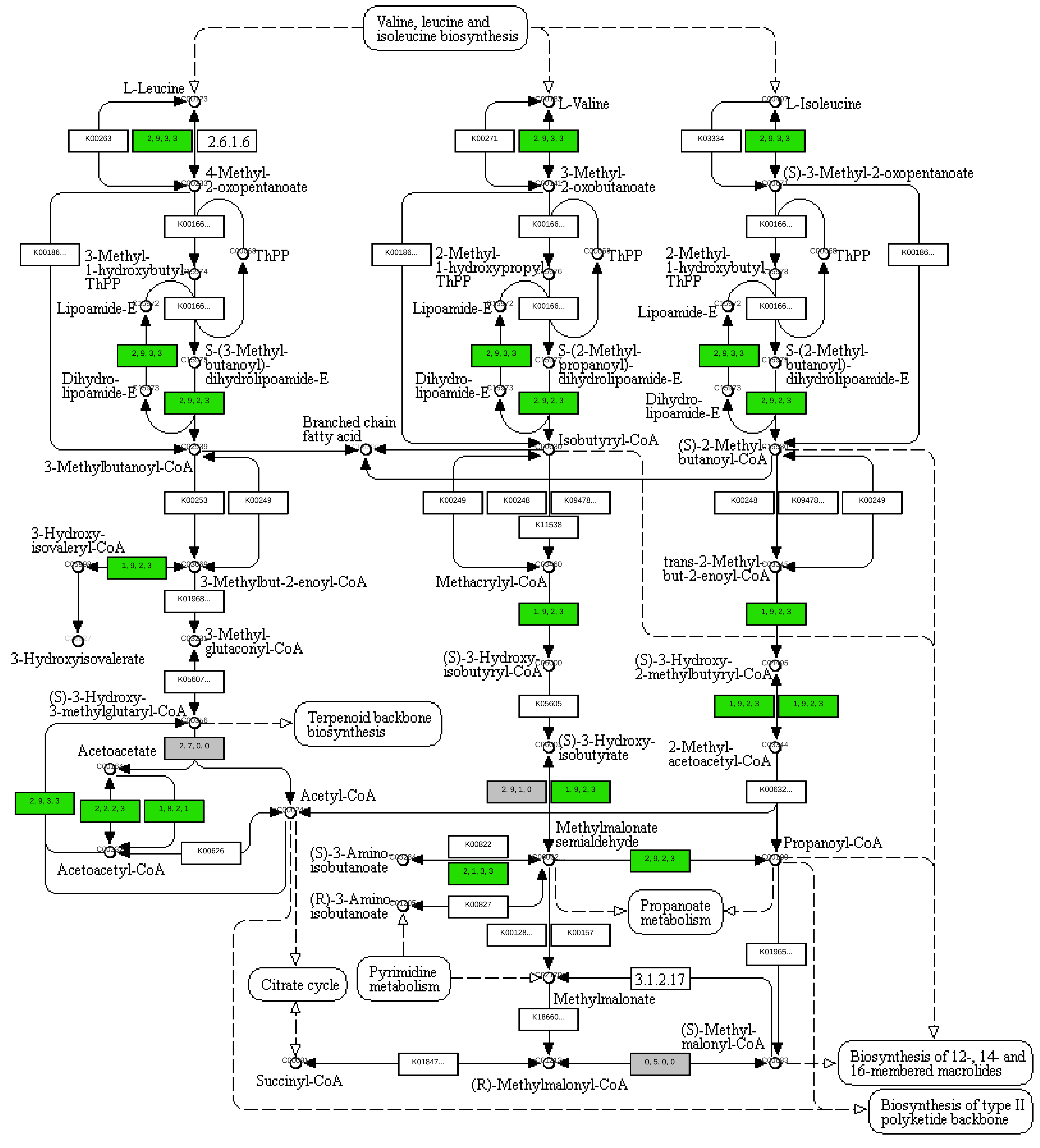
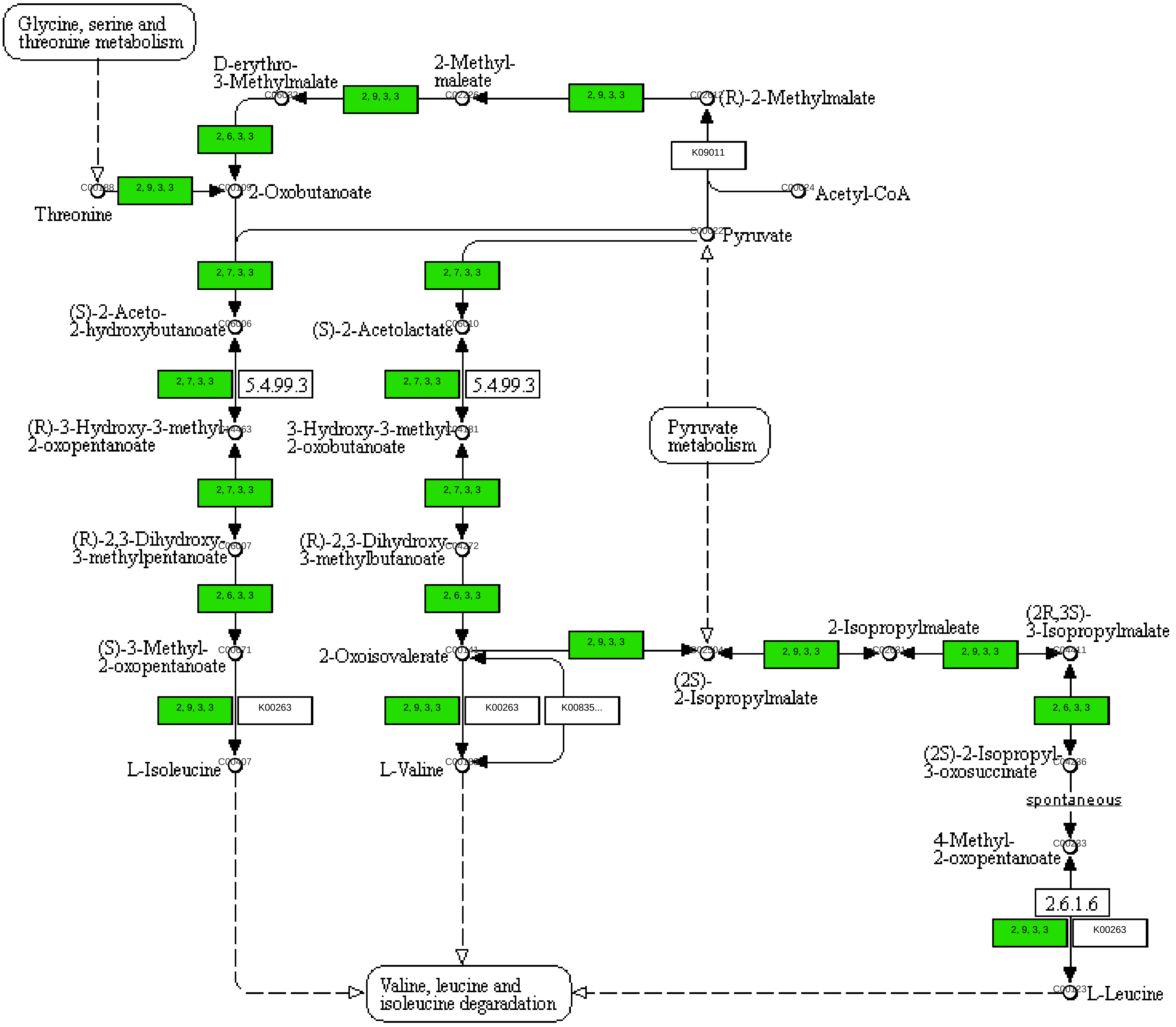
VALINE, LEUCINE AND ISOLEUCINE DEGRADATION



VALINE, LEUCINE AND ISOLEUCINE BIOSYNTHESIS



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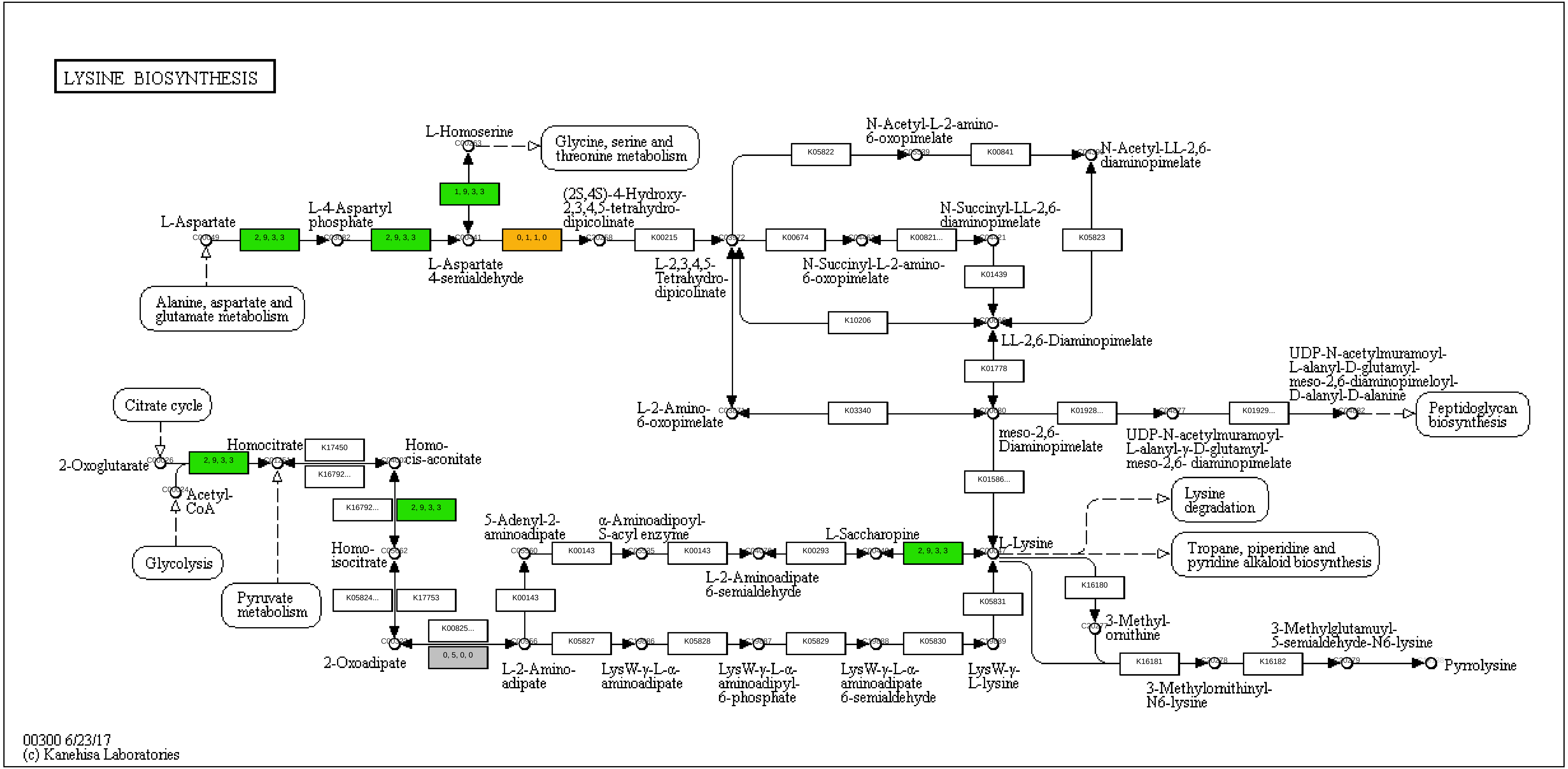
LYSINE BIOSYNTHESIS
L-Homoserine
C00263
Glycine, serine and threonine metabolism
1, 9, 3, 3
L-Aspartate
C00049
2, 9, 3, 3
L-4-Aspartyl phosphate
C03082
2, 9, 3, 3
C00441
L-Aspartate 4-semialdehyde
0, 1, 1, 0
(2S,4S)-4-Hydroxy-2,3,4,5-tetrahydrodipicolinate
C20258
K00215
C03972
L-2,3,4,5-Tetrahydrodipicolinate
Alanine, aspartate and glutamate metabolism
K05822
N-Acetyl-L-2-amino-6-oxopimelate
C05539
K00841
C04390
N-Acetyl-LL-2,6-diaminopimelate
K00674
C04462
K00821...
N-Succinyl-LL-2,6-diaminopimelate
C04421
N-Succinyl-L-2-amino-6-oxopimelate
K05823
K01439
K10206
C00666
LL-2,6-Diaminopimelate
K01778
L-2-Amino-6-oxopimelate
C03871
K03340
C00680
meso-2,6-Diaminopimelate
K01928...
C04877
UDP-N-acetylmuramoyl-L-alanyl-γ-D-glutamyl-meso-2,6- diaminopimelate
K01929...
UDP-N-acetylmuramoyl-L-alanyl-D-glutamyl-meso-2,6-diaminopimeloyl-D-alanyl-D-alanine
C04882
Peptidoglycan biosynthesis
Citrate cycle
2-Oxoglutarate
C00026
2, 9, 3, 3
Homocitrate
C01251
K17450
K16792...
Homo-cis-aconitate
C04002
C00024
Acetyl-CoA
Glycolysis
Pyruvate metabolism
K16792...
2, 9, 3, 3
Homo-isocitrate
C05662
K05824...
K17753
C00322
2-Oxoadipate
K00825...
0, 5, 0, 0
K01586...
Lysine degradation
5-Adenyl-2-aminoadipate
C05560
K00143
α-Aminoadipoyl-S-acyl enzyme
C05535
K00143
C04076
L-2-Aminoadipate 6-semialdehyde
K00293
L-Saccharopine
C00449
2, 9, 3, 3
L-Lysine
C00047
Tropane, piperidine and pyridine alkaloid biosynthesis
K00143
C00956
L-2-Amino-adipate
K05827
C19886
LysW-γ-L-α-aminoadipate
K05828
C19887
LysW-γ-L-α-aminoadipyl-6-phosphate
K05829
C19888
LysW-γ-L-α-aminoadipate 6-semialdehyde
K05830
C19889
LysW-γ-L-lysine
K05831
K16180
C20277
3-Methyl-ornithine
K16181
3-Methylornithinyl-N6-lysine
C20278
K16182
3-Methylglutamuyl-5-semialdehyde-N6-lysine
C20279
C16138
Pyrrolysine
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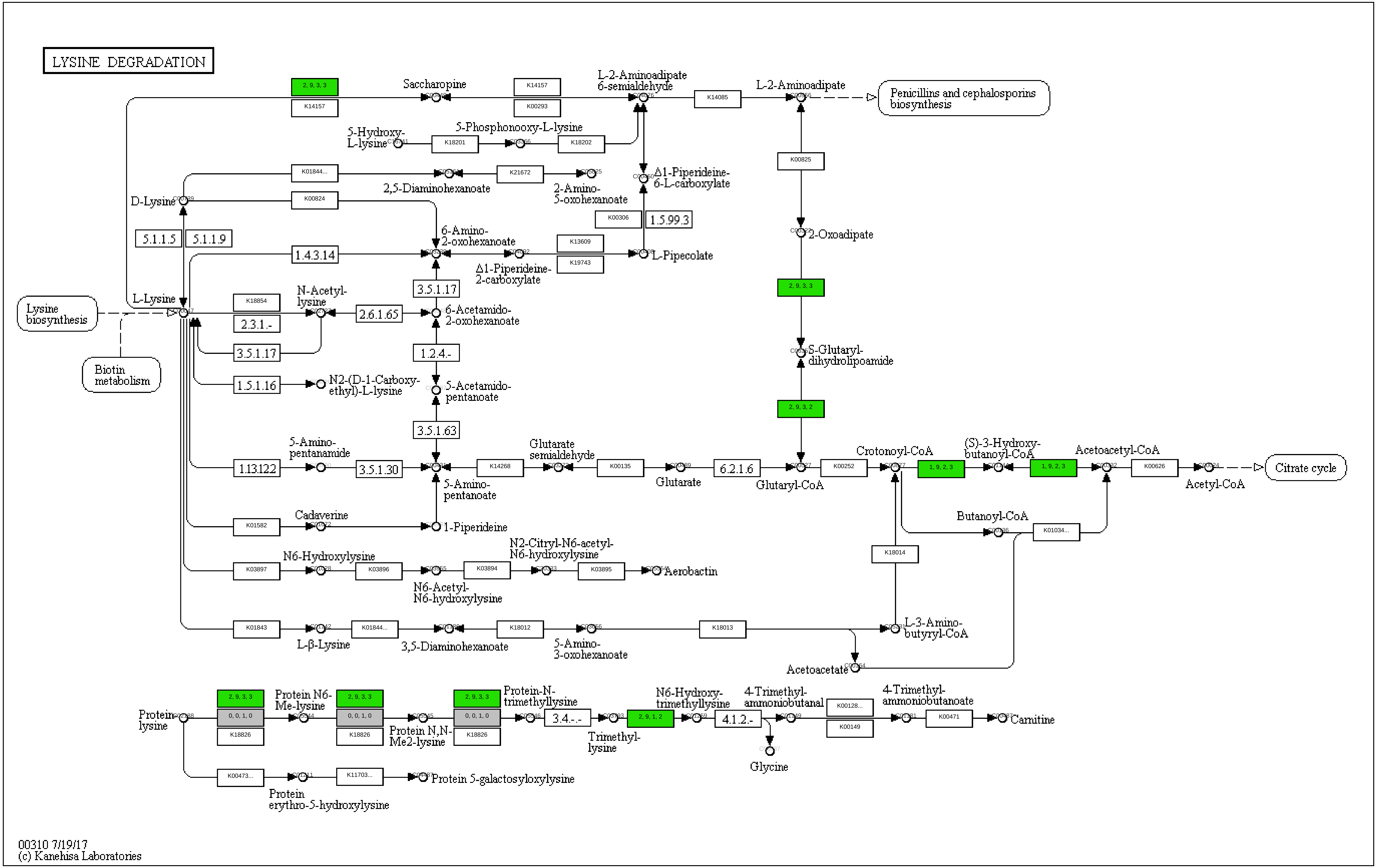
LYSINE DEGRADATION
2, 9, 3, 3
K14157
Saccharopine
K14157
K00293
L-2-Aminoadipate 6-semialdehyde
K14085
L-2-Aminoadipate
Penicillins and cephalosporins biosynthesis
5-Hydroxy-L-lysine
K18201
5-Phosphonooxy-L-lysine
K18202
K01844...
K21672
2,5-Diaminohexanoate
2-Amino-5-oxohexanoate
Δ1-Piperideine-6-L-carboxylate
K00825
D-Lysine
K00824
K00306
1.5.99.3
5.1.1.5
5.1.1.9
6-Amino-2-oxohexanoate
2-Oxoadipate
1.4.3.14
K13609
K19743
L-Pipecolate
Δ1-Piperideine-2-carboxylate
2, 9, 3, 3
Lysine biosynthesis
L-Lysine
K18854
N-Acetyl-lysine
3.5.1.17
2.6.1.65
6-Acetamido-2-oxohexanoate
2.3.1.-
Biotin metabolism
3.5.1.17
1.2.4.-
S-Glutaryl-dihydrolipoamide
1.5.1.16
N2-(D-1-Carboxy-ethyl)-L-lysine
5-Acetamido-pentanoate
2, 9, 3, 2
3.5.1.63
5-Amino-pentanamide
Glutarate semialdehyde
Crotonoyl-CoA
(S)-3-Hydroxy-butanoyl-CoA
Acetoacetyl-CoA
1.13.12.2
3.5.1.30
K14268
K00135
6.2.1.6
K00252
1, 9, 2, 3
1, 9, 2, 3
K00626
Citrate cycle
5-Amino-pentanoate
Glutarate
Glutaryl-CoA
Acetyl-CoA
Cadaverine
Butanoyl-CoA
K01582
1-Piperideine
K01034...
K18014
N2-Citryl-N6-acetyl-N6-hydroxylysine
N6-Hydroxylysine
K03897
K03896
K03894
K03895
Aerobactin
N6-Acetyl-N6-hydroxylysine
L-3-Amino-butyryl-CoA
K01843
K01844...
K18012
K18013
L-β-Lysine
3,5-Diaminohexanoate
5-Amino-3-oxohexanoate
Acetoacetate
2, 9, 3, 3
Protein N6-Me-lysine
2, 9, 3, 3
2, 9, 3, 3
Protein-N-trimethyllysine
N6-Hydroxy-trimethyllysine
4-Trimethyl-ammoniobutanal
4-Trimethyl-ammoniobutanoate
Protein-lysine
0, 0, 1, 0
0, 0, 1, 0
0, 0, 1, 0
3.4.-.-
2, 9, 1, 2
4.1.2.-
K00128...
K00471
Carnitine
K18826
K18826
K18826
Protein N,N-Me2-lysine
Trimethyl-lysine
K00149
Glycine
K00473...
K11703...
Protein 5-galactosyloxylysine
Protein erythro-5-hydroxylysine
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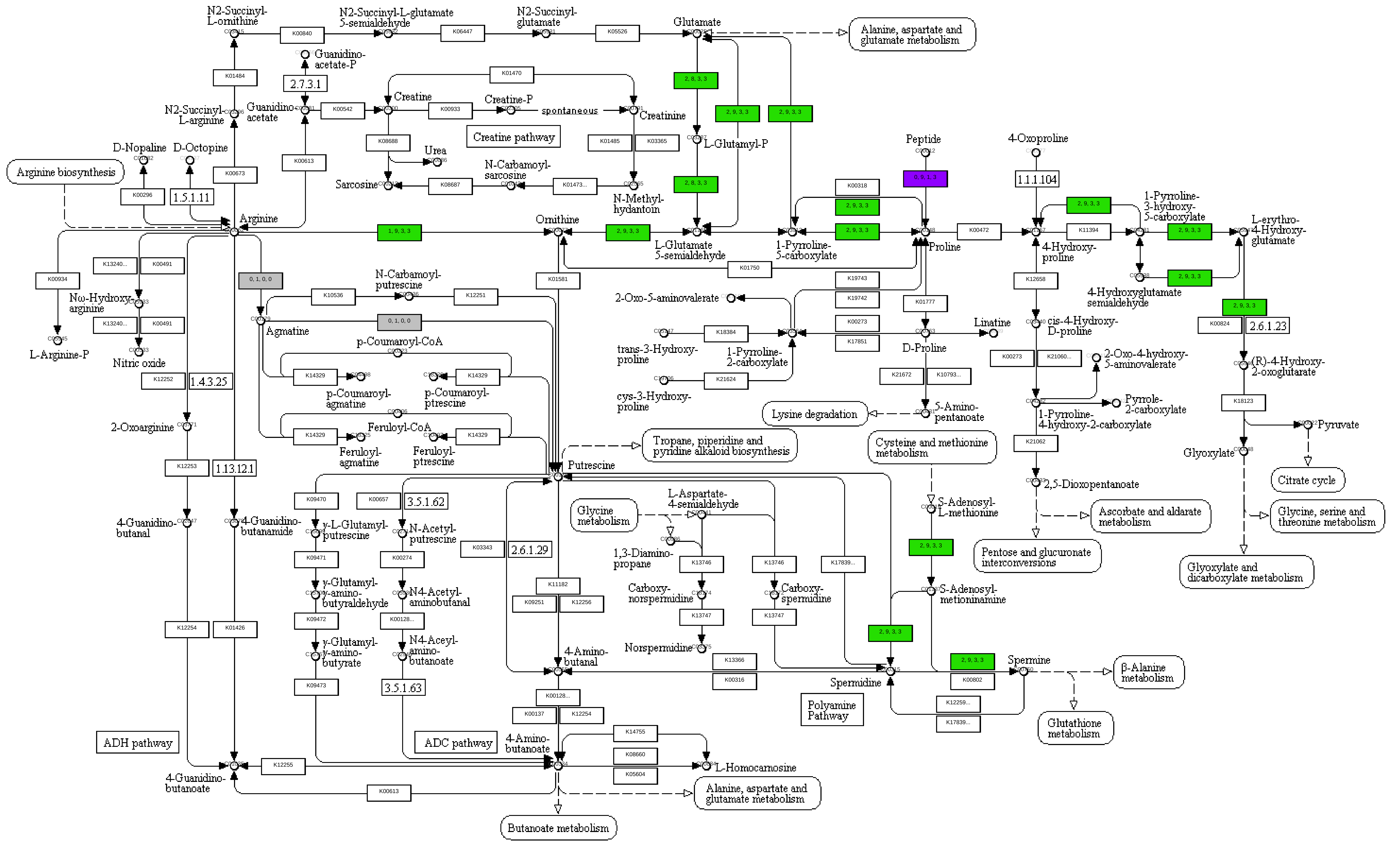
ARGININE AND PROLINE METABOLISM



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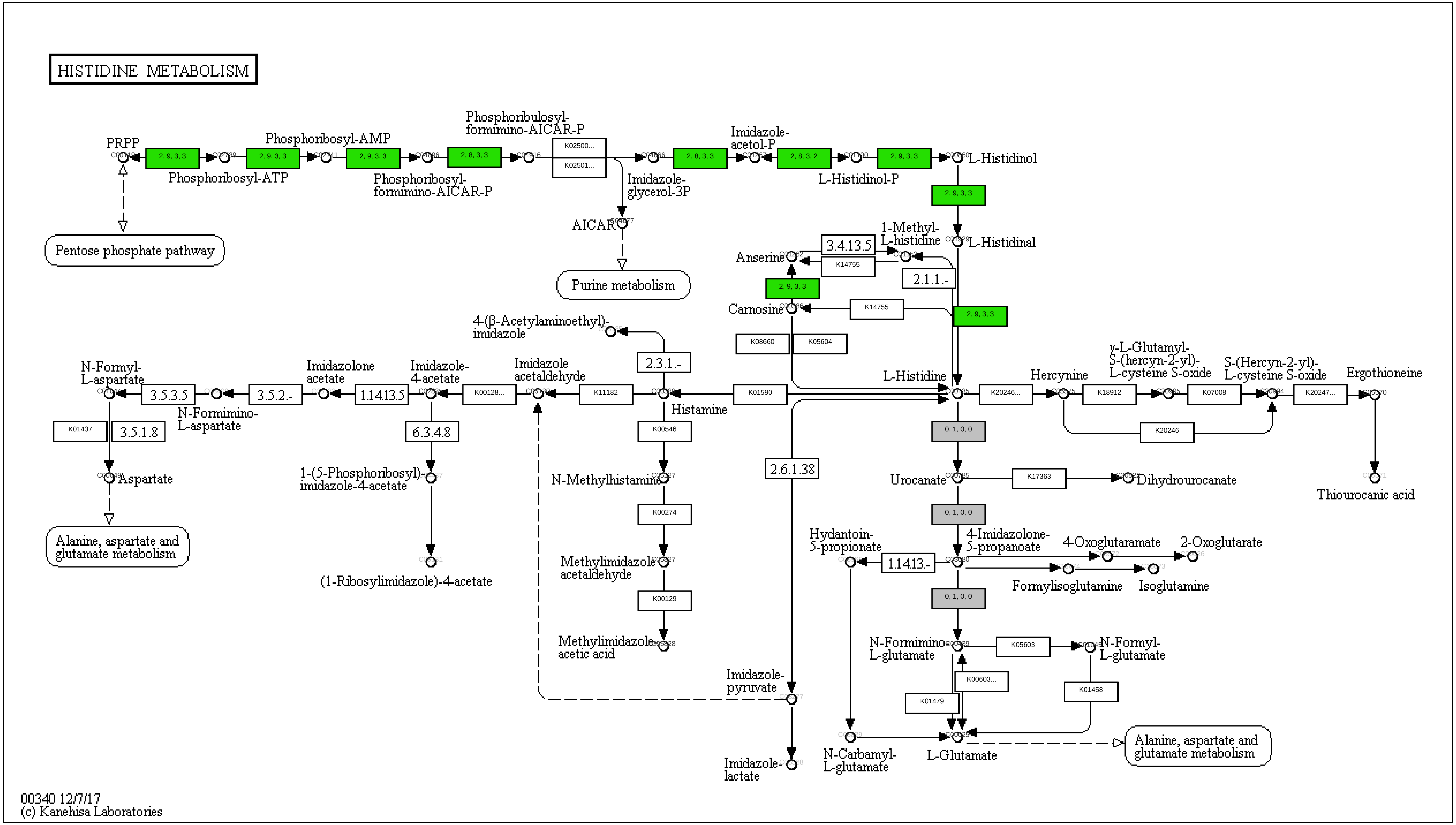
HISTIDINE METABOLISM
PRPP
Phosphoribosyl-ATP
Phosphoribosyl-AMP
Phosphoribosyl-formimino-AICAR-P
Phosphoribulosyl-formimino-AICAR-P
Imidazole-glycerol-3P
Imidazole-acetol-P
L-Histidinol-P
L-Histidinol
L-Histidinal
AICAR
Pentose phosphate pathway
Purine metabolism
2, 9, 3, 3
2, 8, 3, 3
2, 8, 3, 2
K02500...
K02501...
1-Methyl-L-histidine
Anserine
Carnosine
3.4.13.5
2.1.1.-
K14755
K08660
K05604
L-Histidine
Hercynine
γ-L-Glutamyl-S-(hercyn-2-yl)-L-cysteine S-oxide
S-(Hercyn-2-yl)-L-cysteine S-oxide
Ergothioneine
Thiourocanic acid
K20246...
K18912
K07008
K20247...
K20246
0, 1, 0, 0
Urocanate
Dihydrourocanate
K17363
4-Imidazolone-5-propanoate
4-Oxoglutaramate
2-Oxoglutarate
Formylisoglutamine
Isoglutamine
Hydantoin-5-propionate
1.14.13.-
N-Formimino-L-glutamate
N-Formyl-L-glutamate
K05603
K00603...
K01479
K01458
N-Carbamyl-L-glutamate
L-Glutamate
Alanine, aspartate and glutamate metabolism
2.6.1.38
Imidazole-pyruvate
Imidazole-lactate
K01590
Histamine
4-(β-Acetylaminoethyl)-imidazole
2.3.1.-
K11182
Imidazole acetaldehyde
K00128...
Imidazole-4-acetate
1.14.13.5
Imidazolone acetate
3.5.2.-
N-Formimino-L-aspartate
3.5.3.5
N-Formyl-L-aspartate
K01437
3.5.1.8
Aspartate
Alanine, aspartate and glutamate metabolism
6.3.4.8
1-(5-Phosphoribosyl)-imidazole-4-acetate
(1-Ribosylimidazole)-4-acetate
K00546
N-Methylhistamine
K00274
Methylimidazole acetaldehyde
K00129
Methylimidazole-acetic acid
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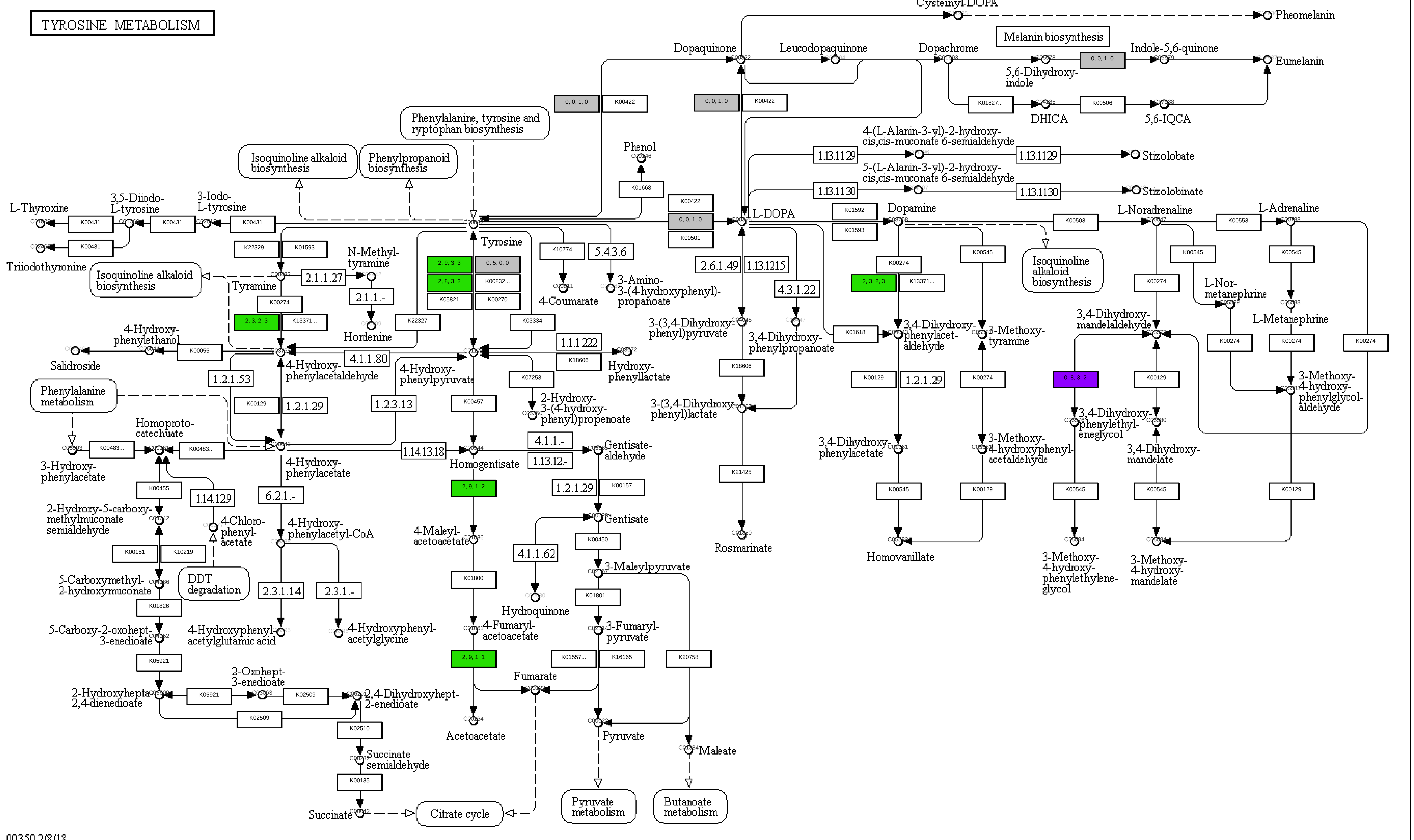
TYROSINE METABOLISM



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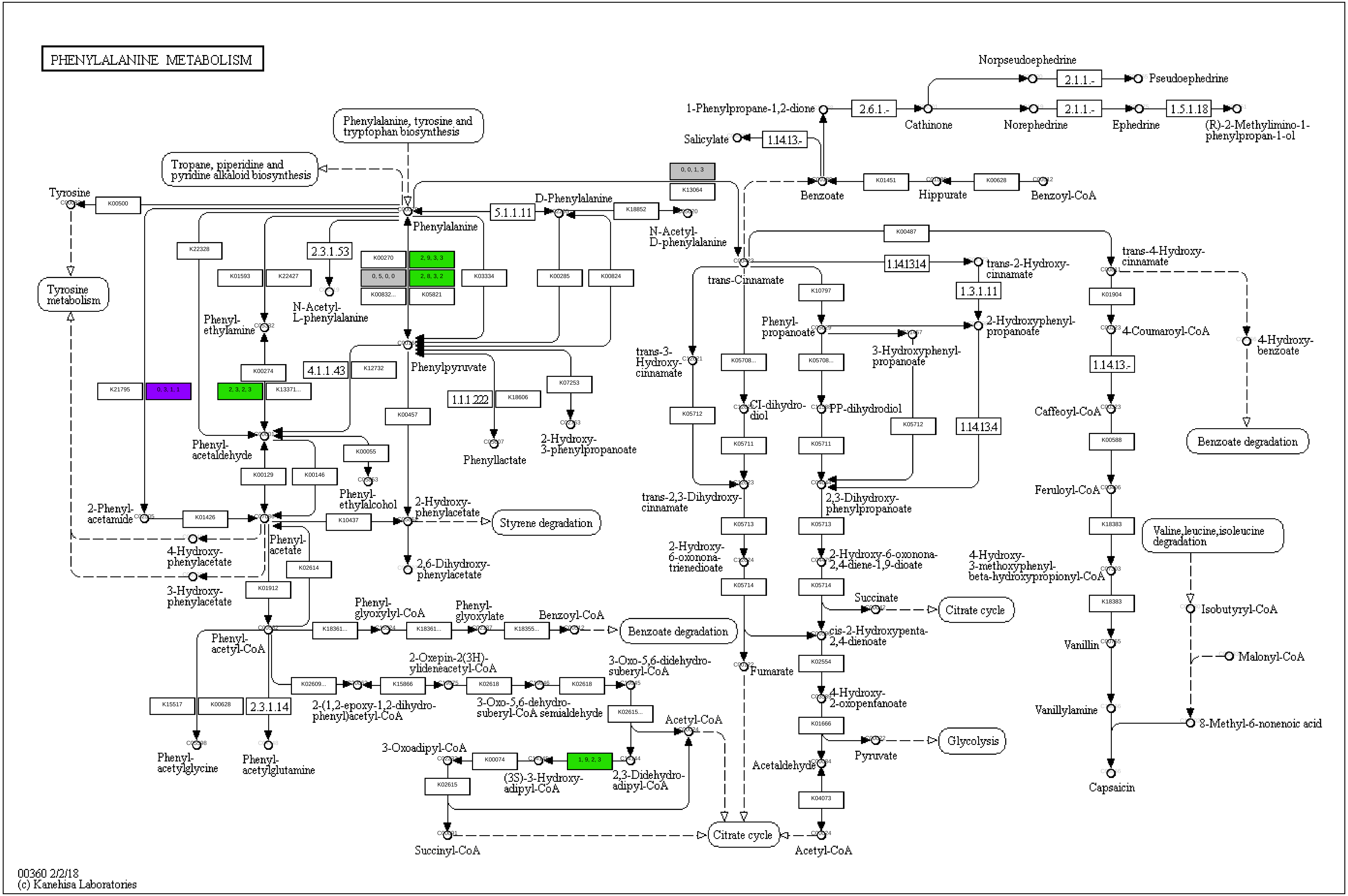
PHENYLALANINE METABOLISM
Phenylalanine, tyrosine and tryptophan biosynthesis
Tropane, piperidine and pyridine alkaloid biosynthesis
Tyrosine
K00500
Tyrosine metabolism
Phenylalanine
5.1.1.11
D-Phenylalanine
K18852
N-Acetyl-D-phenylalanine
K22328
K01593
K22427
2.3.1.53
N-Acetyl-L-phenylalanine
K00270
2, 9, 3, 3
0, 5, 0, 0
2, 8, 3, 2
K00832...
K05821
K03334
K00285
K00824
0, 0, 1, 3
K13064
Phenyl-ethylamine
K00274
4.1.1.43
K12732
Phenylpyruvate
K07253
K21795
0, 3, 1, 1
2, 3, 2, 3
K13371...
1.1.1.222
K18606
K00457
2-Hydroxy-3-phenylpropanoate
Phenyllactate
Phenyl-acetaldehyde
K00055
K00129
K00146
Phenyl-ethylalcohol
2-Hydroxy-phenylacetate
Styrene degradation
2-Phenyl-acetamide
K01426
K10437
4-Hydroxy-phenylacetate
Phenyl-acetate
K02614
2,6-Dihydroxy-phenylacetate
3-Hydroxy-phenylacetate
K01912
Phenyl-acetyl-CoA
K18361...
Phenyl-glyoxylyl-CoA
K18361...
Phenyl-glyoxylate
K18355...
Benzoyl-CoA
Benzoate degradation
2-Oxepin-2(3H)-ylideneacetyl-CoA
K02609...
K15866
K02618
K02618
3-Oxo-5,6-didehydro-suberyl-CoA
2-(1,2-epoxy-1,2-dihydro-phenyl)acetyl-CoA
3-Oxo-5,6-dehydro-suberyl-CoA semialdehyde
K02615...
Acetyl-CoA
K15517
K00628
2.3.1.14
Phenyl-acetylglycine
Phenyl-acetylglutamine
3-Oxoadipyl-CoA
K00074
1, 9, 2, 3
(3S)-3-Hydroxy-adipyl-CoA
2,3-Didehydro-adipyl-CoA
K02615
Succinyl-CoA
Citrate cycle
Norpseudoephedrine
2.1.1.-
Pseudoephedrine
1-Phenylpropane-1,2-dione
2.6.1.-
Cathinone
Norephedrine
2.1.1.-
Ephedrine
1.5.1.18
(R)-2-Methylimino-1-phenylpropan-1-ol
Salicylate
1.14.13.-
Benzoate
K01451
Hippurate
K00628
Benzoyl-CoA
K00487
trans-Cinnamate
1.14.13.14
trans-2-Hydroxy-cinnamate
trans-4-Hydroxy-cinnamate
K10797
1.3.1.11
K01904
Phenyl-propanoate
2-Hydroxyphenyl-propanoate
4-Coumaroyl-CoA
4-Hydroxy-benzoate
3-Hydroxyphenyl-propanoate
trans-3-Hydroxy-cinnamate
K05708...
K05708...
1.14.13.-
K05712
CI-dihydro-diol
PP-dihydrodiol
K05712
1.14.13.4
Caffeoyl-CoA
Benzoate degradation
K05711
K05711
K00588
trans-2,3-Dihydroxy-cinnamate
2,3-Dihydroxy-phenylpropanoate
Feruloyl-CoA
K05713
K05713
K18383
Valine, leucine, isoleucine degradation
2-Hydroxy-6-oxonona-trienedioate
2-Hydroxy-6-oxonona-2,4-diene-1,9-dioate
4-Hydroxy-3-methoxyphenyl-beta-hydroxypropionyl-CoA
K05714
K05714
Succinate
Citrate cycle
K18383
Isobutyryl-CoA
cis-2-Hydroxypenta-2,4-dienoate
Vanillin
Malonyl-CoA
Fumarate
K02554
4-Hydroxy-2-oxopentanoate
Vanillylamine
K01666
8-Methyl-6-nonenoic acid
Pyruvate
Glycolysis
Acetaldehyde
Capsaicin
K04073
Citrate cycle
Acetyl-CoA
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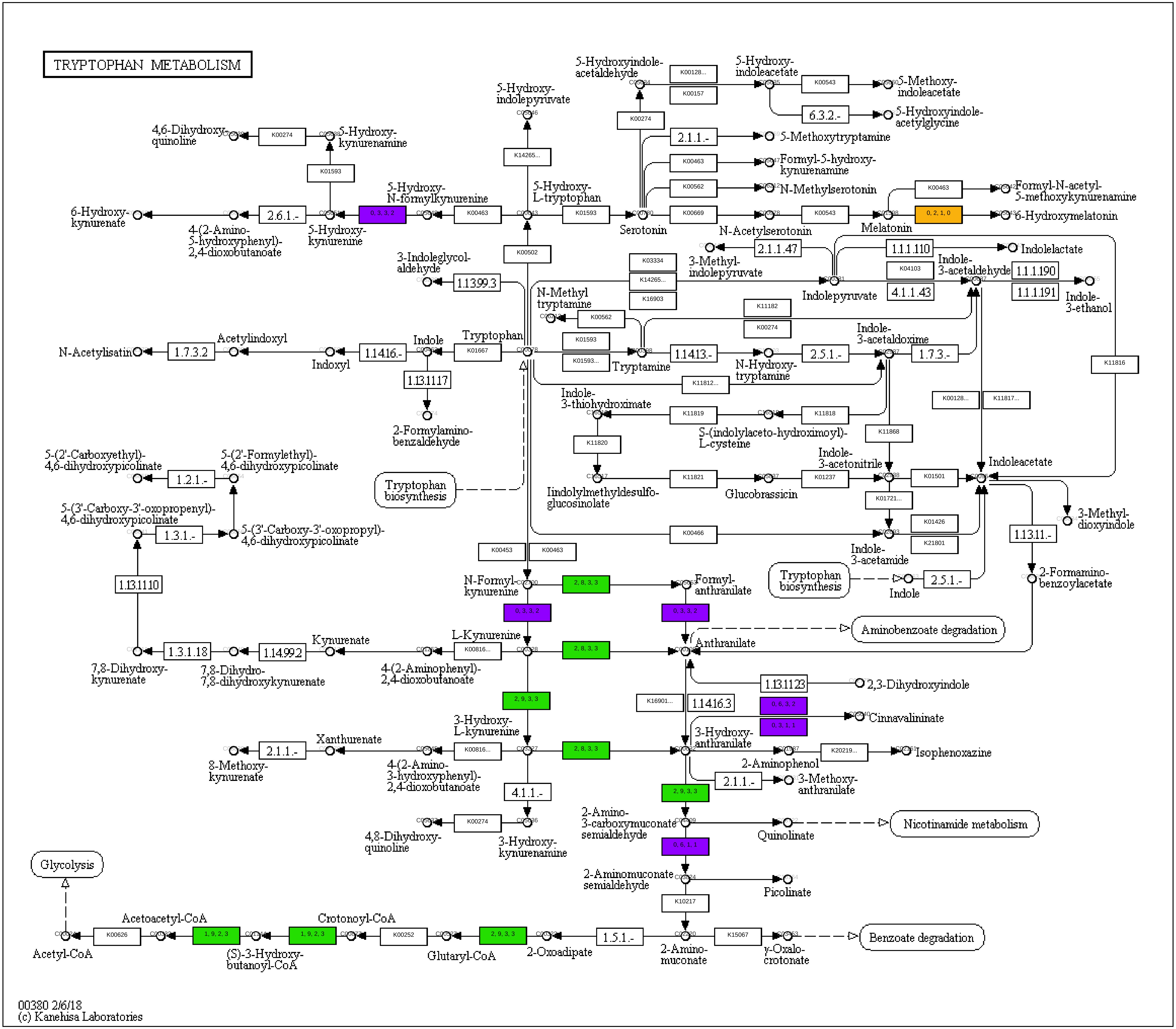
TRYPTOPHAN METABOLISM
5-Hydroxyindole-acetaldehyde
K00128...
K00157
5-Hydroxy-indoleacetate
K00543
5-Methoxy-indoleacetate
6.3.2.-
5-Hydroxyindole-acetylglycine
K00274
5-Hydroxy-indolepyruvate
2.1.1.-
5-Methoxytryptamine
4,6-Dihydroxy-quinoline
K00274
5-Hydroxy-kynurenamine
K14265...
K00463
Formyl-5-hydroxy-kynurenamine
K01593
K00562
N-Methylserotonin
K00463
Formyl-N-acetyl-5-methoxykynurenamine
5-Hydroxy-N-formylkynurenine
5-Hydroxy-L-tryptophan
6-Hydroxy-kynurenate
2.6.1.-
0, 3, 3, 2
K00463
K01593
K00669
K00543
0, 2, 1, 0
6-Hydroxymelatonin
4-(2-Amino-5-hydroxyphenyl)-2,4-dioxobutanoate
5-Hydroxy-kynurenine
Serotonin
N-Acetylserotonin
Melatonin
K00502
2.1.1.47
1.1.1.110
Indolelactate
3-Indoleglycol-aldehyde
K03334
3-Methyl-indolepyruvate
K04103
Indole-3-acetaldehyde
1.1.1.190
1.13.99.3
K14265...
4.1.1.43
1.1.1.191
N-Methyl tryptamine
K16903
Indolepyruvate
Indole-3-ethanol
K11182
K00562
K00274
Acetylindoxyl
Tryptophan
Indole-3-acetaldoxime
N-Acetylisatin
1.7.3.2
1.14.16.-
Indole
K01667
K01593
1.14.13.-
2.5.1.-
1.7.3.-
K11816
Indoxyl
K01593...
Tryptamine
N-Hydroxy-tryptamine
1.13.11.17
K11812...
Indole-3-thiohydroximate
K00128...
K11817...
K11819
K11818
2-Formylamino-benzaldehyde
S-(indolylaceto-hydroximoyl)-L-cysteine
K11868
K11820
5-(2'-Carboxyethyl)-4,6-dihydroxypicolinate
5-(2'-Formylethyl)-4,6-dihydroxypicolinate
Indole-3-acetonitrile
Indoleacetate
1.2.1.-
K11821
K01237
K01501
Tryptophan biosynthesis
Iindolylmethyldesulfo-glucosinolate
Glucobrassicin
K01721...
3-Methyl-dioxyindole
5-(3'-Carboxy-3'-oxopropenyl)-4,6-dihydroxypicolinate
K01426
1.3.1.-
5-(3'-Carboxy-3'-oxopropyl)-4,6-dihydroxypicolinate
K00466
1.13.11.-
K21801
K00453
K00463
Indole-3-acetamide
1.13.11.10
Tryptophan biosynthesis
N-Formyl-kynurenine
2, 8, 3, 3
Formyl-anthranilate
2.5.1.-
2-Formamino-benzoylacetate
Indole
0, 3, 3, 2
0, 3, 3, 2
Aminobenzoate degradation
L-Kynurenine
Kynurenate
Anthranilate
1.3.1.18
1.14.99.2
K00816...
2, 8, 3, 3
7,8-Dihydroxy-kynurenate
7,8-Dihydro-7,8-dihydroxykynurenate
4-(2-Aminophenyl)-2,4-dioxobutanoate
1.13.11.23
2,3-Dihydroxyindole
2, 9, 3, 3
K16901...
1.14.16.3
0, 6, 3, 2
Cinnavalinate
0, 3, 1, 1
3-Hydroxy-L-kynurenine
3-Hydroxy-anthranilate
Xanthurenate
2.1.1.-
K00816...
2, 8, 3, 3
K20219...
Isophenoxazine
8-Methoxy-kynurenate
4-(2-Amino-3-hydroxyphenyl)-2,4-dioxobutanoate
2-Aminophenol
2.1.1.-
3-Methoxy-anthranilate
4.1.1.-
2, 9, 3, 3
2-Amino-3-carboxymuconate semialdehyde
K00274
Quinolinate
Nicotinamide metabolism
4,8-Dihydroxy-quinoline
3-Hydroxy-kynurenamine
0, 6, 1, 1
Glycolysis
2-Aminomuconate semialdehyde
Picolinate
K10217
Acetoacetyl-CoA
Crotonoyl-CoA
K00626
1, 9, 2, 3
1, 9, 2, 3
K00252
2, 9, 3, 3
1.5.1.-
K15067
Benzoate degradation
Acetyl-CoA
(S)-3-Hydroxy-butanoyl-CoA
Glutaryl-CoA
2-Oxoadipate
2-Amino-muconate
γ-Oxalo-crotonate
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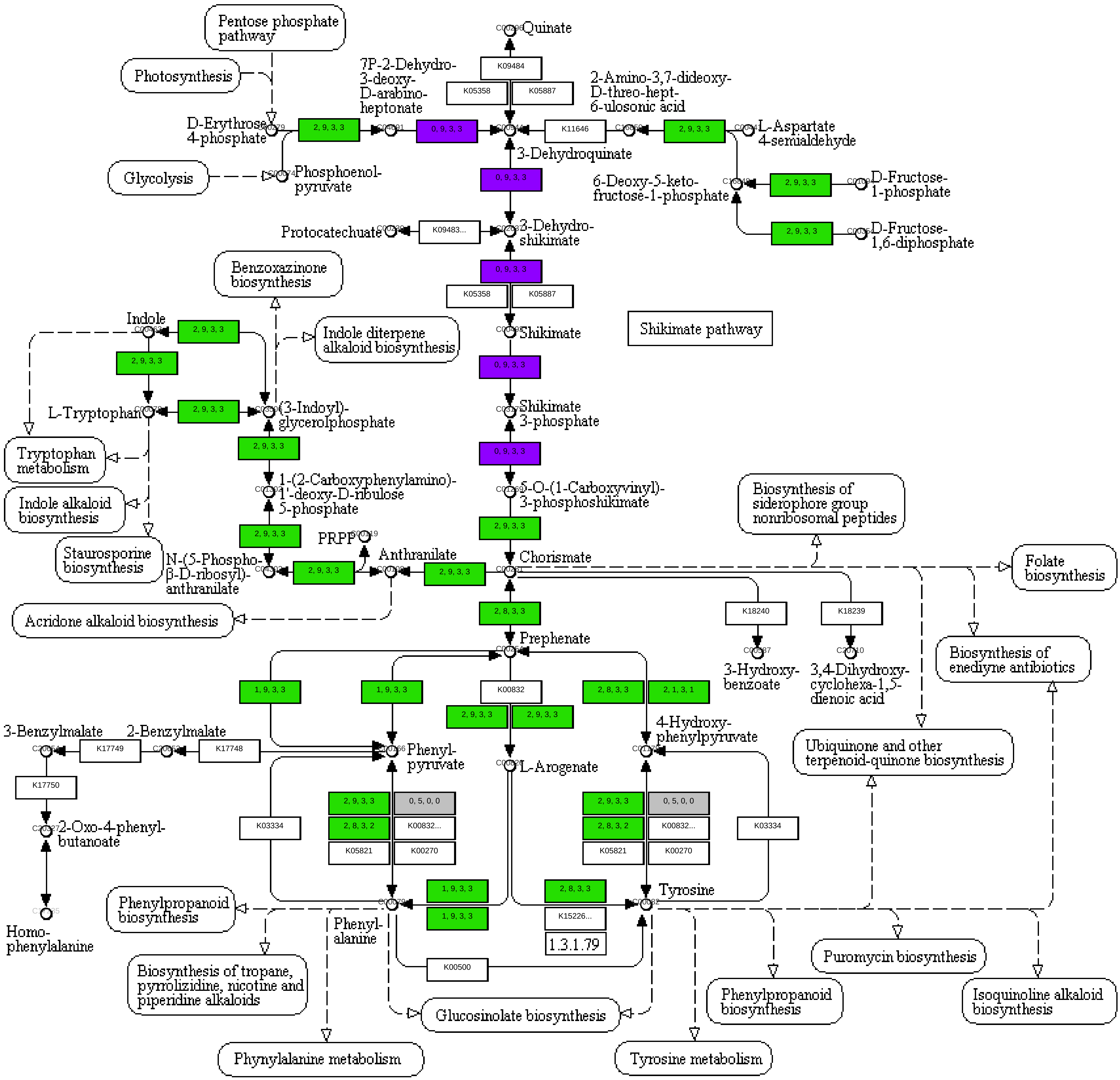
PHENYLALANINE, TYROSINE AND TRYPTOPHAN BIOSYNTHESIS



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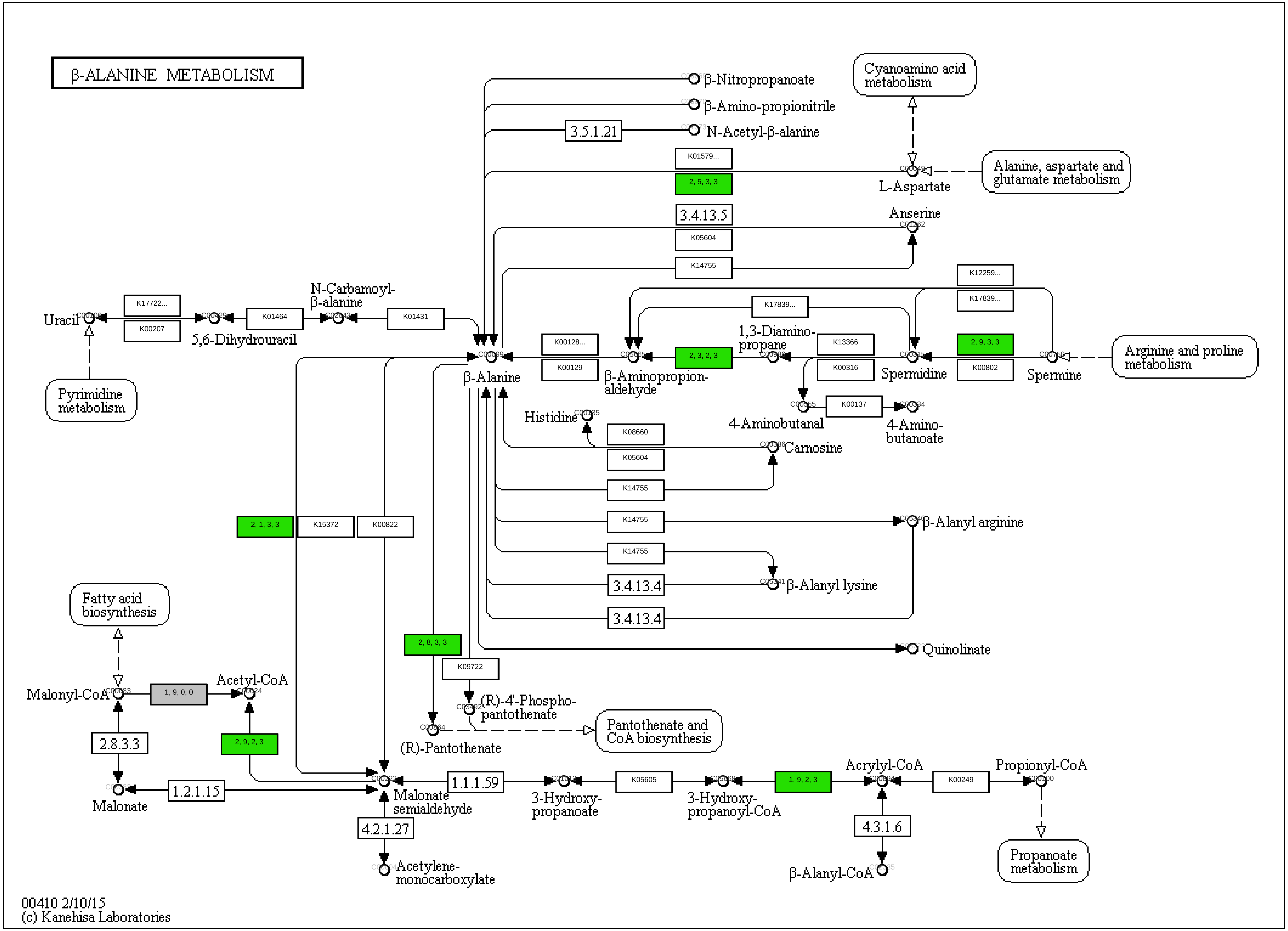
6. Metabolism of other amino acids

MAP	PATHWAY
410	beta-Alanine metabolism
430	Taurine and hypotaurine metabolism
440	Phosphonate and phosphinate metabolism
450	Selenocompound metabolism
460	Cyanoamino acid metabolism
480	Glutathione metabolism



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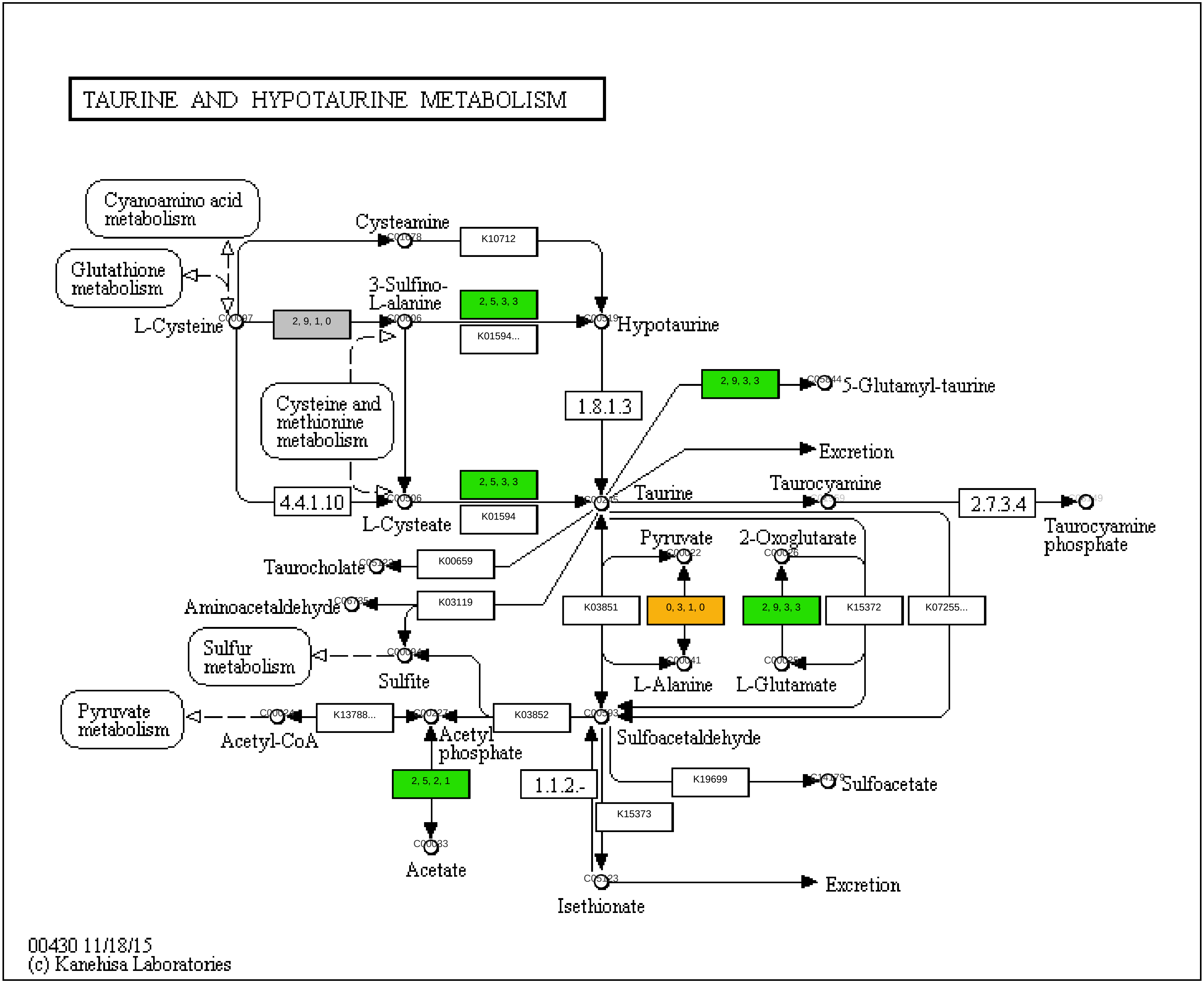
TAURINE AND HYPOTAURINE METABOLISM
Cyanoamino acid metabolism
Glutathione metabolism
Cysteamine
C01678
K10712
3-Sulfino-L-alanine
C00606
2, 5, 3, 3
K01594...
C00519
Hypotaurine
L-Cysteine
C00097
2, 9, 1, 0
Cysteine and methionine metabolism
1.8.1.3
2, 9, 3, 3
C05844
5-Glutamyl-taurine
Excretion
4.4.1.10
C00506
L-Cysteate
2, 5, 3, 3
K01594
C00245
Taurine
Taurocyamine
C01959
2.7.3.4
C03149
Taurocyamine phosphate
Pyruvate
C00022
2-Oxoglutarate
C00026
Taurocholate
C05122
K00659
Aminoacetaldehyde
C06735
K03119
K03851
0, 3, 1, 0
2, 9, 3, 3
K15372
K07255...
Sulfur metabolism
C00094
Sulfite
C00041
L-Alanine
C00025
L-Glutamate
Pyruvate metabolism
C00024
Acetyl-CoA
K13788...
C00227
Acetyl phosphate
K03852
C00593
Sulfoacetaldehyde
2, 5, 2, 1
1.1.2.-
K19699
C14179
Sulfoacetate
K15373
C00033
Acetate
C05123
Isethionate
Excretion
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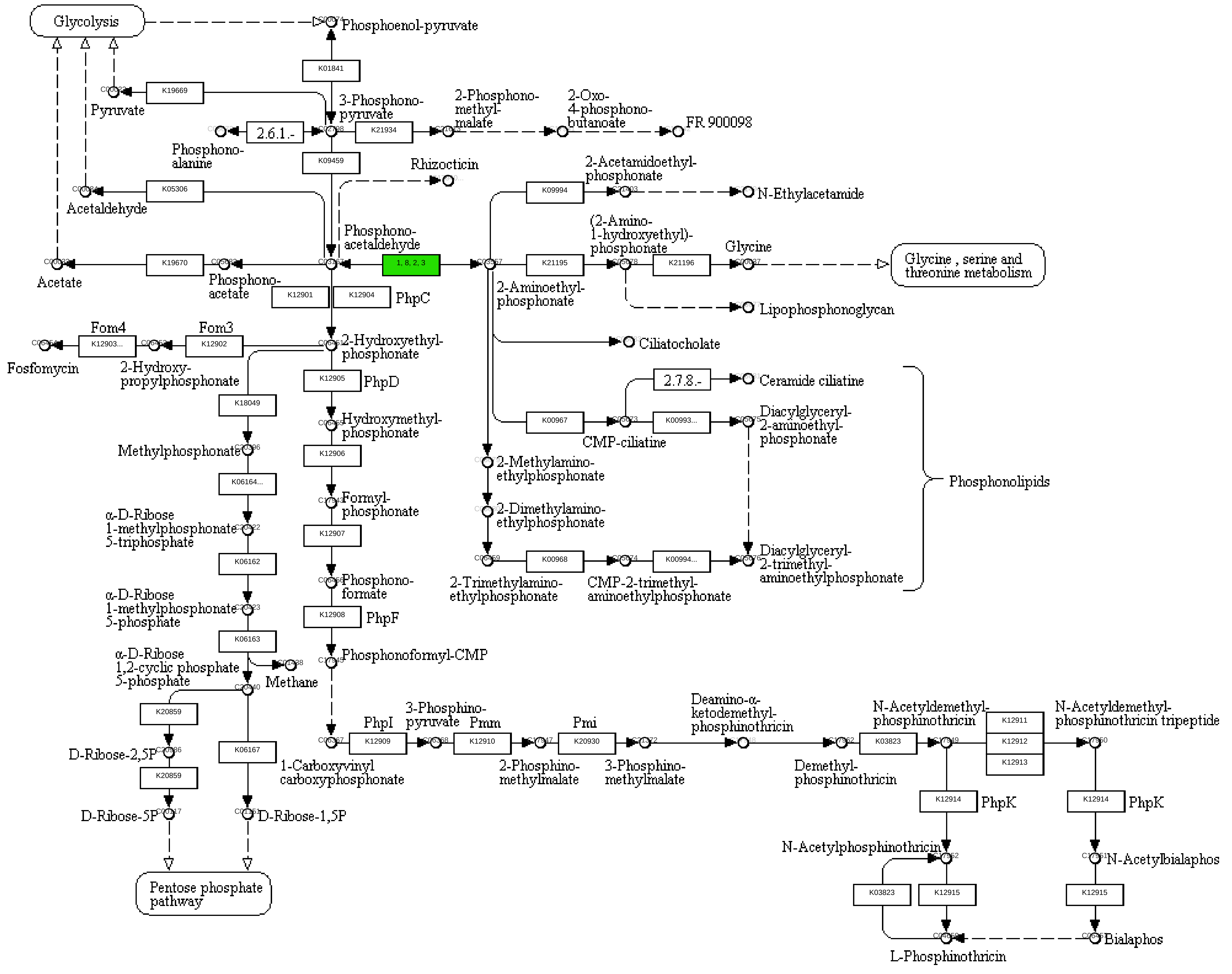
PHOSPHONATE AND PHOSPHINATE METABOLISM



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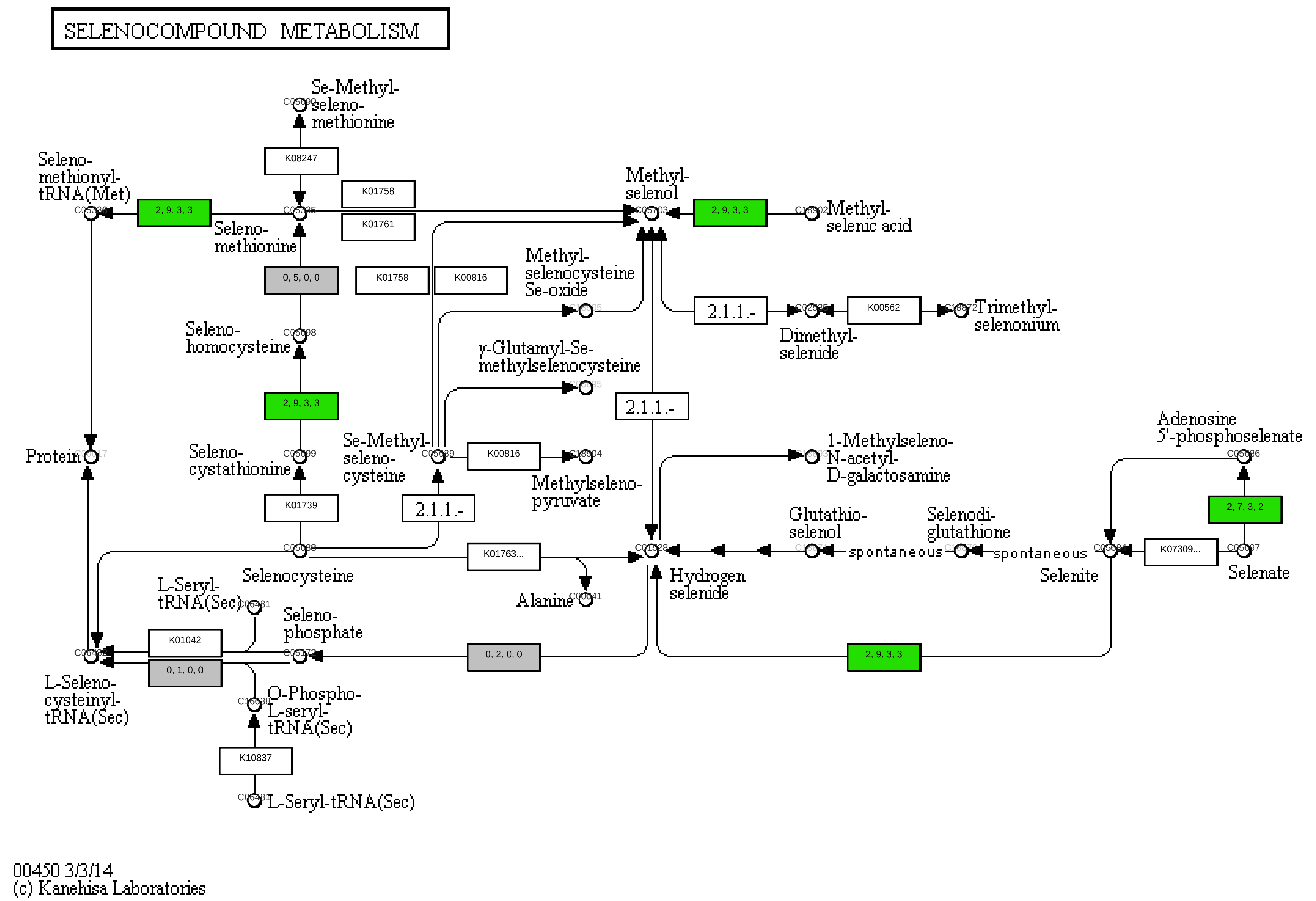
SELENOCOMPOUND METABOLISM
Se-Methyl-seleno-methionine
K08247
Seleno-methionyl-tRNA(Met)
C05336
2, 9, 3, 3
C05335
Seleno-methionine
K01758
K01761
Methyl-selenol
C05703
2, 9, 3, 3
C18902
Methyl-selenic acid
0, 5, 0, 0
K01758
K00816
Methyl-selenocysteine Se-oxide
2.1.1.-
C02535
K00562
C18872
Trimethyl-selenonium
Dimethyl-selenide
Seleno-homocysteine
C05698
γ-Glutamyl-Se-methylselenocysteine
2, 9, 3, 3
2.1.1.-
Se-Methyl-seleno-cysteine
C05689
K00816
C18904
Methylseleno-pyruvate
Seleno-cystathionine
C05699
Protein
1-Methylseleno-N-acetyl-D-galactosamine
Adenosine 5'-phosphoselenate
C05696
2, 7, 3, 2
K01739
2.1.1.-
Glutathio-selenol
Selenodi-glutathione
C05688
K01763...
C01528
spontaneous
spontaneous
C05684
K07309...
C05697
Selenocysteine
Hydrogen selenide
Selenite
Selenate
L-Seryl-tRNA(Sec)
C06481
Alanine
C00041
Seleno-phosphate
K01042
C05172
0, 2, 0, 0
2, 9, 3, 3
C06482
0, 1, 0, 0
L-Seleno-cysteinyl-tRNA(Sec)
C16038
O-Phospho-L-seryl-tRNA(Sec)
K10837
C06481
L-Seryl-tRNA(Sec)
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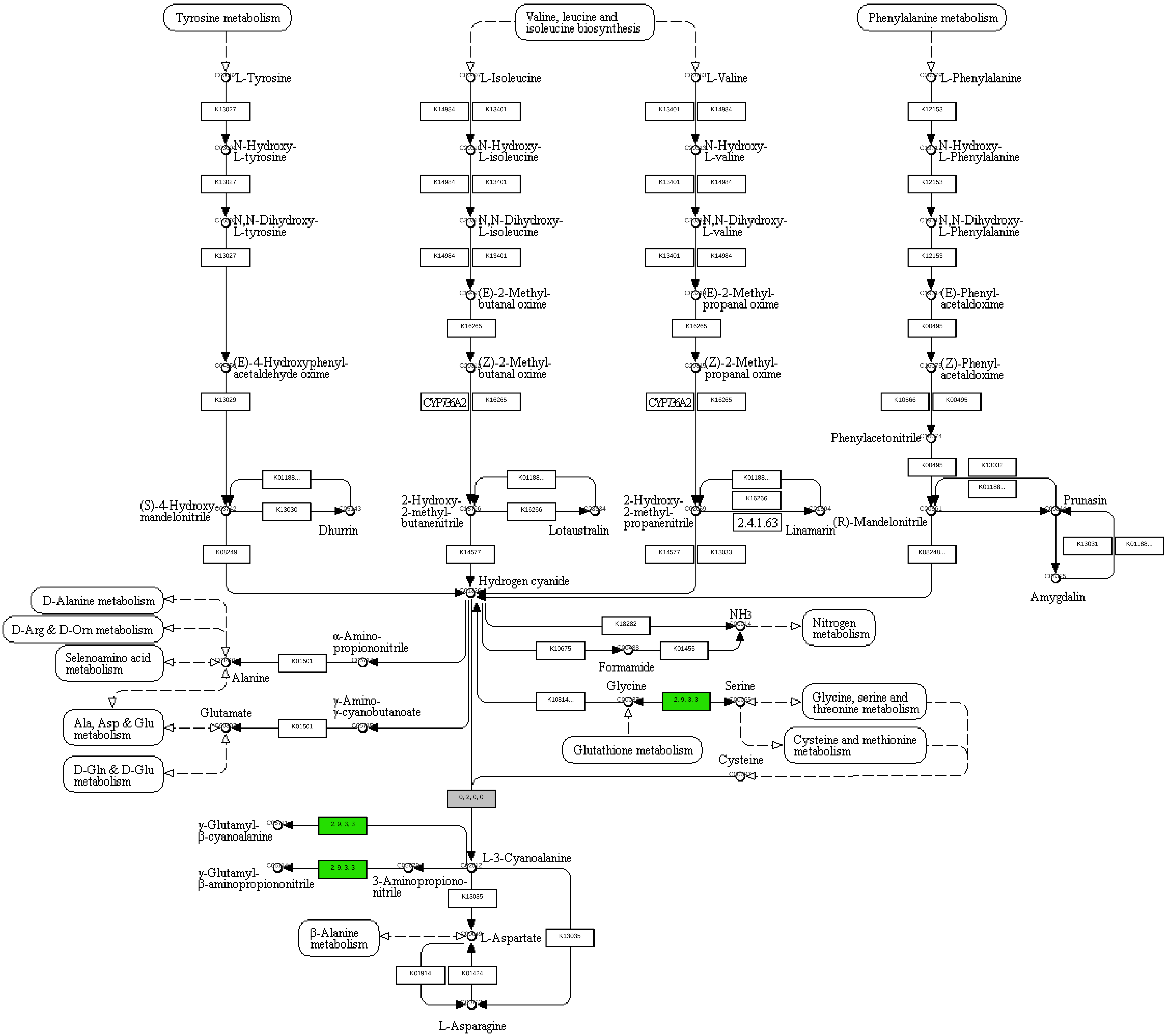
CYANOAMINO ACID METABOLISM



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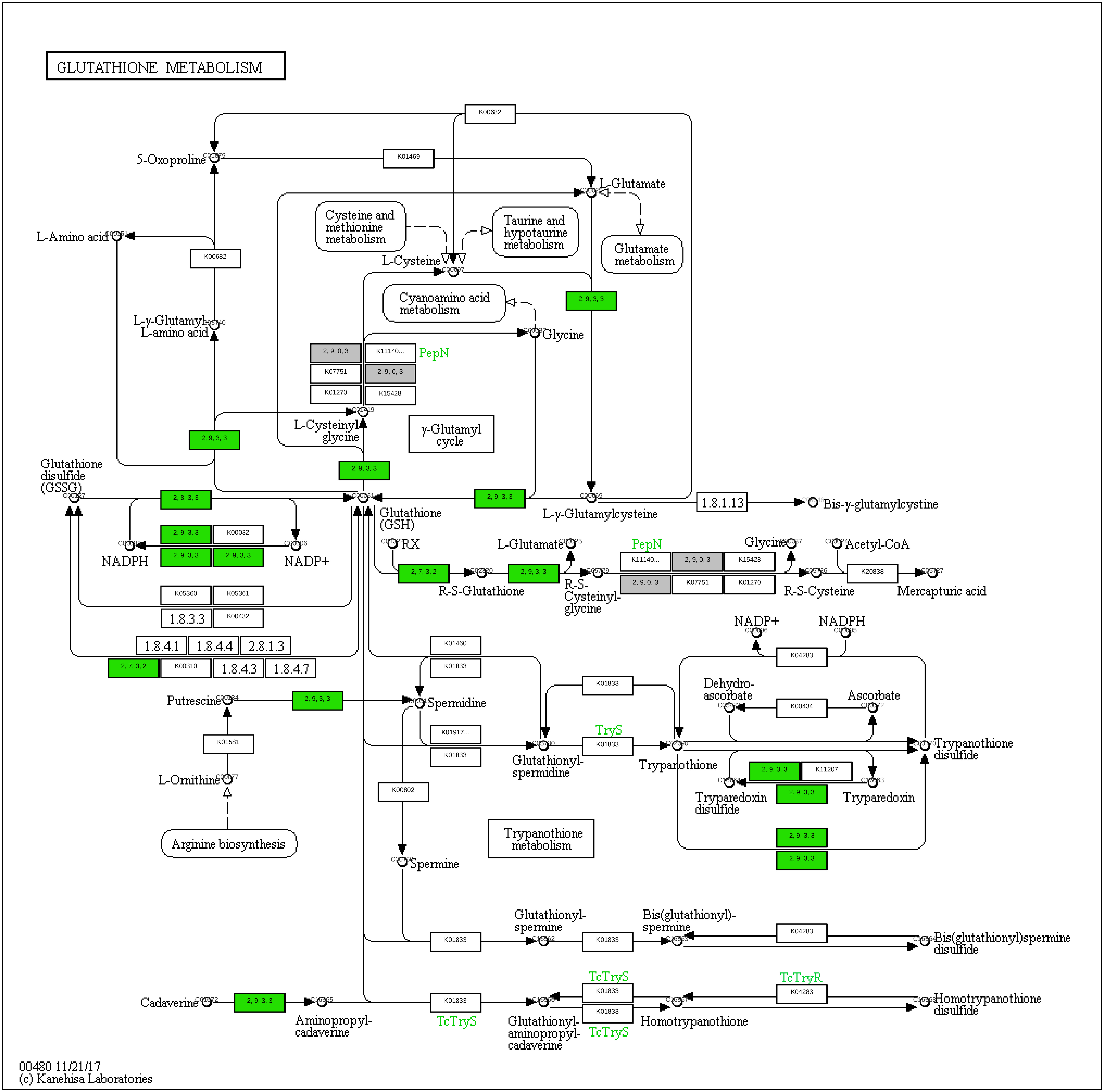
GLUTATHIONE METABOLISM
K00682
5-Oxoproline
C01879
K01469
L-Glutamate
C00025
Cysteine and methionine metabolism
Taurine and hypotaurine metabolism
Glutamate metabolism
L-Amino acid
C00151
K00682
L-Cysteine
C00097
Cyanoamino acid metabolism
2, 9, 3, 3
L-γ-Glutamyl-L-amino acid
C03740
Glycine
C00037
2, 9, 0, 3
K11140...
PepN
K07751
2, 9, 0, 3
K01270
K15428
C01419
L-Cysteinyl-glycine
γ-Glutamyl cycle
2, 9, 3, 3
2, 9, 3, 3
Glutathione disulfide (GSSG)
C00127
2, 8, 3, 3
C00051
2, 9, 3, 3
C00669
1.8.1.13
Bis-γ-glutamylcystine
L-γ-Glutamylcysteine
Glutathione (GSH)
2, 9, 3, 3
K00032
C00005
C00006
NADPH
2, 9, 3, 3
2, 9, 3, 3
NADP+
C01322
RX
L-Glutamate
C00025
PepN
Glycine
C00037
C00024
Acetyl-CoA
K11140...
2, 9, 0, 3
K15428
2, 7, 3, 2
C02320
2, 9, 3, 3
C01419
C05726
K20838
C00127
2, 9, 0, 3
K07751
K01270
R-S-Glutathione
R-S-Cysteinyl-glycine
R-S-Cysteine
Mercapturic acid
K05360
K05361
1.8.3.3
K00432
NADP+
NADPH
C00006
C00005
1.8.4.1
1.8.4.4
2.8.1.3
K01460
K04283
2, 7, 3, 2
K00310
1.8.4.3
1.8.4.7
K01833
K01833
Dehydro-ascorbate
Ascorbate
Putrescine
C00134
2, 9, 3, 3
C00315
Spermidine
K00434
C05422
C00072
TryS
K01917...
C05730
K01833
C02090
C05870
Trypanothione disulfide
K01581
K01833
Glutathionyl-spermidine
Trypanothione
2, 9, 3, 3
K11207
L-Ornithine
C00077
K00802
C16634
2, 9, 3, 3
C16063
Tryparedoxin disulfide
Tryparedoxin
Arginine biosynthesis
Trypanothione metabolism
2, 9, 3, 3
2, 9, 3, 3
C00750
Spermine
Glutathionyl-spermine
Bis(glutathionyl)-spermine
K04283
K01833
C16562
K01833
C16563
C16564
Bis(glutathionyl)spermine disulfide
TcTryS
TcTryR
K01833
K04283
Cadaverine
C01672
2, 9, 3, 3
C16565
K01833
C16566
K01833
C16567
C16568
Homotrypanothione disulfide
Aminopropyl-cadaverine
TcTryS
Glutathionyl-aminopropyl-cadaverine
TcTryS
Homotrypanothione
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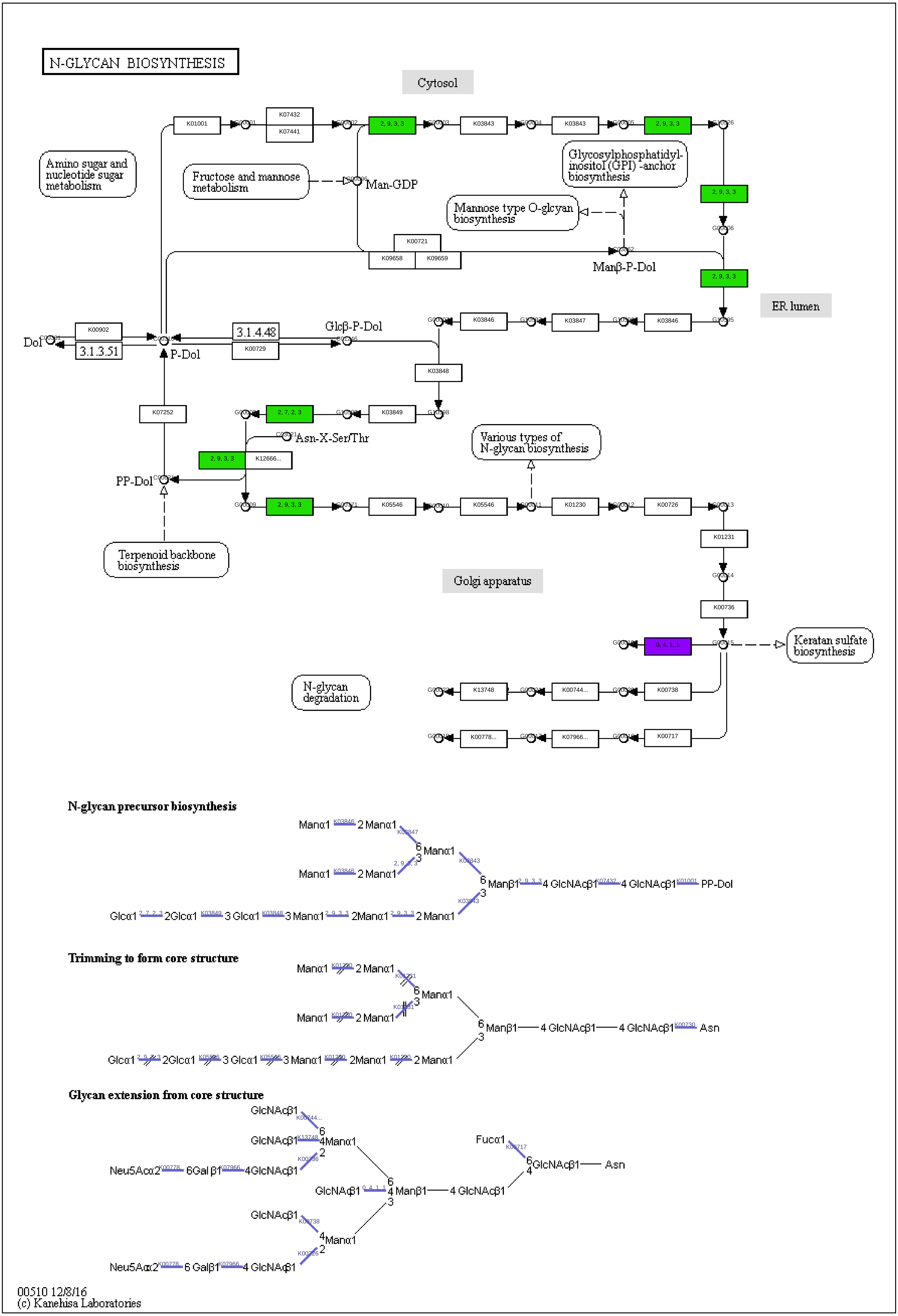
7. Glycan biosynthesis and metabolism

MAP	PATHWAY
510	N-Glycan biosynthesis
513	Various types of N-glycan biosynthesis
531	Glycosaminoglycan degradation
563	Glycosylphosphatidylinositol (GPI)-anchor biosynthesis


N-GLYCAN BIOSYNTHESIS
Cytosol
ER lumen
Golgi apparatus
Amino sugar and nucleotide sugar metabolism
Fructose and mannose metabolism
Glycosylphosphatidyl-inositol (GPI) -anchor biosynthesis
Mannose type O-glcyan biosynthesis
Various types of N-glycan biosynthesis
Terpenoid backbone biosynthesis
Keratan sulfate biosynthesis
N-glycan degradation
Man-GDP
Manβ-P-Dol
Glcβ-P-Dol
Dol
P-Dol
PP-Dol
Asn-X-Ser/Thr
K01001
K07432
K07441
K03843
K00721
K09658
K09659
K00902
3.1.3.51
3.1.4.48
K00729
K07252
K03846
K03847
K03848
K03849
K12666...
K05546
K01230
K00726
K01231
K00736
K13748
K00744...
K00738
K00778...
K07966...
K00717
2, 9, 3, 3
2, 7, 2, 3
0, 4, 1, 1
N-glycan precursor biosynthesis
Trimming to form core structure
Glycan extension from core structure
Manα1 2Manα1 6Manα1 3 6Manβ1 4GlcNAcβ1 4GlcNAcβ1 PP-Dol
Glcα1 2Glcα1 3Glcα1 3Manα1 2Manα1 2Manα1
Manβ1 4GlcNAcβ1 4GlcNAcβ1 Asn
GlcNAcβ1 4Manα1 Neu5Acα2 6Galβ1 4GlcNAcβ1 Fucα1 6GlcNAcβ1 Asn
00510 12/8/16
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VARIOUS TYPES OF N-GLYCAN BIOSYNTHESIS
High-mannose type (Yeast)
N-Glycan biosynthesis
K01230
K05528
2.4.1.-
K05538
K05529
K05530
K05531
K05532
K05533
K05534
K05535
K05536
K05537
Complex type (Plant)
K00726
K01231
K00736
K03714
K00753
K14413
K14412
Paucimannose type (Plant)
2, 9, 2, 3
Paucimannose type (Insect)
K00717
Paucimannose type (Nematode)
K14434
K14464
Glycohormone
K07966...
K00781
K09656...
K09673...
Manα1
Manβ1
GlcNAcβ1
Fucα1
Galβ1
Xylβ1
Asn
GalNAcβ1
Neu5Acα2
S
00513 9/7/16
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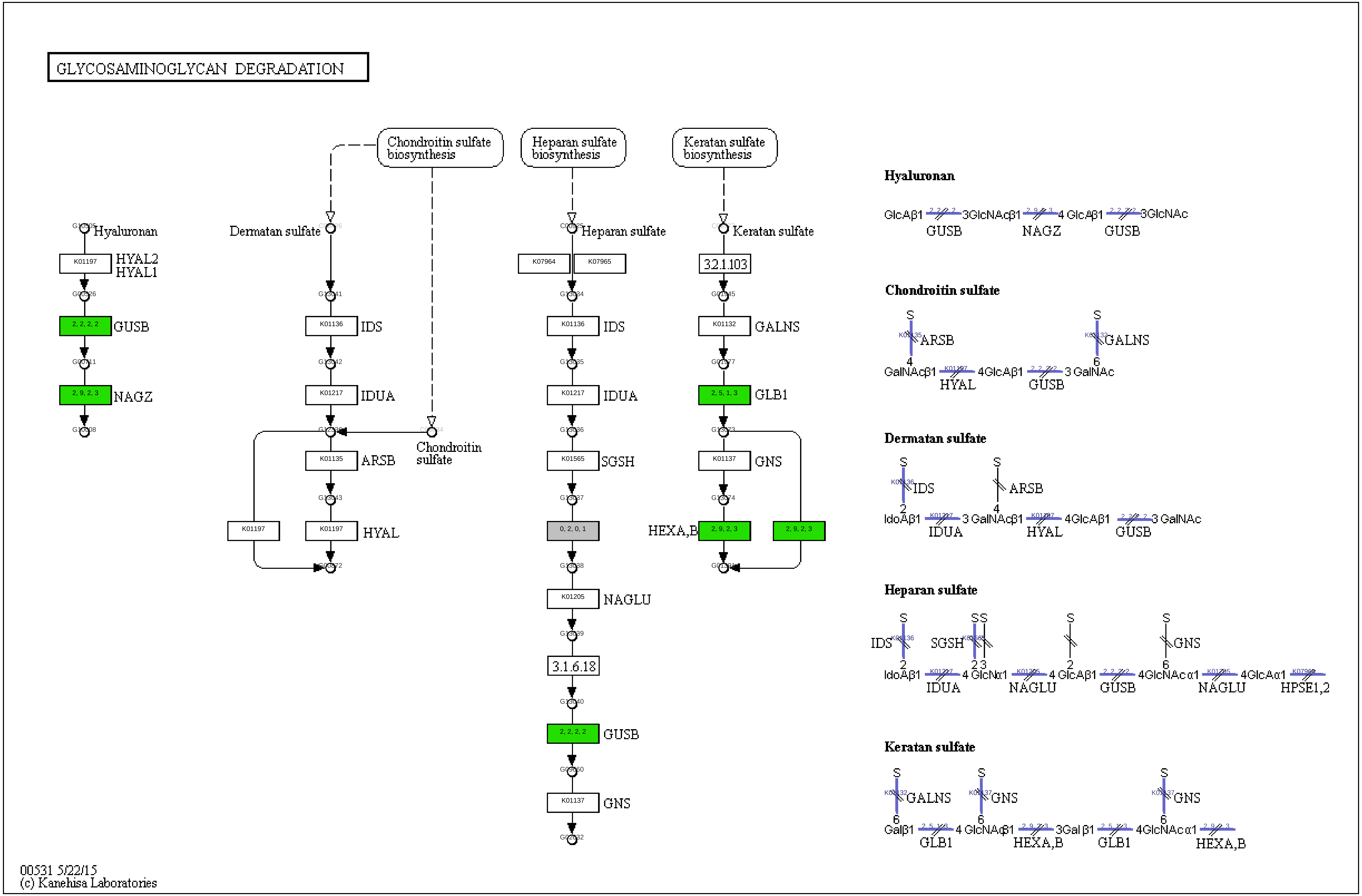
GLYCOSAMINOGLYCAN DEGRADATION
Chondroitin sulfate biosynthesis
Heparan sulfate biosynthesis
Keratan sulfate biosynthesis
Hyaluronan
K01197
HYAL2
HYAL1
2, 2, 2, 2
GUSB
2, 9, 2, 3
NAGZ
Dermatan sulfate
K01136
IDS
K01217
IDUA
K01135
ARSB
K01197
HYAL
K01197
Chondroitin sulfate
Heparan sulfate
K07964
K07965
K01136
IDS
K01217
IDUA
K01565
SGSH
0, 2, 0, 1
K01205
NAGLU
3.1.6.18
2, 2, 2, 2
GUSB
K01137
GNS
Keratan sulfate
3.2.1.103
K01132
GALNS
2, 5, 1, 3
GLB1
K01137
GNS
HEXA,B
2, 9, 2, 3
2, 9, 2, 3
Hyaluronan
GlcAβ1
3GlcNAcβ1
4 GlcAβ1
3GlcNAc
GUSB
NAGZ
GUSB
Chondroitin sulfate
S
ARSB
S
GALNS
4
6
GalNAcβ1
4GlcAβ1
3 GalNAc
HYAL
GUSB
Dermatan sulfate
S
IDS
S
ARSB
2
4
IdoAβ1
3 GalNAcβ1
4GlcAβ1
3 GalNAc
IDUA
HYAL
GUSB
Heparan sulfate
S
IDS
SS
SGSH
S
S
GNS
2
2 3
2
6
IdoAβ1
4 GlcNα1
4 GlcAβ1
4GlcNAcα1
4GlcAα1
IDUA
NAGLU
GUSB
NAGLU
HPSE1,2
Keratan sulfate
S
GALNS
S
GNS
S
GNS
6
6
6
Galβ1
4 GlcNAcβ1
3Gal β1
4GlcNAcα1
GLB1
HEXA,B
GLB1
HEXA,B
00531 5/22/15
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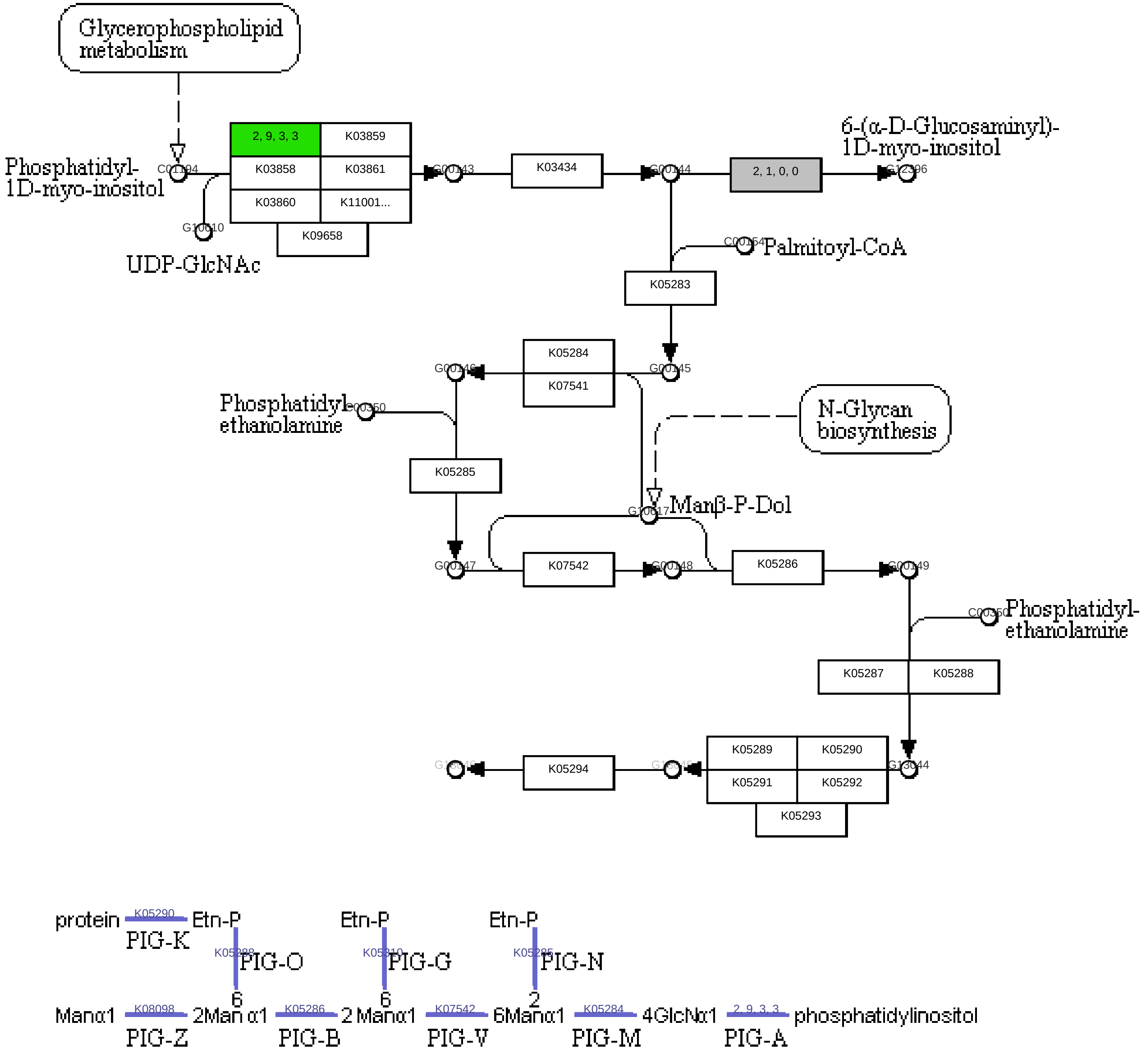
GLYCOSYLPHOSPHATIDYLINOSITOL (GPI) - ANCHOR BIOSYNTHESIS



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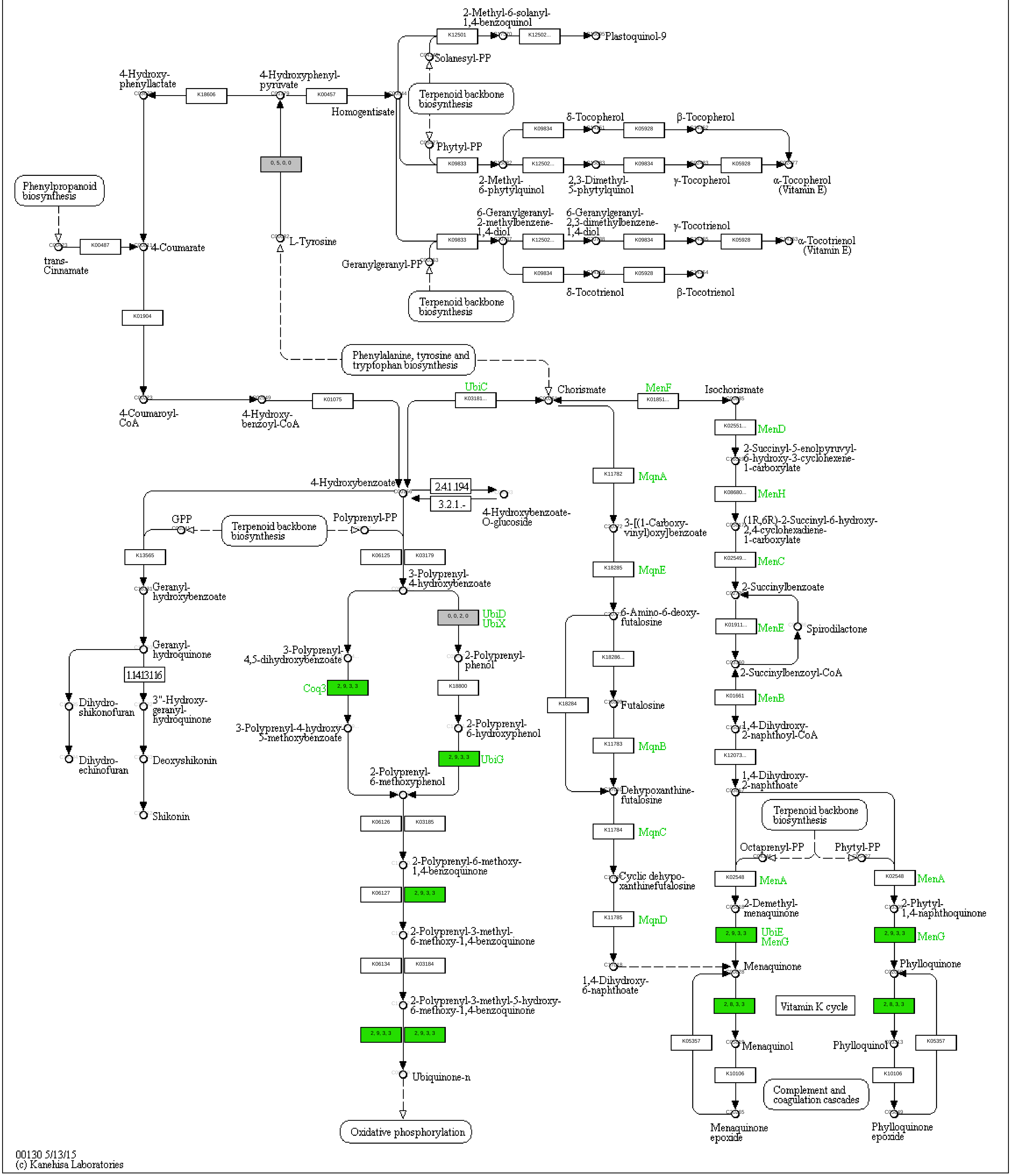
8. Metabolism of cofactors and vitamins

MAP	PATHWAY
130	Ubiquinone and other terpenoid-quinone biosynthesis
670	One carbon pool by folate
730	Thiamine metabolism
740	Riboflavin metabolism
750	Vitamin B6 metabolism
760	Nicotinate and nicotinamide metabolism
770	Pantothenate and CoA biosynthesis
780	Biotin metabolism
785	Lipoic acid metabolism
790	Folate biosynthesis
860	Porphyrin and chlorophyll metabolism

UBIQUINONE AND OTHER TERPENOID-QUINONE BIOSYNTHESIS



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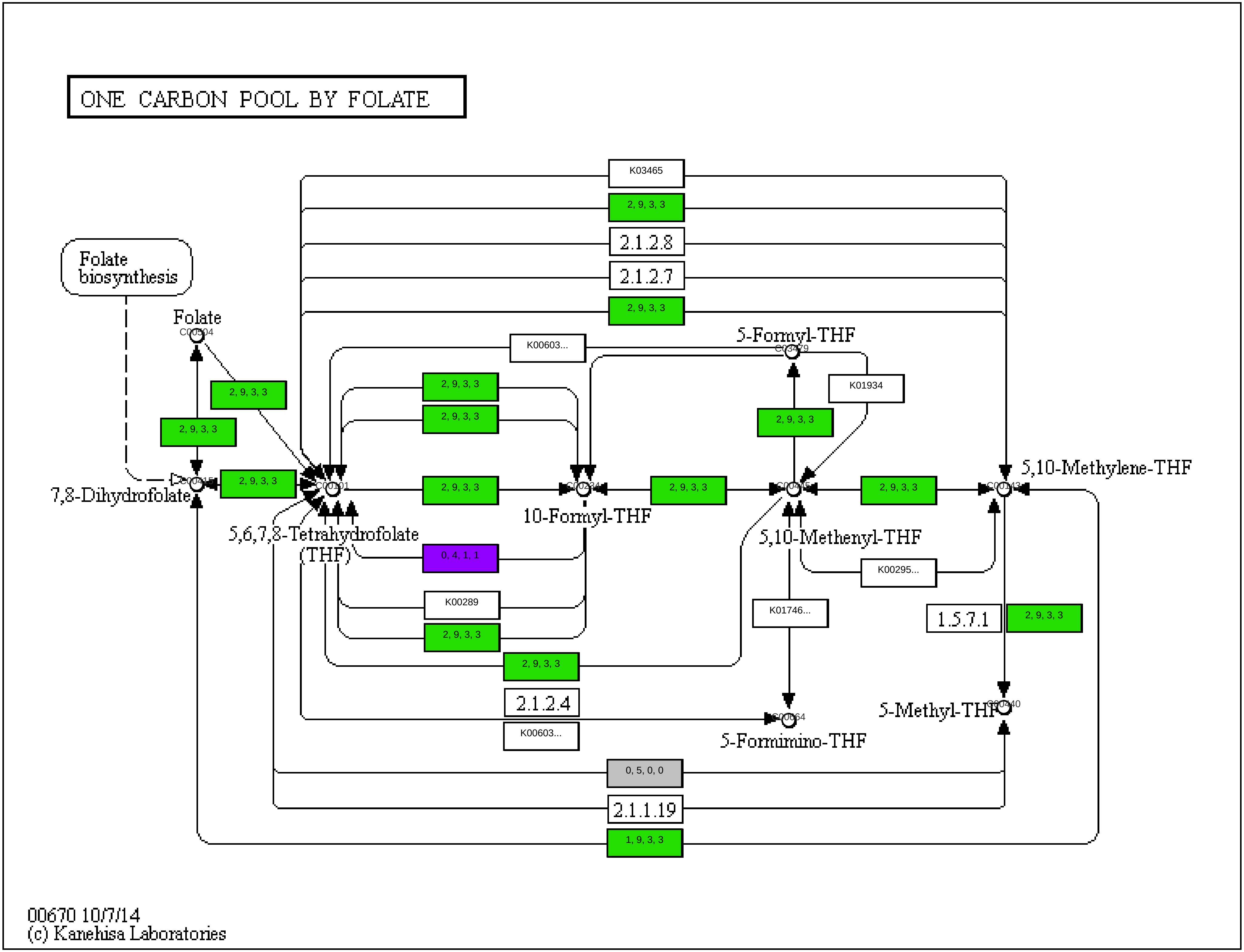
ONE CARBON POOL BY FOLATE
Folate biosynthesis
Folate
C00504
7,8-Dihydrofolate
C00415
5,6,7,8-Tetrahydrofolate (THF)
C00101
10-Formyl-THF
C00234
5-Formyl-THF
C03479
5,10-Methenyl-THF
C00445
5,10-Methylene-THF
C00143
5-Methyl-THF
C00440
5-Formimino-THF
C00664
K03465
2, 9, 3, 3
2.1.2.8
2.1.2.7
2, 9, 3, 3
K00603...
K01934
2, 9, 3, 3
2, 9, 3, 3
2, 9, 3, 3
2, 9, 3, 3
2, 9, 3, 3
2, 9, 3, 3
2, 9, 3, 3
2, 9, 3, 3
2, 9, 3, 3
0, 4, 1, 1
K00289
2, 9, 3, 3
2, 9, 3, 3
2.1.2.4
K00603...
K01746...
K00295...
1.5.7.1
2, 9, 3, 3
0, 5, 0, 0
2.1.1.19
1, 9, 3, 3
00670 10/7/14
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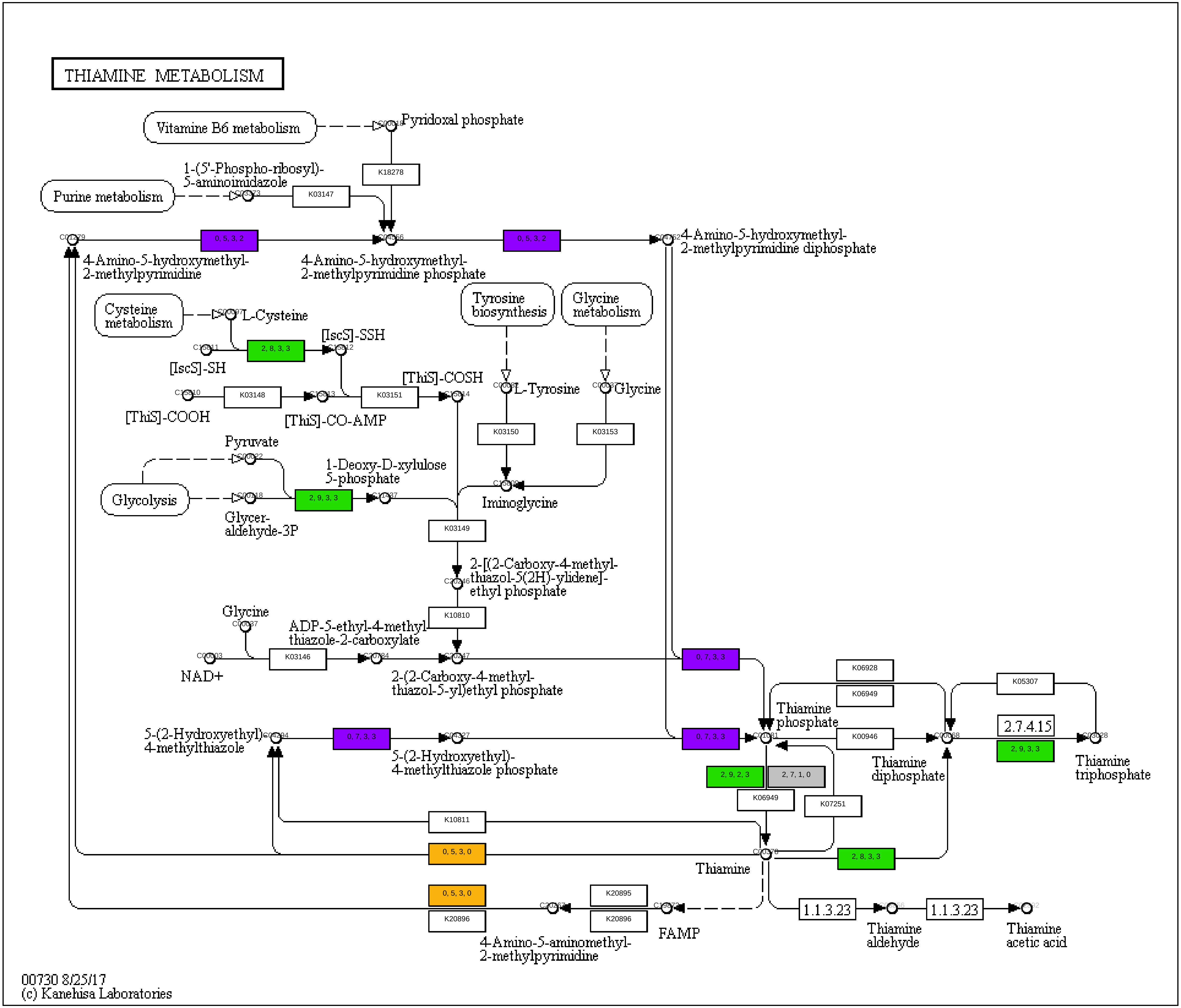
THIAMINE METABOLISM
Vitamine B6 metabolism
Pyridoxal phosphate
K18278
Purine metabolism
1-(5'-Phospho-ribosyl)-5-aminoimidazole
K03147
C01279
0, 5, 3, 2
0, 5, 3, 2
4-Amino-5-hydroxymethyl-2-methylpyrimidine diphosphate
4-Amino-5-hydroxymethyl-2-methylpyrimidine
4-Amino-5-hydroxymethyl-2-methylpyrimidine phosphate
Cysteine metabolism
L-Cysteine
2, 8, 3, 3
[IscS]-SSH
[IscS]-SH
Tyrosine biosynthesis
Glycine metabolism
[ThiS]-COSH
K03148
K03151
L-Tyrosine
Glycine
[ThiS]-COOH
[ThiS]-CO-AMP
K03150
K03153
Pyruvate
1-Deoxy-D-xylulose 5-phosphate
Glycolysis
2, 9, 3, 3
Iminoglycine
Glycer-aldehyde-3P
K03149
2-[(2-Carboxy-4-methyl-thiazol-5(2H)-ylidene]-ethyl phosphate
Glycine
K10810
ADP-5-ethyl-4-methyl-thiazole-2-carboxylate
K03146
0, 7, 3, 3
NAD+
2-(2-Carboxy-4-methyl-thiazol-5-yl)ethyl phosphate
K06928
K06949
K05307
Thiamine phosphate
5-(2-Hydroxyethyl)-4-methylthiazole
0, 7, 3, 3
0, 7, 3, 3
K00946
2.7.4.15
2, 9, 3, 3
5-(2-Hydroxyethyl)-4-methylthiazole phosphate
Thiamine diphosphate
Thiamine triphosphate
2, 9, 2, 3
2, 7, 1, 0
K06949
K07251
K10811
0, 5, 3, 0
2, 8, 3, 3
Thiamine
0, 5, 3, 0
K20895
1.1.3.23
1.1.3.23
K20896
K20896
FAMP
Thiamine aldehyde
Thiamine acetic acid
4-Amino-5-aminomethyl-2-methylpyrimidine
00730 8/25/17
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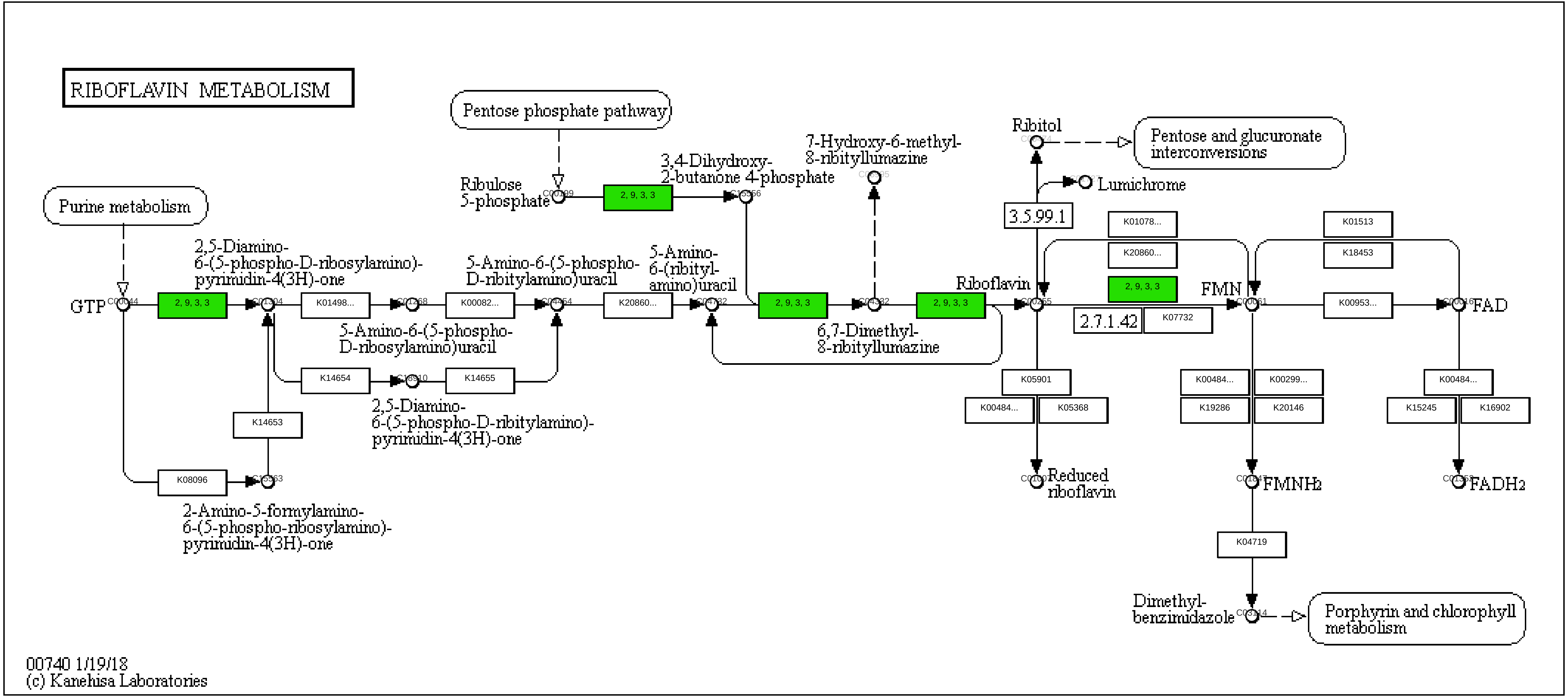
RIBOFLAVIN METABOLISM
Pentose phosphate pathway
Purine metabolism
Ribulose 5-phosphate
C00199
2, 9, 3, 3
3,4-Dihydroxy-2-butanone 4-phosphate
C15556
7-Hydroxy-6-methyl-8-ribityllumazine
Ribitol
Pentose and glucuronate interconversions
Lumichrome
3.5.99.1
GTP
C00044
2,5-Diamino-6-(5-phospho-D-ribosylamino)-pyrimidin-4(3H)-one
C01304
K01498...
C01268
5-Amino-6-(5-phospho-D-ribitylamino)uracil
K00082...
C04454
K20860...
5-Amino-6-(ribitylamino)uracil
C04732
C04332
Riboflavin
C00255
K01078...
K20860...
2, 9, 3, 3
K01513
K18453
FMN
C00061
K00953...
C00016
FAD
2.7.1.42
K07732
5-Amino-6-(5-phospho-D-ribosylamino)uracil
6,7-Dimethyl-8-ribityllumazine
K14654
K14655
2,5-Diamino-6-(5-phospho-D-ribitylamino)-pyrimidin-4(3H)-one
K14653
K08096
2-Amino-5-formylamino-6-(5-phospho-ribosylamino)-pyrimidin-4(3H)-one
K05901
K00484...
K05368
Reduced riboflavin
K00484...
K00299...
K19286
K20146
FMNH2
K04719
Dimethyl-benzimidazole
Porphyrin and chlorophyll metabolism
K00484...
K15245
K16902
FADH2
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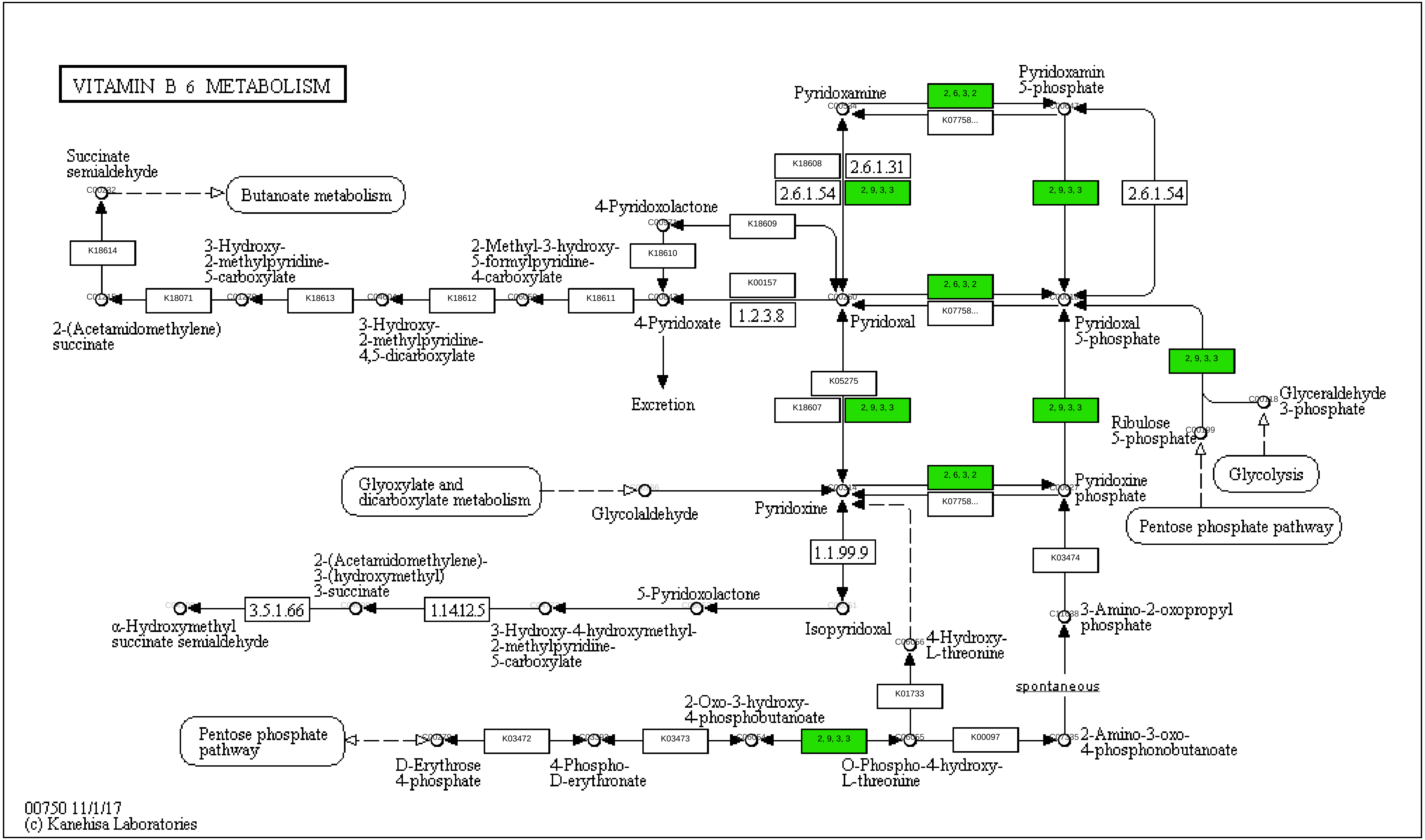
VITAMIN B 6 METABOLISM
Succinate semialdehyde
C00232
Butanoate metabolism
K18614
C01215
K18071
C01279
K18613
C04004
K18612
C06050
K18611
C00847
2-(Acetamidomethylene) succinate
3-Hydroxy-2-methylpyridine-5-carboxylate
3-Hydroxy-2-methylpyridine-4,5-dicarboxylate
2-Methyl-3-hydroxy-5-formylpyridine-4-carboxylate
4-Pyridoxolactone
C00971
K18610
K18609
4-Pyridoxate
Excretion
K00157
1.2.3.8
Pyridoxamine
C00534
2, 6, 3, 2
K07758...
Pyridoxamin 5-phosphate
C00647
K18608
2.6.1.31
2.6.1.54
2, 9, 3, 3
2, 9, 3, 3
2.6.1.54
C00250
Pyridoxal
2, 6, 3, 2
K07758...
C00018
Pyridoxal 5-phosphate
2, 9, 3, 3
Glyceraldehyde 3-phosphate
C00118
Ribulose 5-phosphate
C00199
Glycolysis
K05275
K18607
2, 9, 3, 3
2, 9, 3, 3
Glyoxylate and dicarboxylate metabolism
C00266
Glycolaldehyde
C00314
Pyridoxine
2, 6, 3, 2
K07758...
C00627
Pyridoxine phosphate
Pentose phosphate pathway
1.1.99.9
K03474
2-(Acetamidomethylene)-3-(hydroxymethyl)3-succinate
5-Pyridoxolactone
3.5.1.66
1.14.12.5
C00941
α-Hydroxymethyl succinate semialdehyde
3-Hydroxy-4-hydroxymethyl-2-methylpyridine-5-carboxylate
Isopyridoxal
C06056
4-Hydroxy-L-threonine
C11638
3-Amino-2-oxopropyl phosphate
spontaneous
K01733
2-Oxo-3-hydroxy-4-phosphobutanoate
Pentose phosphate pathway
C00279
K03472
C03393
K03473
C06054
2, 9, 3, 3
C06055
K00097
C07335
D-Erythrose 4-phosphate
4-Phospho-D-erythronate
O-Phospho-4-hydroxy-L-threonine
2-Amino-3-oxo-4-phosphonobutanoate
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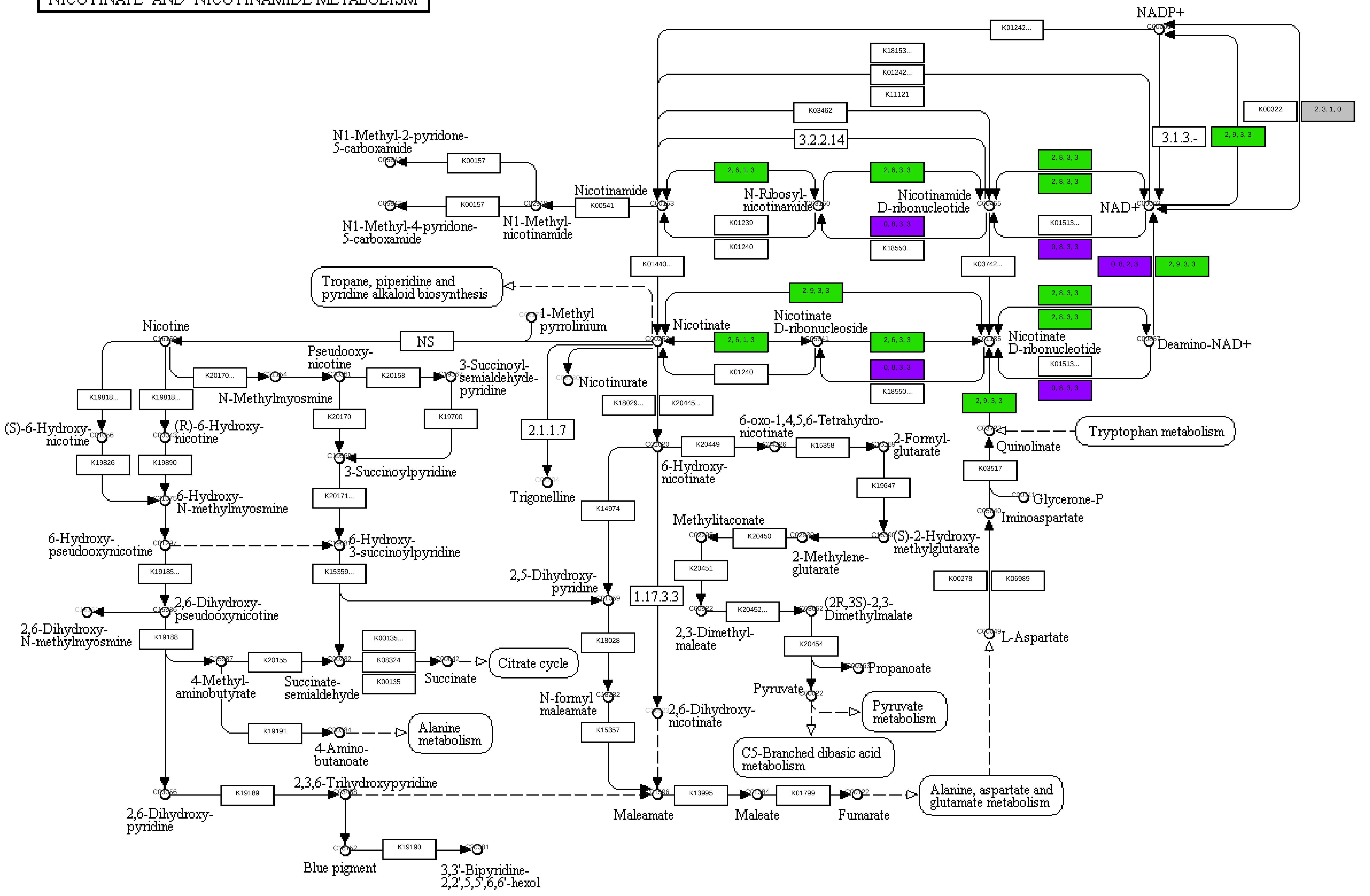
NICOTINATE AND NICOTINAMIDE METABOLISM



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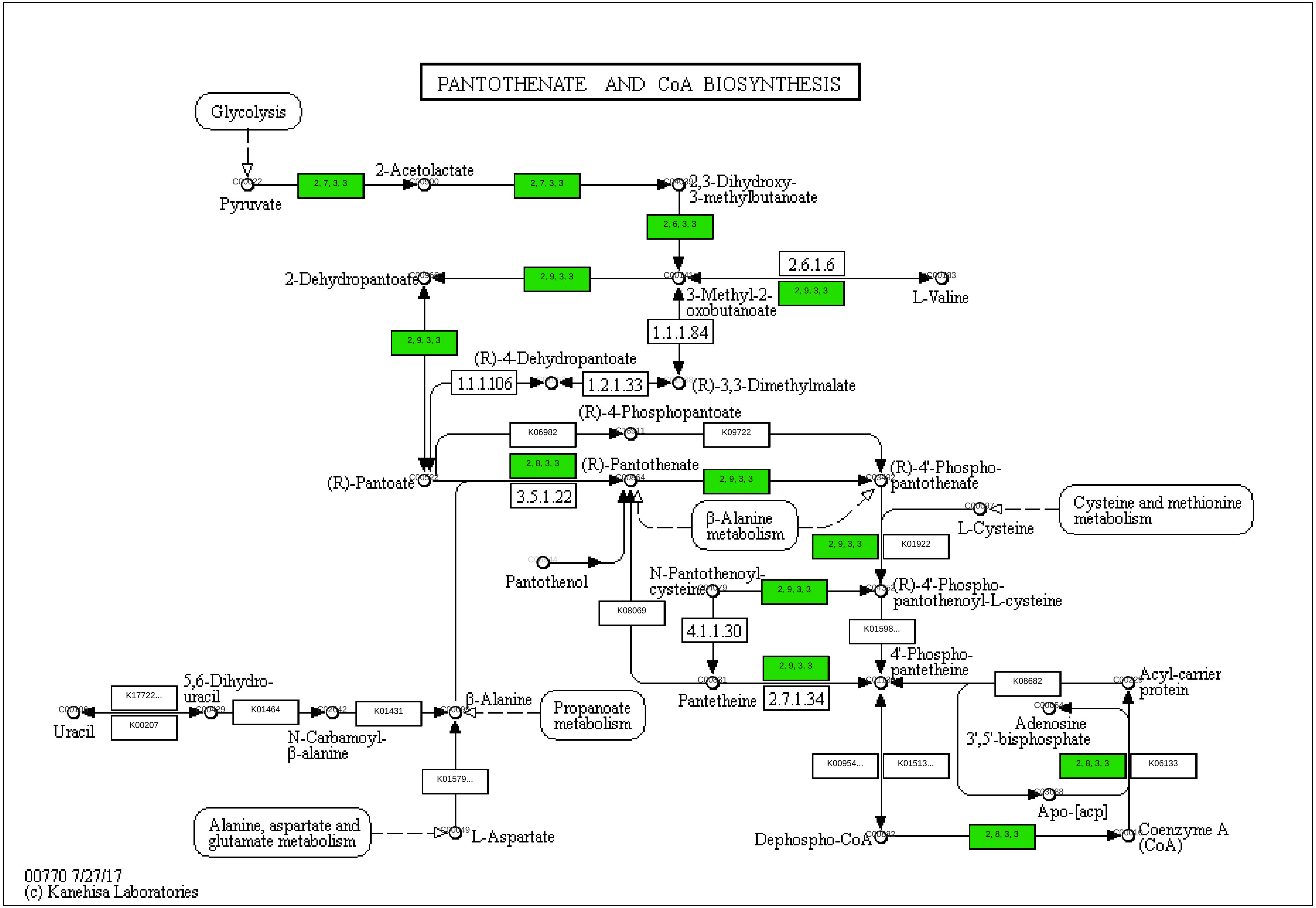
PANTOTHENATE AND CoA BIOSYNTHESIS
Glycolysis
C00022
Pyruvate
2, 7, 3, 3
2-Acetolactate
C00900
2, 7, 3, 3
2,3-Dihydroxy-3-methylbutanoate
2, 6, 3, 3
2.6.1.6
2, 9, 3, 3
C00183
L-Valine
C00141
3-Methyl-2-oxobutanoate
2, 9, 3, 3
2-Dehydropantoate
C00966
2, 9, 3, 3
1.1.1.84
(R)-4-Dehydropantoate
1.1.1.106
1.2.1.33
(R)-3,3-Dimethylmalate
(R)-4-Phosphopantoate
K06982
C18911
K09722
(R)-Pantoate
C00522
2, 8, 3, 3
(R)-Pantothenate
C00864
3.5.1.22
2, 9, 3, 3
(R)-4'-Phosphopantothenate
C03492
β-Alanine metabolism
Cysteine and methionine metabolism
C00097
L-Cysteine
2, 9, 3, 3
K01922
Pantothenol
N-Pantothenoyl-cysteine
C04079
2, 9, 3, 3
(R)-4'-Phosphopantothenoyl-L-cysteine
C04352
K08069
4.1.1.30
K01598...
2, 9, 3, 3
4'-Phosphopantetheine
C01134
C00831
Pantetheine
2.7.1.34
K08682
Acyl-carrier protein
C00229
C00054
Adenosine 3',5'-bisphosphate
K17722...
5,6-Dihydrouracil
C00429
K00207
C00106
Uracil
K01464
C02642
N-Carbamoyl-β-alanine
K01431
C00099
β-Alanine
Propanoate metabolism
K01579...
K00954...
K01513...
2, 8, 3, 3
K06133
C03688
Apo-[acp]
Alanine, aspartate and glutamate metabolism
C00049
L-Aspartate
Dephospho-CoA
C00882
2, 8, 3, 3
C00010
Coenzyme A (CoA)
00770 7/27/17
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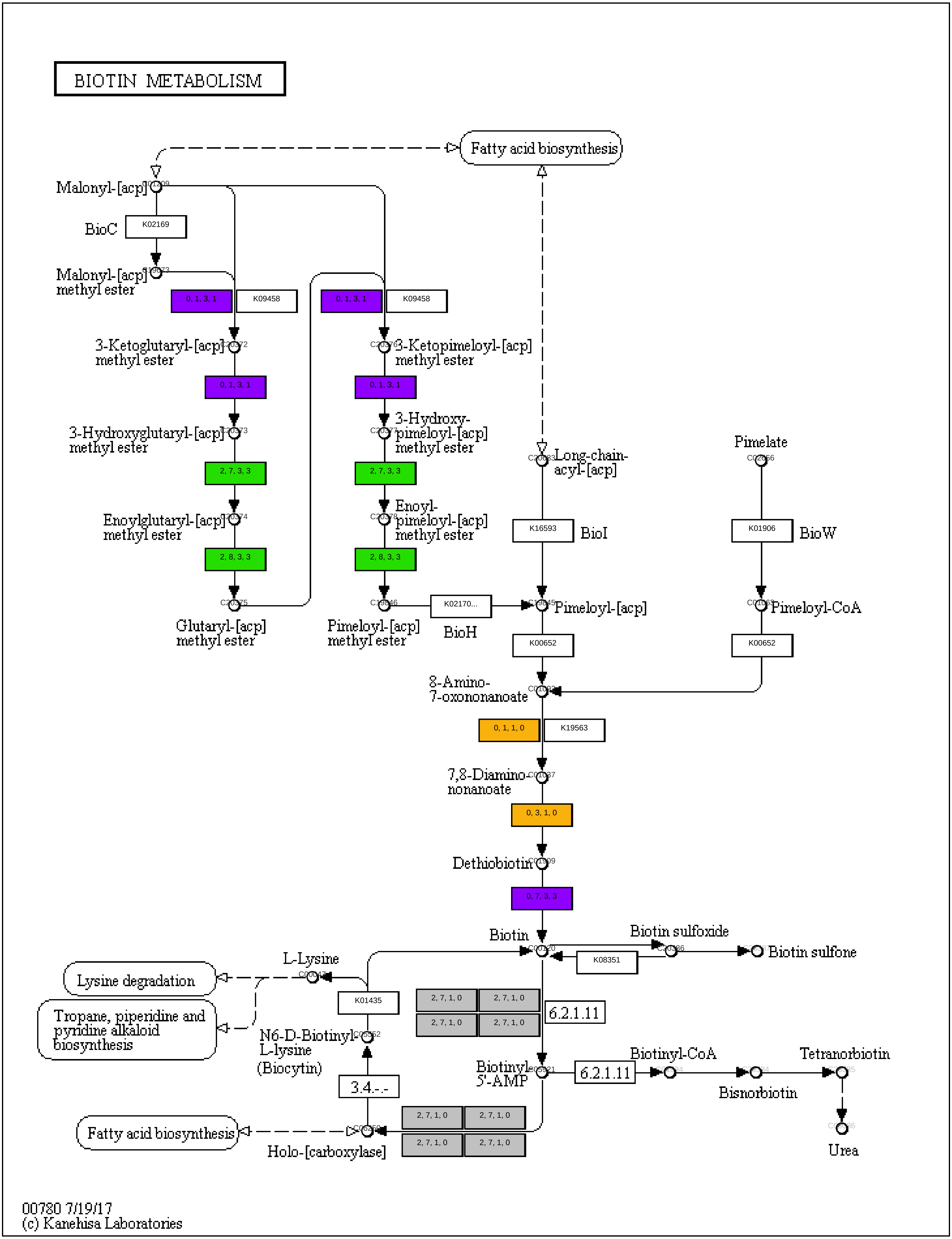
BIOTIN METABOLISM
Fatty acid biosynthesis
Malonyl-[acp]
C01209
BioC
K02169
Malonyl-[acp] methyl ester
C19673
0, 1, 3, 1
K09458
0, 1, 3, 1
K09458
3-Ketoglutaryl-[acp] methyl ester
C20372
C20376
3-Ketopimeloyl-[acp] methyl ester
0, 1, 3, 1
0, 1, 3, 1
3-Hydroxyglutaryl-[acp] methyl ester
C20373
C20377
3-Hydroxy-pimeloyl-[acp] methyl ester
2, 7, 3, 3
2, 7, 3, 3
Enoylglutaryl-[acp] methyl ester
C20374
C20378
Enoyl-pimeloyl-[acp] methyl ester
2, 8, 3, 3
2, 8, 3, 3
C20375
Glutaryl-[acp] methyl ester
C19846
Pimeloyl-[acp] methyl ester
K02170...
BioH
C20683
Long-chain-acyl-[acp]
K16593
BioI
Pimelate
C02656
K01906
BioW
C19845
Pimeloyl-[acp]
C01063
Pimeloyl-CoA
K00652
K00652
8-Amino-7-oxononanoate
C01092
0, 1, 1, 0
K19563
7,8-Diamino-nonanoate
C01037
0, 3, 1, 0
Dethiobiotin
C01909
0, 7, 3, 3
Biotin
C00120
Biotin sulfoxide
C20386
Biotin sulfone
K08351
L-Lysine
C00047
Lysine degradation
Tropane, piperidine and pyridine alkaloid biosynthesis
K01435
2, 7, 1, 0
2, 7, 1, 0
2, 7, 1, 0
2, 7, 1, 0
6.2.1.11
N6-D-Biotinyl-L-lysine (Biocytin)
C05552
3.4.-.-
Biotinyl-5'-AMP
C05921
6.2.1.11
Biotinyl-CoA
Bisnorbiotin
Tetranorbiotin
Urea
2, 7, 1, 0
2, 7, 1, 0
2, 7, 1, 0
2, 7, 1, 0
Fatty acid biosynthesis
C06250
Holo-[carboxylase]
00780 7/19/17
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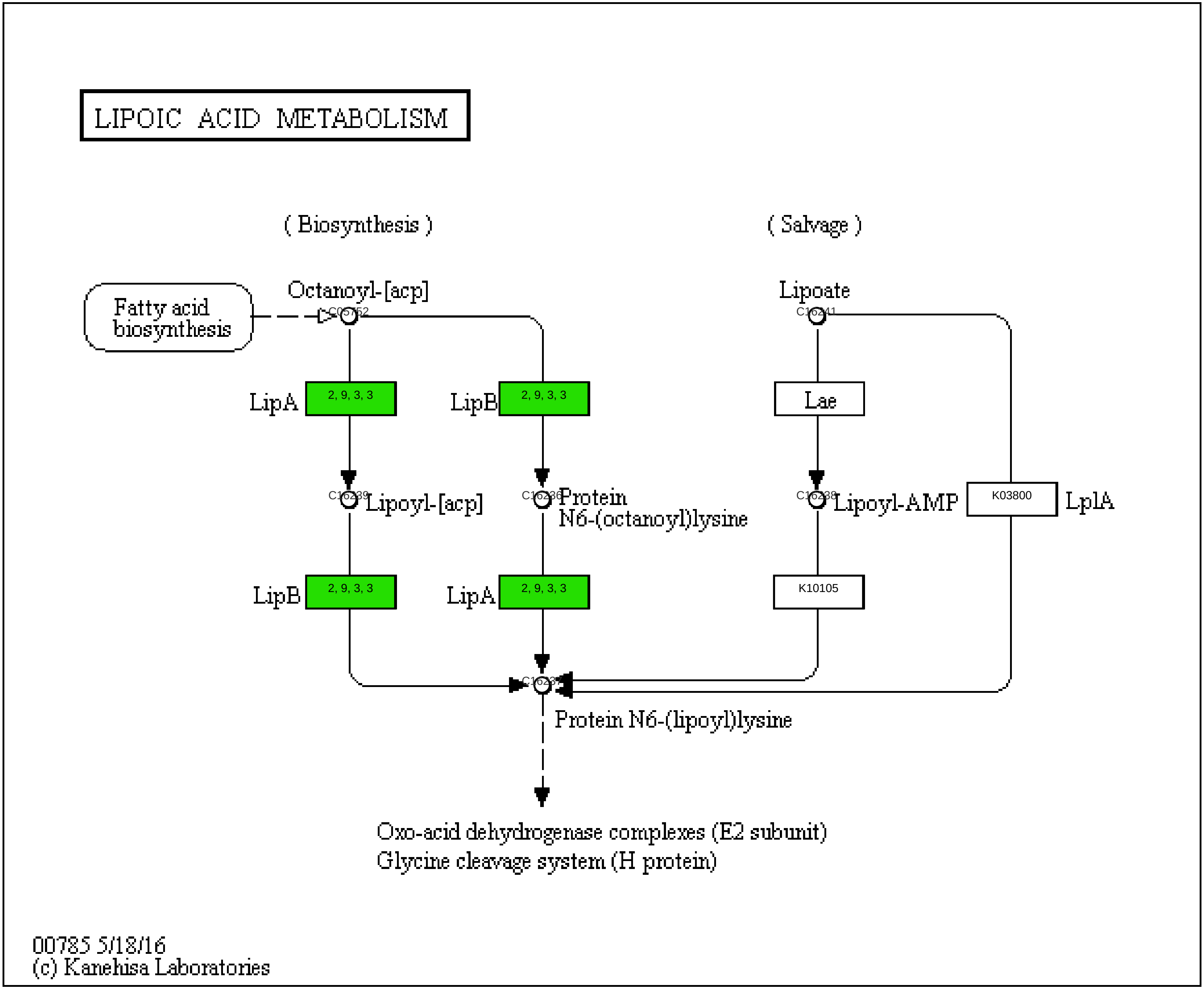
LIPOIC ACID METABOLISM
(Biosynthesis)
(Salvage)
Fatty acid biosynthesis
Octanoyl-[acp]
C05752
Lipoate
C16241
LipA
2, 9, 3, 3
LipB
2, 9, 3, 3
Lae
C16239
Lipoyl-[acp]
C16236
Protein N6-(octanoyl)lysine
C16238
Lipoyl-AMP
K03800
LplA
LipB
2, 9, 3, 3
LipA
2, 9, 3, 3
K10105
C1623
Protein N6-(lipoyl)lysine
Oxo-acid dehydrogenase complexes (E2 subunit)
Glycine cleavage system (H protein)
00785 5/18/16
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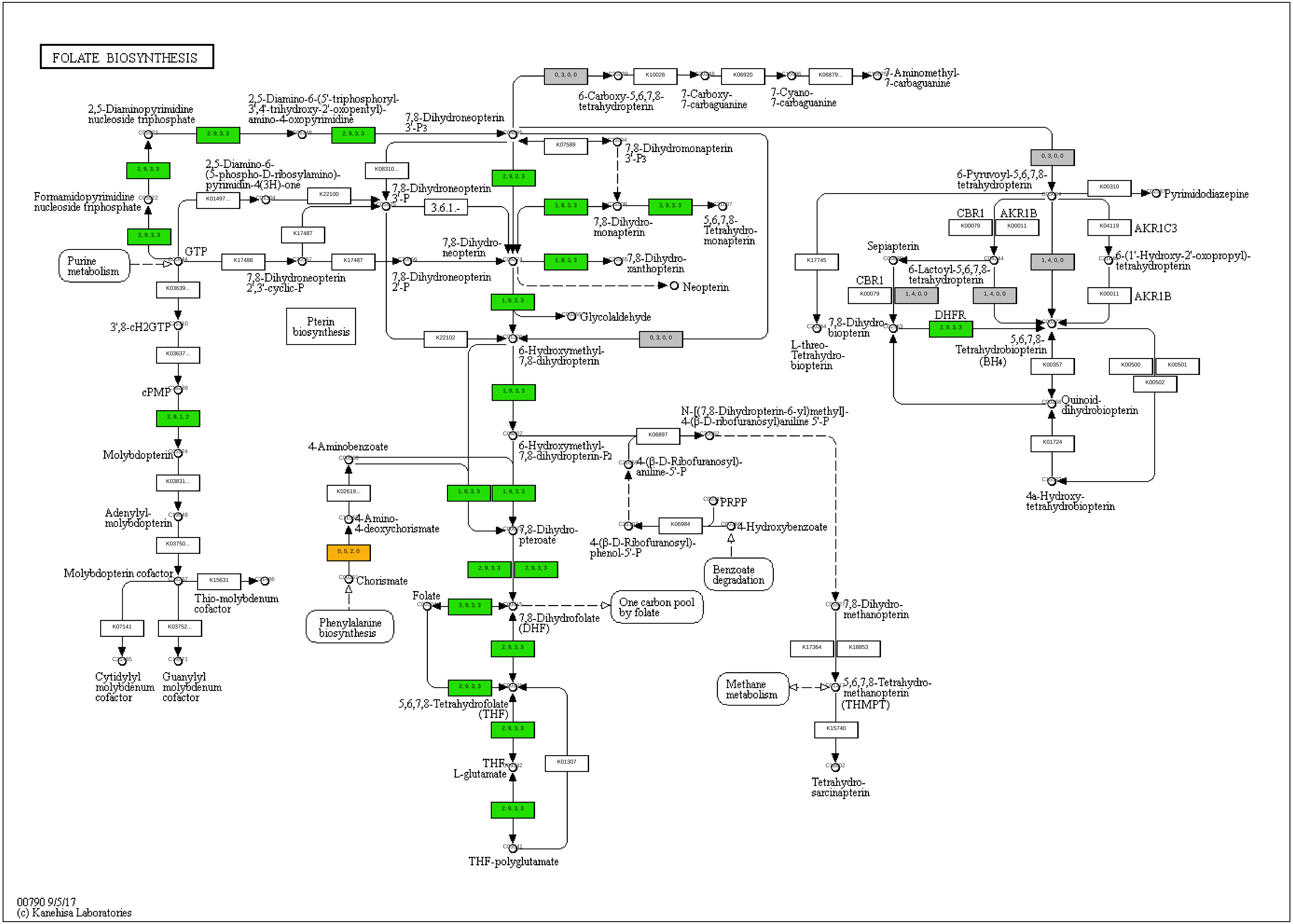
FOLATE BIOSYNTHESIS



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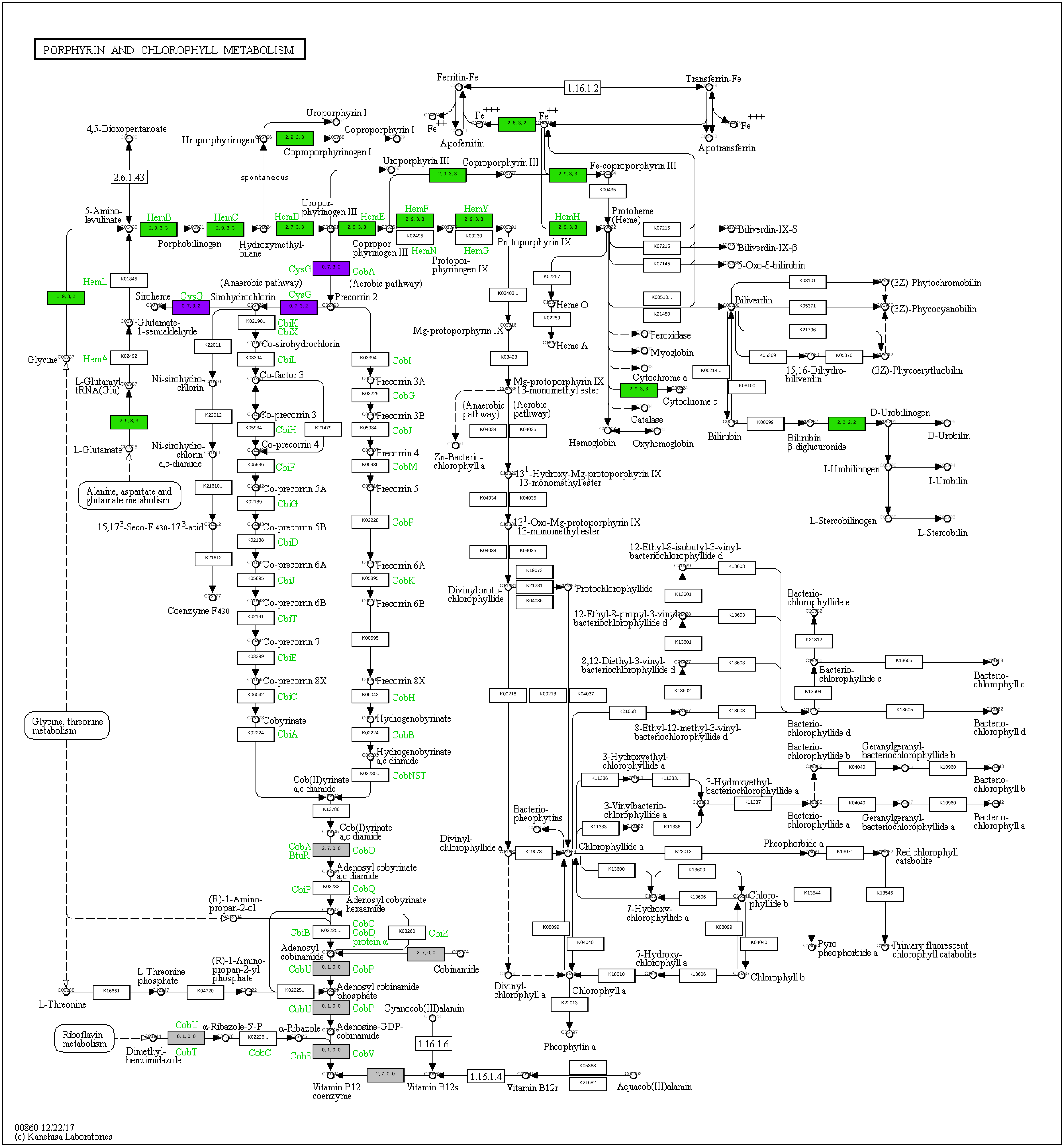
PORPHYRIN AND CHLOROPHYLL METABOLISM
Ferritin-Fe
1.16.1.2
Transferrin-Fe
Fe++
Fe++
Fe++
Fe+++
Apoferritin
Apotransferrin
2.8.3.2
4,5-Dioxopentanoate
2.6.1.43
Uroporphyrin I
Uroporphyrinogen I
Coproporphyrin I
Coproporphyrinogen I
2.9.3.3
spontaneous
Uroporphyrin III
Coproporphyrin III
Fe-coproporphyrin III
K00435
5-Amino-levulinate
HemB
HemC
HemD
HemE
HemF
HemY
HemH
2.9.3.3
2.7.3.3
Porphobilinogen
Hydroxymethyl-bilane
Uropor-phyrinogen III
Coprophor-phyrinogen III
HemN
K02495
K00230
HemG
Protopor-phyrinogen IX
Protoporphyrin IX
Protoheme (Heme)
K07215
Biliverdin-IX-δ
K07215
Biliverdin-IX-β
K07145
5-Oxo-δ-bilirubin
K08101
(3Z)-Phytochromobilin
K00510...
K21480
Biliverdin
K05371
(3Z)-Phycocyanobilin
K21796
K05369
K05370
15,16-Dihydro-biliverdin
(3Z)-Phycoerythrobilin
K00214...
K08100
HemL
1.9.3.2
K01845
Glycine
HemA
K02492
Glutamate-1-semialdehyde
L-Glutamyl-tRNA(Glu)
2.9.3.3
L-Glutamate
Alanine, aspartate and glutamate metabolism
CysG
0.7.3.2
CobA
(Anaerobic pathway)
(Aerobic pathway)
Siroheme
CysG
Sirohydrochlorin
CysG
Precorrin 2
K02190...
CbiK
CbiX
Co-sirohydrochlorin
K22011
K03394...
CbiL
K03394...
CobI
Co-factor 3
Precorrin 3A
Ni-sirohydro-chlorin
K22012
Co-precorrin 3
K05934...
CbiH
K21479
K02229
CobG
Precorrin 3B
K05934...
CobJ
Co-precorrin 4
Precorrin 4
Ni-sirohydro-chlorin a,c-diamide
K05936
CbiF
K05936
CobM
K21610...
Co-precorrin 5A
Precorrin 5
K02189...
CbiG
K02228
CobF
15,17³-Seco-F 430-17³-acid
Co-precorrin 5B
K02188
CbiD
K21612
Co-precorrin 6A
Precorrin 6A
K05895
CbiJ
K05895
CobK
Coenzyme F430
Co-precorrin 6B
Precorrin 6B
K02191
CbiT
K00595
Co-precorrin 7
K03399
CbiE
Co-precorrin 8X
Precorrin 8X
K06042
CbiC
K06042
CobH
Glycine, threonine metabolism
Cobyrinate
Hydrogenobyrinate
K02224
CbiA
K02224
CobB
Hydrogenobyrinate a,c diamide
K02230...
CobNST
Cob(II)yrinate a,c diamide
K13786
Cob(I)yrinate a,c diamide
CobA
BtuR
2.7.0.0
CobO
Adenosyl cobyrinate a,c diamide
CbiP
K02232
CobQ
(R)-1-Amino-propan-2-ol
Adenosyl cobyrinate hexaamide
CbiB
K02225...
CobC
CobD
protein α
K08260
CbiZ
Adenosyl cobinamide
2.7.0.0
Cobinamide
CobU
0.1.0.0
CobP
L-Threonine phosphate
(R)-1-Amino-propan-2-yl phosphate
K16651
K04720
K02225...
Adenosyl cobinamide phosphate
L-Threonine
CobU
0.1.0.0
CobP
Cyanocob(III)alamin
CobU
α-Ribazole-5'-P
α-Ribazole
Adenosine-GDP-cobinamide
Riboflavin metabolism
0.1.0.0
K02226...
Dimethyl-benzimidazole
CobT
CobC
CobS
0.1.0.0
CobV
1.16.1.6
Vitamin B12 coenzyme
2.7.0.0
Vitamin B12s
1.16.1.4
Vitamin B12r
K05368
K21682
Aquacob(III)alamin
K02257
Heme O
K02259
Heme A
K03403...
Mg-protoporphyrin IX
K03428
Peroxidase
Myoglobin
Cytochrome a
2.9.3.3
Cytochrome c
Catalase
Hemoglobin
Oxyhemoglobin
Bilirubin
K00699
Bilirubin β-diglucuronide
2.2.2.2
D-Urobilinogen
D-Urobilin
I-Urobilinogen
I-Urobilin
L-Stercobilinogen
L-Stercobilin
Mg-protoporphyrin IX 13-monomethyl ester
(Anaerobic pathway)
(Aerobic pathway)
K04034
K04035
Zn-Bacterio-chlorophyll a
13¹-Hydroxy-Mg-protoporphyrin IX 13-monomethyl ester
K04034
K04035
13¹-Oxo-Mg-protoporphyrin IX 13-monomethyl ester
K04034
K04035
K19073
K21231
K04036
Divinylproto-chlorophyllide
Protochlorophyllide
12-Ethyl-8-isobutyl-3-vinyl-bacteriochlorophyllide d
K13603
K13601
12-Ethyl-8-propyl-3-vinyl-bacteriochlorophyllide d
K13603
Bacterio-chlorophyllide e
K13601
K21312
8,12-Diethyl-3-vinyl-bacteriochlorophyllide d
K13603
K13605
K13602
Bacterio-chlorophyllide c
Bacterio-chlorophyll c
K00218
K00218
K04037...
K13604
K21058
K13603
K13605
8-Ethyl-12-methyl-3-vinyl-bacteriochlorophyllide d
Bacterio-chlorophyllide d
Bacterio-chlorophyll d
3-Hydroxyethyl-chlorophyllide a
Bacterio-chlorophyllide b
Geranylgeranyl-bacteriochlorophyllide b
K04040
K10960
Bacterio-chlorophyll b
K11336
K11333...
3-Hydroxyethyl-bacteriochlorophyllide a
K11337
K04040
K10960
Bacterio-pheophytins
3-Vinylbacterio-chlorophyllide a
Bacterio-chlorophyllide a
Geranylgeranyl-bacteriochlorophyllide a
Bacterio-chlorophyll a
K11333...
K11336
Divinyl-chlorophyllide a
K19073
Chlorophyllide a
K22013
Pheophorbide a
K13071
Red chlorophyll catabolite
K13600
K13600
K13606
Chloro-phyllide b
K13544
K13545
7-Hydroxy-chlorophyllide a
K08099
K04040
K08099
K04040
Pyro-pheophorbide a
Primary fluorescent chlorophyll catabolite
7-Hydroxy-chlorophyll a
Divinyl-chlorophyll a
K18010
K13606
Chlorophyll b
Chlorophyll a
K22013
Pheophytin a
00860 12/22/17
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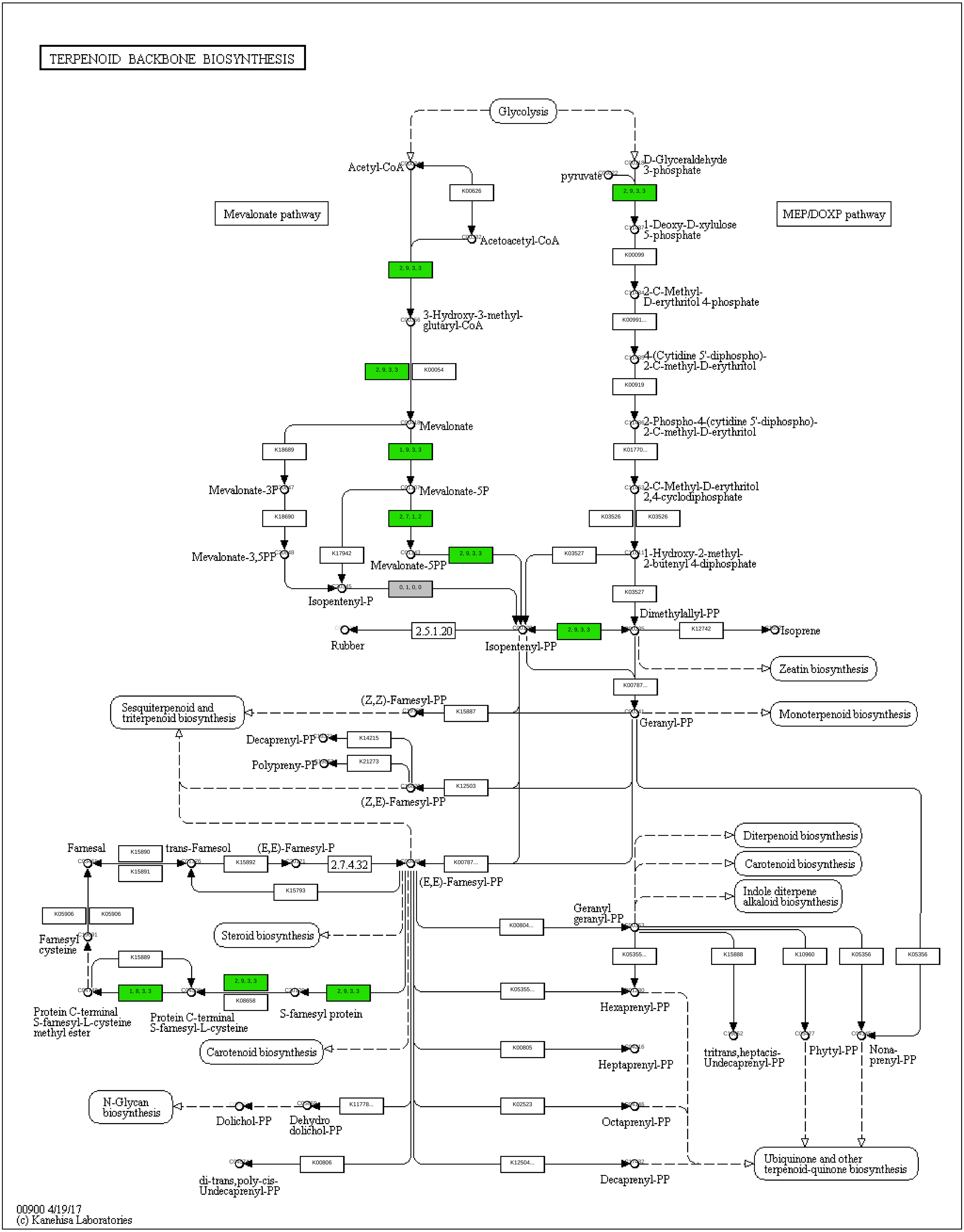
9. Metabolism of terpenoids and polyketides

MAP	PATHWAY
900	Terpenoid backbone biosynthesis
909	Sesquiterpenoid and triterpenoid biosynthesis


TERPENOID BACKBONE BIOSYNTHESIS
Glycolysis
Acetyl-CoA
K00626
D-Glyceraldehyde 3-phosphate
pyruvate
2, 9, 3, 3
Mevalonate pathway
MEP/DOXP pathway
Acetoacetyl-CoA
1-Deoxy-D-xylulose 5-phosphate
2, 9, 3, 3
K00099
3-Hydroxy-3-methyl-glutaryl-CoA
2-C-Methyl-D-erythritol 4-phosphate
K00991...
2, 9, 3, 3
K00054
4-(Cytidine 5'-diphospho)-2-C-methyl-D-erythritol
K00919
Mevalonate
2-Phospho-4-(cytidine 5'-diphospho)-2-C-methyl-D-erythritol
K18689
1, 9, 3, 3
K01770...
Mevalonate-3P
Mevalonate-5P
2-C-Methyl-D-erythritol 2,4-cyclodiphosphate
K18690
2, 7, 1, 2
K03526
K03526
Mevalonate-3,5PP
K17942
2, 9, 3, 3
Mevalonate-5PP
K03527
1-Hydroxy-2-methyl-2-butenyl 4-diphosphate
0, 1, 0, 0
K03527
Isopentenyl-P
Dimethylallyl-PP
2.5.1.20
2, 9, 3, 3
K12742
Isoprene
Rubber
Isopentenyl-PP
Zeatin biosynthesis
K00787...
(Z,Z)-Farnesyl-PP
Sesquiterpenoid and triterpenoid biosynthesis
K15887
Monoterpenoid biosynthesis
Geranyl-PP
Decaprenyl-PP
K14215
Polypreny-PP
K21273
K12503
(Z,E)-Farnesyl-PP
Diterpenoid biosynthesis
Farnesal
K15890
trans-Farnesol
(E,E)-Farnesyl-P
K15891
K15892
2.7.4.32
K00787...
Carotenoid biosynthesis
(E,E)-Farnesyl-PP
K15793
Indole diterpene alkaloid biosynthesis
K05906
K05906
Geranyl geranyl-PP
K00804...
Farnesyl cysteine
Steroid biosynthesis
K05355...
K15888
K10960
K05356
K05356
K15889
2, 9, 3, 3
1, 8, 3, 3
2, 9, 3, 3
K08658
K05355...
Hexaprenyl-PP
Protein C-terminal S-farnesyl-L-cysteine methyl ester
Protein C-terminal S-farnesyl-L-cysteine
S-farnesyl protein
tritrans,heptacis-Undecaprenyl-PP
Phytyl-PP
Nona-prenyl-PP
Carotenoid biosynthesis
K00805
Heptaprenyl-PP
N-Glycan biosynthesis
K11778...
K02523
Dolichol-PP
Dehydro dolichol-PP
Octaprenyl-PP
Ubiquinone and other terpenoid-quinone biosynthesis
K00806
K12504...
di-trans,poly-cis-Undecaprenyl-PP
Decaprenyl-PP
00900 4/19/17
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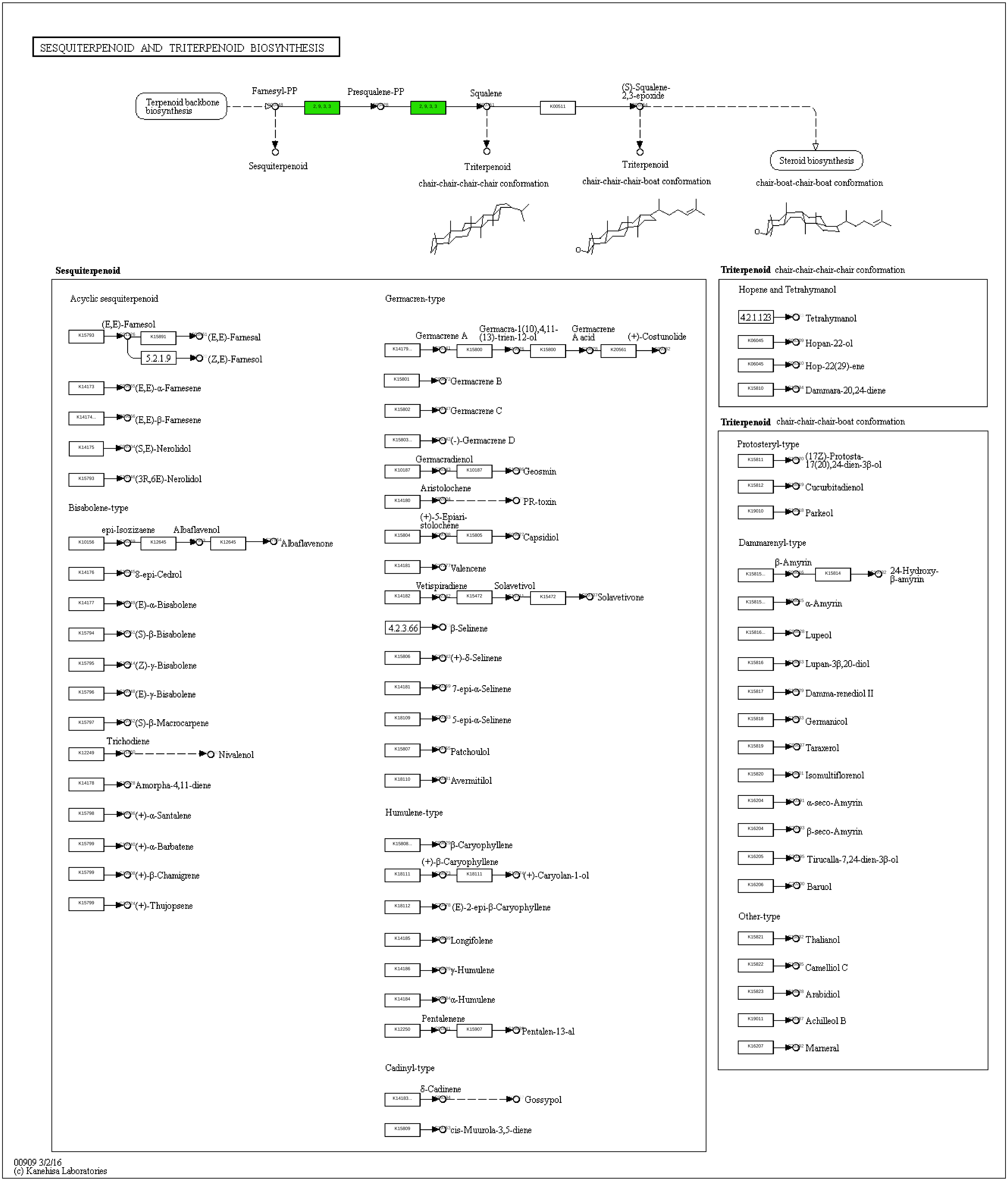
SESQUITERPENOID AND TRITERPENOID BIOSYNTHESIS
Terpenoid backbone biosynthesis
Farnesyl-PP
2.5.1.21
Presqualene-PP
2.5.1.21
Squalene
K00511
(S)-Squalene-2,3-epoxide
Steroid biosynthesis
Sesquiterpenoid
Triterpenoid
chair-chair-chair-chair conformation
Triterpenoid
chair-chair-chair-boat conformation
chair-boat-chair-boat conformation
O
O
Sesquiterpenoid
Acyclic sesquiterpenoid
(E,E)-Farnesol
K15793
K15891
(E,E)-Farnesal
5.2.1.9
(Z,E)-Farnesol
K14173
(E,E)-α-Farnesene
K14174...
(E,E)-β-Farnesene
K14175
(S,E)-Nerolidol
K15793
(3R,6E)-Nerolidol
Bisabolene-type
epi-Isozizaene
Albaflavenol
K10156
K12645
K12645
Albaflavenone
K14176
8-epi-Cedrol
K14177
(E)-α-Bisabolene
K15794
(S)-β-Bisabolene
K15795
(Z)-γ-Bisabolene
K15796
(E)-γ-Bisabolene
K15797
(S)-β-Macrocarpene
Trichodiene
K12249
Nivalenol
K14178
Amorpha-4,11-diene
K15798
(+)-α-Santalene
K15799
(+)-α-Barbatene
K15799
(+)-β-Chamigrene
K15799
(+)-Thujopsene
Germacren-type
Germacrene A
Germacra-1(10),4,11-(13)-trien-12-ol
Germacrene A acid
(+)-Costunolide
K14179...
K15800
K15800
K20561
K15801
Germacrene B
K15802
Germacrene C
K15803...
(-)-Germacrene D
Germacradienol
K10187
K10187
Geosmin
Aristolochene
K14180
PR-toxin
(+)-5-Epiaristolochene
K15804
K15805
Capsidiol
K14181
Valencene
Vetispiradiene
Solavetivol
K14182
K15472
K15472
Solavetivone
4.2.3.66
β-Selinene
K15806
(+)-δ-Selinene
K14181
7-epi-α-Selinene
K18109
5-epi-α-Selinene
K15807
Patchoulol
K18110
Avermitilol
Humulene-type
K15808...
β-Caryophyllene
(+)-β-Caryophyllene
K18111
K18111
(+)-Caryolan-1-ol
K18112
(E)-2-epi-β-Caryophyllene
K14185
Longifolene
K14186
γ-Humulene
K14184
α-Humulene
Pentalenene
K12250
K15907
Pentalen-13-al
Cadinyl-type
δ-Cadinene
K14183...
Gossypol
K15809
cis-Muurola-3,5-diene
Triterpenoid chair-chair-chair-chair conformation
Hopene and Tetrahymanol
4.2.1.123
Tetrahymanol
K06045
Hopan-22-ol
K06045
Hop-22(29)-ene
K15810
Dammara-20,24-diene
Triterpenoid chair-chair-chair-boat conformation
Protosteryl-type
K15811
(17Z)-Protosta-17(20),24-dien-3β-ol
K15812
Cucurbitadienol
K19010
Parkeol
Dammarenyl-type
β-Amyrin
K15815...
K15814
24-Hydroxy-β-amyrin
K15815...
α-Amyrin
K15816...
Lupeol
K15816
Lupan-3β,20-diol
K15817
Damma-renediol II
K15818
Germanicol
K15819
Taraxerol
K15820
Isomultiflorenol
K16204
α-seco-Amyrin
K16204
β-seco-Amyrin
K16205
Tirucalla-7,24-dien-3β-ol
K16206
Baruol
Other-type
K15821
Thalianol
K15822
Camelliol C
K15823
Arabidiol
K19011
Achilleol B
K16207
Marneral
00909 3/2/16
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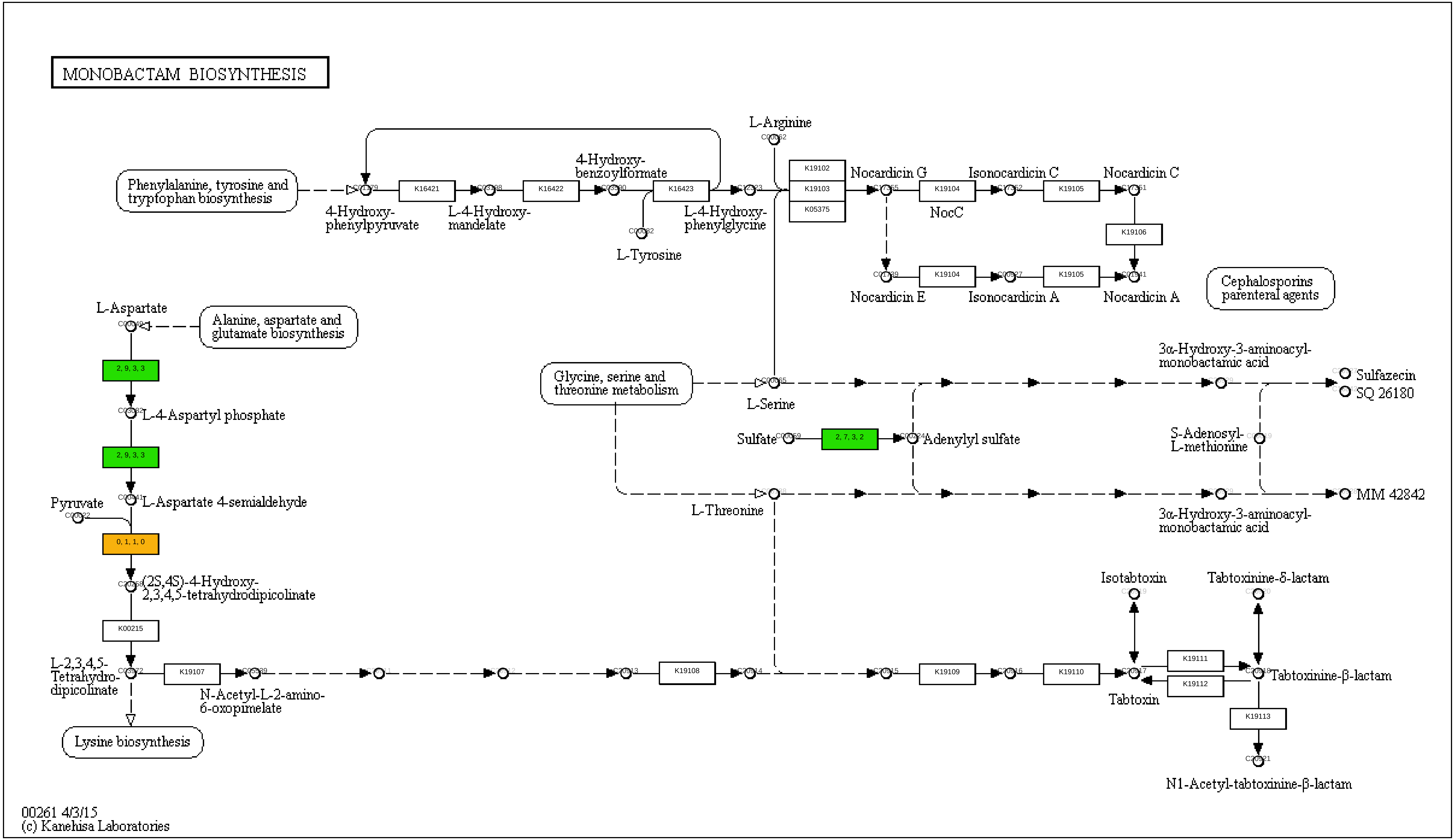
10. Biosynthesis of other secondary metabolites

MAP	PATHWAY
261	Monobactam biosynthesis
332	Carbapenem biosynthesis


MONOBACTAM BIOSYNTHESIS
Phenylalanine, tyrosine and tryptophan biosynthesis
4-Hydroxy-phenylpyruvate
K16421
L-4-Hydroxy-mandelate
K16422
4-Hydroxy-benzoylformate
K16423
L-Tyrosine
L-4-Hydroxy-phenylglycine
L-Arginine
K19102
K19103
K05375
Nocardicin G
K19104
NocC
Isonocardicin C
K19105
Nocardicin C
K19106
Nocardicin E
K19104
Isonocardicin A
K19105
Nocardicin A
Cephalosporins parenteral agents
L-Aspartate
Alanine, aspartate and glutamate biosynthesis
2, 9, 3, 3
L-4-Aspartyl phosphate
2, 9, 3, 3
Pyruvate
L-Aspartate 4-semialdehyde
0, 1, 1, 0
(2S,4S)-4-Hydroxy-2,3,4,5-tetrahydrodipicolinate
K00215
L-2,3,4,5-Tetrahydro-dipicolinate
K19107
N-Acetyl-L-2-amino-6-oxopimelate
Lysine biosynthesis
Glycine, serine and threonine metabolism
L-Serine
Sulfate
2, 7, 3, 2
Adenylyl sulfate
L-Threonine
3α-Hydroxy-3-aminoacyl-monobactamic acid
Sulfazecin
SQ 26180
S-Adenosyl-L-methionine
MM 42842
3α-Hydroxy-3-aminoacyl-monobactamic acid
K19108
K19109
K19110
Isotabtoxin
Tabtoxinine-δ-lactam
K19111
K19112
Tabtoxinine-β-lactam
Tabtoxin
K19113
N1-Acetyl-tabtoxinine-β-lactam
00261 4/3/15
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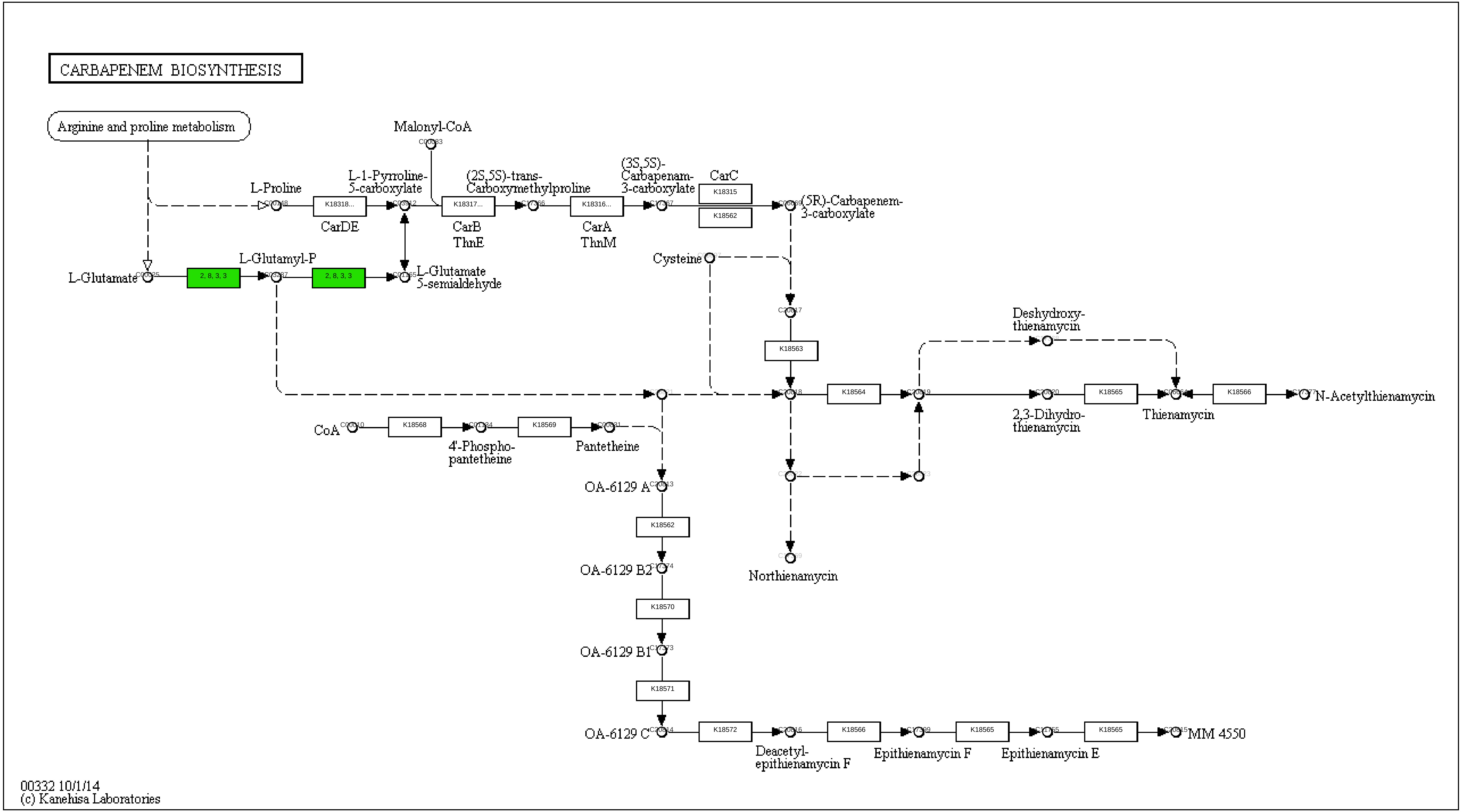
CARBAPENEM BIOSYNTHESIS
Arginine and proline metabolism
Malonyl-CoA
C00083
L-Proline
C00148
K18318...
CarDE
L-1-Pyrroline-5-carboxylate
K18317...
CarB
ThnE
(2S,5S)-trans-Carboxymethylproline
K18316...
CarA
ThnM
(3S,5S)-Carbapenam-3-carboxylate
CarC
K18315
K18562
(5R)-Carbapenem-3-carboxylate
L-Glutamate
C00025
2, 8, 3, 3
L-Glutamyl-P
2, 8, 3, 3
L-Glutamate 5-semialdehyde
Cysteine
C20817
K18563
C20818
K18564
C20819
Deshydroxy-thienamycin
C20820
2,3-Dihydro-thienamycin
K18565
Thienamycin
K18566
N-Acetylthienamycin
CoA
C00010
K18568
4'-Phospho-pantetheine
K18569
Pantetheine
C00831
OA-6129 A
C20813
K18562
OA-6129 B2
K18570
OA-6129 B1
K18571
OA-6129 C
C20814
K18572
Deacetyl-epithienamycin F
K18566
Epithienamycin F
K18565
Epithienamycin E
K18565
C20815
MM 4550
Northienamycin
00332 10/1/14
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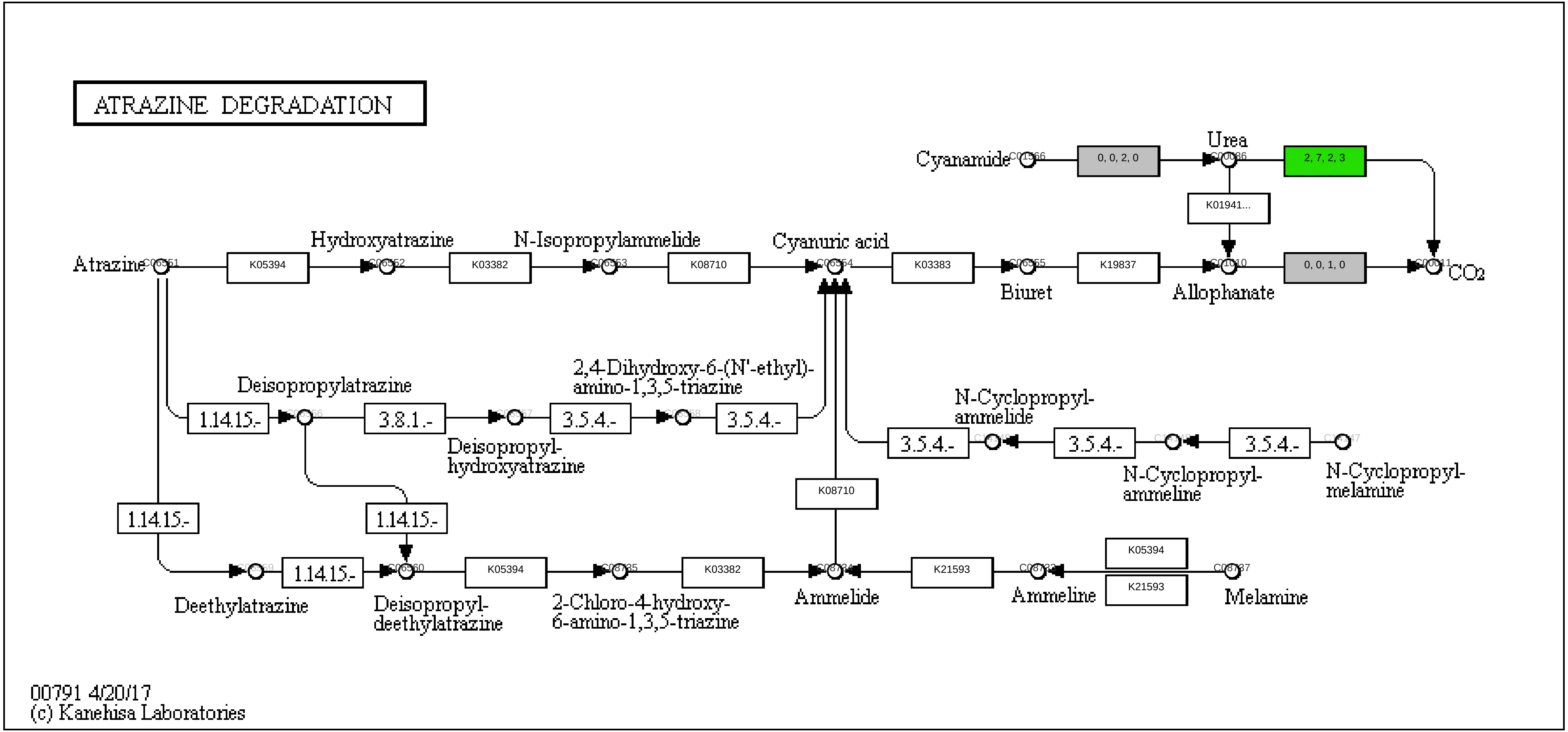
11. Xenobiotics biodegradation and metabolism

MAP	PATHWAY
791	Atrazine degradation


ATRAZINE DEGRADATION
Cyanamide
C01566
0, 0, 2, 0
Urea
C00086
2, 7, 2, 3
K01941...
Atrazine
C06551
K05394
Hydroxyatrazine
C06552
K03382
N-Isopropylammelide
C06553
K08710
Cyanuric acid
C06554
K03383
C06555
Biuret
K19837
C01010
Allophanate
0, 0, 1, 0
C00011
CO2
Deisopropylatrazine
1.14.15.-
C06556
3.8.1.-
C06557
Deisopropyl-
hydroxyatrazine
2,4-Dihydroxy-6-(N'-ethyl)-
amino-1,3,5-triazine
3.5.4.-
C06558
3.5.4.-
N-Cyclopropyl-
ammelide
3.5.4.-
3.5.4.-
N-Cyclopropyl-
ammeline
3.5.4.-
N-Cyclopropyl-
melamine
K08710
1.14.15.-
1.14.15.-
C06559
1.14.15.-
C06560
Deethylatrazine
Deisopropyl-
deethylatrazine
K05394
C08735
2-Chloro-4-hydroxy-
6-amino-1,3,5-triazine
K03382
C08734
Ammelide
K21593
C08733
Ammeline
K05394
K21593
C08737
Melamine
00791 4/20/17
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