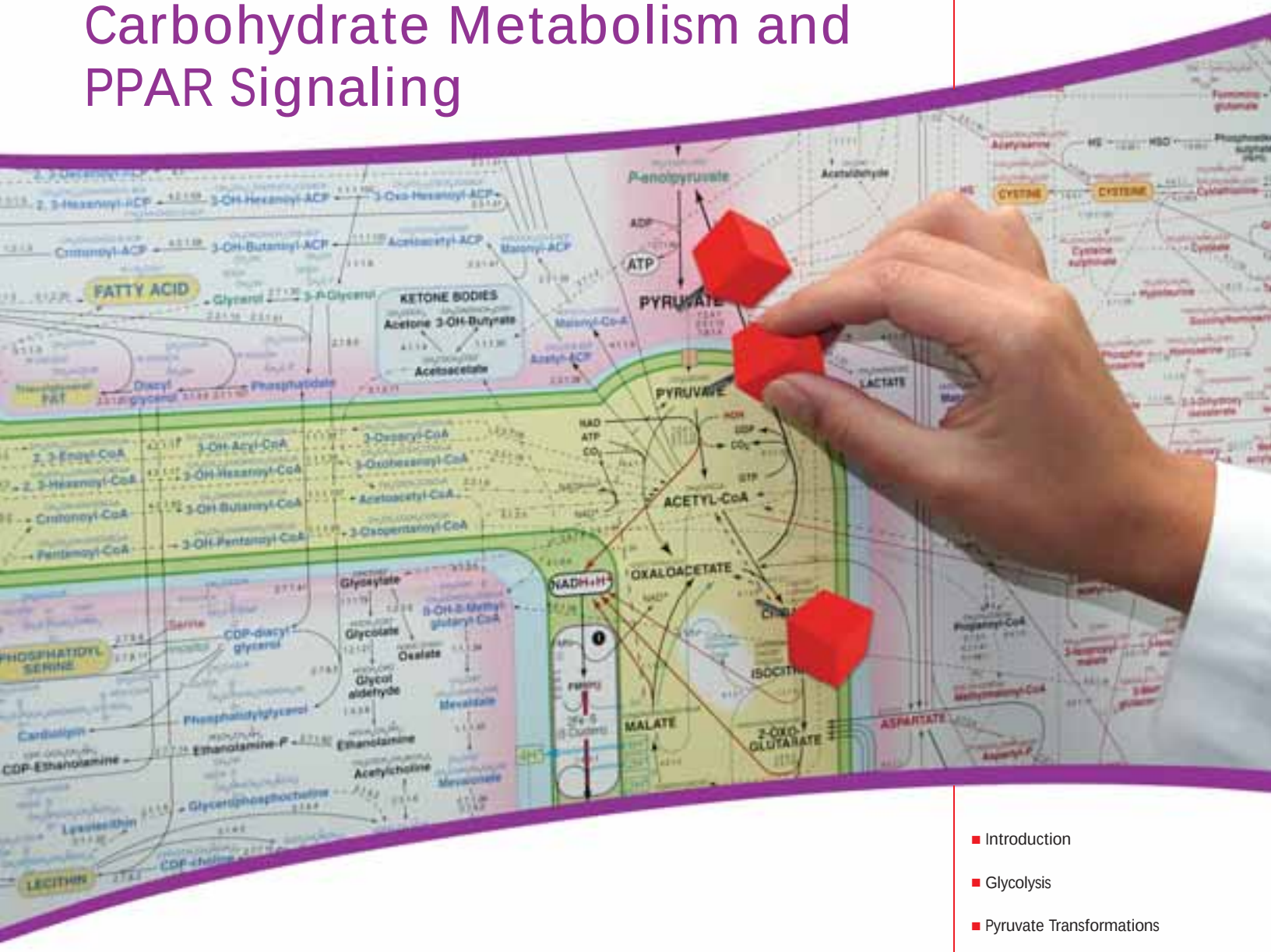
BioFiles
FOR LIFE SCIENCE RESEARCH
Volume 2 Number 6

SIGMA Life Science

Carbohydrate Metabolism and PPAR Signaling



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Metabolic Pathways Resource Center

The evolutionary pathway of life science technology has brought today's researchers full circle to a destination we now call metabolomics.

The Sigma Enzyme Explorer Metabolic Pathway Resource Center provides the online tools you need to explore the metabolome.

In 1947 Sigma produced the first batch of commercially available ATP. Since then, Sigma has consistently expanded its product offerings to what is now the most comprehensive line of organic metabolites, enzymes and analytical tools in the world.
The cornerstone of our commitment to metabolomics is our long-standing alliance with the IUBMB to produce animate and publish the Nicholson Metabolic Pathway Charts.

To take advantage of these and many other free resources visit the Sigma metabolomics resource at **sigma.com/metpath**

Introduction

The analysis and understanding of the functional biology of cells, tissues and organisms not only require information on the genome and proteome level, but also a snapshot of the small molecules present. Low-molecular weight metabolites have been the subject of classical biochemical research in the 20th century and have been further defined as substrates and products of enzyme reactions. Changes in the levels of specific metabolites are used in routine analysis of healthy and pathological states of humans and animals. In addition, microbial and plant systems used in biochemical manufacturing benefit from the quantification of metabolites (e.g. D(+)-glucose, acetate and L(+)-lactate).

Advances in separation and detection technologies along with the availability of new metabolite standards have improved the ability to analyze defined target molecules. Analysis of large numbers of related metabolites up to the complete metabolome have now become possible.

A rapid global analysis can be used as a metabolic fingerprint for phenotype or sample classification. On a more detailed level, the analysis of specific metabolic pathways and changes under experimental conditions can be utilized as a metabolic profile while also contributing information to genomic and proteomic studies.

Sigma offers hundreds of metabolite standards. This issue of BioFiles features products related to carbohydrate metabolism.

To order a 33 in. x 50 in.
Metabolic Pathways Poster, click here.

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Carbohydrate Metabolism and PPAR Signaling

Cationic Metabolites of Increasing Mass/Charge-Ratios

As the discovery of novel metabolites is supported by comparison with existing metabolites, a list of both cationic and anionic metabolites arranged in the order of increasing molecular weight/charge are shown in **Table 1** and **Table 2**.

Table 1

Cationic Metabolite Standards	m/z	Cat. No.
Urea	61	U0631
3-Aminopropionitrile	71	A3134
Methylguanidine	74	M0377
1,3-Diaminopropane	75	D2,360-2
L-Glycine	76	G7403
Isopropanolamine	76	A1531
Cysteamine	78	M9768
Pyridine	80	P4036
Pyrimidine	81	83120
3-Amino-1,2,4-triazole	85	A8056
Piperidine	86	P5881
Piperazine	87	80621
1,4-Butanediamine	89	P7630
L-β-Alanine	90	A7752
L-Alanine	90	A7627
Sarcosine	90	S7672
3-Amino-1,2-propanediol	92	9265
Aniline	94	A9880
2-Hydroxypyridine	96	H5,680-0
4-Hydroxymethylimidazole	99	H1877
1-Methyl-2-pyrrolidone	100	78769
Succinimide	100	S9381
α-Aminocyclopropane-1-carboxylate	102	A3903
Hexylamine	102	21,970-3
Cadaverine	103	C1541
α-Aminoisobutyrate	104	A8504
GABA	104	A5835
N,N-Dimethylglycine	104	D1156
N-Methyl-L-alanine	104	2676
DL-2,3-Diaminopropionate	105	D1502
L-Serine	106	S4500
Diethanolamine	106	D0681
Hypotaurine	110	H1384
4-Aminophenol	110	9160
Cytosine	112	C3506
Uracil	113	U0750
Creatinine	114	C4255
Dihydrouracil	115	D7628
L-Proline	116	P0380
L-Valine	118	V0500
L-Norvaline	118	N7627
Guanidinoacetate	118	50920
Benzimidazole	119	12250
L-Homoserine	120	H6515
L-Threonine	120	T8625
α-Methyl-DL-serine	120	M6877
Benzamidine	121	12072
Purine	121	P1655
L-Cystein	122	30089
N,N-Dimethylaniline	122	39430
Benzamide	122	B2009
beta-Phenylethylamine	122	P2641
Taurine	126	T0625
1-Methylhistamine	126	M4910
5-Methylcytosine	126	M6751
Imidazole-4-acetate	127	I0375
Isoguvacine	128	G-002
Octylamine	130	74988
Oxoproline	130	83170
Cyanurate	130	28640
1-Amino-1-cyclopentanecarboxylate	130	A4,810-5
1,1-Dimethyl biguanide	130	D5035
N-Acetylputrescine	131	A8784
Creatine	132	C3630
L-Isoleucine	132	I2752
L-Leucine	132	L8912
L-Hydroxyproline	132	H5534
δ-Aminolevulinate	132	A3785
ε-Amino-n-caproate	132	A2504
L-Norleucine	132	N6877
β-Guanidinopropionate	132	G6878
L-Ornithine	133	O4386
L-Asparagine	133	A0884
D-Ornithine	133	O5250
4-Aminoindole	133	8244
5-Aminoindole	133	8245
Glycyl-glycine	133	G7278
L-Aspartic acid	134	A8949
2-Aminoimidazole	134	8225
Adenine	136	A8626

Cationic Metabolite Standards	m/z	Cat. No.
DL-Homocysteine	136	H4628
Hypoxanthine	137	H9377
Pralidoxime	137	P9053
Tyramine	138	T7255
Anthranilate	138	A1506
para-Aminobenzoate	138	A9878
Urocanate	139	U7500
6-Hydroxynicotinate	140	55968
Tropine	142	T7878
4-Methyl-5-thiazoleethanol	144	54405
Spermidine	146	S2626
gamma-Guanidinobutyrate	146	G6503
L-Lysine	146	L5501
L-Glutamine	147	G3126
Acetylcholine	147	A 6625
Carbachole	147	C4382
Isatin	148	58240
L-Glutamic acid	148	G1251
O-acetyl-L-serine	148	A6262
D-Penicillamine	150	P4875
L-Methionine	150	M9625
2,6-Dimethylaniline	150	36766
3-Methyladenine	150	M9281
Triethanolamine	151	T9534
Guanine	152	G6779
1-Adamantanamine	152	6649
3,4-Dihydroxyphenethylamine	154	H8502
L-Histidine	156	H8000
3-Indolylacetonitrile	157	57280
Allantoin	159	A7878
Tolazoline	161	T6886
L-Carnitine	162	C0158
3-Indole ethanol	162	54350
Nicotine	163	N0267
Pterin	164	P1132
L-Phenylalanine	166	P2126
Phenylephrine	168	P6126
Pyridoxal	168	P9130
Mecamylamine	168	M9020
Pyridoxine	170	P5669
L-Arginine	175	A5006
N-Ethyl-L-Glutamine	175	E4393
N-Acetyl-L-Ornithine	175	A3626
Gramine	175	G1,080-6
L-Citrulline	176	C7629
Fusarate	180	F6513
o-Phenanthroline	181	P9375
L-Tyrosine	182	T3754
Quisqualate	190	Q2128
Castanospermine	190	C3784
2,6-Diaminoheptanedioate	191	D1377
Caffeine	195	C8960
DOPA	198	D9503
Spermine	203	85590
L-Tryptophan	205	T0254
Minoxidil	210	M4145
Baclofen	214	B5399
Harmaline	215	H2256
N-Acetyl-D(+)-glucosamine	222	A8625
L-Cystathionine	223	C7505
L-Carnosine	227	C9625
Porphobilinogen	227	P1134
2'-Deoxyuridine	229	D5412
N-Acetylspermine	235	1467
L-Homocarnosine	241	H4885
Thymidine	243	T9250
Cytidine	244	C3506
Uridine	245	U3750
Octopine	247	O4875
Adenosine	268	A9251
Inosine	269	I1024
Eserine	276	E8375
Guanosine	284	G6752
Nopaline	305	N6134
Glutathione	308	G6529
S-Adenosyl-L-homocystein	385	A9384
Leucyl-leucyl-tyrosin	408	L9890
Leupeptin	427	L2884
Piperacillin	518	P8396

Anionic Metabolites of Increasing Mass/Charge-Ratios

Table 2.

Anionic Metabolite Standards	m/z	Cat. No.
Propiolate	69	81860
Acrylate	71	1730
Glyoxylate	73	G4627
Propionate	73	40,290-7
Glycolate	75	G8284
Butyrate	87	B10,350-0
Pyruvate	87	P8574
Lactate	89	L6402
Thioglycolate	91	T0632
Chloroacetate	93	40,292-3
Methanesulfonate	95	64280
Tiglate	99	T3,520-3
Isovalerate	101	12,954-2
2-Oxobutyrate	101	K8875
Pentanoate	101	V9759
β-Hydroxypyruvate	103	54913/06367
β-Hydroxybutyrate	103	H6501
Malonate	103	M4795
Glycerate	105	G8766
Maleamate	114	M2422
Hexanoate	115	C4026
Fumarate	115	F2752
3-Methyl-2-oxobutanoate	115	68253
Guanidoacetate	116	G6002
Methylmalonate	117	M5,405-8
Succinate	117	S3674
Benzoate	121	B7521
Isonicotinate	122	I1137
Nicotinate	122	N4126
L(+)-Tartrate	123	T1807
2-Aminoethylphosphonate	124	A6037
(S)-(+)-1-Aminoethylphosphonate	124	A7426
Citraconate	129	C8,260-4
Itaconate	129	59950
Mesaconate	129	13,104-0
4-Methyl-2-oxovalerate	129	K0629
Glutarate	131	49660
3-Ureido propionate	131	C3750
L-Malate	133	M6413
p-Toluate	135	89902
m-Toluate	135	89890
p-Hydroxybenzoate	137	H3766
m-Hydroxybenzoate	137	54610
Salicylate	137	S5922
Acetylphosphate	139	A0262
Ethanolamine phosphate	140	P0503
Caprylate	143	C2875
2-Oxoglutarate	145	K1750
threo-beta-Methyl-aspartate	146	M6126
trans.Cinnamate	147	C8,085-7
4-Carboxybenzaldehyde	149	21873
p-Hydroxyphenylacetate	151	H4377
L-Cysteine sulfinate	152	C4418
2,5-Dihydroxybenzoate	153	G5254
Protocatechuate	153	P5630
Dihydroorotate	157	D7003
Acetylcysteine	162	A8199
p-Coumarate	163	C9008
o-Coumarate	163	C4400
beta-Phenylpyruvate	163	P8001
3,4-Dihydroxyphenylacetate	167	D9128
Phosphoenolpyruvate	167	P7127
L-Cysteate	168	C7630
Glyphosate	168	P5671
Dihydroxyacetone phosphate	169	D7137
Glycerol-3-phosphate	171	G2138
2-Quinolinecarboxylate	172	22560
cis-Aconitate	173	A3412
Phenylphosphate	173	71900
(-)-Shikimate	173	S5375
Dehydroascorbate	173	D8132
Ascorbate	175	A5960
S-Carboxymethyl-L-cysteine	178	C7757
Glucose	179	G7528
p-Hydroxyphenylpyruvate	179	H5005
O-Phospho-L-serine	184	P0878
3-Phosphoglycerate	185	P8877
2-Phosphoglycerate	185	P0257
Azelaate	187	11470
N-Acetyl-L-glutamate	188	1160
N-Acetyl-L-methionine	190	A3258
Citrate	191	C0706
Threo-D-Isocitrate	191	58790

Anionic Metabolite Standards	m/z	Cat. No.
D-Glucuronate	193	G8645
O-Hydroxyhippurate	194	H7254
Gluconate	195	G4500
Erythrose-4-phosphate	199	E0377
Sebacate	201	S2625
Indole-3-pyruvate	202	I1017
Xanthurenate	204	X3250
DL-6,8-Thioctate amide	205	T5875
DL-6,8-Thioctate reduced	207	T8260
N-Benzyloxycarbonylglycine	208	B1268
Mucin	209	M4778
2-Deoxyribose-5-phosphate	213	D3126
Pantothenate	218	P3161
Ribose-5-phosphate	229	R7750
Ribulose-5-phosphate	229	R9875
Pyridoxal-5'-phosphate	246	P9255
Pyridoxamine-5'-phosphate	247	82890
D-Glucosamine-6-phosphate	258	G5509
Fructose-6-phosphate	259	F3627
Glucose-1-phosphate	259	G7000
Glucose-6-phosphate	259	G7879
2,3-Diphosphoglycerate	265	D5764
Gluconate-6-phosphate	275	P6888
Argininosuccinate	289	A5707
cTMP	303	T6754
cCMP	304	C8631
dCMP	306	D7625
dUMP	307	D3876
N-Acetylneuramate	308	A2388
TMP	321	T7004
CMP	322	C1131
UMP	323	U6375
cAMP	328	A4137
Pyrroloquinoline quinone	329	D7783
dAMP	330	D6250
dIMP	331	D0126
Fructose-1,6-diphosphate	339	F 0752
cGMP	344	G7504
AMP	346	A1752
dGMP	346	D9625
IMP	347	I 2879
GMP	362	G8377
XMP	363	X1000
dCDP	386	D7250
Ribose-1,5-diphosphate	389	79535
TDP	401	T9375
CDP	402	C9755
UDP	403	U4125
dADP	410	D6000
ADP	426	A2754
Adenosine-3',5'-diphosphate	426	A5763
dGDP	426	D9250
Adenosine-5'-phosphosulfate	426	A1651
IDP	427	I 4375
GDP	442	G7127
7,8-Dihydrofolate	443	D7006
FMN	455	F8399
Adenylosuccinate	462	A5028
dCTP	466	D4635
dUTP	467	D4001
TTP	481	T0251
CTP	482	C1506
UTP	483	U6625
dATP	490	D6500
dITP	491	D0758
ATP	506	A7699
dGTP	506	D4010
ITP	507	I0879
GTP	522	G5884
UDP-glucose	565	U4625
UDP-glucuronate	579	U6751
UDP-N-acetylgalactosamin	607	U5252
CMP-N-acetylneuramate	614	C8271
NAD	662	N6522
NADH	664	N8129
NADP	742	N0505
NADPH	744	N8129
CoA	766	C3144
FAD	784	F6625
AcetylCoA	808	A2056
PropionylCoA	822	P5397
MalonylCoA	852	M4263
SuccinylCoA	866	S1129

Glycolysis

Carbohydrates synthesized during photosynthesis act as the main storage molecules of solar energy. When ingested, complex carbohydrates are enzymatically hydrolyzed to monosaccharides, such as starch to D(+)-glucose.

The catabolism of glucose is the primary energy source for short-term requirements and begins with the Embden-Meyerhoff-Pathway as illustrated in **Figure 1.** D(+)-Glucose (1) is phosphorylated in the first reaction with ATP to give glucose-6-phosphate (2).

The isomerization of glucose-6-phosphate (2) in the second reaction to fructose-6-phosphate (3) occurs via ring-opening and subsequent keto-enol-tautomerization.

The third reaction is another phosphorylation with ATP, whereby fructose-6-phosphate (3) is converted to fructose-1,6-bis-phosphate (4).

A key branching reaction is the fourth reaction: a ring-opening reaction of fructose-1,6-bisphosphate (4), which is cleaved in a retro-aldol reaction into D-glyceraldehyde-3-phosphate (5), and dihydroxyacetone phosphate (6).

The branch via dihydroxyacetonephosphate (6) is channelled back into D-glyceraldehyde-3-phosphate (5) in the fifth reaction by an isomerization. In the sixth reaction the combined D-glyceraldehyde-3-phosphate from both routes is oxidized at the C1 to a carboxylic acid and then phosphorylated in the 1-position to yield 1,3-bisphospho-D-glycerate (7).

This phosphate group in the 1-position is transferred in the seventh reaction from the carboxyl group of (7) to ADP to give 3-phospho-D-glycerate (8).

The eighth reaction is an isomerization of 3-phospho-D-glycerate (8) to 2-phospho-D-glycerate (9).

The next metabolite phosphoenolpyruvate (10) is formed in a dehydration reaction from 2-phospho-D-glycerate in the ninth reaction.

The glycolysis pathway from D(+)-glucose (1) to two molecules of pyruvate (11) is concluded by the tenth reaction, which transfers a phosphate group from phosphoenolpyruvate (10) to ADP, thereby giving ATP and pyruvate (11).

Visit the Sigma Metabolomics Resource Center to view the Nicholson-IUBMB animation of glycolysis at **sigma.com/metpath.**

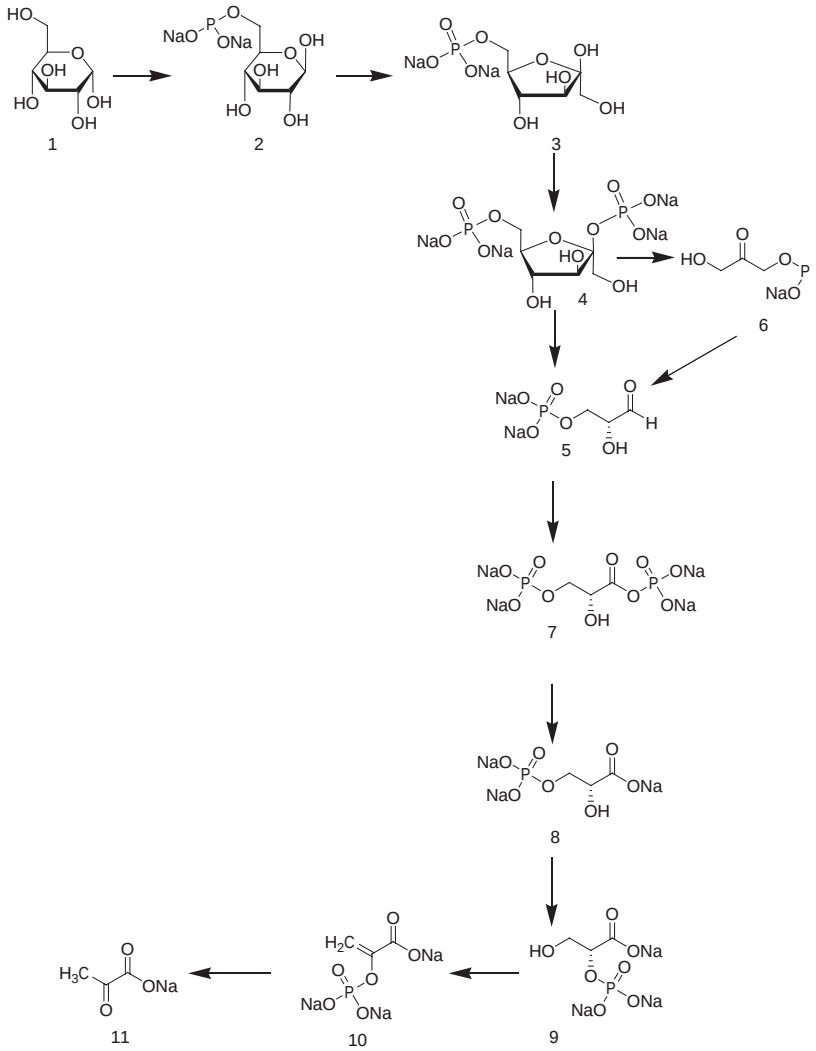

Figure 1. Embden-Meyerhoff-Pathway.

Non-Labeled Metabolites for Glycolysis

D-Fructose 1,6-bisphosphate octahydrate trisodium salt

FDP-Na_3H; D-Fructose 1,6-diphosphate trisodium salt

$C_6H_{11}Na_3O_{12}P_2 \cdot 8H_2O$ FW 550.18 [38099-82-0] EC No. 2537780
BRN 3837985

▶ ***BioChemika*, ≥98.0% (NT)**

water.....~25%

store at: 2-8°C

47810-1G	1 g
47810-5G	5 g

Pyruvic acid

α-Ketopropionic acid; 2-Oxopropionic acid

$CH_3COCOOH$ FW 88.06 [127-17-3] EC No. 2048243 BRN 506211

▶ **purum, ≥98.0% (T)**

R: 34 S: 26-36/37/39-45 EC No. 204-824-3 FP: 82 °C (180 °F)

store at: 2-8°C

15940-100ML	100 mL
15940-500ML	500 mL

Phospho(enol)pyruvic acid heptahydrate trisodium salt

Trisodium phosphoenolpyruvate heptahydrate

$C_3H_2Na_3O_6P \cdot 7H_2O$ FW 360.09 [5541-93-5] EC No. 2269068
BRN 4611329

▶ ***BioChemika*, ≥97.0% (enzymatic)**

store at: -20°C

79435	inquire

D-Glucose 6-phosphate sodium salt

D(+)-Glucopyranose 6-phosphate sodium salt ; G-6-P Na; Robison ester

$C_6H_{12}NaO_9P$ FW 282.12 [54010-71-8] EC No. 2589210
BRN 5787568

▶ ***BioChemika*, crystallized, anhydrous, ≥98.0% (enzymatic)**

Substrate for the determination of glucose-6-phosphate dehydrogenase, EC 1.1.1.491

[α]20/D +34±1°, c = 10 in H_2O

store at: 2-8°C

49282-250MG	250 mg
49282-1G	1 g
49282-5G	5 g

D-Fructose 1,6-bisphosphate tetra(cyclohexylammonium) salt

D(+)Fructofuranose 1,6-diphosphate; Harden-Young ester; Hexose diphosphate

$C_6H_{14}O_{12}P_2 \cdot 4C_6H_{13}N$ FW 736.81 [103213-44-1]

▶ **≥95%**

Hexose monophosphates..... essentially free

Hygroscopic store at: -20°C

F0752-5G	5 g
F0752-10G	10 g

D-Fructose 6-phosphate dipotassium salt

$C_6H_{11}O_9PK_2$ FW 336.32 [103213-47-4]

▶ **~98% (enzymatic)**

glucose 6-phosphate.....≤1.5 mol %
fructose 1,6-diphosphate.....≤0.05 mol %

store at: -20°C

F1502-500MG	500 mg
F1502-1G	1 g

D-Fructose 6-phosphate hydrate disodium salt

$C_6H_{11}Na_2O_9P \cdot xH_2O$ FW 304.10 (Anh) [26177-86-6] EC No. 2475054
BRN 5686786

▶ **~98% (enzymatic)**

glucose 6-phosphate.....<1.5 mol %
fructose 1,6-diphosphate.....<0.05 mol %

store at: -20°C

F3627-10MG	10 mg
F3627-100MG	100 mg
F3627-500MG	500 mg
F3627-1G	1 g
F3627-5G	5 g

DL-Glyceraldehyde 3-phosphate solution

$C_3H_7O_6P$ FW 170.06 [591-59-3]

▶ **45-55 mg/mL in H_2O**

Ba..... ≤100 µg/mL

ship: dry ice store at: -20°C

G5251-25MG	25 mg
G5251-100MG	100 mg
G5251-250MG	250 mg
G5251-500MG	500 mg
G5251-1G	1 g

DL-Glyceraldehyde 3-phosphate diethyl acetal barium salt

3,3-Diethoxy-1,2-propanediol 1-phosphate barium salt

$C_7H_{15}BaO_7P$ FW 379.49 [93965-35-6] EC No. 3009865

A package of specially washed Dowex® 50× 4-200R is also included for preparing a solution of glyceraldehyde 3-phosphate from this derivative at no extra charge. Instructions for preparing this solution from this derivative accompanies each package.

store at: -20°C

G5376-250MG	250 mg
G5376-1G	1 g
G5376-5G	5 g

D-Fructose 1,6-bisphosphate trisodium salt

D(+)Fructofuranose 1,6-diphosphate; Harden-Young ester; Hexose diphosphate

$C_6H_{11}O_{12}P_2Na_3$ FW 406.06 [81028-91-3]

▶ **≥98% (TLC)**

store at: -20°C

F6803-10MG	10 mg
F6803-1G	1 g
F6803-5G	5 g

D-Glucose 6-phosphate potassium salt

D(+)-Glucopyranose 6-phosphate potassium salt

$C_6H_{12}O_9PK$ FW 298.23 [103192-55-8]

▶ ≥95%

store at: -20°C

G6526-1G	1 g
G6526-5G	5 g

D-Glucose 6-phosphate hydrate disodium salt

G-6-P-Na_2

$C_6H_{11}Na_2O_9P \cdot xH_2O$ FW 304.10 (Anh) [3671-99-6] BRN 5199009

▶ **Sigma Grade, 98-100%**

usually 2-4 H_2O/mole

store at: -20°C

G7250-10MG	10 mg
G7250-500MG	500 mg
G7250-1G	1 g
G7250-5G	5 g
G7250-25G	25 g

D-Glucose 6-phosphate hydrate dipotassium salt

D(+)-Glucopyranose 6-phosphate dipotassium salt

$C_6H_{11}K_2O_9P \cdot xH_2O$ FW 336.32 (Anh)

▶ **Sigma Grade, 98-100%**

usually 2-4 H_2O/mole

store at: -20°C

G7375-1G	1 g
G7375-5G	5 g

D-(+)-Glucose

Dextrose

$C_6H_{12}O_6$ FW 180.16 [50-99-7] EC No. 2077578 BRN 1724615

▶ **SigmaUltra, 99.5% (GC)**

[α]20/546 +62±2°, 3 hr, c = 10 in H_2O (lit.)

[α]20/D +53±2°, 3 hr, c = 10 in H_2O (lit.)

solubility

H_2O.....1 M at 20 °C, clear, colorless

A 1M/260, H_2O.....<0.02

A 1M/280, H_2O.....<0.02

Insoluble matter..... passes filter test

LOD	<0.1%	Cu	<0.0005%
ign. residue	<0.1% (as SO4)	Fe	<0.0005%
chloride (Cl^-)	<0.005%	K	<0.005%
sulfate (SO_4^{2-})	<0.005%	Li	<0.0005%
Al	<0.0005%	Mg	<0.0005%
As	<0.0001%	Mn	<0.0005%
Ba	<0.0005%	Mo	<0.0005%
Bi	<0.0005%	Na	<0.005%
Ca	<0.001%	Ni	<0.0005%
Cd	<0.0005%	Pb	<0.0005%
Co	<0.0005%	Sr	<0.0005%
Cr	<0.0005%	Zn	<0.0005%

G7528-10MG	10 mg
G7528-250G	250 g
G7528-1KG	1 kg
G7528-5KG	5 kg

Phospho(enol)pyruvic acid hydrate monosodium salt

Mono-sodium phosphoenolpyruvate; 2-(Phosphonooxy)-2-propenoic acid monopotassium salt; mono-Sodium phosphoenolpyruvate monohydrate

$C_3H_4NaO_6P \cdot H_2O$ FW 208.04 [53823-68-0] EC No. 2588107 BRN 4771585

▶ ≥97% (enzymatic)

store at: -20°C

P0564-100MG	100 mg
P0564-250MG	250 mg
P0564-1G	1 g

D(−)3-Phosphoglyceric acid trisodium salt

$C_3H_4O_7PNa_3$ FW 252.00 [6134-04-9]

▶ ~95%

store at: -20°C

P0769	P0769 1

Phospho(enol)pyruvic acid monopotassium salt

Mono-potassium phosphoenolpyruvate; PEP-K; 2-(Phosphonooxy)-2-propenoic acid monopotassium salt; mono-Potassium phosphoenolpyruvate

$C_3H_4KO_6P$ FW 206.13 [4265-07-0] EC No. 2242470 BRN 4603446

▶ ≥97% (enzymatic)

EC No. 224-247-0 store at: -20°C

P7127-100MG	100 mg
P7127-250MG	250 mg
P7127-500MG	500 mg
P7127-1G	1 g
P7127-5G	5 g

D(−)3-Phosphoglyceric acid barium salt

$C_3H_5O_7PBa$ FW 321.37 [86879-11-0]

▶ ~95%

store at: -20°C

P8627	P8627 1

D-(−)-3-Phosphoglyceric acid disodium salt

(−)-Disodium D-3-phosphoglycerate; D-Glycerate 3-phosphate disodium salt

$C_3H_5Na_2O_7P$ FW 230.02 [80731-10-8] BRN 3767836

▶ ~95%

store at: -20°C

P8877-10MG	10 mg
P8877-1G	1 g
P8877-5G	5 g

Stable Isotope-labeled Metabolites for Glycolysis

D-Glucose-6,6-d_2

Dextrose-6,6-d_2

$C_6D_2H_{10}O_6$ FW 182.17 [18991-62-3]

[α]25/D +52.0, c = 2 in water + trace NH4OH

▸ **98 atom % D**

mol wt 182.15 by atom % calculation

Hygroscopic

282650-100MG	100 mg
282650-500MG	500 mg
282650-1G	1 g

D-Glucose-$^{13}C_6$

Dextrose-$^{13}C_6$; D-Glucose-ul-^{13}C

$^{13}C_6H_{12}O_6$ FW 186.11 [110187-42-3]

/α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

▸ **99 atom % ^{13}C**

mol wt 186.05 by atom % calculation

Hygroscopic

389374-100MG	100 mg
389374-250MG	250 mg
389374-1G	1 g
389374-2G	2 g
389374-3G	3 g
389374-10G	10 g

D-Glucose-1-^{13}C

Dextrose-1-^{13}C

$^{13}CC_5H_{12}O_6$ FW 181.15 [40762-22-9] BRN 2263682

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

▸ **99 atom % ^{13}C**

mol wt 181.14 by atom % calculation

297046-250MG	250 mg
297046-1G	1 g
297046-10G	10 g

D-Glucose-2-^{13}C

Dextrose-2-^{13}C

$^{13}CC_5H_{12}O_6$ FW 181.15 [105931-74-6]

[α]25/D +52.0, c = 2 in H_2O (trace NH_4OH)

▸ **99 atom % ^{13}C**

mol wt 181.14 by atom % calculation

310794-250MG	250 mg
310794-1G	1 g

D-Glucose-2-d_1

Dextrose-2-d_1

$HOCH_2[CHOH]_3CDOHCHO$ FW 181.16 [30737-83-8]

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

▸ **98 atom % D**

mol wt 181.16 by atom % calculation

Hygroscopic

310824-250MG	250 mg
310824-1G	1 g

D-Glucose-6-^{13}C

Dextrose-6-^{13}C

$^{13}CC_5H_{12}O_6$ FW 181.15 [106032-62-6] BRN 5810734

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

▸ **99 atom % ^{13}C**

mol wt 181.14 by atom % calculation

310808-100MG	100 mg
310808-500MG	500 mg

D-Glucose-1-d_1

Dextrose-1-d_1

$HOCH_2[CHOH]_4CDO$ FW 181.16 [106032-61-5]

▸ **98 atom % D**

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

mol wt 181.16 by atom % calculation

Hygroscopic

310816-250MG	250 mg
310816-1G	1 g

D-Glucose-1,2-$^{13}C_2$

Dextrose-1,2-$^{13}C_2$

$^{13}C_2C_4H_{12}O_6$ FW 182.14 [138079-87-5]

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

▸ **99 atom % ^{13}C**

mol wt 182.12 by atom % calculation

453188-100MG	100 mg
453188-500MG	500 mg

D-Glucose-1,6-$^{13}C_2$

Dextrose-1,6-$^{13}C_2$

$^{13}C_2C_4H_{12}O_6$ FW 182.14 [287100-67-8]

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

▸ **98 atom % ^{13}C**

mol wt 182.12 by atom % calculation

Hygroscopic

453196-100MG	100 mg
453196-250MG	250 mg

Sodium pyruvate-2,3-$^{13}C_2$

Pyruvic acid-2,3-$^{13}C_2$ sodium salt

$^{13}CH_3{}^{13}COCO_2Na$ FW 112.03 [89196-78-1]

▸ **99 atom % ^{13}C**

mol wt 112.01 by atom % calculation

486191-500MG	500 mg

Sodium pyruvate-1-^{13}C

Pyruvic acid-1-^{13}C sodium salt

$CH_3CO^{13}CO_2Na$ FW 111.04 [87976-71-4]

▸ **99 atom % ^{13}C**

mol wt 111.03 by atom % calculation

Moisture sensitive

490709-250MG	250 mg

Sodium pyruvate-$^{13}C_3$

Pyruvic acid-$^{13}C_3$ sodium salt

$^{13}CH_3{}^{13}CO^{13}CO_2Na$ FW 113.02 [142014-11-7]

▸ **99 atom % ^{13}C**

mol wt 112.99 by atom % calculation

490717-500MG	500 mg

Sodium pyruvate-2-^{13}C

Pyruvic acid-2-^{13}C sodium salt

$CH_3{}^{13}COCO_2Na$ FW 111.04 [87976-70-3]

▸ **99 atom % ^{13}C**

mol wt 111.03 by atom % calculation

490725-500MG	500 mg

Sodium pyruvate-3-^{13}C

Pyruvic acid-3-^{13}C sodium salt

$^{13}CH_3COCO_2Na$ FW 111.04 [124052-04-6]

▸ **99 atom % ^{13}C**

mol wt 111.03 by atom % calculation

490733-250MG	250 mg

Sodium pyruvate-1,2-$^{13}C_2$

Pyruvic acid-1,2-$^{13}C_2$ sodium salt

$CH_3{}^{13}CO^{13}CO_2Na$ FW 112.03 [312623-97-5]

▸ **99 atom % ^{13}C**

mol wt 112.01 by atom % calculation

493392-500MG	500 mg

D-Glucose-$^{13}C_6$,C-d_7

Dextrose-$^{13}C_6$,C-d_7; D-Glucose-$^{13}C_6$,1,2,3,4,5,6,6-d_7

$^{13}C_6H_5D_7O_6$ FW 193.15 [201417-01-8]

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

▸ **99 atom % ^{13}C; 97-99 atom % D**

mol wt 192.88 by atom % calculation

Hygroscopic

552151-500MG	500 mg
552151-1G	1 g
552151-5G	5 g

Phospho(enol)pyruvic acid-3-^{13}C potassium salt

$^{13}CC_2H_4KO_6P$ FW 207.13

▸ **99 atom % ^{13}C**

mol wt 207.12 by atom % calculation ◆▸

Hygroscopic

571237-50MG	50 mg

D-Glucose-3-^{13}C

Dextrose-3-^{13}C

$^{13}CC_5H_{12}O_6$ FW 181.15

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

▸ **99 atom % ^{13}C**

mol wt 181.14 by atom % calculation

605409	inquire

Sodium pyruvate-3-^{13}C,d_3

Pyruvic acid-3-^{13}C,d_3 sodium salt

$^{13}CD_3COCO_2Na$ FW 114.06

▸ **99 atom % ^{13}C; 50-60 atom % D**

mol wt 112.54 by atom % calculation

Hygroscopic

608483-1G	1 g

D-Glucose-d_{12}

Dextrose-d_{12}

$C_6D_{12}O_6$ FW 192.23

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

▸ **97-99 atom % D**

mol wt 192.11 by atom % calculation

Hygroscopic

616338-250MG	250 mg

Pyruvic-1-^{13}C acid (free acid)

Pyruvic-1-^{13}C acid (free acid)

$^{13}CC_2H_4O_3$ FW 89.05

▸ **95% (CP), 99 atom % ^{13}C**

R: 34 S: 26-36/37/39-45 FP: 82 °C (180 °F) ◆▸

677175	inquire

Sodium pyruvate-$^{13}C_3$

Pyruvic acid-$^{13}C_3$ sodium salt

$^{13}CH_3{}^{13}CO^{13}CO_2Na$ FW 113.02 [142014-11-7]

▸ **99 atom % ^{13}C**

S&P tested

660957	inquire

Radioactively-labeled Metabolites for Glycolysis

D-Glucose-UL-^{14}C

$^{14}C_6H_{12}O_6$ FW 180.16 [815-92-9]
Combi-vial

▶ **≥98% as radiochemical purity (HPLC)**

extent of labeling.....2-10 mCi per mmol ship: dry ice
store at: -20°C

G4395-50UCI	50 µCi
G4395-100UCI	100 µCi
G4395-250UCI	250 µCi
G4395-1MCI	1 mCi
G4395-5MCI	5 mCi

▶ **≥98% as radiochemical purity (HPLC)**

extent of labeling.....180-360 mCi per mmol ship: dry ice
store at: -20°C

G5020-50UCI	50 µCi
G5020-100UCI	100 µCi
G5020-250UCI	250 µCi
G5020-1MCI	1 mCi
G5020-5MCI	5 mCi

D-Glucose-1-^{14}C

$HOCH_2[CHOH]_4{}^{14}CHO$ FW 180.16 [4005-41-8]
Combi-vial

▶ **≥98% as radiochemical purity (HPLC)**

extent of labeling.....40-60 mCi per mmol ship: dry ice
store at: -20°C

G5770-50UCI	50 µCi
G5770-250UCI	250 µCi

▶ **≥98% as radiochemical purity (HPLC)**

extent of labeling.....2-10 mCi per mmol ship: dry ice
store at: -20°C

G5645-50UCI	50 µCi
G5645-250UCI	250 µCi

D-Glucose-6-^{14}C

$C_6H_{12}O_6$ FW 180.16 [3573-62-4]

Ethanol: water (9:1) solution

serum bottle
extent of labeling.....40-60 mCi per mmol
store at: 2-8°C

G9899-50UCI	50 µCi
G9899-100UCI	100 µCi
G9899-250UCI	250 µCi

D-Glucose-1-^{14}C

$HOCH_2[CHOH]_4{}^{14}CHO$ FW 180.16 [4005-41-8]

▶ **in ethanol/water (9:1)**

Packaged in serum bottle
extent of labeling.....45-60 mCi per mmol

311502-50UCI	50 µCi

D-Glucose-UL-^{14}C

$^{14}C_6H_{12}O_6$ FW 180.16 [815-92-9]

▶ **in ethanol/water (9:1), Ethyl alcohol/water solution (9:1)**

Packaged in serum bottle
extent of labeling.....250-360 mCi per mmol

297569-1UCI	1 µCi

Pyruvate Transformations

Depending on the environmental conditions, e.g. whether oxygen is present or not, pyruvate, a product of glucose metabolism, can undergo different biotransformations as shown in **Figure 2**. Under reductive conditions, e.g. in the absence of oxygen, pyruvate (1) can be either reduced to lactate (2) or ethanol (5). The well-known formation of L-lactate from pyruvate in muscles during intense physical activity is catalyzed by lactate dehydrogenase (LDH) which requires NADH as a reducing coenzyme.

The fundamental process by which alcoholic beverages are made is through the conversion of pyruvate to ethanol by yeast under anaerobic conditions.

Pyruvate (1) is in the first step decarboxylated to acetaldehyde (4) using thiamindiphosphate as a cofactor.

In the second step, acetaldehyde is then reduced to ethanol (5) with NADH as reducing coenzyme, also transferring the pro-R hydrogen from NADH to acetaldehyde.

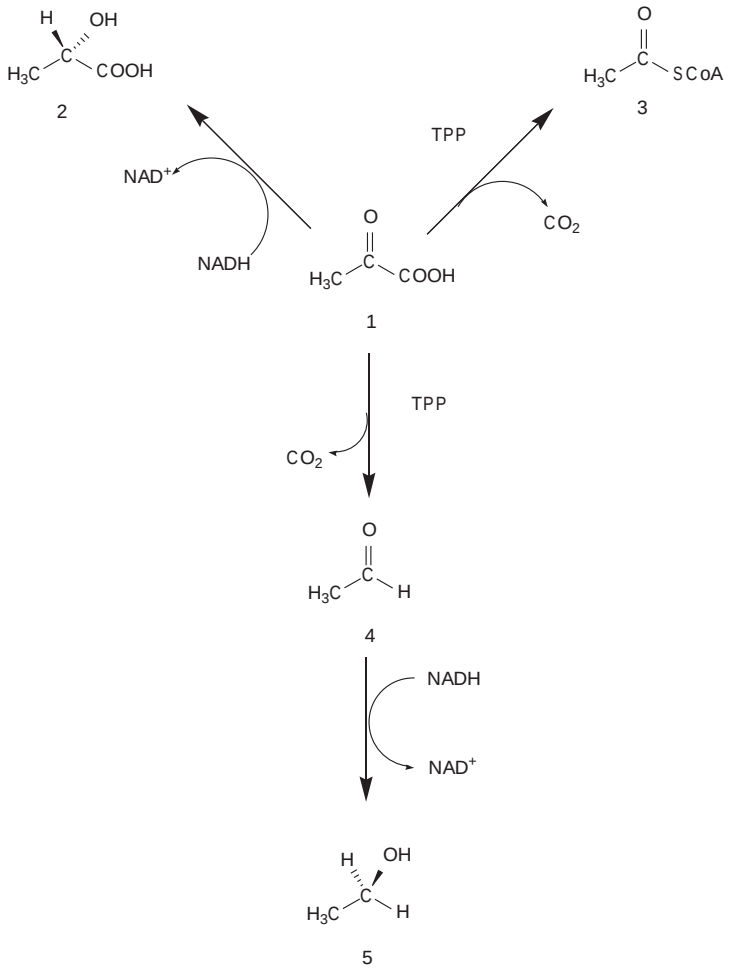

Figure 2. Pyruvate Biotransformations.

Non-labeled Substrates and Metabolites for Pyruvate Transformations

Acetaldehyde

Ethanal

CH_3CHO FW 44.05 [75-07-0] EC No. 2008368 BRN 505984

▶ **puriss. p.a., anhydrous, ≥99.5% (GC)**

free acid (as CH_3COOH).....≤0.5%
evapn. residue.....≤0.002%

Al	≤0.5 mg/kg	K	≤0.5 mg/kg
Ba	≤0.1 mg/kg	Li	≤0.1 mg/kg
Bi	≤0.1 mg/kg	Mg	≤0.1 mg/kg
Ca	≤0.5 mg/kg	Mn	≤0.02 mg/kg
Cd	≤0.05 mg/kg	Mo	≤0.1 mg/kg
Co	≤0.02 mg/kg	Na	≤0.5 mg/kg
Cr	≤0.02 mg/kg	Ni	≤0.02 mg/kg
Cu	≤0.02 mg/kg	Pb	≤0.1 mg/kg
Fe	≤0.1 mg/kg	Sr	≤0.1 mg/kg
		Zn	≤0.1 mg/kg

store at: 2-8°C

00070-100ML	100 mL
00070-500ML	500 mL
00070-1L	1 L

Acetyl coenzyme A sodium salt

Acetyl CoA

$C_{23}H_{38}N_7O_{17}P_3S$ FW 809.57 [102029-73-2]

Acetyl-CoA is an essential cofactor and carrier of acyl groups in enzymatic acetyl transfer reactions. It is formed either by the oxidative decarboxylation of pyruvate in mitochondria, by the oxidation of long-chain fatty acids, or by the oxidative degradation of certain amino acids. It is a key precursor in lipid biosynthesis, and the source of all fatty acid carbons. It is a positive regulator of pyruvate carboxylase. It is a precursor of the neurotransmitter acetylcholine.

An essential cofactor in enzymatic acetyl transfer reactions.

▶ **~95%**

Prepared enzymatically

solubility

H_2O.....100 mg/mL

store at: −20°C

A2056-1MG	1 mg
A2056-5MG	5 mg
A2056-10MG	10 mg
A2056-25MG	25 mg
A2056-100MG	100 mg

Acetyl coenzyme A trilithium salt

Acetyl-S-CoA Li_3

$C_{23}H_{38}N_7O_{17}P_3S \cdot xLi^+$ FW 809.57 (FA) [32140-51-5] EC No. 2007909

Acetyl-CoA is an essential cofactor and carrier of acyl groups in enzymatic acetyl transfer reactions. It is formed either by the oxidative decarboxylation of pyruvate in mitochondria, by the oxidation of long-chain fatty acids, or by the oxidative degradation of certain amino acids. It is a key precursor in lipid biosynthesis, and the source of all fatty acid carbons. It is a positive regulator of pyruvate carboxylase. It is a precursor of the neurotransmitter acetylcholine.

▶ **~95% (HPLC)**

Prepared enzymatically

✖ R: 36/37/38 S: 26-36/37 store at: −20°C

A2181-1MG	1 mg
A2181-5MG	5 mg
A2181-10MG	10 mg
A2181-25MG	25 mg
A2181-100MG	100 mg

Coenzyme A hydrate sodium salt

CoA Na_2

$C_{21}H_{36}N_7O_{16}P_3S$ FW 767.53 [55672-92-9] EC No. 2597478

▶ **cell culture tested**

Enzymatically assayed using phosphotransacetylase. Approx. 95% CoA-SH

store at: −20°C

C4780-10MG	10 mg
C4780-25MG	25 mg
C4780-100MG	100 mg

Coenzyme A trilithium salt

CoA Li_3

$C_{21}H_{33}Li_3N_7O_{16}P_3S$ FW 785.33 [18439-24-2] EC No. 2423179

▶ **from yeast, ~95%**

store at: −20°C

C3019-10MG	10 mg
C3019-25MG	25 mg
C3019-100MG	100 mg
C3019-500MG	500 mg
C3019-1G	1 g

Ethanol

Ethyl alcohol

CH_3CH_2OH FW 46.07 [64-17-5] EC No. 2005786 BRN 1718733

***BioChemika Ultra*, for molecular biology, ≥99.8%, (absolute alcohol, without additive)**

RNases..... none detected
DNases.....none detected
phosphatases.....none detected
proteases.....none detected
formaldehyde (as HCHO).....≤0.001%
free acid (as CH_3COOH).....≤0.002%
methanol (CH_3OH).....≤0.1%
free alkali (as NH_3).....≤0.0004%
substances darkened by H_2SO_4.....in accordance
ketone (as CH_3COCH_3).....≤0.001%
$KMnO_4$-reducing substances.....in accordance
aldehyde (as CH_3CHO).....≤0.001%
water.....≤0.2%
insoluble matter.....passes filter test

evapn. residue	≤0.001%	Mg	≤0.1 mg/kg
Al	≤0.5 mg/kg	Mn	≤0.02 mg/kg
Ba	≤0.1 mg/kg	Mo	≤0.1 mg/kg
Bi	≤0.1 mg/kg	Na	≤1 mg/kg
Ca	≤0.5 mg/kg	Ni	≤0.02 mg/kg
Cd	≤0.05 mg/kg	Pb	≤0.1 mg/kg
Co	≤0.02 mg/kg	Sr	≤0.1 mg/kg
Cr	≤0.02 mg/kg	Zn	≤0.1 mg/kg
Cu	≤0.1 mg/kg	λ	neat
Fe	≤0.1 mg/kg	260 nm	0.04
K	≤0.5 mg/kg	280 nm	0.02
Li	≤0.1 mg/kg		

Hygroscopic

51976-500ML	500 mL

Flavin adenine dinucleotide hydrate disodium salt

FAD; FAD-Na_2; Riboflavin 5'-adenosine diphosphate disodium salt

$C_{27}H_{31}N_9Na_2O_{15}P_2 \cdot xH_2O$ FW 829.51 (Anh) [84366-81-4]
EC No. 2827338 BRN 5326842

▶ **≥95% (HPLC)**

store at: -20°C

F6625-10MG	10 mg
F6625-25MG	25 mg
F6625-100MG	100 mg
F6625-250MG	250 mg
F6625-500MG	500 mg
F6625-1G	1 g

L-(+)-Lactic acid

(*S*)-2-Hydroxypropionic acid; Sarcolactic acid

$C_3H_6O_3$ FW 90.08 [79-33-4] EC No. 2011962 BRN 1720251

▶ **SigmaUltra, ~98% (titration)**

solubility

H_2O.....1 M at 20 °C, clear, colorless
Insoluble matter.....<0.1%
Phosphorus (P).....<0.005%

ign. residue	<0.1%	K	<0.005%
chloride (Cl^-)	<0.05%	Mg	<0.0005
sulfate (SO_4^{2-})	<0.05%	NH_4^+	<0.05%
Al	<0.0005%	Na	<0.005%
Ca	<0.0005%	Pb	<0.001%
Cu	<0.0005%	Zn	<0.0005%
Fe	<0.0005%		

store at: 2-8°C

L6402-1G	1 g
L6402-5G	5 g
L6402-10G	10 g

β-Nicotinamide adenine dinucleotide, reduced hydrate disodium salt

$C_{21}H_{27}N_7Na_2O_{14}P_2 \cdot xH_2O$ FW 709.40 (Anh)

Packaged by solid weight.

▶ **~98% (HPLC), ~98% (spectrophotometric assay)**

Hygroscopic, Light sensitive store at: 2-8°C

N8129-50MG	50 mg
N8129-100MG	100 mg
N8129-500MG	500 mg
N8129-1G	1 g
N8129-5G	5 g

Pyruvic acid

α-Ketopropionic acid; 2-Oxopropionic acid

$CH_3COCOOH$ FW 88.06 [127-17-3] EC No. 2048243 BRN 506211

▶ **purum, ≥98.0% (T)**

store at: 2-8°C

15940-100ML	100 mL
15940-500ML	500 mL

Thiamine pyrophosphate

Aneurinepyrophosphoric acid; Cocarboxylase; Thiamine pyrophosphate chloride

$C_{12}H_{19}ClN_4O_7P_2S$ FW 460.77 [154-87-0] EC No. 2052307
BRN 3875902

▶ **≥97%**

store at: -20°C

C8754-1G	1 g
C8754-5G	5 g
C8754-25G	25 g
C8754-100G	100 g

Stable Isotope-labeled Substrates and Metabolites for Pyruvate Transformations

Acetaldehyde-2,2,2-d_3

CD_3CHO FW 47.07 [19901-15-6]

▸ **98 atom % D**

mol wt 47.04 by atom % calculation

Hygroscopic, Lachrymator

487767-1G	1 g

Acetaldehyde-d_4

Tetradeuteroacetaldehyde

CD_3CDO FW 48.08 [1632-89-9] EC No. 2166416 BRN 1743039

▸ **98 atom % D**

mol wt 48.04 by atom % calculation

176567-1G	1 g
176567-5G	5 g

Acetaldehyde-1-^{13}C

$CH_3{}^{13}CHO$ FW 45.05

▸ **99 atom % ^{13}C**

mol wt 45.03 by atom % calculation

603805	500 mg

Acetaldehyde-$^{13}C_2$

$^{13}CH_3{}^{13}CHO$ FW 46.04 [1632-98-0]

▸ **99 atom % ^{13}C**

mol wt 46.03 by atom % calculation

531227-1G	1 g

Acetyl-1,2-$^{13}C_2$-coenzyme A lithium salt

$^{13}C_2C_{21}H_{35}Li_3N_7O_{17}P_3S$ FW 829.36

99 atom % ^{13}C

658650	inquire

Ethanol-1-^{13}C

Ethyl alcohol-1-^{13}C

$CH_3{}^{13}CH_2OH$ FW 47.06 [14742-23-5]

▸ **99 atom % ^{13}C**

mol wt 47.06 by atom % calculation

Packaged in ampules

Hygroscopic

324523-250MG	250 mg
324523-1G	1 g

Ethanol-2-^{13}C

Ethyl alcohol-2-^{13}C

$^{13}CH_3CH_2OH$ FW 47.06 [14770-41-3]

▸ **99 atom % ^{13}C**

mol wt 47.06 by atom % calculation

Packaged in ampules

427047-250MG	250 mg
427047-1G	1 g

Ethanol-$^{13}C_2$

Ethyl alcohol-$^{13}C_2$

$^{13}CH_3{}^{13}CH_2OH$ FW 48.05 [70753-79-6]

▸ **99 atom % ^{13}C**

mol wt 48.05 by atom % calculation

427039-250MG	250 mg
427039-1G	1 g

L-Lactic acid-1-^{13}C

$CH_3CH(OH)^{13}CO_2H/H_2O$ FW 91.07

▸ **85 wt. % in H_2O, 99 atom % ^{13}C**

$[\alpha]25/D$ -8.5°, c = 1 in H_2O ◆▸

606057	inquire

L-Lactic acid-$^{13}C_3$ solution

▸ **99 atom % ^{13}C, 85 wt. % in H_2O**

$[\alpha]25/D$ -8.5°, c = 1 in H_2O

606065	inquire

L-Lactic acid-3,3,3-d_3

$CD_3CH(OH)CO_2H$ / H_2O FW 93.10

▸ **85 wt. % in H_2O, 98 atom % D**

$[\alpha]25/D$ -8.5°, c = 1 in H_2O

mol wt 93.10 by atom % calculation ◆▸

616567	inquire

Pyruvic-1-^{13}C acid (free acid)

Pyruvic-1-^{13}C acid (free acid)

$^{13}CC_2H_4O_3$ FW 89.05

▸ **95% (CP), 99 atom % ^{13}C**

677175	inquire

Sodium L-lactate-2-d_1 solution

L-Lactic-2-d_1 acid sodium salt solution

$CH_3CD(OH)CO_2Na$ FW 113.07

▸ **98 atom % D**

Packaged as gram of salt

[α]25/D -12°, c = 1 in H_2O

mol wt 113.05 by atom % calculation

589217	inquire

Sodium L-lactate-3,3,3-d_3 solution

L-Lactic-3,3,3-d_3 acid sodium salt solution

$CD_3CH(OH)CO_2Na$ FW 115.08

▸ **98 atom % D**

Packaged as gram of salt

[α]25/D -12°, c = 1 in H_2O

mol wt 115.02 by atom % calculation

Moisture sensitive

616702-1G	1 g

Sodium L-lactate-1-^{13}C solution

L-Lactic acid-1-^{13}C, sodium salt solution

$CH_3CH(OH)^{13}CO_2Na$ FW 113.05

▸ **99 atom % ^{13}C**

Packaged as gram of salt

[α]25/D −12°, c = 1 in H_2O

mol wt 113.05 by atom % calculation

606022-1G	1 g

Sodium L-lactate-2-^{13}C solution

L-Lactic acid-2-^{13}C sodium salt solution

$CH_3{}^{13}CH(OH)CO_2Na$ FW 113.05

▸ **99 atom % ^{13}C**

Packaged as gram of salt

[α]25/D -12°, c = 1 in H_2O

mol wt 113.05 by atom % calculation

589209	inquire

Sodium L-lactate-2,3-^{13}C solution

L-Lactic acid-2,3-$^{13}C_2$ sodium salt solution

$^{13}CH_3{}^{13}CH(OH)CO_2Na$ FW 114.05

▸ **99 atom % ^{13}C**

Packaged as gram of salt

[α]25/D -12°, c = 1 in H_2O

mol wt 114.03 by atom % calculation ◆▸

606006	inquire

Sodium L-lactate-3-^{13}C solution

L-Lactic acid-3-^{13}C sodium salt solution

$^{13}CH_3CH(OH)CO_2Na$ FW 113.05 [201595-70-2]

▸ **99 atom % ^{13}C**

Packaged as gram of salt

[α]25/D -12°, c = 1 in H_2O

mol wt 113.05 by atom % calculation

490040-250MG	250 mg

Sodium L-lactate-$^{13}C_3$ solution

L-Lactic acid-$^{13}C_3$ sodium salt solution

$^{13}CH_3{}^{13}CH(OH)^{13}CO_2Na$ FW 115.04 [201595-71-3]

▸ **99 atom % ^{13}C**

S&P tested

660817	inquire

Sodium pyruvate-1-^{13}C

Pyruvic acid-1-^{13}C sodium salt

$CH_3CO^{13}CO_2Na$ FW 111.04 [87976-71-4]

▸ **99 atom % ^{13}C**

mol wt 111.03 by atom % calculation

Moisture sensitive

490709-250MG	250 mg

Sodium pyruvate-2-^{13}C

Pyruvic acid-2-^{13}C sodium salt

$CH_3{}^{13}COCO_2Na$ FW 111.04 [87976-70-3]

▸ **99 atom % ^{13}C**

mol wt 111.03 by atom % calculation

490725-500MG	500 mg

Sodium pyruvate-3-^{13}C

Pyruvic acid-3-^{13}C sodium salt

$^{13}CH_3COCO_2Na$ FW 111.04 [124052-04-6]

▸ **99 atom % ^{13}C**

mol wt 111.03 by atom % calculation

490733-250MG	250 mg

Sodium pyruvate-3-$^{13}C,d_3$

Pyruvic acid-3-$^{13}C,d_3$ sodium salt

$^{13}CD_3COCO_2Na$ FW 114.06

▶ **99 atom % ^{13}C; 50-60 atom % D**

mol wt 112.54 by atom % calculation

Hygroscopic

608483-1G	1 g

Sodium pyruvate-1,2-$^{13}C_2$

Pyruvic acid-1,2-$^{13}C_2$ sodium salt

$CH_3{}^{13}CO{}^{13}CO_2Na$ FW 112.03 [312623-97-5]

▶ **99 atom % ^{13}C**

mol wt 112.01 by atom % calculation

493392-500MG	500 mg

Sodium pyruvate-2,3-$^{13}C_2$

Pyruvic acid-2,3-$^{13}C_2$ sodium salt

$^{13}CH_3{}^{13}COCO_2Na$ FW 112.03 [89196-78-1]

▶ **99 atom % ^{13}C**

mol wt 112.01 by atom % calculation

486191-500MG	500 mg

Sodium pyruvate-$^{13}C_3$

Pyruvic acid-$^{13}C_3$ sodium salt

$^{13}CH_3{}^{13}CO{}^{13}CO_2Na$ FW 113.02 [142014-11-7]

▶ **99 atom % ^{13}C**

mol wt 112.99 by atom % calculation

490717-500MG	500 mg

Radioactively-labeled Metabolites for Pyruvate transformations

(Acetyl-1-^{14}C)-coenzyme A

$C_{23}H_{38}N_7O_{17}P_3S$ FW 809.57 [4332-37-0]

▶ **≥95% (HPLC)**

Solution in 10 mM sodium acetate, pH 5.0

Combi-vial

extent of labeling.....40-60 mCi per mmol

ship: dry ice store at: -20°C

A7925-10UCI	10 µCi
A7925-50UCI	50 µCi

Acetyl coenzyme A-(acetyl-^3H)

$C_{23}H_{38}N_7O_{17}P_3S$ FW 809.57 [152585-41-6]

▶ **≥95% (HPLC)**

0.01 M sodium acetate solution, pH 5.0

Packaged under Nitrogen

extent of labeling.....5-25 Ci per mmol

ship: dry ice store at: -20°C

A8325-50UCI	50 µCi
A8325-250UCI	250 µCi

Citric Acid Cycle

Acetyl-CoA enters a cycle whose discovery by Hans Krebs 70 years ago marked a milestone in biochemistry. The citric acid cycle is also termed the tricarboxylic acid cycle, TCA cycle or Krebs cycle (**see Figure 3**).

It is started by an enzymatic aldol addition reaction of acetyl CoA to oxaloacetate (1) forming citrate (2), which is then isomerized by a dehydration-hydration sequence to yield (2R,3S)-isocitrate (3).

Further enzymatic oxidation and decarboxylation gives 2-ketoglutarate (4), which, after another enzymatic decarboxylation and oxidation is, transformed into succinyl-CoA (5). The hydrolysis of this metabolite to succinate (6) is coupled to the phosphorylation of GDP to GTP.

Enzymatic desaturation by FAD-dependent succinate dehydrogenase yields fumarate (7), which, after stereospecific hydration catalyzed by fumarase is, transformed to L-malate (8).

The last step of NAD-coupled oxidation of L-malate (8) to oxaloacetate (1) is catalyzed by malate dehydrogenase and closes the cycle.

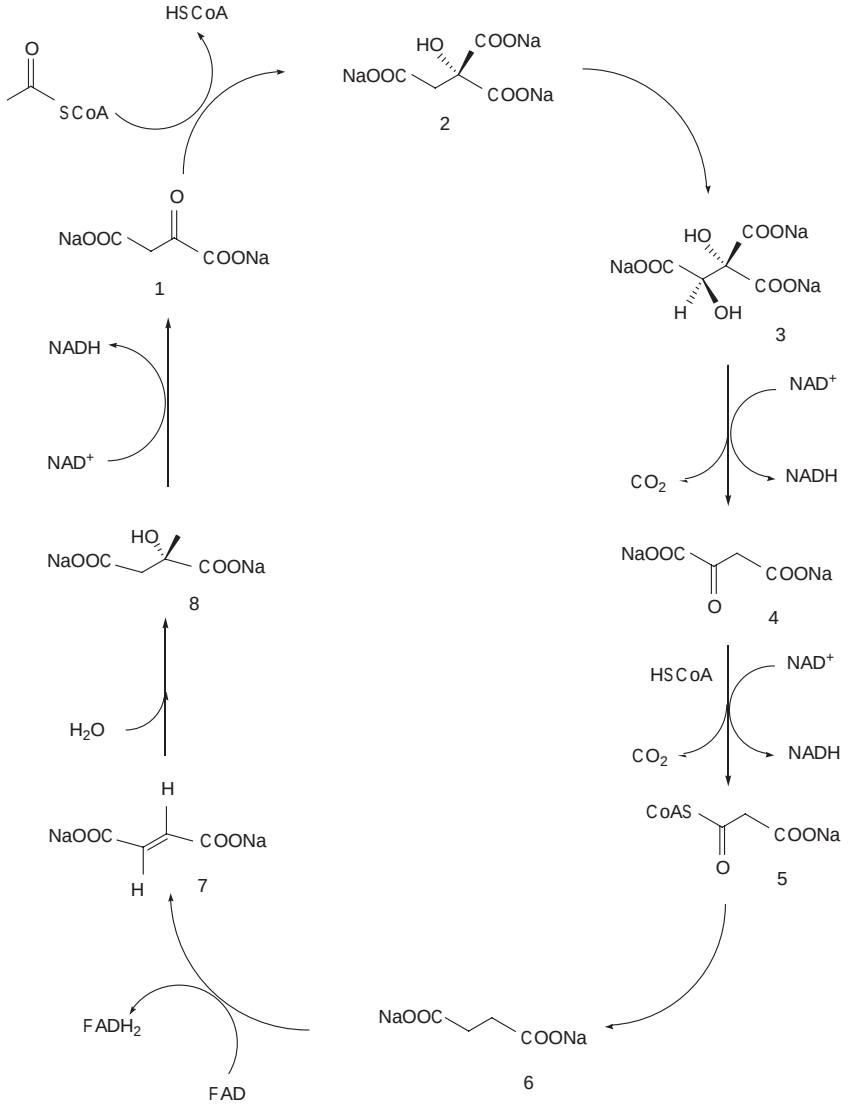

Figure 3. Citric Acid Cycle.

Non-labeled Substrates and Metabolites for the Citric Acid Cycle

Acetyl coenzyme A sodium salt

Acetyl CoA

$C_{23}H_{38}N_7O_{17}P_3S$ FW 809.57 [102029-73-2]

Acetyl-CoA is an essential cofactor and carrier of acyl groups in enzymatic acetyl transfer reactions. It is formed either by the oxidative decarboxylation of pyruvate in mitochondria, by the oxidation of long-chain fatty acids, or by the oxidative degradation of certain amino acids. It is a key precursor in lipid biosynthesis, and the source of all fatty acid carbons. It is a positive regulator of pyruvate carboxylase. It is a precursor of the neurotransmitter acetylcholine.

An essential cofactor in enzymatic acetyl transfer reactions.

▶ **~95%**

Prepared enzymatically

solubility

H_2O.....100 mg/mL

store at: −20°C

A2056-1MG	1 mg
A2056-5MG	5 mg
A2056-10MG	10 mg
A2056-25MG	25 mg
A2056-100MG	100 mg

Acetyl coenzyme A trilithium salt

Acetyl-S-CoA Li_3

$C_{23}H_{38}N_7O_{17}P_3S \cdot xLi^+$ FW 809.57 (FA) [32140-51-5] EC No. 2007909

Acetyl-CoA is an essential cofactor and carrier of acyl groups in enzymatic acetyl transfer reactions. It is formed either by the oxidative decarboxylation of pyruvate in mitochondria, by the oxidation of long-chain fatty acids, or by the oxidative degradation of certain amino acids. It is a key precursor in lipid biosynthesis, and the source of all fatty acid carbons. It is a positive regulator of pyruvate carboxylase. It is a precursor of the neurotransmitter acetylcholine.

▶ **~95% (HPLC)**

Prepared enzymatically

store at: −20°C

A2181-1MG	1 mg
A2181-5MG	5 mg
A2181-10MG	10 mg
A2181-25MG	25 mg
A2181-100MG	100 mg

cis-Aconitic acid

cis-Propene-1,2,3-tricarboxylic acid

$HO_2CCH_2C(CO_2H)=CHCO_2H$ FW 174.11 [585-84-2] EC No. 2095644 BRN 1725829

▶ **≥98%**

May form *trans* isomer upon prolonged storage

store at: −20°C

A3412-1G	1 g
A3412-5G	5 g
A3412-10G	10 g

Coenzyme A trilithium salt

CoA Li_3

$C_{21}H_{33}Li_3N_7O_{16}P_3S$ FW 785.33 [18439-24-2] EC No. 2423179

▶ **from yeast, ~95%**

store at: −20°C

C3019-10MG	10 mg
C3019-25MG	25 mg
C3019-100MG	100 mg
C3019-500MG	500 mg
C3019-1G	1 g

Fumaric acid

HOOCCH=CHCOOH FW 116.07 [110-17-8] EC No. 2037430 BRN 605763

▶ **puriss., ≥99.5% (T)**

sublimes at 165°C at 1.7 mm pressure (Lit.)

47900-100G	100 g
47900-500G	500 g

DL-Isocitric acid trisodium salt

threo-D_SL_S-Isocitric acid trisodium salt

$C_6H_5O_7Na_3$ FW 258.07 [1637-73-6]

▶ **≥93%**

I1252-1G	1 g
I1252-5G	5 g
I1252-10G	10 g
I1252-25G	25 g
I1252-100G	100 g

α-Ketoglutaric acid

2-Oxoglutaric acid; 2-Oxopentanedioic acid

$HOOCCH_2CH_2COCOOH$ FW 146.10 [328-50-7] EC No. 2063303 BRN 1705689

▶ **puriss., ≥99.0% (T)**

Reagent for the analysis of tryptophan1; Substrate for glutamate dehydrogenase

solubility

H_2O.....0.1 g/mL, clear, colorless

ign. residue..... ≤0.05%

store at: 2-8°C

75890-25G	25 g
75890-100G	100 g
75890-500G	500 g

α-Ketoglutaric acid potassium salt

2-Oxopentanedioic acid potassium salt

$C_5H_5O_5K$ FW 184.19 [997-43-3]

▶ **≥98% (enzymatic)**

store at: 2-8°C

K2000-5G	5 g
K2000-25G	25 g
K2000-100G	100 g
K2000-1KG	1 kg

α-Ketoglutaric acid sodium salt

2-Oxoglutaric acid monosodium salt; 2-Oxopentanedioic acid monosodium salt; Sodium 2-oxoglutarate monobasic

$HOOCCH_2CH_2COCOONa$ FW 168.08 [22202-68-2]
EC No. 2448366 BRN 4597521

▸ **SigmaUltra**

solubility

H_2O.....0.5 M at 20 °C, clear, colorless

Insoluble matter.....≤0.1%
Phosphorus (P).....≤0.0005%
chloride (Cl^-).....≤0.05%
sulfate (SO_4^{2-}).....≤0.05%
Al.....≤0.0005%
Ca.....≤0.001%
Cu.....≤0.0005%
Fe.....≤0.0005%
K.....≤0.005%
Mg.....≤0.0005%
NH_4^+.....≤0.05%
Pb.....≤0.001%
Zn.....≤0.0005%

store at: 2-8°C

K2010-5G	5 g
K2010-25G	25 g
K2010-100G	100 g

L-(−)-Malic acid

L-Hydroxybutanedioic acid; (*S*)-(−)-2-Hydroxysuccinic acid

$HO_2CCH_2CH(OH)CO_2H$ FW 134.09 [97-67-6] EC No. 2026015
BRN 1723541

▸ **95-100% (enzymatic)**

pKa (25 °C).....(1) 3.46, (2) 5.10

M1000-100G	100 g
M1000-500G	500 g
M1000-1KG	1 kg

L-(−)-Malic acid disodium salt

L-Hydroxybutanedioic acid

$C_4H_4O_5Na_2$ FW 178.05 [138-09-0]

▸ **95-100% (enzymatic)**

M9138-5G	5 g
M9138-25G	25 g
M9138-100G	100 g

Oxaloacetic acid

Ketosuccinic acid; Oxalacetic acid; Oxobutanedioic acid; 2-Oxosuccinic acid

$HOOCCH_2COCOOH$ FW 132.07 [328-42-7] EC No. 2063298
BRN 1705475

▸ **~98%**

store at: -20°C

O4126-1G	1 g
O4126-5G	5 g
O4126-25G	25 g
O4126-100G	100 g

(+)-Potassium D_s-*threo*-isocitrate monobasic

(1R,2S)-1-Hydroxy-1,2,3-propanetricarboxylic acid monopotassium salt; D_s-(+)-*threo*-Isocitric acid monopotassium salt

$C_6H_7KO_7$ FW 230.21 [20226-99-7] BRN 3767339

▸ **purum, ≥98.0% (NT)**

$[\alpha]20/D$ +20.5±1°, c = 2 in H_2O

Substrate for the characterization of isocitrate dehydrogenase1

58790-250MG	250 mg
58790-1G	1 g

Sodium fumarate dibasic

Disodium fumarate; Fumaric acid disodium salt

NaOOCCH=CHCOONa FW 160.04 [17013-01-3] EC No. 2410877
BRN 4301302

▸ **puriss., anhydrous, ≥99.0% (NT)**

water.....~0.5%

Hygroscopic

RTECS # LT1830000

47970-100G-F	100 g
47970-500G-F	500 g

Succinyl coenzyme A sodium salt

$C_{25}H_{40}N_7O_{19}P_3S$ FW 867.61 [108347-97-3]

▸ **Minimum 85%**

store at: -20°C

S1129-5MG	5 mg
S1129-25MG	25 mg

Stable Isotope-labeled Substrates and Metabolites for the Citric Acid Cycle

Acetyl-1,2-$^{13}C_2$-coenzyme A lithium salt

$^{13}C_2C_{21}H_{35}Li_3N_7O_{17}P_3S$ FW 829.36

99 atom % ^{13}C

658650	inquire

Citric acid-2,2,4,4-d_4

$HOC(CO_2H)(CD_2CO_2H)_2$ FW 196.15 [147664-83-3]

▶ **98 atom % D, 98% (CP)**

mol wt 196.07 by atom % calculation

485438-1G	1 g

Citric acid-1,5-$^{13}C_2$

$HOC(CO_2H)(CH_2{}^{13}CO_2H)_2$ FW 194.11 [302912-06-7]

▶ **99 atom % ^{13}C**

mol wt 194.09 by atom % calculation

488607-100MG	100 mg

Citric acid-2,4-$^{13}C_2$

$HO_2C^{13}CH_2C(OH)(CO_2H)^{13}CH_2CO_2H$ FW 194.11 [121633-50-9]

▶ **99 atom % ^{13}C**

mol wt 194.09 by atom % calculation

492078-100MG	100 mg

Citric acid-$^{13}C_6$

$HO^{13}C(^{13}CO_2H)(^{13}CH_2{}^{13}CO_2H)_2$ FW 198.08

▶ **99 atom % ^{13}C**

97% (CP)

mol wt 198.02 by atom % calculation

606081-100MG	100 mg

Fumaric acid-2,3-d_2

$HO_2CCD{=}CDCO_2H$ FW 118.08 [24461-32-3]

▶ **98 atom % D**

mol wt 118.06 by atom % calculation

486671-5G	5 g

Fumaric acid-d_4

$DO_2CCD{=}CDCO_2D$ FW 120.10 [194160-45-7]

▶ **98 atom % D**

mol wt 120.06 by atom % calculation

485713-5G	5 g

Fumaric acid-2,3-$^{13}C_2$

$HO_2C^{13}CH{=}{}^{13}CHCO_2H$ FW 118.06

▶ **99 atom % ^{13}C**

mol wt 118.04 by atom % calculation

606073-100MG	100 mg

Fumaric acid-$^{13}C_4$

$HO_2{}^{13}C^{13}CH{=}{}^{13}CH^{13}CO_2H$ FW 120.04

▶ **99 atom % ^{13}C**

mol wt 120.01 by atom % calculation

606014-100MG	100 mg

Fumaric acid-$^{13}C_4$,d_4

$DO_2{}^{13}C^{13}CD{=}{}^{13}CD^{13}CO_2D$ FW 124.07

▶ **99 atom % ^{13}C; 98 atom % D**

mol wt 123.99 by atom % calculation

608475	inquire

2-Ketopentanedioic acid-d_6

α-Ketopentanoic acid-d_6

$DO_2CCD_2CD_2COCO_2D$ FW 152.14

▶ **98 atom % D**

mol wt 152.02 by atom % calculation

615390	inquire

DL-Malic acid-2,3,3-d_3

$HO_2CCD_2CD(OH)CO_2H$ FW 137.11

▶ **98 atom % D**

mol wt 137.05 by atom % calculation

641049	inquire

DL-Malic acid-2-^{13}C

$HO_2CCH_2{}^{13}CH(OH)CO_2H$ FW 135.08

▶ **99 atom % ^{13}C**

mol wt 135.08 by atom % calculation

603899	inquire

Succinic acid-2,2,3,3-d_4

Butanedioic acid-2,2,3,3-d_4

$HO_2CCD_2CD_2CO_2H$ FW 122.11 [14493-42-6]

▶ **98 atom % D**

mol wt 122.08 by atom % calculation

Hygroscopic

293075-1G	1 g
293075-5G	5 g

Succinic acid-d_6

Butanedioic acid-d_6

$DO_2C(CD_2)_2CO_2D$ FW 124.13 [21668-90-6]

▸ **98 atom % D**

mol wt 124.07 by atom % calculation

488356-5G	5 g

Succinic acid-1,2-$^{13}C_2$

Butanedioic acid-1,2-$^{13}C_2$

$HO_2CCH_2{}^{13}CH_2{}^{13}CO_2H$ FW 120.07 [94641-55-1]

▸ **99 atom % ^{13}C**

mol wt 120.16 by atom % calculation

491977-100MG	100 mg

Succinic acid-1,4-$^{13}C_2$

Butanedioic acid-1,4-$^{13}C_2$

$HO_2{}^{13}CCH_2CH_2{}^{13}CO_2H$ FW 120.07 [79864-95-2]

▸ **99 atom % ^{13}C**

mol wt 120.16 by atom % calculation

485349-500MG	500 mg

Succinic acid-2,3-$^{13}C_2$

Butanedioic acid-2,3-$^{13}C_2$

$HO_2C{}^{13}CH_2{}^{13}CH_2CO_2H$ FW 120.07 [61128-08-3]

▸ **99 atom % ^{13}C**

mol wt 120.16 by atom % calculation

488364-100MG	100 mg

Radioactively-labeled Metabolites fot the Citric Acid Cycle

Citric acid-1,5-^{14}C

$HOO^{14}CCH_2C[OH][COOH]CH_2{}^{14}COOH$ FW 192.12 [58308-53-5]

sealed ampule

extent of labeling.....40-60 mCi per mmol

store at: 2-8°C

C2916-50UCI	50 µCi
C2916-250UCI	250 µCi

Fumaric acid-2,3-^{14}C

$HOOC^{14}CH=^{14}CHCOOH$ FW 116.07 [54744-93-3]

Packaged in screw-cap bottle

extent of labeling.....1-10 mCi per mmol

304735	304735 1

Succinic acid-2,3-^3H

$HO_2CC^3H_2C^3H_2CO_2H$ FW 118.09 [3073-84-5]

▸ **≥95% (Radiochemical Purity)**

Ethanol: water (1:1) solution

serum bottle

extent of labeling.....20-40 Ci per mmol

store at: 2-8°C

S2174-250UCI	250 µCi
S2174-1MCI	1 mCi

Succinic acid-carboxy-^{14}C

$HO_2{}^{14}CCH_2CH_2{}^{14}CO_2H$ [13613-74-6]

Packaged in screw-cap bottle

extent of labeling.....1-15 mCi per mmol

305006	inquire

Monosaccharide Biosynthesis

Each of the monosaccharides has its own interesting metabolism. The pathway by which a monosaccharide is made, is not the reverse of its degradation pathway (see **Figure 4**).

Glucose biosynthesis starts with the carboxylation of pyruvate (1) to oxaloacetate (2) catalyzed by pyruvate carboxylase requiring ATP and biotin as coenzymes.

The decarboxylation and phosphorylation of oxaloacetate (2) is catalyzed by phosphoenol pyruvate carboxykinase and utilizes both ATP and GTP to yield energy-rich phosphoenolpyruvate (3).

Enolase-catalyzed addition of water to the double bond of phosphoenolpyruvate (3) occurs stereospecifically and gives D-2-phosphoglycerate (4), which is converted through a sequence of phosphorylation at the primary hydroxyl group and a dephosphorylation at the secondary hydroxyl group gives D-3-phospho-glycerate (5).

Another phosphorylation of D-3-phosphoglycerate with ATP produces D-1,3-bisphospho-glycerate (6), which after reduction leads to D-glyceraldehyde-3-phosphate (7).

D-Glyceraldehyde-3-phosphate (7) tautomerizes to dihydroxyacetone phosphate (8) and the condensation of these two three-carbon units to fructose-1,6-bisphosphate (9) is catalyzed by a class I aldolase, fructose-1,6-bis-phosphate aldolase.

A hydrolysis reaction catalyzed by fructose-1,6-bisphosphatase removes the phosphate group at C1 and yields fructose-6-phosphate (10), which further tautomerizes to glucose-6-phosphate (11).

The final hydrolysis step to glucose (12) is catalyzed by phosphatase.

The pathways of other monosaccharides are also of importance to both healthy and pathological states. Sigma offers metabolites from pentose and glucuronate interconversions, fructose and mannose metabolism, galactose metabolism, ascorbate and aldarate metabolism, starch and sucrose metabolism, amino- and nucleotide sugar metabolism, inositol and other monosaccharide metabolic pathways.

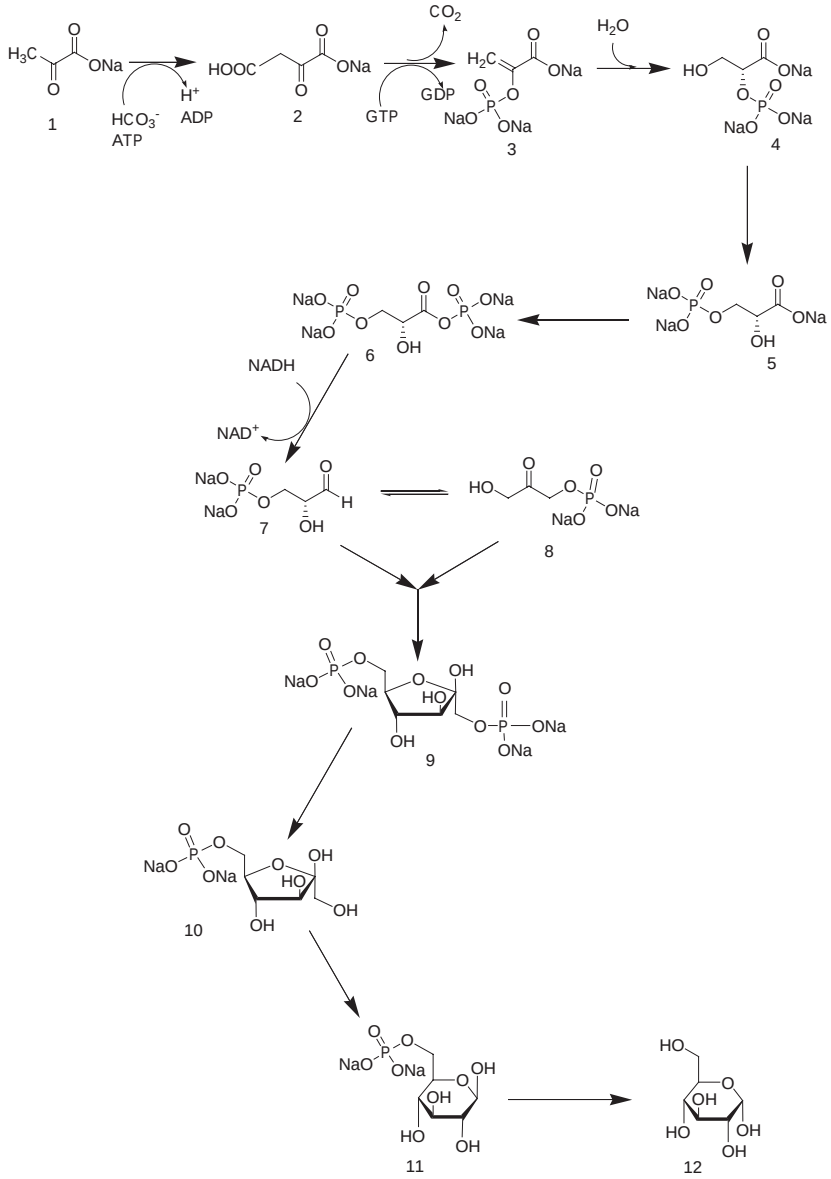

Figure 4. Monosaccharide Biosynthesis.

Non-labeled Metabolites for Monosaccharide Biosynthesis

Phospho(enol)pyruvic acid heptahydrate trisodium salt

Trisodium phosphoenolpyruvate heptahydrate

$C_3H_2Na_3O_6P \cdot 7H_2O$ FW 360.09 [5541-93-5] EC No. 2269068
BRN 4611329

▶ ***BioChemika*, ≥97.0% (enzymatic)**

solubility

H_2O.....0.1 g/mL, clear to slightly turbid, colorless

store at: -20°C

79435-500MG	500 mg

D-Glucose 6-phosphate sodium salt

D(+)-Glucopyranose 6-phosphate sodium salt; G-6-P Na; Robison ester

$C_6H_{12}NaO_9P$ FW 282.12 [54010-71-8] EC No. 2589210
BRN 5787568

▶ ***BioChemika*, crystallized, anhydrous, ≥98.0% (enzymatic)**

Substrate for the determination of glucose-6-phosphate dehydrogenase, EC 1.1.1.491

[α]20/D +34±1°, c = 10 in H_2O

solubility

H_2O.....50 mg/mL, clear, colorless to very faintly yellow
pH.....3.5-4.5, 0.5 g/10 mL H2O at 25 °C

store at: 2-8°C

49282-250MG	250 mg
49282-1G	1 g
49282-5G	5 g

Dihydroxyacetone phosphate dilithium salt

DHAP; 1,3-Dihydroxy-2-propanone 1-phosphate dilithium salt; Glycerone phosphate; 1-Hydroxy-3-(phosphonooxy)-2-propanone dilithium salt

$C_3H_5Li_2O_6P$ FW 181.92 [102783-56-2] BRN 1708891

▶ **≥95% (enzymatic)**

Enzymatically prepared.

Unlike the dimethyl ketal, does not require hydrolysis prior to use as a substrate.

D-glyceraldehyde 3-phosphate.....~0.2 mol %
phosphate (PO_4^-)..... ~5 mol %

store at: -20°C

D7137-5MG	5 mg
D7137-10MG	10 mg
D7137-25MG	25 mg
D7137-100MG	100 mg
D7137-250MG	250 mg

DL-Glyceraldehyde 3-phosphate solution

$C_3H_7O_6P$ FW 170.06 [591-59-3]

▶ **45-55 mg/mL in H_2O**

Ba..... ≤100 µg/mL

ship: dry ice store at: -20°C

G5251-25MG	25 mg
G5251-100MG	100 mg
G5251-250MG	250 mg
G5251-500MG	500 mg
G5251-1G	1 g

Oxaloacetic acid

Ketosuccinic acid; Oxalacetic acid; Oxobutanedioic acid; 2-Oxosuccinic acid

$HOOCCH_2COCOOH$ FW 132.07 [328-42-7] EC No. 2063298
BRN 1705475

▶ **~98%**

store at: -20°C

O4126-1G	1 g
O4126-5G	5 g
O4126-25G	25 g
O4126-100G	100 g

D(−)3-Phosphoglyceric acid trisodium salt

$C_3H_4O_7PNa_3$ FW 252.00 [6134-04-9]

▶ **~95%**

store at: -20°C

P0769-10MG	10 mg
P0769-1G	1 g

D-(−)-3-Phosphoglyceric acid disodium salt

(−)-Disodium D-3-phosphoglycerate; D-Glycerate 3-phosphate disodium salt

$C_3H_5Na_2O_7P$ FW 230.02 [80731-10-8] BRN 3767836

▶ **~95%**

store at: -20°C

P8877-10MG	10 mg
P8877-1G	1 g
P8877-5G	5 g

Stable Isotope-labeled Substrates and Metabolites for Monosaccharide Biosynthesis

D-Glucose-6,6-d_2

Dextrose-6,6-d_2

$C_6D_2H_{10}O_6$ FW 182.17 [18991-62-3]

[α]25/D +52.0, c = 2 in water + trace NH_4OH

▸ **98 atom % D**

mol wt 182.15 by atom % calculation

Hygroscopic

282650-100MG	100 mg
282650-500MG	500 mg
282650-1G	1 g

D-Glucose-$^{13}C_6$

Dextrose-$^{13}C_6$; D-Glucose-ul-^{13}C

$^{13}C_6H_{12}O_6$ FW 186.11 [110187-42-3]

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

▸ **99 atom % ^{13}C**

mol wt 186.05 by atom % calculation

Hygroscopic

389374-100MG	100 mg
389374-250MG	250 mg
389374-1G	1 g
389374-2G	2 g
389374-3G	3 g
389374-10G	10 g

D-Glucose-1-^{13}C

Dextrose-1-^{13}C

$^{13}CC_5H_{12}O_6$ FW 181.15 [40762-22-9] BRN 2263682

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

▸ **99 atom % ^{13}C**

mol wt 181.14 by atom % calculation

297046-250MG	250 mg
297046-1G	1 g
297046-10G	10 g

D-Glucose-2-^{13}C

Dextrose-2-^{13}C

$^{13}CC_5H_{12}O_6$ FW 181.15 [105931-74-6]

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

▸ **99 atom % ^{13}C**

mol wt 181.14 by atom % calculation

310794-250MG	250 mg
310794-1G	1 g

D-Glucose-2-d_1

Dextrose-2-d_1

$HOCH_2[CHOH]_3CDOHCHO$ FW 181.16 [30737-83-8]

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

▸ **98 atom % D**

mol wt 181.16 by atom % calculation

Hygroscopic

310824-250MG	250 mg
310824-1G	1 g

D-Glucose-6-^{13}C

Dextrose-6-^{13}C

$^{13}CC_5H_{12}O_6$ FW 181.15 [106032-62-6] BRN 5810734

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

▸ **99 atom % ^{13}C**

mol wt 181.14 by atom % calculation

310808-100MG	100 mg
310808-500MG	500 mg

D-Glucose-1-d_1

Dextrose-1-d_1

$HOCH_2[CHOH]_4CDO$ FW 181.16 [106032-61-5]

▸ **98 atom % D**

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

mol wt 181.16 by atom % calculation

Hygroscopic

310816-250MG	250 mg
310816-1G	1 g

D-Glucose-1,2-$^{13}C_2$

Dextrose-1,2-$^{13}C_2$

$^{13}C_2C_4H_{12}O_6$ FW 182.14 [138079-87-5]

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

▸ **99 atom % ^{13}C**

mol wt 182.12 by atom % calculation

453188-100MG	100 mg
453188-500MG	500 mg

D-Glucose-1,6-$^{13}C_2$

Dextrose-1,6-$^{13}C_2$

$^{13}C_2C_4H_{12}O_6$ FW 182.14 [287100-67-8]

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

▸ **98 atom % ^{13}C**

mol wt 182.12 by atom % calculation

Hygroscopic

453196-100MG	100 mg
453196-250MG	250 mg

Sodium pyruvate-2,3-$^{13}C_2$

Pyruvic acid-2,3-$^{13}C_2$ sodium salt

$^{13}CH_3{}^{13}COCO_2Na$ FW 112.03 [89196-78-1]

▸ **99 atom % ^{13}C**

mol wt 112.01 by atom % calculation

486191-500MG	500 mg

Sodium pyruvate-1-^{13}C

Pyruvic acid-1-^{13}C sodium salt

$CH_3CO^{13}CO_2Na$ FW 111.04 [87976-71-4]

▸ **99 atom % ^{13}C**

mol wt 111.03 by atom % calculation

Moisture sensitive

490709-250MG	250 mg

Sodium pyruvate-$^{13}C_3$

Pyruvic acid-$^{13}C_3$ sodium salt

$^{13}CH_3{}^{13}CO^{13}CO_2Na$ FW 113.02 [142014-11-7]

▸ **99 atom % ^{13}C**

mol wt 112.99 by atom % calculation

490717-500MG	500 mg

Sodium pyruvate-2-^{13}C

Pyruvic acid-2-^{13}C sodium salt

$CH_3{}^{13}COCO_2Na$ FW 111.04 [87976-70-3]

▸ **99 atom % ^{13}C**

mol wt 111.03 by atom % calculation

490725-500MG	500 mg

Sodium pyruvate-3-^{13}C

Pyruvic acid-3-^{13}C sodium salt

$^{13}CH_3COCO_2Na$ FW 111.04 [124052-04-6]

▸ **99 atom % ^{13}C**

mol wt 111.03 by atom % calculation

490733-250MG	250 mg

Sodium pyruvate-1,2-$^{13}C_2$

Pyruvic acid-1,2-$^{13}C_2$ sodium salt

$CH_3{}^{13}CO^{13}CO_2Na$ FW 112.03 [312623-97-5]

▸ **99 atom % ^{13}C**

mol wt 112.01 by atom % calculation

493392-500MG	500 mg

D-Glucose-$^{13}C_6$,C-d_7

Dextrose-$^{13}C_6$,C-d_7; D-Glucose-$^{13}C_6$,1,2,3,4,5,6,6-d_7

$^{13}C_6H_5D_7O_6$ FW 193.15 [201417-01-8]

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

▸ **99 atom % ^{13}C; 97-99 atom % D**

mol wt 192.88 by atom % calculation

Hygroscopic

552151-500MG	500 mg
552151-1G	1 g
552151-5G	5 g

Phospho(enol)pyruvic acid-3-^{13}C potassium salt

$^{13}CC_2H_4KO_6P$ FW 207.13

▸ **99 atom % ^{13}C**

mol wt 207.12 by atom % calculation ◆

Hygroscopic

571237-50MG	50 mg

D-Glucose-3-^{13}C

Dextrose-3-^{13}C

$^{13}CC_5H_{12}O_6$ FW 181.15

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

▸ **99 atom % ^{13}C**

mol wt 181.14 by atom % calculation

605409	inquire

D-Glucose-4,5-$^{13}C_2$

Dextrose-4,5-$^{13}C_2$

$^{13}C_2C_4H_{12}O_6$ FW 182.14

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

▸ **99 atom % ^{13}C**

mol wt 182.12 by atom % calculation ◆

605468	inquire

D-Glucose-2,5-$^{13}C_2$

Dextrose-2,5-$^{13}C_2$

$^{13}C_2C_4H_{12}O_6$ FW 182.14

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

▸ **99 atom % ^{13}C**

mol wt 182.12 by atom % calculation

605506	inquire

Sodium pyruvate-3-^{13}C,d_3

Pyruvic acid-3-^{13}C,d_3 sodium salt

$^{13}CD_3COCO_2Na$ FW 114.06

▸ **99 atom % ^{13}C; 50-60 atom % D**

mol wt 112.54 by atom % calculation

Hygroscopic

608483-1G	1 g

D-Glucose-3-d_1

Dextrose-3-d_1

$C_6DH_{11}O_6$ FW 181.16

▸ **98 atom % D**

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

mol wt 181.15 by atom % calculation

615498	inquire

D-Glucose-d_{12}

Dextrose-d_{12}

$C_6D_{12}O_6$ FW 192.23

[α]25/D +52.0°, c = 2 in H_2O (trace NH_4OH)

▸ **97-99 atom % D**

mol wt 192.11 by atom % calculation

Hygroscopic

616338-250MG	250 mg

D-Glucose-4-^{13}C

$^{13}CC_5H_{12}O_6$ FW 181.15

▸ **99 atom % ^{13}C**

[α]25/D +52.0°, c = 2 in water + trace NH_4OH

668648	inquire

Pentose Phosphate Pathway

While glucose metabolism by glycolysis occurs where energy is needed quickly, e.g. in brain and muscle cells, a second pathway for glucose metabolism, called pentose phosphate pathway, operates in tissues that synthesize fatty acids and steroids (see **Figure 5**).

As in glycolysis, glucose is phosphorylated at the 6-position to give glucose-6-phosphate (1).

NADP-dependent oxidation at the anomeric center is catalyzed by glucose-6-phosphate dehydrogenase and yields 6-phosphogluconolactone (2), which upon hydrolysis yields the 6-phosphogluconate (3).

Another NADP-dependent oxidation at the C3-hydroxy group transforms 6-phosphogluconate to ribulose-5-phosphate (4).

Tautomerization leads to either xylulose-5-phosphate (6) formation catalyzed by ribulose-5-phosphate epimerase or to ribose-5-phosphate (5) formation, which is catalyzed by ribulose-5-phosphate isomerase.

Growing and dividing cells require ribose-5-phosphate, but excess ribose-5-phosphate (5) reacts with xylulose-5-phosphate (6), a reaction catalyzed by transketolase, which leads to glyceraldehyde-3-phosphate (8) and sedoheptulose-7-phosphate (7) as products.

In the next step, the transaldolase-catalyzed reaction of sedoheptulose-7-phosphate (7) with glyceraldehydes-3-phosphate (8) yields erythrose-4-phosphate (9) and fructose-6-phosphate (11).

One closing step of this pathway involves again xylulose-5-phosphate (6) and erythrose-4-phosphate (9), but in this step the transketolase-catalyzed two-carbon unit transfer gives fructose-6-phosphate (11) and D-glyceraldehyde-3-phosphate (8).

An additional link between D-glyceraldehyde-3-phosphate (8) and fructose-6-phosphate is channelled through fructose-1,6-bisphosphate (10).

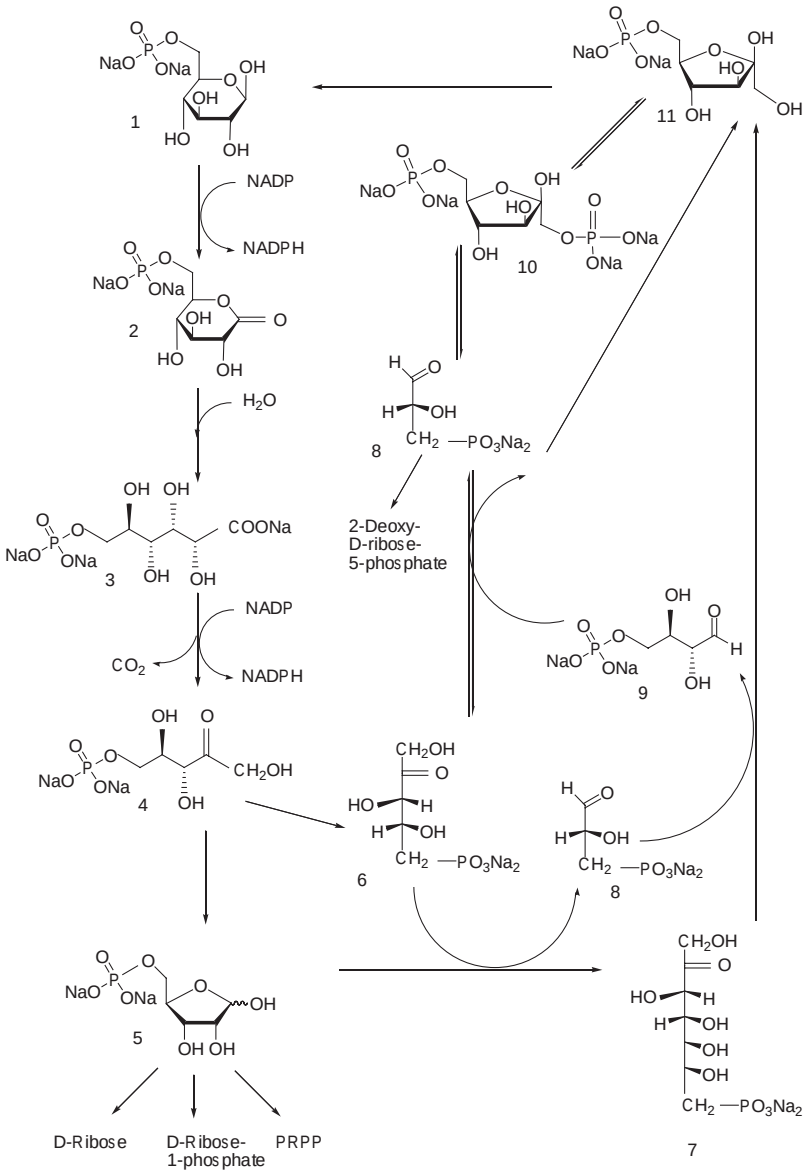

Figure 5. Pentose Phosphate Pathway.

Non-labeled Metabolites for Pentose Phosphate Pathway

D-Erythrose 4-phosphate sodium salt

4-Phospho-D-erythrose sodium salt

$C_4H_8NaO_7P$ FW 222.07 [103302-15-4]

▸ **60-75%**

suitable for substrate for transaldolase

store at: -20°C

E0377-5MG	5 mg
E0377-10MG	10 mg
E0377-25MG	25 mg
E0377-100MG	100 mg
E0377-250MG	250 mg

D-Glucose 6-phosphate sodium salt

D(+)-Glucopyranose 6-phosphate sodium salt; G-6-P Na; Robison ester

$C_6H_{12}NaO_9P$ FW 282.12 [54010-71-8] EC No. 2589210 BRN 5787568

▸ ***BioChemika*, crystallized, anhydrous, ≥98.0% (enzymatic)**

Substrate for the determination of glucose-6-phosphate dehydrogenase, EC 1.1.1.491

[α]20/D +34±1°, c = 10 in H_2O

solubility

H_2O.....50 mg/mL, clear, colorless to very faintly yellow

pH.....3.5-4.5, 0.5 g/10 mL H_2O at 25 °C

store at: 2-8°C

49282-250MG	250 mg
49282-1G	1 g
49282-5G	5 g

DL-Glyceraldehyde 3-phosphate solution

$C_3H_7O_6P$ FW 170.06 [591-59-3]

▸ **45-55 mg/mL in H_2O**

Ba..... ≤100 µg/mL

ship:dry ice store at: -20°C

G5251-25MG	25 mg
G5251-100MG	100 mg
G5251-250MG	250 mg
G5251-500MG	500 mg
G5251-1G	1 g

6-Phosphogluconic acid tri(cyclohexylammonium) salt

D-Gluconate 6-phosphate tris(cyclohexylamine) salt; 6-Phosphogluconic acid tris(cyclohexylamine) salt

$C_6H_{13}O_{10}P \cdot 3C_6H_{13}N$ FW 573.66 [108347-81-5]

▸ **Grade V**

store at: -20°C

P7752-100MG	100 mg
P7752-500MG	500 mg
P7752-1G	1 g

6-Phosphogluconic acid trisodium salt

D-Gluconate 6-phosphate trisodium salt

$C_6H_{10}Na_3O_{10}P$ FW 342.08 [53411-70-4] EC No. 2585436 BRN 3814212

▸ **Grade IV, ≥97% (enzymatic)**

store at: -20°C

P7877-100MG	100 mg
P7877-500MG	500 mg
P7877-1G	1 g
P7877-5G	5 g

D-Ribose 5-phosphate dihydrate disodium salt

$C_5H_9Na_2O_8P \cdot 2H_2O$ FW 310.10 [207671-46-3]

▸ ***BioChemika*, ≥99.0% (TLC)**

For the synthesis of 5-phospho-D-ribosyl α-1-pyrophosphate; Isolation of transketolase

solubility

H_2O.....50 mg/mL, clear, colorless

solvent (ethanol, methanol).....≤5%

store at: -20°C

83875-250MG	250 mg
83875-1G	1 g

D-Ribose 5-phosphate hydrate disodium salt

D-Ribofuranose 5-phosphate disodium salt

$C_5H_9Na_2O_8P \cdot xH_2O$ FW 274.07 (Anh) EC No. 2421407 BRN 4774244

▸ **≥98%**

EC No. 242-140-7 store at: -20°C

R7750-10MG	10 mg
R7750-250MG	250 mg
R7750-1G	1 g
R7750-5G	5 g

D-Ribulose 5-phosphate disodium salt

$C_5H_9Na_2O_8P$ FW 274.07

▸ ***BioChemika*, ≥96% (TLC)**

solubility

H_2O.....50 mg/mL, clear, light yellow methanol....≤1%

ethanol.....≤2% water.....<10%

S: 22-24/25 store at: -20°C

83899-5MG	5 mg
83899-25MG	25 mg
83899-100MG	100 mg

D-Ribulose 5-phosphate sodium salt

Ru-5-P $C_5H_{11}O_8P$ FW 230.11 [108321-99-9]

▸ **~90%**

store at: -20°C

R9875-5MG	5 mg
R9875-25MG	25 mg

D-Xylulose 5-phosphate sodium salt

Xu 5-P $C_5H_{10}NaO_8P$ FW 252.09 [105931-44-0]

▸ ***BioChemika*, ~30% (enzymatic)** ◆

X0754-5MG	5 mg
X0754-25MG	25 mg

Calvin Cycle

The Calvin cycle is a more complex process used by algae, plants and photosynthetic bacteria to convert carbon dioxide and water into carbohydrate and molecular oxygen with the aid of sunlight. The light reactions split water into molecular oxygen and reducing power in the form of NADPH, while the dark reactions reduce carbon dioxide to carbohydrates (see **Figure 6**).

The fixation of carbon dioxide with D-ribulose-1,5-bisphosphate (1) is catalyzed by ribulose-1,5-bisphosphate carboxylase and yields D-3-phosphoglycerate (2).

This compound yields D-1,3-bisphosphoglycerate (3) upon phosphorylation with ATP and D-glyceraldehyde-3-phosphate (4) upon reduction with NADPH.

The next steps are isomerization to dihydroxyacetonephosphate (5), aldol condensation to D-fructose-1,6-bisphosphate (6) and further hydrolysis to D-fructose-6-phosphate.

A transketolase-catalyzed two-carbon unit transfer from D-fructose-6-phosphate to D-glyceraldehyde-3-phosphate yields D-xylulose-5-phosphate (7) and D-erythrose-4-phosphate (8).

Aldol condensation of erythrose-4-phosphate (8) with dihydroxyacetone-phosphate (5) produces D-sedoheptulose-1,7-bisphosphate (9), which after enzymatic hydrolysis, yields D-sedoheptulose-7-phosphate (10).

The next transketolase-catalyzed reaction of D-sedoheptulose-7-phosphate (10) and D-glyceraldehyde-3-phosphate gives again D-xylulose-5-phosphate (7) and D-ribose-5-phosphate (11), both of which are enzymatically isomerized to ribulose-5-phosphate (12).

This is then converted back to ribulose-1,5-bisphosphate (1) by phosphorylation with ATP, completing the Calvin cycle.

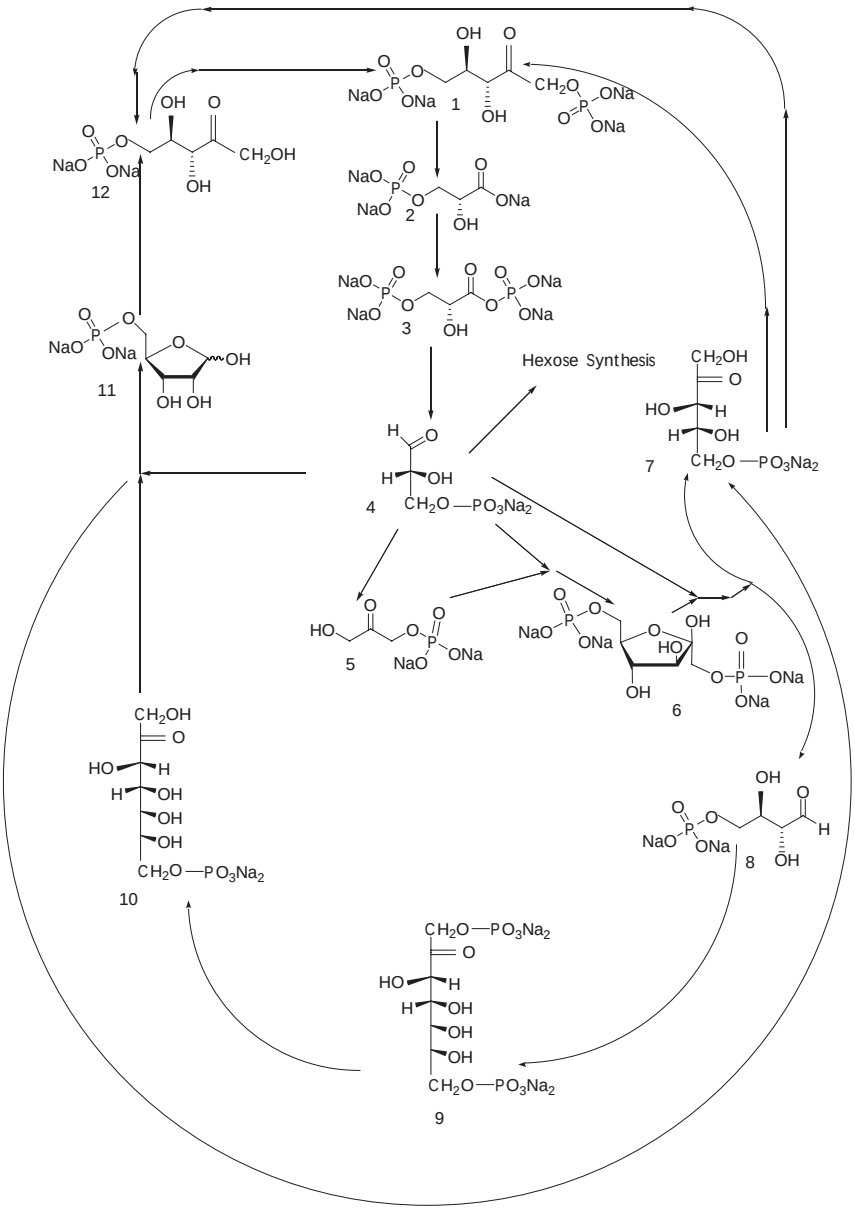

Figure 6. Calvin Cycle.

Non-labeled Metabolites for Calvin Cycle

D-Erythrose 4-phosphate sodium salt

4-Phospho-D-erythrose sodium salt

$C_4H_8NaO_7P$ FW 222.07 [103302-15-4]

▶ **60-75%**

suitable for substrate for transaldolase

store at: -20°C

E0377-5MG	5 mg
E0377-10MG	10 mg
E0377-25MG	25 mg
E0377-100MG	100 mg
E0377-250MG	250 mg

DL-Glyceraldehyde 3-phosphate solution

$C_3H_7O_6P$ FW 170.06 [591-59-3]

▶ **45-55 mg/mL in H_2O**

Ba..... ≤100 µg/mL

ship: dry ice store at: -20°C

G5251-25MG	25 mg
G5251-100MG	100 mg
G5251-250MG	250 mg
G5251-500MG	500 mg
G5251-1G	1 g

D-(−)-3-Phosphoglyceric acid disodium salt

(−)-Disodium D-3-phosphoglycerate; D-Glycerate 3-phosphate disodium salt

$C_3H_5Na_2O_7P$ FW 230.02 [80731-10-8] BRN 3767836

▶ **~95%**

store at: -20°C

P8877-10MG	10 mg
P8877-1G	1 g
P8877-5G	5 g

D(−)3-Phosphoglyceric acid trisodium salt

$C_3H_4O_7PNa_3$ FW 252.00 [6134-04-9]

▶ **~95%**

store at: -20°C

P0769-10MG	10 mg
P0769-1G	1 g

D-Ribose 5-phosphate hydrate disodium salt

D-Ribofuranose 5-phosphate disodium salt

$C_5H_9Na_2O_8P \cdot xH_2O$ FW 274.07 (Anh) EC No. 2421407 BRN 4774244

▶ **≥98%**

store at: -20°C

R7750-10MG	10 mg
R7750-250MG	250 mg
R7750-1G	1 g
R7750-5G	5 g

D-Ribulose 1,5-bisphosphate hydrate sodium salt

D-Ribulose 1,5-diphosphate; RuDP

$C_5H_{12}O_{11}P_2 \cdot xNa^+ \cdot yH_2O$ FW 310.09 (FA/Anh)

▶ **~90%**

store at: -20°C

R0878-10MG	10 mg
R0878-25MG	25 mg
R0878-100MG	100 mg

D-Ribulose 5-phosphate disodium salt

$C_5H_9Na_2O_8P$ FW 274.07

▶ ***BioChemika*, ≥96% (TLC)**

solubility

H_2O.....50 mg/mL, clear, light yellow
methanol.....≤1%
ethanol.....≤2%
water.....<10%

store at: -20°C

83899-5MG	5 mg
83899-25MG	25 mg
83899-100MG	100 mg

D-Ribulose 5-phosphate sodium salt

Ru-5-P

$C_5H_{11}O_8P$ FW 230.11 [108321-99-9]

▶ **~90%**

store at: -20°C

R9875-5MG	5 mg
R9875-25MG	25 mg

D-Xylulose 5-phosphate sodium salt

Xu 5-P

$C_5H_{10}NaO_8P$ FW 252.09 [105931-44-0]

▶ ***BioChemika*, ~30% (enzymatic)**

▶ **≥70%**

X0754-5MG	5 mg
X0754-25MG	25 mg

PPAR Signaling

Similar to other nuclear hormone receptors, peroxisome proliferator-activated receptors (PPARs) act as ligand-activated transcription factors that play a role in the regulation of storage and catabolism of dietary fats. When bound to its fatty acid ligand, PPARα forms a heterodimeric complex with the retinoid X receptor (RXR) to regulate transcription. PPARγ is activated by prostaglandins and leukotrienes and regulates the gene expression of proteins involved in the storage of fatty acids. PPARß is weakly activated by fatty acids, prostaglandins, and leukotrienes. Its physiological ligand has not been identified.

PPARγ agonists decrease circulationg fatty acid levels and may thereby indirectly affect glucose levels by invoking the the Randle Cycle, a pathway that links carbohydrate and fat metabolism. In addition PPARγ activation in rodents has been shown to increase the number of small adipocytes while decreasing the number of large adipocytes. Smaller adipocytes typically have greater insulin sensitivity, take up more glucose and have lower rates of lipolysis compare to large adipocytes. PPARγ agonist treatment of insulin-resistant rats results in decreased expression of genes required for gluconeogenesis in the liver. This is consistent with PPARγ agonsists promoting a flux of glucose and fatty acids into adipose tissue and away from muscle with a net result of increased glucose utilization in muscle and decreased gluconeogenesis in the liver.

PPARγ agonists are efficacious antidiabetic agents and represent a novel class of marketed diabetic drugs, collectively referred to as the glitazones.

AC-41848 hydrate

1-[(2,4-Dichlorophenyl)methyl]-6,7,8,9-tetrahydro-3-phenyl-5H-imidazo[1,2-a]azepinium bromide hydrate

$C_{21}H_{21}BrCl_2N_2 \cdot xH_2O$ FW 452.21 (Anh)

AC-41848 is a potent, cell permeable, subtype selective retinoic acid receptor RARγ agonist. AC-41848 has high selectivity (92%) for RARγ. EC_{50} = 5.9 µM.

▶ **≥98% (HPLC)**

solubility

DMSO.....~14 mg/mL
H_2O.....>5 mg/mL

store at: 2-8°C

A7980-5MG	5 mg
A7980-20MG	20 mg

AC-55649

8BCA; 4′-Octyl-4-biphenylcarboxylic acid, 4′-n-octylbiphenyl-4-carboxylic acid

$C_{21}H_{26}O_2$ FW 310.43 [59662-49-6]

AC-55649 is a subtype selective RAR (RARβ2) agonist. AC-55649 is a potent, orally available isoform selective Retinoic Acid Receptor β2. AC-55649 has high selectivity, 99% for RARβ2 and 31% for RARβ1. When compared to AM-580 (Prod No A8843), both isoform receptors were 100%. AC-55649 has a potent EC_{50} of 6.9 µM compared to an EC_{50} of 7.7 µM for AM-580.

▶ **≥98% (HPLC)**

solubility

DMSO.....>7 mg/mL

store at: 2-8°C

A9480-5MG	5 mg
A9480-20MG	20 mg

AC-93253 iodide

2-[3-(1,3-Dihydro-1,3,3-trimethyl-2H-indol-2-ylidene)-1-propenyl]-3-ethyl-benzothiazolium iodide

$C_{23}H_{25}N_2SI$ FW 488.43 [108527-83-9]

AC-93253 is a potent, cell permeable, subtype selective RAR (RARα) agonist. EC_{50} = 6.3 µM. AC-93253 has high selectivity; 89% for RARα vs 67% for RARβ1, 35% for RARβ2, and 11% for RARγ.

▶ **≥98% (HPLC)**

solubility

H_2O.....insoluble
DMSO.....>12 mg/mL

store at: 2-8°C

A9605-10MG	10 mg
A9605-25MG	25 mg

AM580

4-[(5,6,7,8-Tetrahydro-5,5,8,8-tetramethyl-2-naphthalenyl)carbox-amido]benzoic acid

$C_{22}H_{25}NO_3$ FW 351.44 [102121-60-8]

▶ **98% (TLC)**

Retinoid derivative used for gene expression studies of leukemia-retinoic acid receptor (PHL-RAR) cell line differentiation.

store at: -20°C

A8843-5MG	5 mg

Azelaoyl PAF

1-O-Hexadecyl-2-azelaoyl-*sn*-glycero-3-phosphocholine; hexadecyl azelaoyl phosphatidylcholine; 1-O-Hexadecyl-2-O-(9-carboxyoctanoyl)-*sn*-glyceryl-3-phosphocholine

$C_{33}H_{66}NO_9P$ FW 651.85

Potent PPARγ agonist.

▶ **10 mg/mL in ethanol**

store at: -20°C

A6850-1MG	1 mg

Bezafibrate

2-[4-[2-(4-Chlorobenzamido)ethyl]phenoxy]-2-methylpropanoic acid

$C_{19}H_{20}ClNO_4$ FW 361.82 [41859-67-0]

The peroxisome proliferator-activated receptor (PPAR) is a member of the steroid nuclear receptor superfamily. Bezafibrate is a peroxisome proliferator-activated receptor agonist for PPARα, PPARδ, and PPARγ. Lipoprotein lipase (LPL) activator.

PPARgamma agonists, including Bezafibrate, have beneficial effects in the suppression of the inflammatory response during RSV infection and therefore might have clinical efficacy in the course of severe RSV-infection.

▶ **≥98%**

solubility

DMF.....soluble
deionized water.....insoluble

RTECS # UE8755000

B7273-1G	1 g
B7273-5G	5 g
B7273-25G	25 g

Ciglitizone

(±)-5-[4-(1-Methylcyclohexylmethoxy)benzyl]thiazolidine-2,4-dione

$C_{18}H_{23}NO_3S$ FW 333.45 [74772-77-3]

▶ ≥99% (TLC)

Selective peroxisome proliferator-activated receptor-γ (PPARγ) agonist (EC_{50} = 3 µM) and antihyperglycemic agent displaying activity in genetically obese C57 B1/6 ob/ob mice.

C3974-5MG	5 mg

Ciprofibrate

2-[p-(2,2-Dichlorocyclopropyl)phenoxy]-2-methylpropanoic acid

$C_{13}H_{14}Cl_2O_3$ FW 289.15 [52214-84-3]

Peroxisome proliferator-activated receptor α (PPARα) agonist

store at: 2-8°C

C0330-10MG	10 mg
C0330-25MG	25 mg

GW1929 hydrate

N-(2-Benzoylphenyl)-O-[2-(methyl-2-pyridinylamino)ethyl]-L-tyrosine hydrate

$C_{30}H_{29}N_3O_4 \cdot xH_2O$ FW 495.57 (Anh)

High affinity agonist of PPAR-γ

▶ **>98% (HPLC)**

solubility

DMSO.....20 mg/mL

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G5668-5MG	5 mg
G5668-25MG	25 mg

GW3965 hydrochloride

3-[3-[N-(2-Chloro-3-trifluoromethylbenzyl)-(2,2-diphenylethyl)amino]propyl-oxy]phenylacetic acid hydrochloride

$C_{33}H_{31}F_3ClNO_3 \cdot HCl$ FW 618.51 [405911-17-3]

GW3965 is a liver X receptor full agonist on hLXRa and hLXRb. GW3965 has an EC_{50} = 125 nM in a cell-free ligand-sensing assay of LXRa and profiles as a full agonist on hLXRa and hLXRb in cell-based assays with EC_{50} = 190 nM and 30 nM, respectively. It is orally active in mice. When screened against a panel of nuclear receptors, it cross-reacted with only the pregnane X receptor (PXR). The literature agonist, T0901317 (Tularik), had an EC_{50} = 60 nM and 85 nM in the cell-free and cell-based assays, respectively.

▶ ≥98% (HPLC)

solubility

DMSO.....≥20 mg/mL

G6295-5MG	5 mg
G6295-25MG	25 mg

GW4716

N'-(4-Diethylaminobenzylidene)-4-hydroxybenzoylhydrazide; GSK4716; GW574716

$C_{18}H_{21}N_3O_2$ FW 311.38 [95167-41-2]

GW4716 is an estrogen-related receptor γ (ERRγ) agonist. The ERRs generally are considered to be constitutively active receptors that interact with coactivator proteins in the absence of exogenous ligands. IC_{50} value of 300-500 nM in transient transfection assays.

▶ ≥98% (HPLC)

solubility

H_2O.....not directly soluble

DMSO.....≥14 mg/mL

store at: 2-8°C

G5920-5MG	5 mg
G5920-25MG	25 mg

GW7647

2-(4-(2-(1-Cyclohexanebutyl)-3-cyclohexylureido)ethyl)phenylthio)-2-methyl-propionic acid

$C_{29}H_{46}N_2O_3S$ FW 502.75 [265129-71-3]

Potent human PPARα agonist. Use to study the biology of PPARα receptor in human cells.

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▶ ≥98% (HPLC)

solubility

H_2O.....insoluble

DMSO.....16 mg/mL, soluble

G6793-5MG	5 mg
G6793-25MG	25 mg

GW9662

2-Chloro-5-nitro-N-phenylbenzamide

$C_{13}H_9ClN_2O_3$ FW 276.68 [22978-25-2]

GW9662 is an irreversible PPAR-γ antagonist. GW9662 inhibits connective tissue growth factor and activation of CD36 by IL-4.

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▶ **>98% (HPLC)**

solubility

H_2O.....insoluble

DMSO.....26 mg/mL, soluble

store at: 2-8°C

M6191-5MG	5 mg
M6191-25MG	25 mg

13(S)-Hydroxyoctadeca-9Z,11E-dienoic acid

13(S)-HODE

$C_{18}H_{32}O_3$ FW 296.44 [29623-28-7]

PPARγ agonist

▶ **~100 µg/mL in ethanol, ~98%**

Expression of 15-lipoxygenase-1 (15-LOX-1) and its main product, 13(S)-HODE, are decreased in human colorectal and esophageal cancers. Certain non-steroidal anti-inflammatory drugs (NSAIDs) can induce apoptosis in human colon cancer cells by increased expression of 15-LOX-1, which down-regulates PPAR-delta through 13-HODE.

Packaged under Argon.

store at: –20°C

H9146-10UG	10 µg
H9146-25UG	25 µg

L-165,041

4-[3-(4-Acetyl-3-hydroxy-2-propylphenoxy)propoxy]phenoxyacetic acid

$C_{22}H_{26}O_7$ FW 402.44 [79558-09-1]

PPARβ (PPARδ) selective agonist.

▶ **≥98% (HPLC)**

solubility

DMSO.....>10 mg/mL

store at: –20°C

L2167-5MG	5 mg
L2167-25MG	25 mg

Retinoic acid

ATRA; *all-trans*-Retinoic acid; Tretinoin; Vitamin A acid

$C_{20}H_{28}O_2$ FW 300.44 [302-79-4] EC No. 2061290 BRN 2057223

all–trans–Retinoic acid (ATRA) is a ligand for both the retinoic acid receptor (RAR) and the retinoid X receptor (RXR). The bound RAR and RXR act as transcription factors that regulate the growth and differentiation of both normal and malignant cells. Cytochromes P450 (CYPs) catalyze the 4-hydroxylation of ATRA. Retinoic acid primes embryonic stem cells to become neurons.

▶ **≥98% (HPLC)**

Sealed ampule

store at: –20°C

R2625-50MG	50 mg
R2625-100MG	100 mg
R2625-500MG	500 mg
R2625-1G	1 g
R2625-5G	5 g

9-*cis*-Retinoic acid

9-*cis*-Tretinoin

$C_{20}H_{28}O_2$ FW 300.44 [5300-03-8]

▶ **~98% (HPLC)**

Ligand for both the retinoic acid receptor (RAR) and the retinoid X receptor (RXR) that act as transcription factors to regulate the growth and differentiation of normal and malignant cells.

Sealed ampule

store at: –20°C

R4643-1MG	1 mg

13-*cis*-Retinoic acid

Isotretinoin

$C_{20}H_{28}O_2$ FW 300.44 [4759-48-2]

13-*cis*-Retinoic acid (RA) has anti-inflammatory and anti-tumor action. The action of RA is mediated through RAR-β and RAR-α receptors. RA attenuates iNOS expression and activity in cytokine-stimulated murine mesangial cells. It induces mitochondrial membrane permeability transition, observed as swelling and as a decrease in membrane potential, and stimulates the release of cytochrome c implicating mechanisms through the apoptosis pathway. These activities are reversed by EGTA and cyclosporin A. RA also increases MMP-1 protein expression partially via increased transcription.

▶ **≥98% (HPLC)**

store at: –20°C

R3255-100MG	100 mg
R3255-250MG	250 mg
R3255-500MG	500 mg

Retinoic acid p-hydroxyanilide

Fenretinide; 4-HPR; N-(4-Hydroxyphenyl)retinamide

$C_{26}H_{33}NO_2$ FW 391.55 [65646-68-6]

▶ **≥95%**

Vitamin A acid analogue with antiproliferative activity in cultured human breast cancer cells; induces apoptosis in malignant hemopoietic cell lines.

store at: –20°C

H7779-5MG	5 mg

T0901317

$C_{17}H_{12}NSO_3F_9$ FW 481.33 [293754-55-9]

LXR agonist whose treatment results in an LXR-dependent up-regulation of ABC1 gene expression

mol wt 481.3

▶ **>98%**

store at: –20°C

T2320-5MG	5 mg

Tetradecylthioacetic acid

TTA

$C_{14}H_{29}$-S-CH_2COOH FW 288.49

PPARα agonist; activation in ranking order: PPARα > PPARδ > PPARγ

▸ **≥97% (NMR)**

Packaged under nitrogen.

solubility

DMSO.....≥22 mg/mL, soluble

T1698-5MG	5 mg

Troglitazone

CS-045; (±)-5-[4-[(6-Hydroxy-2,5,7,8-tetramethylchroman-2-yl)methoxy]benzyl]-2,4-thiazolidinedione

$C_{24}H_{27}NO_5S$ FW 441.54

PPARγ agonist; anti-diabetic thiazolidinedione (TZD) with anti-inflammatory and anti-tumor activity; induces apoptosis via a p53 pathway.

▸ **>98% (HPLC)**

solubility

DMSO.....20 mg/mL

T2573-5MG	5 mg

TTNPB

Arotinoid acid; 4-[(E)-2-(5,6,7,8-Tetrahydro-5,5,8,8-tetramethyl-2-naphthalenyl)-1-propenyl]benzoic acid

$C_{24}H_{28}O_2$ FW 348.48 [71441-28-6]

Selective and highly potent retinoic acid analog with affinity for retinoic acid receptors (RAR) α, β, and γ, which are nuclear transcription factors. Produces ligand-activated transcription of genes that possess retinoic acid responsive elements.

store at: -20°C

T3757-10MG	10 mg
T3757-25MG	25 mg

WY-14643

4-Chloro-6-(2,3-xylidino)-2-pyrimidinylthioacetic acid; Pirinixic acid

$C_{14}H_{14}ClN_3O_2S$ FW 323.80 [50892-23-4]

Selective PPARα agonist.

C7081-10MG	10 mg
C7081-50MG	50 mg

XCT790

3-[4-(2,4-Bis-trifluoromethylbenzyloxy)-3-methoxyphenyl]-2-cyano-N-(5-trifluoromethyl-1,3,4-thiadiazol-2-yl)acrylamide

$C_{23}H_{13}F_9N_4O_3S$ FW 596.42 [725247-18-7]

XCT790 is a potent and specific inverse agonist of ERRα. XCT790 is selective; showing no significant antagonist activity on related nuclear receptors, such as ERRγ or ERα at concentrations below 10 µM. XCT790 inhibits the constitutive activity of ERRα in both biochemical and cell-based assays. The IC_{50} value is 300-500 nM in transient transfection assays using GAL4-ERR LBD or full-length ERR with the mSHP promoter.

▸ **≥98% (HPLC)**

solubility

DMSO.....10 mg/mL

store at: 2-8°C

X4753-5MG	5 mg
X4753-25MG	25 mg

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