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Stable Isotopes in Metabolomics and Metabolism

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Recent advances in mass spectrometry (MS) and nuclear magnetic resonance (NMR) technologies have greatly enhanced metabolite analysis. Hundreds to thousands of metabolites can now be measured simultaneously with unprecedented accuracy from exceedingly small amounts of biological material. These technical developments have given rise to the field of metabolomics, which generally aims to assess metabolic regulation as a function of health and disease. During the last decade, it has become relatively routine to perform metabolomic analysis on most biological samples. Interpretation of the acquired data, however, remains a considerable challenge. Stable isotopes are providing experimental strategies that overcome some of these barriers. One obstacle in performing metabolomics, for example, is that many of the signals detected by MS do not correspond to unique metabolites of biological origin. Rather, it has been demonstrated that hundreds to thousands of MS peaks arise from contaminants. Given that only real metabolites are derived from a nutrient precursor, isotopic labeling is being used to distinguish biologically derived metabolites from experimental noise. Additionally, because the incorporation of stable isotopes generally does not affect the retention time or ionization efficiency of metabolites, isotopically labeled compounds are the gold standard for quantifying the concentration of endogenous metabolites within a complex biological matrix.

Beyond their role in improving the analytical accuracy of metabolomics, isotopes can also be used as tracers in metabolic analyses. When metabolomics is performed without stable isotopic tracers, only metabolite concentrations can be determined. When metabolomics is performed with stable isotopic tracers, in contrast, both metabolite concentrations and pathway activities (i.e., metabolic fluxes) can be assessed. The latter provides a much richer understanding of metabolism.

While measuring metabolite concentrations without isotopes can certainly be insightful, such measurements reveal only part of the story. They provide a mere snapshot of metabolism that cannot be translated into a dynamic map of metabolite traffic on biochemical routes. When comparing two sample groups, for example, an elevated metabolite level may indicate increased or decreased pathway flux. This is because metabolites can accumulate not only due to increased production, but also due to decreased consumption. Yet, the difference between increased production and decreased consumption may yield entirely different experimental interpretations. In a biomedical context, for instance, increased production of a metabolite may suggest pharmacological inhibition of the pathway as a therapeutic strategy. Thus, to understand pathway regulation and metabolic mechanisms of disease, the application of isotopic tracers is required.

In addition to enabling assessment of metabolic fluxes, isotopic tracers also add biochemical resolution to metabolomic analyses. Most metabolites lie at the intersection of multiple metabolic pathways. Without isotopic labeling, only a single metabolite pool is measured. It is not possible to distinguish the amount of this pool that is associated with one metabolic pathway relative to another. By using isotopic tracers, on the other hand, the fraction of the metabolic pool associated with a specific pathway can be delineated with labeling. As an example, palmitate can be synthesized from numerous metabolic substrates such as glucose, glutamine, acetate, etc. Stable isotopic tracers enable the fraction of palmitate produced from each precursor to be quantified.

Importantly, most modern MS and NMR instrumentation is well suited for the analysis of stable isotopes. Although processing of the data can be complicated, there are an increasing number of user-friendly software platforms (some commercial and some freely available). Moreover, when the appropriate isotopic tracer is selected, simple qualitative analyses of the data is often sufficient to yield important insight into metabolic pathway activities. Finally, it is worth noting that isotopic tracing experiments are not limited to micro-organisms that can be grown in defined media. To the contrary, some of the most widely used applications of isotope labeling have been in mammalian cell culture, plant and animal models, and in human patients.

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Compounds

Amino Acids and Their Derivatives

Catalog No.	Description
DLM-7476	ADMA·HCl·XH_2O (asymmetric dimethylarginine) (2,3,3,4,4,5,5-D_7, 98%) may be hydrate
CLM-1655	D-Alanine (1-^{13}C, 99%)
CLM-2495	D-Alanine (3-^{13}C, 99%)
DLM-7326	D-Alanine (D_7, 98%) <5% L
NLM-6762	D-Alanine (^{15}N, 98%)
NLM-3289	D-Alanine, *N*-acetyl (^{15}N, 98%)
CLM-705	DL-Alanine (1-^{13}C, 99%)
CLM-115	DL-Alanine (2-^{13}C, 99%)
CLM-707	DL-Alanine (3-^{13}C, 99%)
CLM-4514	DL-Alanine ($^{13}C_3$, 98%)
DLM-2760	DL-Alanine (2-D, 98%)
DLM-176	DL-Alanine (3,3,3-D_3, 98%)
DLM-1276	DL-Alanine (2,3,3,3-D_4, 97-98%)
NLM-706	DL-Alanine (^{15}N, 98%)
CLM-116	L-Alanine (1-^{13}C, 99%)
CLM-2016	L-Alanine (2-^{13}C, 99%)
CLM-117	L-Alanine (3-^{13}C, 99%)
CLM-117-MPT	L-Alanine (3-^{13}C, 99%)
CLM-2734	L-Alanine (2,3-$^{13}C_2$, 99%)
CLM-2184-H	L-Alanine ($^{13}C_3$, 99%)
DLM-3101	L-Alanine (2-D, 96-98%)
DLM-248	L-Alanine (3,3,3-D_3, 99%)
DLM-250	L-Alanine (2,3,3,3-D_4, 98%)
DLM-251	L-Alanine (D_7, 98%)
NLM-454	L-Alanine (^{15}N, 98%)
NLM-454-MPT	L-Alanine (^{15}N, 98%)
OLM-7460	L-Alanine ($^{18}O_2$, 90%)
CDLM-8649	L-Alanine (3-^{13}C, 99%; 2-D, 96%)
CDLM-3439	L-Alanine (3-^{13}C, 99%; 3,3,3-D_3, 98%)
CNLM-6993	L-Alanine (1-^{13}C, 99%; ^{15}N, 98%)
CNLM-3594	L-Alanine (2-^{13}C, 99%; ^{15}N, 98%)
CNLM-534-H	L-Alanine ($^{13}C_3$, 99%; ^{15}N, 99%)
DNLM-7178	L-Alanine (2,3,3,3-D_4, 98%; ^{15}N, 98%)
CDNLM-6800	L-Alanine ($^{13}C_3$, 97-99%; D_4, 97-99%; ^{15}N, 97-99%)
DLM-9799	DL-2-Aminoadipic acid (2,5,5-D_3, 98%)
CLM-535	5-Aminolevulinic acid·HCl (4-^{13}C, 99%)
CLM-1371	5-Aminolevulinic acid·HCl (5-^{13}C, 99%) CP 96%
CLM-1268	L-Arginine·HCl (1-^{13}C, 99%)
CLM-2070	L-Arginine·HCl (guanido-^{13}C, 99%)
CLM-2051	L-Arginine·HCl (1,2-$^{13}C_2$, 99%)
CLM-2265-H	L-Arginine·HCl ($^{13}C_6$, 99%)
DLM-6038	L-Arginine·HCl (4,4,5,5-D_4, 94%) <5% D
DLM-541	L-Arginine·HCl (D_7, 98%)
NLM-1267	L-Arginine·HCl (α-^{15}N, 98%)
NLM-395	L-Arginine·HCl (guanido-$^{15}N_2$, 98%)
NLM-395-MPT	L-Arginine·HCl (guanido-$^{15}N_2$, 98%)
NLM-396	L-Arginine·HCl ($^{15}N_4$, 98%)
CNLM-7819	L-Arginine·HCl (1-^{13}C, 99%; α-^{15}N, 98%)
CNLM-539-H	L-Arginine·HCl ($^{13}C_6$, 99%; $^{15}N_4$, 99%)
DNLM-7543	L-Arginine·HCl (D_7, 98%; $^{15}N_4$, 98%)
CDNLM-6801	L-Arginine·HCl ($^{13}C_6$, 97-99%; D_7, 97-99%; $^{15}N_4$, 97-99%)
ULM-8347	L-Arginine·HCl (unlabeled)
CNLM-9007-CA	L-Argininosuccinic acid, barium salt·2H_2O (arginine-$^{13}C_6$, 99%; $^{15}N_4$, 99%) CP 90%
ULM-9008-CA	L-Argininosuccinic acid, barium salt·3H_2O (unlabeled) CP 90%

MPT: microbiologically and pyrogen tested.

Chemical purity (CP) is 98% or greater, unless otherwise indicated.
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Amino Acids and Their Derivatives *(continued)*

Catalog No.	Description
CLM-8699-H	L-Asparagine·H_2O ($^{13}C_4$, 99%)
DLM-6844	L-Asparagine·H_2O (2,3,3-D_3, 94%)
NLM-120	L-Asparagine·H_2O (amide-^{15}N, 98%)
NLM-3286	L-Asparagine·H_2O ($^{15}N_2$, 98%)
CNLM-7818	L-Asparagine·H_2O (1,4-$^{13}C_2$, 99%; α-^{15}N, 98%)
CNLM-3819-H	L-Asparagine·H_2O ($^{13}C_4$, 99%; $^{15}N_2$, 99%)
DNLM-6932	L-Asparagine·H_2O (2,3,3-D_3, 98%; $^{15}N_2$, 98%)
CDNLM-6802	L-Asparagine·H_2O ($^{13}C_4$, 97-99%; D_3, 97-99%; $^{15}N_2$, 97-99%)
CLM-865	DL-Aspartic acid (3-^{13}C, 99%)
CLM-518	DL-Aspartic acid (4-^{13}C, 99%)
DLM-832	DL-Aspartic acid (2,3,3-D_3, 98%)
DLM-8599	DL-Aspartic acid, *N*-acetyl (aspartate-2,3,3-D_3, 98%) CP 97%
CLM-3616	L-Aspartic acid (1-^{13}C, 99%)
CLM-3617	L-Aspartic acid (2-^{13}C, 99%)
CLM-627	L-Aspartic acid (3-^{13}C, 98-99%)
CLM-519	L-Aspartic acid (4-^{13}C, 99%)
CLM-4455	L-Aspartic acid (1,4-$^{13}C_2$, 99%)
CLM-1801-H	L-Aspartic acid ($^{13}C_4$, 99%)
DLM-546	L-Aspartic acid (2,3,3-D_3, 98%)
NLM-718	L-Aspartic acid (^{15}N, 98%)
CNLM-7817	L-Aspartic acid (1,4-$^{13}C_2$, 99%; ^{15}N, 98%)
CNLM-544-H	L-Aspartic acid ($^{13}C_4$, 99%; ^{15}N, 99%)
DNLM-6931	L-Aspartic acid (2,3,3-D_3, 98%; ^{15}N, 98%)
CDNLM-6803	L-Aspartic acid ($^{13}C_4$, 97-99%; D_3, 97-99%; ^{15}N, 97-99%)
ULM-8676	L-Aspartic acid (unlabeled)
CLM-4899	L-Citrulline (ureido-^{13}C, 99%)
DLM-3860	L-Citrulline (5,5-D_2, 98%)
DLM-3860-MPT	L-Citrulline (5,5-D_2, 98%)
DLM-6039	L-Citrulline (4,4,5,5-D_4, 95%)
NLM-6850	L-Citrulline (ureido-^{15}N, 98%)
CDLM-7879	L-Citrulline (ureido-^{13}C, 99%; 5,5-D_2, 98%)
CDLM-7139	L-Citrulline (5-^{13}C, 99%; 4,4,5,5-D_4, 95%)
CDLM-7139-MPT	L-Citrulline (5-^{13}C, 99%; 4,4,5,5-D_4, 95%)
DLM-3653	Creatinine (*N*-methyl-D_3, 98%)
CDLM-4211	Cycloleucine (carboxyl-^{13}C, 99%; 2,2,5,5-D_4, 96%)
DLM-6108	DL-Cystathionine (3,3,4,4-D_4, 98%)
CLM-3790	DL-Cysteine (1-^{13}C, 99%)
CLM-898	DL-Cysteine (3-^{13}C, 99%)
DLM-899	DL-Cysteine (3,3-D_2, 98%)
CLM-3852	L-Cysteine (1-^{13}C, 99%)
CLM-1868	L-Cysteine (3-^{13}C, 99%)
CLM-4320-H	L-Cysteine ($^{13}C_3$, 99%)
DLM-769	L-Cysteine (3,3-D_2, 98%)
DLM-6901	L-Cysteine (2,3,3-D_3, 98%)
NLM-2295	L-Cysteine (^{15}N, 98%)
DLM-2942	L-Cysteine, *S*-methyl (*S*-methyl-D_3, 98%) CP 97%
CNLM-7815	L-Cysteine (1-^{13}C, 99%; ^{15}N, 98%)
CNLM-3871-H	L-Cysteine ($^{13}C_3$, 99%; ^{15}N, 99%)
DNLM-6902	L-Cysteine (2,3,3-D_3, 98%; ^{15}N, 98%)
CDNLM-6809	L-Cysteine ($^{13}C_3$, 97-99%; D_3, 97-99%; ^{15}N, 97-99%)

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Catalog No.	Description
DLM-8738	*S*-Sulfo-DL-cysteine (2,3,3-D_3, 99%)
DLM-1000	DL-Cystine (3,3,3′,3′-D_4, 98%)
NLM-1668	DL-Cystine ($^{15}N_2$, 95%)
CLM-520	L-Cystine (3,3′-$^{13}C_2$, 99%)
DLM-9812	L-Cystine (3,3,3′,3′-D_4, 98%)
NLM-3818	L-Cystine ($^{15}N_2$, 98%)
CNLM-4244-H	L-Cystine ($^{13}C_6$, 99%; $^{15}N_2$, 99%)
CDNLM-8659	L-Cystine ($^{13}C_6$, 98%; D_6, 98%; $^{15}N_2$, 98%) CP 95%
DLM-8516	*N,N*-Dimethylglycine·HCl (D_6, 99%)
CLM-3632	DL-Glutamic acid (3-^{13}C, 99%)
DLM-335	DL-Glutamic acid (2,4,4-D_3, 98%)
DLM-357	DL-Glutamic acid (2,3,3,4,4-D_5, 97%)
CLM-674	L-Glutamic acid (1-^{13}C, 99%)
CLM-674-MPT	L-Glutamic acid (1-^{13}C, 99%)
CLM-2474	L-Glutamic acid (2-^{13}C, 99%)
CLM-4742	L-Glutamic acid (3-^{13}C, 99%)
CLM-2431	L-Glutamic acid (4-^{13}C, 98-99%)
CLM-613	L-Glutamic acid (5-^{13}C, 99%)
CLM-2024	L-Glutamic acid (1,2-$^{13}C_2$, 99%)
CLM-3646	L-Glutamic acid (3,4-$^{13}C_2$, 99%)
CLM-1800-H	L-Glutamic acid ($^{13}C_5$, 99%)
DLM-3725	L-Glutamic acid (2,4,4-D_3, 97-98%)
DLM-556	L-Glutamic acid (2,3,3,4,4-D_5, 97-98%)
NLM-135	L-Glutamic acid (^{15}N, 98%)
CNLM-7812	L-Glutamic acid (1-^{13}C, 99%; ^{15}N, 98%)
CNLM-554-H	L-Glutamic acid ($^{13}C_5$, 99%; ^{15}N, 99%)
DNLM-6996	L-Glutamic acid (2,3,3,4,4-D_5, 98%; ^{15}N, 98%)
CDNLM-6804	L-Glutamic acid ($^{13}C_5$, 97-99%; D_5, 97-99%; ^{15}N, 97-99%)
CLM-3721	DL-Glutamic acid·H_2O (1-^{13}C, 99%)
OLM-8028	L-Glutamic acid·HCl ($^{17}O_4$, ~30%)
CLM-3612	L-Glutamine (1-^{13}C, 99%)
CLM-3612-MPT	L-Glutamine (1-^{13}C, 99%)
CLM-3613	L-Glutamine (2-^{13}C, 99%)
CLM-770	L-Glutamine (4-^{13}C, 99%)
CLM-1166	L-Glutamine (5-^{13}C, 99%)
CLM-2001	L-Glutamine (1,2-$^{13}C_2$, 99%)
CLM-3641	L-Glutamine (3,4-$^{13}C_2$, 99%)
CLM-1822-H	L-Glutamine ($^{13}C_5$, 99%)
CLM-1822-H-MPT	L-Glutamine ($^{13}C_5$, 99%)
DLM-1826	L-Glutamine (2,3,3,4,4-D_5, 97%)
NLM-1016	L-Glutamine (α-^{15}N, 98%)
NLM-1016-MPT	L-Glutamine (α-^{15}N, 98%)
NLM-557	L-Glutamine (amide-^{15}N, 98%)
NLM-1328	L-Glutamine ($^{15}N_2$, 98%)
NLM-1328-MPT	L-Glutamine ($^{15}N_2$, 98%)
CNLM-7813	L-Glutamine (1-^{13}C, 99%; α-^{15}N, 98%)
CNLM-1275-H	L-Glutamine ($^{13}C_5$, 99%; $^{15}N_2$, 99%)
DNLM-6997	L-Glutamine (2,3,3,4,4-D_5, 97-98%; $^{15}N_2$, 97-98%)
CDNLM-6805	L-Glutamine ($^{13}C_5$, 97-99%; D_5, 97-99%; $^{15}N_2$, 97-99%)
CLM-422	Glycine (1-^{13}C, 99%)
CLM-422-MPT	Glycine (1-^{13}C, 99%)
CLM-136	Glycine (2-^{13}C, 99%)

Catalog No.	Description
CLM-136-MPT	Glycine (2-^{13}C, 99%)
CLM-1017	Glycine (1,2-$^{13}C_2$, 97-99%)
CLM-1017-MPT	Glycine (1,2-$^{13}C_2$, 97-99%)
DLM-1674	Glycine (2,2-D_2, 98%)
DLM-280	Glycine (D_5, 98%)
NLM-202	Glycine (^{15}N, 98%)
NLM-202-MPT	Glycine (^{15}N, 98%)
CNLM-507	Glycine (1-^{13}C, 99%; ^{15}N, 98%)
CNLM-508	Glycine (2-^{13}C, 99%; ^{15}N, 98%)
CNLM-1673-H	Glycine ($^{13}C_2$, 99%; ^{15}N, 99%)
CNLM-1673-H-MPT	Glycine ($^{13}C_2$, 99%; ^{15}N, 99%)
DNLM-6862	Glycine (2,2-D_2, 98%; ^{15}N, 98%)
CDNLM-6799	Glycine ($^{13}C_2$, 97-99%; 2,2-D_2, 97-99%; ^{15}N, 97-99%)
CNLM-7175	Glycine·HCl, ethyl ester ($^{13}C_2$, 98%; ^{15}N, 98%)
DLM-10822	Glycine, *N*-octanoyl (2,2-D_2, 98%)
CLM-2636	DL-Histidine (ring-2-^{13}C, 99%)
NLM-138	DL-Histidine·2HCl (α-^{15}N, 98%)
NLM-4649	L-Histidine (ring-ε-^{15}N, 98%) (<5% D)
NLM-4457	L-Histidine (ring-π-^{15}N, 98%) (<5% D)
NLM-9585	L-Histidine (ring-$^{15}N_2$, 98%)
DLM-8691	π-Methyl-L-histidine (methyl-D_3, 98%)
DLM-2949	τ-Methyl-L-histidine (methyl-D_3, 98%)
DLM-2949-MPT	τ-Methyl-L-histidine (methyl-D_3, 98%)
CLM-1512	L-Histidine·HCl·H_2O (ring-2-^{13}C, 99%) <5% D
DLM-7855	L-Histidine·HCl·H_2O (ring-2,4-D_2; α,β,β-D_3, 98%)
NLM-2245	L-Histidine·HCl·H_2O (α-^{15}N, 98%)
NLM-846	L-Histidine·HCl·H_2O (ring-π-^{15}N, 98%) <5% D
DNLM-7366	L-Histidine·HCl·H_2O (D_5, 98%; $^{15}N_3$, 98%)
CDNLM-6806	L-Histidine·HCl·H_2O ($^{13}C_6$, 97-99%; D_5, 97-99%; $^{15}N_3$, 97-99%) CP 95%
CNLM-4645	L-Homoarginine·HCl ($^{13}C_7$, 98%; $^{15}N_4$, 98%)
DLM-8259	DL-Homocysteine (3,3,4,4-D_4, 98%)
DLM-3619	DL-Homocystine (3,3,3′,3′,4,4,4′,4′-D_8, 98%)
NLM-2466	L-Homoserine (^{15}N, 95-99%) CP 97%
CLM-10745	Indole 3-carboxaldehyde (indole-$^{13}C_8$, 99%)
CLM-8742	L-Allo-isoleucine ($^{13}C_6$, 97-99%)
DLM-1505	L-Allo-isoleucine (D_{10}, 98%)
CNLM-8670	L-Allo-isoleucine ($^{13}C_6$, 97-99%; ^{15}N, 97-99%)
CLM-1026	L-Isoleucine (1-^{13}C, 99%)
CLM-1026-MPT	L-Isoleucine (1-^{13}C, 99%)
CLM-2248-H	L-Isoleucine ($^{13}C_6$, 99%)
DLM-141	L-Isoleucine (D_{10}, 98%)
NLM-292	L-Isoleucine (^{15}N, 98%)
CNLM-7810	L-Isoleucine (1-^{13}C, 99%; ^{15}N, 98%)
CNLM-561-H	L-Isoleucine ($^{13}C_6$, 99%; ^{15}N, 99%)
DNLM-7325	L-Isoleucine (D_{10}, 98%; ^{15}N, 98%)
CDNLM-6807	L-Isoleucine ($^{13}C_6$, 97-99%; D_{10}, 97-99%; ^{15}N, 97-99%)
DLM-7374	Kynurenic acid (ring-D_5, 98%)
CLM-204	DL-Leucine (1-^{13}C, 99%)
CLM-207	DL-Leucine (2-^{13}C, 99%)
DLM-9423	DL-Leucine (D_{10}, 98%)

CTM: manufactured following ICH Q7, Section XIX
MPT: microbiologically and pyrogen tested.

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Catalog No.	Description
NLM-355	DL-Leucine (^{15}N, 98%)
CLM-468	L-Leucine (1-^{13}C, 99%)
CLM-468-MPT	L-Leucine (1-^{13}C, 99%)
CLM-2014	L-Leucine (2-^{13}C, 99%)
CLM-3524	L-Leucine (1,2-$^{13}C_2$, 99%)
CLM-3524-MPT	L-Leucine (1,2-$^{13}C_2$, 99%)
CLM-2262-CTM	L-Leucine ($^{13}C_6$, 99%)
CLM-2262-H	L-Leucine ($^{13}C_6$, 99%)
CLM-2262-H-MPT	L-Leucine ($^{13}C_6$, 99%)
DLM-1259	L-Leucine (5,5,5-D_3, 99%)
DLM-1259-CTM	L-Leucine (5,5,5-D_3, 99%)
DLM-1259-MPT	L-Leucine (5,5,5-D_3, 99%)
DLM-4212	L-Leucine (isopropyl-D_7, 98%)
DLM-567	L-Leucine (D_{10}, 98%)
DLM-567-MPT	L-Leucine (D_{10}, 98%)
NLM-142	L-Leucine (^{15}N, 98%)
NLM-142-MPT	L-Leucine (^{15}N, 98%)
OLM-2041	L-Leucine ($^{18}O_2$, 94%)
CNLM-615	L-Leucine (1-^{13}C, 99%; ^{15}N, 98%)
CNLM-615-MPT	L-Leucine (1-^{13}C, 99%; ^{15}N, 98%)
CNLM-3450	L-Leucine (2-^{13}C, 99%; ^{15}N, 95-99%)
CNLM-281-H	L-Leucine ($^{13}C_6$, 99%; ^{15}N, 99%)
CNLM-281-H-MPT	L-Leucine ($^{13}C_6$, 99%; ^{15}N, 99%)
DNLM-4642	L-Leucine (D_{10}, 98%; ^{15}N, 97%)
CDNLM-6808	L-Leucine ($^{13}C_6$, 97-99%; D_{10}, 97-99%; ^{15}N, 97-99%)
ULM-8203	L-Leucine (unlabeled)
ULM-8203-MPT	L-Leucine (unlabeled)
CLM-10684	L-Leucine·HCl (1-^{13}C, 99%)
CLM-749	DL-Lysine·2HCl (1-^{13}C, 99%)
DLM-8941	DL-Lysine·2HCl (4,4,5,5-D_4, 96-98%)
NLM-1031	DL-Lysine·2HCl (ε-^{15}N, 98%)
CNLM-3452	DL-Lysine·2HCl (1-^{13}C, 99%; ε-^{15}N, 99%)
CNLM-3453	DL-Lysine·2HCl (2-^{13}C, 99%; ε-^{15}N, 99%)
CLM-653	L-Lysine·2HCl (1-^{13}C, 99%)
CLM-653-MPT	L-Lysine·2HCl (1-^{13}C, 99%)
CLM-632	L-Lysine·2HCl (6-^{13}C, 99%)
CLM-2247-H	L-Lysine·2HCl ($^{13}C_6$, 99%)
DLM-2640	L-Lysine·2HCl (4,4,5,5-D_4, 96-98%)
DLM-2640-MPT	L-Lysine·2HCl (4,4,5,5-D_4, 96-98%)
DLM-2641	L-Lysine·2HCl (3,3,4,4,5,5,6,6-D_8, 98%)
DLM-570	L-Lysine·2HCl (D_9, 98%)
NLM-143	L-Lysine·2HCl (α-^{15}N, 95-99%)
NLM-143-MPT	L-Lysine·2HCl (α-^{15}N, 95-99%)
NLM-1554	L-Lysine·2HCl ($^{15}N_2$, 98%)
NLM-631	L-Lysine·2HCl (ε-^{15}N, 98%)
CNLM-7821	L-Lysine·2HCl (1-^{13}C, 99%; α-^{15}N, 98%)
CNLM-3454	L-Lysine·2HCl (6-^{13}C, 99%; ε-^{15}N, 98%)
CNLM-291-H	L-Lysine·2HCl ($^{13}C_6$, 99%; $^{15}N_2$, 99%)
CNLM-291-H-MPT	L-Lysine·2HCl ($^{13}C_6$, 99%; $^{15}N_2$, 99%)
DNLM-7545	L-Lysine·2HCl (D_9, 98%; $^{15}N_2$, 98%)
CDNLM-6810	L-Lysine·2HCl ($^{13}C_6$, 97-99%; D_9, 97-99%; $^{15}N_2$, 97-99%)
ULM-8766	L-Lysine·2HCl (unlabeled)

Amino Acids and Their Derivatives *(continued)*

Catalog No.	Description
CLM-7356	D-Methionine (1-^{13}C, 99%) CP 96%
CLM-6191	DL-Methionine (1-^{13}C, 99%)
DLM-10774	DL-Methionine (*S*-methyl-D$_3$, 98%)
DLM-2933	DL-Methionine (3,3,4,4-D$_4$, 98%)
DLM-9019	DL-Methionine (3,3,4,4-D$_4$; methyl-D$_3$, 98%)
CLM-3267	L-Methionine (1-^{13}C, 99%)
CLM-3267-MPT	L-Methionine (1-^{13}C, 99%)
CLM-206	L-Methionine (methyl-^{13}C, 99%)
CLM-893-H	L-Methionine (^{13}C$_5$, 99%)
DLM-431	L-Methionine (methyl-D$_3$, 98%)
DLM-431-MPT	L-Methionine (methyl-D$_3$, 98%)
DLM-6797	L-Methionine (2,3,3,4,4-D$_5$; methyl-D$_3$, 98%)
NLM-752	L-Methionine (^{15}N, 96-98%)
CDLM-760	L-Methionine (1-^{13}C, 99%; methyl-D$_3$, 98%)
CDLM-760-MPT	L-Methionine (1-^{13}C, 99%; methyl-D$_3$, 98%)
CDLM-9289	L-Methionine (methyl-^{13}C, 99%; methyl-D$_3$, 98%)
CDLM-8885	L-Methionine (2,3,3,4,4-D$_5$, 98%; methyl-^{13}CH$_3$, 99%)
CNLM-7807	L-Methionine (1-^{13}C, 99%; ^{15}N, 98%)
CNLM-9774	L-Methionine (1,2,3,4-^{13}C$_4$, 99%; ^{15}N, 98%)
CNLM-759-H	L-Methionine (^{13}C$_5$, 99%; ^{15}N, 99%)
DNLM-7179	L-Methionine (D$_8$, 98%; ^{15}N, 98%)
CDNLM-6798	L-Methionine (^{13}C$_5$, 97-99%; D$_8$, 97-99%; ^{15}N, 97-99%)
CLM-8002	L-Methionine sulfone (1-^{13}C, 99%)
CNLM-10424	β-*N*-Methylamino-L-alanine (^{13}C$_3$, 99%; ^{15}N$_2$, 98%)
ULM-10493	β-*N*-Methylamino-L-alanine HCl (unlabeled) CP 97%
DLM-10673	3-Methylcrotonylglycine (glycine-2,2-D$_2$, 98%)
CLM-7104	3-Nitro-L-tyrosine (ring-^{13}C$_6$, 99%) CP 94%
CLM-1036	L-Ornithine·HCl (1,2-^{13}C$_2$, 99%)
CLM-4724-H	L-Ornithine·HCl (^{13}C$_5$, 99%)
DLM-4261	L-Ornithine·HCl (5,5-D$_2$, 98%)
DLM-6046	L-Ornithine·HCl (4,4,5,5-D$_4$, 95%)
DLM-2969	L-Ornithine·HCl (3,3,4,4,5,5-D$_6$, 98%)
DLM-6669	L-Ornithine·HCl (D$_7$, 98%)
NLM-2212	L-Ornithine·HCl (α-^{15}N, 98%)
NLM-2174	L-Ornithine·HCl (5-^{15}N, 98%)
NLM-3610	L-Ornithine·HCl (^{15}N$_2$, 98%)
CDLM-3873	L-Ornithine·HCl (5-^{13}C, 99%; 4,4,5,5-D$_4$, 95%)
CNLM-7578-H	L-Ornithine·HCl (^{13}C$_5$, 99%; ^{15}N$_2$, 99%)
DLM-4526	D-Phenylalanine (ring-D$_5$, 97%)
CLM-761	DL-Phenylalanine (1-^{13}C, 99%)
DLM-2983	DL-Phenylalanine (2-D, 98%)
DLM-2986	DL-Phenylalanine (ring-D$_5$, 98%)
NLM-3434	DL-Phenylalanine (^{15}N, 98%)
CLM-762	L-Phenylalanine (1-^{13}C, 99%)
CLM-762-CTM	L-Phenylalanine (1-^{13}C, 99%)
CLM-762-HP-MPT	L-Phenylalanine (1-^{13}C, 99%) <0.2% D
CLM-762-MPT	L-Phenylalanine (1-^{13}C, 99%)
CLM-1631	L-Phenylalanine (2-^{13}C, 99%) CP 97%
CLM-1053	L-Phenylalanine (3-^{13}C, 99%)
CLM-1055	L-Phenylalanine (ring-^{13}C$_6$, 99%)
CLM-1055-MPT	L-Phenylalanine (ring-^{13}C$_6$, 99%)
CLM-2250-H	L-Phenylalanine (^{13}C$_9$, 99%)
DLM-2984	L-Phenylalanine (2-D, 95%)
DLM-2985	L-Phenylalanine (3,3-D$_2$, 98%)
DLM-1258	L-Phenylalanine (ring-D$_5$, 98%)
DLM-1258-MPT	L-Phenylalanine (ring-D$_5$, 98%)
DLM-372	L-Phenylalanine (D$_8$, 98%)
DLM-372-MPT	L-Phenylalanine (D$_8$, 98%)
NLM-108	L-Phenylalanine (^{15}N, 98%)
NLM-108-MPT	L-Phenylalanine (^{15}N, 98%)
CNLM-7611	L-Phenylalanine (2,3-^{13}C$_2$, 99%; ^{15}N, 98%)
CNLM-575-H	L-Phenylalanine (^{13}C$_9$, 99%; ^{15}N, 99%)
DNLM-7180	L-Phenylalanine (D$_8$, 98%; ^{15}N, 98%)
CDNLM-6811	L-Phenylalanine (^{13}C$_9$, 97-99%; D$_8$, 97-99%; ^{15}N, 97-99%)
ULM-8205	L-Phenylalanine (unlabeled)
CLM-2479	DL-Proline (1-^{13}C, 99%)
DLM-2657	DL-Proline (2,3,3,4,4,5,5-D$_7$, 97-98%)
CLM-510	L-Proline (1-^{13}C, 99%)
CLM-2260-H	L-Proline (^{13}C$_5$, 99%)
DLM-10775	L-Proline (2,5,5-D$_3$, 98%)
DLM-487	L-Proline (D$_7$, 97-98%)
NLM-835	L-Proline (^{15}N, 98%)
CNLM-7822	L-Proline (1-^{13}C, 99%; ^{15}N, 98%)
CNLM-436-H	L-Proline (^{13}C$_5$, 99%; ^{15}N, 99%)
DNLM-7562	L-Proline (D$_7$, 98%; ^{15}N, 98%)
CDNLM-6812	L-Proline (^{13}C$_5$, 97-99%; D$_7$, 97-99%; ^{15}N, 97-99%)
ULM-8333	L-Proline (unlabeled)
DLM-6874	Sarcosine·HCl (*N*-methylglycine·HCl) (methyl-D$_3$, 98%)
CNLM-9699	Sarcosine·HCl (*N*-methylglycine·HCl) (^{13}C$_3$, 99%; ^{15}N, 98%)
CLM-1075	DL-Serine (1-^{13}C, 99%)
CLM-496	DL-Serine (2-^{13}C, 99%)
CLM-497	DL-Serine (3-^{13}C, 99%)
DLM-1073	DL-Serine (2,3,3-D$_3$, 98%)
NLM-1531	DL-Serine (^{15}N, 98%)
CNLM-4207	DL-Serine (^{13}C$_3$, 98%; ^{15}N, 98%)
CLM-1573	L-Serine (1-^{13}C, 99%)
CLM-2013	L-Serine (2-^{13}C, 99%)
CLM-1572	L-Serine (3-^{13}C, 99%)
CLM-1574-H	L-Serine (^{13}C$_3$, 99%)
DLM-161	L-Serine (3,3-D$_2$, 98%)
DLM-582	L-Serine (2,3,3-D$_3$, 98%)
DLM-582-MPT	L-Serine (2,3,3-D$_3$, 98%)
NLM-2036	L-Serine (^{15}N, 98%)
OLM-9960	L-Serine (carboxyl-^{18}O$_2$, 95%)
CNLM-7814	L-Serine (1-^{13}C, 99%; ^{15}N, 98%)
CNLM-474-H	L-Serine (^{13}C$_3$, 99%; ^{15}N, 99%)
DNLM-6863	L-Serine (2,3,3-D$_3$, 98%; ^{15}N, 98%)
CDNLM-6813	L-Serine (^{13}C$_3$, 97-99%; D$_3$, 97-99%; ^{15}N, 97-99%)
DLM-10873	L-Serine, *N*-acetyl (2,3,3-D$_3$, 98%)

CTM: manufactured following ICH Q7, Section XIX
MPT: microbiologically and pyrogen tested.

Chemical purity (CP) is 98% or greater, unless otherwise indicated.
For research use only. Not for use in diagnostic procedures.

Catalog No.	Description
CLM-3949	Sodium glutamate·XH_2O ($^{13}C_5$, 97-98%) may be hydrate
CLM-447	L-Threonine (1-^{13}C, 99%)
CLM-2261	L-Threonine ($^{13}C_4$, 97-99%)
DLM-1693	L-Threonine (D_5, 98%)
NLM-742	L-Threonine (^{15}N, 98%)
CDLM-9307	L-Threonine (4-^{13}C, 97%; 2,3-D_2, 96-98%)
CNLM-587	L-Threonine ($^{13}C_4$, 97-99%; ^{15}N, 97-99%)
DNLM-7367	L-Threonine (D_5, 97%; ^{15}N, 98%)
CDNLM-6814	L-Threonine ($^{13}C_4$, 97-99%; D_5, 97-99%; ^{15}N, 97-99%)
ULM-8800	L-Threonine (unlabeled)
CLM-778	L-Tryptophan (1-^{13}C, 99%)
CLM-1543	L-Tryptophan (indole-2-^{13}C, 98%)
CLM-716	L-Tryptophan (indole-3-^{13}C, 95-99%)
CLM-717	L-Tryptophan (indole-4-^{13}C, 99%) CP 95%
CLM-4290-H	L-Tryptophan ($^{13}C_{11}$, 99%)
DLM-1092	L-Tryptophan (indole-D_5, 98%)
DLM-6903	L-Tryptophan (D_8, 97-98%)
NLM-1208	L-Tryptophan (indole-^{15}N, 98%)
NLM-1695	L-Tryptophan (α-^{15}N, 95-99%)
NLM-800	L-Tryptophan ($^{15}N_2$, 98%)
CNLM-2475-H	L-Tryptophan ($^{13}C_{11}$, 99%; $^{15}N_2$, 99%)
DNLM-6904	L-Tryptophan (D_8, 98%; $^{15}N_2$, 98%)
CDNLM-6816	L-Tryptophan ($^{13}C_{11}$, 97-99%; D_8, 97-99%; $^{15}N_2$, 97-99%)
CLM-7103	3-Chloro-L-tyrosine (ring-$^{13}C_6$, 99%) CP 95%
CLM-448	DL-Tyrosine (1-^{13}C, 99%)
DLM-137	DL-Tyrosine (3,3-D_2, 98%)
DLM-2914	DL-Tyrosine (ring-3,5-D_2, 98%)
CLM-776	L-Tyrosine (1-^{13}C, 99%)
CLM-437	L-Tyrosine (2-^{13}C, 99%)
CLM-3378	L-Tyrosine (3-^{13}C, 99%)
CLM-622	L-Tyrosine (phenol-4-^{13}C, 95-99%)
CLM-623	L-Tyrosine (phenol-3,5-$^{13}C_2$, 95-99%)
CLM-1542	L-Tyrosine (ring-$^{13}C_6$, 99%)
CLM-1542-MPT	L-Tyrosine (ring-$^{13}C_6$, 99%)
CLM-2263-H	L-Tyrosine ($^{13}C_9$, 99%)
DLM-2317	L-Tyrosine (3,3-D_2, 98%)
DLM-2317-MPT	L-Tyrosine (3,3-D_2, 98%)
DLM-449	L-Tyrosine (ring-3,5-D_2, 98%)

Catalog No.	Description
DLM-449-MPT	L-Tyrosine (ring-3,5-D_2, 98%)
DLM-2917	L-Tyrosine (ring-2,6-D_2, 2-D, 98%)
DLM-451	L-Tyrosine (ring-D_4, 98%)
DLM-451-MPT	L-Tyrosine (ring-D_4, 98%)
DLM-589	L-Tyrosine (D_7, 98%)
NLM-590	L-Tyrosine (^{15}N, 98%)
NLM-590-MPT	L-Tyrosine (^{15}N, 98%)
OLM-621	L-Tyrosine (phenol-^{17}O, 35-40%)
OLM-8696	L-Tyrosine (phenol-^{18}O, 85-90%)
CDLM-2369	L-Tyrosine (ring-$^{13}C_6$, 99%; 3,3-D_2, 30%)
CNLM-7809	L-Tyrosine (1-^{13}C, 99%; ^{15}N, 98%)
CNLM-7610	L-Tyrosine (2,3-$^{13}C_2$, 99%; ^{15}N, 98%)
CNLM-439-H	L-Tyrosine ($^{13}C_9$, 99%; ^{15}N, 99%)
DNLM-7373	L-Tyrosine (D_7, 97-98%; ^{15}N, 98%)
CDNLM-6815	L-Tyrosine ($^{13}C_9$, 97-99%; D_7, 97-99%; ^{15}N, 97-99%)
CLM-166	DL-Valine (1-^{13}C, 99%)
CLM-3277	DL-Valine (2-^{13}C, 99%)
DLM-311	DL-Valine (D_8, 98%)
NLM-236	DL-Valine (^{15}N, 98%)
CLM-470	L-Valine (1-^{13}C, 99%)
CLM-470-MPT	L-Valine (1-^{13}C, 99%)
CLM-3050	L-Valine (2-^{13}C, 99%)
CLM-9217	L-Valine (dimethyl-$^{13}C_2$, 99%)
CLM-2249-H	L-Valine ($^{13}C_5$, 99%)
DLM-7732	L-Valine (3-D, 98%)
DLM-4364	L-Valine (2,3-D_2, 98%)
DLM-488	L-Valine (D_8, 98%)
NLM-316	L-Valine (^{15}N, 98%)
CNLM-3466	L-Valine (1-^{13}C, 99%; ^{15}N, 98%)
CNLM-8678	L-Valine (2-^{13}C, 99%; ^{15}N, 98%)
CNLM-442-H	L-Valine ($^{13}C_5$, 99%; ^{15}N, 99%)
DNLM-4643	L-Valine (D_8, 96%; ^{15}N, 96%)
CDNLM-4281	L-Valine ($^{13}C_5$, 95-97%; 2,3-D_2, 97%; ^{15}N, 96-99%)
CDNLM-6817	L-Valine ($^{13}C_5$, 97-99%; D_8, 97-99%; ^{15}N, 97-99%)

➤ **Please visit isotope.com for a complete listing of amino acids and their derivatives.**

See pages 28-34 for metabolite mixtures comprising amino acids.

MPT: microbiologically and pyrogen tested.

Chemical purity (CP) is 98% or greater, unless otherwise indicated.
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Bile Acids

Catalog No.	Description
CLM-2709	Chenodeoxycholic acid (24-^{13}C, 99%)
DLM-6780*	Chenodeoxycholic acid (2,2,4,4-D_4, 98%)
DLM-9327	Chenodeoxycholic acid (2,2,3,4,4-D_5, 98%)
DLM-9541*	Chenodeoxycholic acid (2,2,3,4,4,6,6,7,8-D_9, 98%)
ULM-9540	Chenodeoxycholic acid (unlabeled)
CLM-2710	Cholic acid (24-^{13}C, 99%)
DLM-2611*	Cholic acid (2,2,4,4-D_4, 98%)
DLM-9549	Cholic acid (2,2,3,4,4-D_5, 98%)
ULM-9543	Cholic acid (unlabeled)
CLM-3364	Deoxycholic acid (24-^{13}C, 98%) CP 97%
DLM-2824*	Deoxycholic acid (2,2,4,4-D_4, 98%)
DLM-9546*	Deoxycholic acid (2,2,4,4,11,11-D_6, 98%)
ULM-9545	Deoxycholic acid (unlabeled)
DLM-7804*	Glycochenodeoxycholic acid (2,2,4,4-D_4, 98%) CP 97%
DLM-9550*	Glycochenodeoxycholic acid (2,2,3,4,4,6,6,7,8-D_9, 98%) CP 97%
ULM-9942	Glycochenodeoxycholic acid, sodium salt (unlabeled)
CLM-191	Glycocholic acid (glycine-1-^{13}C, 99%)
DLM-2742*	Glycocholic acid (2,2,4,4-D_4, 98%) may contain ~4% H_2O
ULM-9551	Glycocholic acid, hydrate (unlabeled)
DLM-9554*	Glycodeoxycholic acid (2,2,4,4-D_4, 98%)
DLM-9553*	Glycodeoxycholic acid (2,2,4,4,11,11-D_6, 98%)
ULM-9552	Glycodeoxycholic acid, sodium salt (unlabeled)
DLM-9556*	Glycolithocholic acid (2,2,4,4-D_4, 98%)
ULM-9555	Glycolithocholic acid (unlabeled)
DLM-9558*	Glycoursodeoxycholic acid (2,2,4,4-D_4, 98%) CP 97%
ULM-9557	Glycoursodeoxycholic acid (unlabeled)
DLM-9560*	Lithocholic acid (2,2,4,4-D_4, 98%)
ULM-9559	Lithocholic acid (unlabeled)
DLM-10627	α-Muricholic acid (2,2,3,4,4-D_5, 99%)
ULM-10621	α-Muricholic acid (unlabeled)

Catalog No.	Description
DLM-10626	β-Muricholic acid (2,2,3,4,4-D_5, 99%)
ULM-10620	β-Muricholic acid (unlabeled)
DLM-10628	γ-Muricholic acid (2,2,3,4,4-D_5, 99%)
ULM-10622	γ-Muricholic acid (unlabeled)
DLM-10629	ω-Muricholic acid (2,2,3,4,4-D_5, 99%)
ULM-10623	ω-Muricholic acid (unlabeled)
DLM-9562*	Taurochenodeoxycholic acid, sodium salt (2,2,4,4-D_4, 98%) CP 97%
DLM-9563*	Taurochenodeoxycholic acid, sodium salt (2,2,3,4,4,6,6,7,8-D_9, 98%)
ULM-9561	Taurochenodeoxycholic acid, sodium salt (unlabeled)
DLM-9572*	Taurocholic acid, sodium salt (2,2,4,4-D_4, 98%)
ULM-9571	Taurocholic acid, sodium salt, hydrate (unlabeled) CP 97%
DLM-9568*	Taurodeoxycholic acid, sodium salt (2,2,4,4-D_4, 98%)
DLM-9567*	Taurodeoxycholic acid, sodium salt (2,2,4,4,11,11-D_6, 98%)
ULM-9943	Taurodeoxycholic acid, sodium salt, hydrate (unlabeled)
DLM-9570*	Taurolithocholic acid, sodium salt (2,2,4,4-D_4, 98%)
CNLM-10251	Taurocholic acid, sodium salt (taurine-$^{13}C_2$, 99%; ^{15}N, 98%)
ULM-9569	Taurolithocholic acid, sodium salt (unlabeled)
DLM-9882*	Tauroursodeoxycholic acid, sodium salt (2,2,4,4-D_4, 98%)
CNLM-10250	Tauroursodeoxycholic acid, sodium salt (taurine-$^{13}C_2$, 99%; ^{15}N, 98%)
ULM-9885	Tauroursodeoxycholic acid, dihydrate (unlabeled)
CLM-3412	Ursodeoxycholic acid (24-^{13}C, 99%)
DLM-9574*	Ursodeoxycholic acid (2,2,4,4-D_4, 98%) CP 95%
ULM-9573	Ursodeoxycholic acid (unlabeled)

➤ **Please visit isotope.com for a complete listing of bile acids.**

Caffeine and Its Metabolites

Catalog No.	Description
CNLM-9240	5-Acetylamino-6-amino-3-methyluracil (AAMU) (2,4,5,6-$^{13}C_4$, 99%; 1,3-$^{15}N_2$, 6-amino-^{15}N, 98%) CP 97%
CLM-728	Caffeine (3-methyl-^{13}C, 99%)
CLM-514	Caffeine (trimethyl-$^{13}C_3$, 99%)
NLM-332	Caffeine (1,3-$^{15}N_2$, 99%)
CNLM-333	Caffeine (2-^{13}C, 99%; 1,3-$^{15}N_2$, 98%)
CNLM-9241	1,3-Dimethyluric acid (2,4,5,6-$^{13}C_4$, 99%; 1,3,9-$^{15}N_3$, 98%)
CNLM-9242	1,7-Dimethyluric acid (2,4,5,6-$^{13}C_4$, 99%; 1,3,9-$^{15}N_3$, 98%)
DLM-9245	1,7-Dimethylxanthine (paraxathine) (dimethyl-D_6, 98%)
CNLM-9243	1,7-Dimethylxanthine (paraxanthine) (2,4,5,6-13C_4, 99%; 1,3,9-$^{15}N_3$, 98%)
CLM-522	Ethyl acetoacetate (1,3-$^{13}C_2$, 99%)
CLM-523	Ethyl acetoacetate (2,4-$^{13}C_2$, 99%)

Catalog No.	Description
CNLM-9246	1-Methyluric acid (2,4,5,6-$^{13}C_4$, 99%; 1,3,9-$^{15}N_3$, 98%)
CNLM-9248	7-Methyluric acid (2,4,5,6-$^{13}C_4$, 99%; 1,3,9-$^{15}N_3$, 98%)
CDLM-9249	1-Methylxanthine (1-methyl,6-$^{13}C_2$, 99%; 1-methyl-D_3, 98%) CP 97%
CNLM-9252	1-Methylxanthine (2,4,5,6-$^{13}C_4$, 99%; 1,3,9-$^{15}N_3$, 98%)
CNLM-9250	3-Methylxanthine (2,4,5,6-$^{13}C_4$, 99%; 1,3,9-$^{15}N_3$, 98%)
CNLM-9251	7-Methylxanthine (2,4,5,6-$^{13}C_4$, 99%;1,3,9-$^{15}N_3$, 98%)
DLM-10436	Theobromine (3,7-dimethylxanthine) (7-methyl-D_3, 98%)
DLM-8565	Theobromine (3,7-dimethylxanthine) (dimethyl-D_6, 98%)
CLM-6154	Theophylline (dimethyl-$^{13}C_2$, 99%)
CNLM-444	Theophylline (2-^{13}C, 99%; 1,3-$^{15}N_2$, 98%)
CNLM-9253	1,3,7-Trimethyluric acid (2,4,5,6-$^{13}C_4$, 99%; 1,3,9-$^{15}N_3$, 98%)

Chemical purity (CP) is 98% or greater, unless otherwise indicated.
For research use only. Not for use in diagnostic procedures.

Carbohydrates

Catalog No.	Description
CLM-7642	D-Arabinitol (U-$^{13}C_5$, 98%)
CLM-715	D-Arabinose (1-^{13}C, 99%)
CLM-1288	D-Arabinose (2-^{13}C, 98%)
CLM-8477	D-Arabinose (U-$^{13}C_5$, 99%)
DLM-1379	D-Arabinose (2-D, 97%)
CLM-1824	2-Deoxy-D-glucose (1-^{13}C, 99%)
CLM-2122	2-Deoxy-D-glucose (6-^{13}C, 99%)
CLM-10466	2-Deoxy-D-glucose (U-$^{13}C_6$, 99%)
DLM-6732	2-Deoxy-D-glucose (1-D, 98%)
DLM-6940	2-Deoxy-D-glucose (D_8, 98%)
CLM-9601	2-Deoxy-D-glucose-6-phosphate, disodium salt (6-^{13}C, 99%)
CLM-7266	2-Deoxyribose (1-^{13}C, 99%)
DLM-9068	Diglycolic acid (D_4, 98%)
CLM-9207	Erythritol (U-$^{13}C_4$, 99%)
CLM-1118	D-Erythrose (1-^{13}C, 99%) 1.2% in H_2O
CLM-1387	D-Erythrose (2-^{13}C, 99%) 1.2% in H_2O
CLM-8944	D-Erythrose (4-^{13}C, 99%) 1.2% in H_2O
CLM-7863	D-Erythrose (U-$^{13}C_4$, 98%) 1.2% in H_2O
CLM-1201	D-Fructose (1-^{13}C, 99%)
CLM-1527	D-Fructose (2-^{13}C, 99%)
CLM-7660	D-Fructose (3-^{13}C, 99%)
CLM-7661	D-Fructose (4-^{13}C, 99%)
CLM-7662	D-Fructose (5-^{13}C, 99%)
CLM-1388	D-Fructose (6-^{13}C, 99%)
CLM-2462	D-Fructose (1-^{13}C, 99%; 6-^{13}C, 97%)
CLM-528	D-Fructose (1,2-$^{13}C_2$, 99%)
CLM-10546	D-Fructose (4,5-$^{13}C_2$, 99%)
CLM-8415	D-Fructose (1,2,3-$^{13}C_3$, 99%)
CLM-1553	D-Fructose (U-$^{13}C_6$, 99%)
CLM-1553-MPT	D-Fructose (U-$^{13}C_6$, 99%)
DLM-6050	D-Fructose (1-D, 97%)
DLM-1389	D-Fructose (6,6-D_2, 98%)
ULM-10676	D-Fructose (unlabeled)
CLM-6678	D-Fructose-1,6-bisphosphate, sodium salt, hydrate (1-^{13}C, 99%)
CLM-8962	D-Fructose-1,6-bisphosphate, sodium salt, hydrate (U-$^{13}C_6$, 98%)
CLM-8616	D-Fructose-6-phosphate·$2Na^+$·XH_2O (U-$^{13}C_6$, 99%) may contain up to ~10% $^{13}C_6$ glucose-6-phosphate
CLM-3705	L-Fucose (1-^{13}C, 99%)
CLM-219	L-Fucose (6-^{13}C, 99%)
CLM-9605	L-Fucose (U-$^{13}C_6$, 99%)
CLM-529	D-Galactitol (1-^{13}C, 99%)
CLM-744	D-Galactose (1-^{13}C, 99%)
CLM-744-MPT	D-Galactose (1-^{13}C, 99%)
CLM-745	D-Galactose (2-^{13}C, 99%)
CLM-4217	D-Galactose (1,2-$^{13}C_2$, 99%)
CLM-1570	D-Galactose (U-$^{13}C_6$, 99%)
DLM-1390	D-Galactose (1-D, 98%)
DLM-1391	D-Galactose (2-D, 98%)

CTM: manufactured following ICH Q7, Section XIX
MPT: microbiologically and pyrogen tested.

Chemical purity (CP) is 98% or greater, unless otherwise indicated.
For research use only. Not for use in diagnostic procedures.

Catalog No.	Description
CLM-8998	D-Galactose-1-phosphate, dipotassium salt (1-^{13}C, 99%)
CLM-9873	D-Galactose-1-phosphate, dipotassium salt (1,2-$^{13}C_2$, 99%)
CLM-9874	D-Galactose-1-phosphate, dipotassium salt (galactose-$^{13}C_6$, 99%)
CLM-10786	*N*-Acetyl-D-galactosamie (galactose-$^{13}C_6$, 99%)
CLM-9452	α-D-Glucopyranosyl-1-phosphate, dipotassium salt monohydrate ($^{13}C_6$, 99%)
CLM-9883	D-Glucosamine·HCl ($^{13}C_6$, 99%)
CLM-4819	D-Glucose (U-$^{12}C_6$, 99.9%)
CLM-420	D-Glucose (1-^{13}C, 98-99%)
CLM-420-MPT	D-Glucose (1-^{13}C, 98-99%)
CLM-746	D-Glucose (2-^{13}C, 99%)
CLM-746-MPT	D-Glucose (2-^{13}C, 99%)
CLM-1393	D-Glucose (3-^{13}C, 99%)
CLM-1394	D-Glucose (4-^{13}C, 99%)
CLM-1395	D-Glucose (5-^{13}C, 98%)
CLM-481	D-Glucose (6-^{13}C, 99%)
CLM-2717	D-Glucose (1-^{13}C, 99%; 6-^{13}C, 97%)
CLM-2717-MPT	D-Glucose (1-^{13}C, 99%; 6-^{13}C, 97%)
CLM-504	D-Glucose (1,2-$^{13}C_2$, 99%)
CLM-8942	D-Glucose (2,3-$^{13}C_2$, 99%)
CLM-6750	D-Glucose (3,4-$^{13}C_2$, 99%)
CLM-6750-MPT	D-Glucose (3,4-$^{13}C_2$, 99%)
CLM-8787	D-Glucose (4,5-$^{13}C_2$, 99%)
CLM-4673	D-Glucose (1,2,3-$^{13}C_3$, 99%)
CLM-8770	D-Glucose (4,5,6-$^{13}C_3$, 98%)
CLM-8946	D-Glucose (2,3,4,5,6-$^{13}C_5$, 99%)
CLM-1396	D-Glucose (U-$^{13}C_6$, 99%)
CLM-1396-MPT	D-Glucose (U-$^{13}C_6$, 99%)
DLM-1150	D-Glucose (1-D, 98%)
DLM-1271	D-Glucose (2-D, 98%)
DLM-3557	D-Glucose (3-D, 97-98%)
DLM-9294	D-Glucose (4-D, 98%)
DLM-6754	D-Glucose (5-D, 98%)
DLM-349	D-Glucose (6,6-D_2, 99%)
DLM-349-CTM	D-Glucose (6,6-D_2, 99%)
DLM-349-MPT	D-Glucose (6,6-D_2, 99%)
DLM-2062	D-Glucose (1,2,3,4,5,6,6-D_7, 97-98%)
DLM-2062-MPT	D-Glucose (1,2,3,4,5,6,6-D_7, 97-98%)
DLM-9047	D-Glucose (U-D_{12}, 98%)
CDLM-6064	D-Glucose (1-^{13}C, 99%; 1-D, 98%)
CDLM-999	D-Glucose (1-^{13}C, 98%; 2-D, 98%)
CDLM-4895	D-Glucose (1-^{13}C, 99%; 6-^{13}C, 97%; 6,6-D_2, 98%)
CDLM-3813-50	D-Glucose (U-$^{13}C_6$, 98%; 1,2,3,4,5,6,6-D_7, 50%)
CDLM-3813	D-Glucose (U-$^{13}C_6$, 99%; 1,2,3,4,5,6,6-D_7, 97-98%)
CDLM-3813-MPT	D-Glucose (U-$^{13}C_6$, 99%; 1,2,3,4,5,6,6-D_7, 97-98%)
ULM-10677	D-Glucose (unlabeled)
CLM-1966	L-Glucose (1-^{13}C, 99%)
CLM-1399	L-Glucose (2-^{13}C, 99%)
CLM-8813	D-Glucose-1-phosphate, dicyclohexylammonium salt, monohydrate (U-$^{13}C_6$, 99%) CP 95%
CLM-8367	D-Glucose-6-phosphate, disodium salt, hydrate (U-$^{13}C_6$, 99%)

Carbohydrates *(continued)*

Catalog No.	Description
ULM-8947	D-Glucose-6-phosphate, disodium salt, hydrate (unlabeled)
DLM-7826	*myo*-Inositol (2-D, 91%)
DLM-2725	*myo*-Inositol (1,2,3,4,5,6-D_6, 98%)
CLM-4423	Lactose·H_2O (glucose-$^{13}C_6$, 98%)
CLM-4518	Lactose ureide·$2H_2O$ (ureide-^{13}C, 99%)
ULM-4519	Lactose ureide·$2H_2O$ (unlabeled)
CLM-1127	D-Lyxose (1-^{13}C, 99%)
CLM-1525	D-Lyxose (2-^{13}C, 99%)
CLM-1128	D-Lyxose (5-^{13}C, 99%)
DLM-1187	D-Lyxose (1-D, 98%)
DLM-1188	D-Lyxose (2-D, 98%)
CLM-2470	L-Lyxose (1,2-$^{13}C_2$, 99%)
CLM-2642	D-Maltose·H_2O (U-$^{13}C_{12}$, 99%)
CLM-10759	Maltotetraose (U-$^{13}C_{24}$, 99%) CP 90%
CLM-1189	D-Mannitol (1-^{13}C, 98%)
CLM-4416	D-Mannitol (2-^{13}C, 99%)
CLM-10764	D-Mannitol (1,2-$^{13}C_2$, 99%)
CLM-6733	D-Mannitol (U-$^{13}C_6$, 99%)
CLM-9393	L-Mannitol (1-^{13}C, 99%)
CLM-358	D-Mannose (1-^{13}C, 99%)
CLM-1523	D-Mannose (2-^{13}C, 99%)
CLM-9064	D-Mannose (3-^{13}C, 99%)
CLM-9394	D-Mannose (4-^{13}C, 99%)
CLM-9063	D-Mannose (5-^{13}C, 99%)
CLM-1192	D-Mannose (6-^{13}C, 99%)
CLM-6567	D-Mannose (U-$^{13}C_6$, 99%)
DLM-1193	D-Mannose (1-D, 98%)
DLM-1194	D-Mannose (2-D, 98%)
DLM-1195	D-Mannose (6,6-D_2, 98%)
CLM-1218	L-Mannose (1-^{13}C, 99%)
CLM-1196	D-Ribitol (1-^{13}C, 99%)
CLM-768	D-Ribose (1-^{13}C, 99%)
CLM-1069	D-Ribose (2-^{13}C, 99%)
CLM-1066	D-Ribose (5-^{13}C, 99%)
CLM-4602	D-Ribose (1,2-$^{13}C_2$, 99%)
CLM-4830	D-Ribose (2,3,4,5-$^{13}C_4$, 99%)
CLM-3652	D-Ribose (U-$^{13}C_5$, 98%)
DLM-1070	D-Ribose (1-D, 98%)
DLM-1197	D-Ribose (2-D, 98%)
DLM-6559	D-Ribose (3-D, 98%)
DLM-7778	D-Ribose (5,5-D_2, 98%)
ULM-10678	D-Ribose (unlabeled)
CLM-8780	Sodium D-gluconate (1-^{13}C, 99%)
CLM-8781	Sodium D-gluconate (U-$^{13}C_6$, 99%)

Catalog No.	Description
CLM-1565	D-Sorbitol (1-^{13}C, 99%)
CLM-8529	D-Sorbitol (U-$^{13}C_6$, 98%)
DLM-3320	Sorbitol (1,1′-D_2, 98%)
CLM-9811	D-Sucrose (fructose-$^{13}C_6$, 98%)
CLM-10823	D-Sucrose (glucose-1,2-$^{13}C_2$, 99%)
CLM-8091	D-Sucrose (glucose-$^{13}C_6$, 98%)
CLM-7757	D-Sucrose ($^{13}C_{12}$, 98%)
CLM-1203	D-Talitol (1-^{13}C, 99%)
CLM-1204	D-Talose (2-^{13}C, 99%)
CLM-1139	D-Threose (1-^{13}C, 99%) 1.8% in H_2O
CLM-1207	D-Threose (2-^{13}C, 99%) 1.8% in H_2O
CLM-1295	D-Xylitol (1-^{13}C, 99%)
CLM-1214	D-Xylitol (5-^{13}C, 99%)
CLM-7608	D-Xylitol (U-$^{13}C_5$, 99%)
CLM-1140	D-Xylose (1-^{13}C, 99%)
CLM-1524	D-Xylose (2-^{13}C, 99%)
CLM-8593	D-Xylose (3-^{13}C, 99%)
CLM-9083	D-Xylose (4-^{13}C, 99%)
CLM-1219	D-Xylose (5-^{13}C, 99%)
CLM-2456	D-Xylose (1,2-$^{13}C_2$, 99%)
CLM-6140	D-Xylose (U-$^{13}C_5$, 99%)
DLM-1215	D-Xylose (1-D, 99%)
DLM-1216	D-Xylose (2-D, 98%)
DLM-7121	D-Xylose (D_6, 98%)

➤ **Please visit isotope.com for a complete listing of carbohydrates.**

See pages 30-34 for metabolite mixtures comprising carbohydrates.

Chemical purity (CP) is 98% or greater, unless otherwise indicated.
For research use only. Not for use in diagnostic procedures.

Carnitine/Acylcarnitines

Catalog No.	Description
DLM-3555	L-Carnitine (trimethyl-D_9, 98%)
ULM-7801	L-Carnitine (unlabeled)
DLM-3820	L-Carnitine·HCl (dimethyl-D_6, 98%)
DLM-1871	L-Carnitine·HCl (methyl-D_3, 98%)
ULM-9173	L-Carnitine·HCl (unlabeled)
ULM-10431	DL-Carnitine·HCl, *O*-acetyl (unlabeled)
ULM-10703	DL-Carnitine·HCl, *O*-butyryl (unlabeled)
ULM-10704	DL-Carnitine·HCl, *O*-isovaleryl (unlabeled)
ULM-10705	DL-Carnitine·HCl, *O*-myristoyl (unlabeled)
ULM-10433	DL-Carnitine·HCl, *O*-palmitoyl (unlabeled) CP 97%
ULM-10702	DL-Carnitine·HCl, *O*-propionyl (unlabeled)
ULM-10432	DL-Carnitine·HCl, *O*-octanoyl (unlabeled)
DLM-754	L-Carnitine·HCl, *O*-acetyl (*N*-methyl-D_3, 98%)
DLM-3821	L-Carnitine·HCl, *O*-acetyl (*N*,*N*-dimethyl-D_6, 98%) CP 97%
ULM-7802	L-Carnitine·HCl, *O*-acetyl (unlabeled)
DLM-3861	L-Carnitine·HCl, *O*-butyryl (*N*-methyl-D_3, 98%)
ULM-7704	L-Carnitine·HCl, *O*-butyryl (unlabeled)
DLM-9067	L-Carnitine·HCl, *O*-decanoyl (*N*-methyl-D_3, 98%)
ULM-7195	L-Carnitine·HCl, *O*-decanoyl (unlabeled)
DLM-8162	L-Carnitine·HCl, *O*-dodecanoyl (*N*-methyl-D_3, 98%)
DLM-8215	L-Carnitine·HCl, *O*-dodecanoyl (*N*,*N*,*N*-trimethyl-D_9, 98%)
ULM-7199	L-Carnitine·HCl, *O*-dodecanoyl (unlabeled)
DLM-9276	L-Carnitine·HCl, *O*-hexanoyl (*N*-methyl-D_3, 98%)
ULM-7198	L-Carnitine·HCl, *O*-hexanoyl (unlabeled)
DLM-6718	L-Carnitine·HCl, *O*-hexacosanoyl (*N*-methyl-D_3, 98%) CP 95%
ULM-6719	L-Carnitine·HCl, *O*-hexacosanoyl (unlabeled) CP 95%
DLM-3974	L-Carnitine·HCl, *O*-isovaleryl (*N*,*N*,*N*-trimethyl-D_9, 98%)
ULM-4697	L-Carnitine·HCl, *O*-isovaleryl (unlabeled)
DLM-4425	L-Carnitine·HCl, *O*-myristoyl (*N*,*N*,*N*-trimethyl-D_9, 98%)
ULM-7737	L-Carnitine·HCl, *O*-myristoyl (unlabeled)

Catalog No.	Description
DLM-8271	L-Carnitine·HCl, *O*-octadecanoyl (*N*-methyl-D_3, 98%)
ULM-7196	L-Carnitine·HCl, *O*-octadecanoyl (unlabeled) CP 97%
DLM-755	L-Carnitine·HCl, *O*-octanoyl (*N*-methyl-D_3, 98%)
ULM-7770	L-Carnitine·HCl, *O*-octanoyl (unlabeled)
DLM-1263	L-Carnitine·HCl, *O*-palmitoyl (*N*-methyl-D_3, 98%)
ULM-7738	L-Carnitine·HCl, *O*-palmitoyl (unlabeled)
DLM-3973	L-Carnitine·HCl, *O*-propionyl (*N*-methyl-D_3, 98%)
ULM-7705	L-Carnitine·HCl, *O*-propionyl (unlabeled)
DLM-8746	L-Carnitine·HCl, *O*-dec-2-enoyl (95% E) (*N*,*N*,*N*-trimethyl-D_9, 98%)
ULM-8744	L-Carnitine·HCl, *O*-tetradec-2-enoyl, 90% E (unlabeled)
ULM-8198	L-Carnitine·HCl, *O*-2-decenoyl (unlabeled)
ULM-8623	L-Carnitine (mono)·ClO_4, benzyl ester (unlabeled)
DLM-3975	L-Carnitine (mono)·ClO_4, *O*-glutaryl (*N*-methyl-D_3, 98%) CP 97%
ULM-7594	L-Carnitine (mono)·ClO_4, *O*-glutaryl (unlabeled)
ULM-8621	L-Carnitine (mono)·ClO_4, *O*-3-DL-hydroxybutyryl (unlabeled)
DLM-9189	L-Carnitine (mono)·ClO_4, *O*-3-DL-hydroxypalmitoyl (*N*-methyl-D_3, 98%)
ULM-8620	L-Carnitine (mono)·ClO_4, *O*-3-DL-hydroxypalmitoyl (unlabeled) CP 97%
DLM-8272	L-Carnitine·ClO_4, 3-hydroxyisovaleryl (*N*-methyl-D_3, 98%)
ULM-8237	L-Carnitine·ClO_4, 3-hydroxyisovaleryl (unlabeled)
DLM-11049	L-Carnitine·ClO_4, *O*-malonyl (*N*-methyl-D_3, 98%)
ULM-8743	L-Carnitine·ClO_4, *O*-malonyl (unlabeled) CP 97%

➤ **Please visit the MS/MS Standards section of isotope.com for a complete listing of carnitine/acylcarnitines.**

See page 28 for carnitine/acylcarnitines mixtures.

Chemical purity (CP) is 98% or greater, unless otherwise indicated.
For research use only. Not for use in diagnostic procedures.

Drugs and Their Metabolites

Catalog No.	Description
CLM-2436	Acetaminophen (carbonyl-^{13}C, 99%)
CLM-10619	Acetaminophen (ring-$^{13}C_6$, 99%)
DLM-10575	Aldox (D_6, 98%) CP 96%
DLM-10574	Alexidine·2HCl (D_{10}, 98%) CP 97%
CLM-630	Aminopyrine (*N,N*-dimethyl-$^{13}C_2$, 99%)
DLM-2762	Amitriptyline·HCl (*N*-methyl-D_3, 98%)
CLM-6585	Aspirin (acetyl-1-^{13}C, 99%)
CLM-3655	AZT (methyl-^{13}C, 99%) CP 96%
CLM-10608	1,2-Benzisothiazol-3(2H)-one (ring-$^{13}C_6$, 99%)
DLM-1566	Benztropine mesylate (*N*-methyl-D_3, 98%) CP 95%
DLM-2790	Buspirone·HCl (butyl-D_8, 98%)
CLM-1608	Chloral hydrate (trichloromethyl-^{13}C, 97%)
DLM-10609	5-Chloro-2-methyl-4-isothiazolin-3-one (*N*-methyl-D_3, 98%)
CLM-10630†	Clobazam (ring-[χ]-$^{13}C_6$, 98%) CP >95%
CLM-10631†	Clonazapam (ring-[χ]-$^{13}C_6$, 98%) CP >95%
DLM-1287*	Clonidine·HCl (4,4,5,5-imidazoline-D_4, 98%) CP 95%
DLM-2816	Clozapine (4-methylpiperazinyl-D_4, 97%)
DLM-1819*	DL-Cotinine (methyl-D_3, 98%)
DLM-3020	Desipramine·HCl (2,4,6,8-D_4, 98%)
DLM-7504	Dexamethasone (4,6α,21,21-D_4, 96%) may contain D at C-2
CLM-10632†	Diazepam (ring-[α]-$^{13}C_6$, 98%) CP >95%
DLM-1886	Diazepam (phenyl-D_5, 98%)
DLM-3025	5,5-Diphenylhydantoin (phenyl-D_5, 98%)
DLM-324	5,5-Diphenylhydantoin (diphenyl-D_{10}, 98%)
CNLM-411	5,5-Diphenylhydantoin (2-^{13}C, 99%; 1,3-$^{15}N_2$, 98%)
DLM-2745	Enalapril maleate (phenyl-D_5, 98%)
DLM-2744	Enalaprilat·H_2O (phenyl-D_5, 98%)
CLM-123	Erythromycin (*N*-methyl-^{13}C, 99%)
CLM-3672	Erythromycin (*N,N*-dimethyl-$^{13}C_2$, ~90%) 90-95% Erythromycin A
CDLM-10030†	Erythromycin (*N*-methyl-^{13}C, 99%; D_3, 98%) CP 97%
CLM-165	Erythromycin, lactobionate salt (*N*-methyl-^{13}C, 99%)
CLM-3758	Erythromycin, lactobionate salt (*N,N*-dimethyl-$^{13}C_2$, ~90%)
CLM-10404*	Estradiol undecanoate (2,3,4-$^{13}C_3$, 98%) CP 95%
DLM-9855*	Everolimus (2-hydroxyethyl-D_4, 98%)
CDLM-10835	Everolimus [40-O-(2-hydroxyethyl-$^{13}C_2$, 99%; D_4, 98%)]
ULM-9856*	Everolimus (unlabeled)
CLM-10405	Fenoprofen, sodium salt, hydrate (ring-$^{13}C_6$, 99%)
DLM-3996	Glybenclamide (cyclohexylamine-D_{11}, 98%)
DLM-10541	Iopromide (*N*-methyl-D_3, 98%)
CLM-6943*	Ibuprofen (propionic-$^{13}C_3$, 99%)
ULM-7275*	Ibuprofen (unlabeled)
DLM-3035	Imipramine·HCl (2,4,6,8-D_4, 98%) CP 97%
CLM-7118	Ketoconazole (carbonyl-^{13}C, 99%)
CNLM-7633	Lamotrigine (5,6-$^{13}C_2$, 99%; 5-amino-^{15}N, 98%)
CNLM-7633-MPT	Lamotrigine (5,6-$^{13}C_2$, 99%; 5-amino-^{15}N, 98%)
CLM-10633†	Lorazepam (ring-[α]-$^{13}C_6$, 98%) CP >95%
DLM-7861	Metformin·HCl (dimethyl-D_6, 99%)
CLM-1280	Methacetin (methoxy-^{13}C, 99%)
CLM-10639†	Midazolam (ring-[α]-$^{13}C_6$, 98%) CP >95%
DLM-10407	Moricizine hydrochloride (D_8, 98%) CP 95%
CNLM-10634†	Naltrexone (9,15,16-$^{13}C_3$, 98%;$^{17\text{-}15}$N, 98%) CP >95%
CLM-7522	Naproxen, sodium salt (*O*-methyl-^{13}C, 98%)
CLM-3914*	DL-Nicotine (3′,4′,5′-$^{13}C_3$, 99%)
DLM-1818	DL-Nicotine (methyl-D_3, 98%)
CLM-10635†	Nordiazepam (ring-[α]-$^{13}C_6$, 98%) CP >95%
DLM-1885	Nordiazepam (phenyl-D_5, 98%)
DLM-9017	DL-Nornicotine (pyridine-D_4, 98%)
DLM-3038	Nortriptyline·HCl (methyl-D_3, 98%)
DLM-10618	Obeticholic acid (2,2,4,4-D_4, 98%)
CLM-10636†	Oxazepam (ring-[α]-$^{13}C_6$, 98%) CP >95%
DLM-1888	Oxazepam (phenyl-D_5, 98%)
DLM-9254	Paclitaxel (12-benzoyloxy-ring-D_5, 98%) CP 97%
CLM-1296	Phenacetin (ethoxy-1-^{13}C, 99%)
DLM-433	Phenobarbital (ethyl-D_5, 98%)
CLM-10637†	Prazepam (ring-[α]-$^{13}C_6$, 98%) CP >95%
CLM-10557	Probucol (propyl-$^{13}C_3$, 99%) CP 96%
DLM-9220	Rapamycin (D_3, 98%)
DLM-2659	DL-Secobarbital (1-methyl-D_3, butyl-2,2-D_2,98%)
ULM-10473†	Stanozolol (unlabeled)
CLM-3045*	Sulfamethazine (phenyl-$^{13}C_6$, 99%)
ULM-7220†	Sulfamethazine (unlabeled)
CLM-10638†	Temazepam (ring-[α]-$^{13}C_6$, 98%) CP >95%
CLM-7119	Temozolomide (methyl-^{13}C, 99%)
CLM-7491	*cis*-(+/-)-Tramadol·HCl (methoxy-^{13}C, 99%)
CLM-10640†	Triazolam (ring-[α]-$^{13}C_6$, 98%) CP >95%
CLM-7988†	Trimethoprim (pyrimidine-4,5,6-$^{13}C_3$, 99%)
ULM-7989†	Trimethoprim (unlabeled)
CDLM-10540	Yohimbine (methyl-^{13}C, 99%; methyl-D_3 ester, 98%)
CLM-10641†	Zolpidem (carbonyl-1,2-$^{13}C_2$, 98%; amide-^{15}N, 98%) CP >95%

➤ **Please visit isotope.com for a complete listing of drug standards.**

MPT: microbiologically and pyrogen tested.

*Compounds available in dry and solution forms.
† Compounds available in solution only.

Chemical purity (CP) is 98% or greater, unless otherwise indicated.
For research use only. Not for use in diagnostic procedures.

Fatty Acids and Lipids

Catalog No.	Description
DLM-2115	Adipic acid (D_{10}, 98%)
CLM-10894	Adipic acid, disodium salt ($^{13}C_6$, 99%)
DLM-1234	Arachidic acid (methyl-D_3, 98%) CP 97%
DLM-1233	Arachidic acid (D_{39}, 98%)
DLM-1661-N	Arachidonic acid (5,6,8,9,11,12,14,15-D_8, 98%)
CLM-9666	Butyric acid (1-^{13}C, 99%)
CLM-9768	Butyryl coenzyme A, lithium salt (butyryl-$^{13}C_4$, 99%) CP 95%
CLM-9950	Decanoic acid ($^{13}C_{10}$, 98%)
DLM-2006	Decanoic acid (methyl-D_3, 98%)
DLM-270	Decanoic acid (D_{19}, 98%)
ULM-9721	*N*-Decanoyl-D-sphingosine (ceramide D18:1/10:0) (unlabeled) CP 97%
CLM-8388	Docosahexaenoic acid (U-$^{13}C_{22}$, 99%) may contain 5% DPA*
DLM-10012	Docosahexaenoic acid (21,21,22,22,22-D_5, 98%)
ULM-10013	Docosahexaenoic acid (unlabeled)
DLM-10015	Docosahexaenoic acid, ethyl ester (21,21,22,22,22-D_5, 98%) CP 95%
ULM-10016	Docosahexaenoic acid, ethyl ester (unlabeled) CP 95%
CLM-8398	Docosahexaenoic acid, methyl ester (docosahexaenoate-U-$^{13}C_{22}$, 99%) may contain 5% DPA
DLM-10014	Docosahexaenoic acid, methyl ester (21,21,22,22,22-D_5, 98%) CP 97%
CLM-9909	Docosanoic acid (1,2,3,4,5,6-$^{13}C_6$, 99%) CP 95%
DLM-9180	Docosanoic acid (22,22,22-D_3, 98%)
DLM-9951	Docosanoic acid (3,3,5,5-D_4, 98%) CP 95%
DLM-4703	Docosanoic acid (D_{43}, 98%)
DLM-2274	Dodecylphosphocholine (D_{38}, 98%)
ULM-2313	Dodecylphosphocholine (unlabeled) CP 90%
DLM-9720	*cis*-5,8,11,14,17-Eicosapentaenoic acid (19,19,20,20,20-D_5, 98%)
ULM-10024	*cis*-5,8,11,14,17-Eicosapentaenoic acid (unlabeled)
CLM-8389	Eicosapentaenoic acid (U-$^{13}C_{20}$, 98%)
CLM-8399	Eicosapentaenoic acid, methyl ester (eicosapentaenoate-U-$^{13}C_{20}$, 90%)
CLM-8274	Ethyl hexanoate (hexanoate-$^{13}C_6$, 99%)
CLM-4338	DL-Glycerol (1-^{13}C, 99%) aqueous solution
CLM-1397	Glycerol (2-^{13}C, 99%)
CLM-1397-MPT	Glycerol (2-^{13}C, 99%)
CLM-1857	Glycerol (1,3-$^{13}C_2$, 99%)
CLM-1510	Glycerol ($^{13}C_3$, 99%)
CLM-1510-MPT	Glycerol ($^{13}C_3$, 99%)
DLM-10430	Glycerol (2-D, 95-98%) aqueous solution
DLM-1229	Glycerol (1,1,2,3,3-D_5, 99%)
DLM-1229-MPT	Glycerol (1,1,2,3,3-D_5, 99%)
DLM-558	Glycerol (D_8, 99%)
DLM-1326	Glycerol [$(OD)_3$, 98%]
CDLM-7745	Glycerol ($^{13}C_3$, 99%; D_8, 98%) CP 95%
DLM-1308	Heptadecanoic acid (methyl-D_3, 98%)
DLM-6905	Heptadecanoic acid (D_{33}, 98%)

**DPA: docosapentaenoic acid*

MPT: microbiologically and pyrogen tested.

Chemical purity (CP) is 98% or greater, unless otherwise indicated.
For research use only. Not for use in diagnostic procedures.

Catalog No.	Description
DLM-1820	Heptanoic acid (2,2,3,3-D_4, 98%)
DLM-2731	Heptanoic acid (D_{13}, 98%)
CLM-9790	Hexacosanoic acid (1,2,3,4,5,6-$^{13}C_6$, 99%)
DLM-9953	Hexacosanoic acid (3,3,5,5-D_4, 98%) CP 95%
DLM-8510	Hexacosanoic acid (12,12,13,13-D_4, 98%)
DLM-2922	DL-3-Hydroxymyristic acid (2,2,3,4,4-D_5, 96%)
CLM-2095	Isovaleric acid (1-^{13}C, 99%)
CLM-2095-MPT	Isovaleric acid (1-^{13}C, 99%)
DLM-2938	Isovaleric acid (D_9, 98%)
CLM-1586	Lauric acid (1-^{13}C, 99%)
DLM-3062	Lauric acid (methyl-D_3, 99%)
DLM-563	Lauric acid (D_{23}, 98%)
CLM-9688	Linoleic acid (18:2) (1-^{13}C, 99%)
CLM-6855	Linoleic acid (18:2) (U-$^{13}C_{18}$, 98%) <10% *cis,trans* isomer, CP 94%
CLM-2119	Linoleic acid (18:2), ethyl ester (1-^{13}C, 99%)
CLM-3960	Linoleic acid (18:2), ethyl ester (linoleate-U-$^{13}C_{18}$, 98%) CP 95%
CLM-3960-MPT	Linoleic acid (18:2), ethyl ester (linoleate-U-$^{13}C_{18}$, 98%) CP 95%
DLM-227	Linoleic acid (18:2), ethyl ester (17,17,18,18,18-D_5, 98%)
DLM-766	Linoleic acid (18:2), ethyl ester (D_{31}, 98%) CP 95%
CLM-8395	Linoleic acid (18:2), methyl ester (linoleate-U-$^{13}C_{18}$, 98%) CP 95%
DLM-9663	Linoleic acid (18:2), methyl ester (D_{31}, 98%) CP 95%
CLM-6229	Linoleic acid (18:2), potassium salt (1-^{13}C, 99%)
CLM-8835	Linoleic acid (18:2), potassium salt (U-$^{13}C_{18}$, 98%) (may have up to 5% isomers) CP 97%
CLM-8835-MPT	Linoleic acid (18:2), potassium salt (U-$^{13}C_{18}$, 98%) (may have up to 5% isomers) CP 97%
CLM-8386	Linolenic acid (18:3) (U-$^{13}C_{18}$, 98%) CP 95%
DLM-9348	Linolenic acid (18:3) (17,17,18,18,18-D_5, 98%) CP 90%
DLM-2351	Linolenic acid (18:3), ethyl ester (17,17,18,18,18-D_5, 98%) CP 95%
CLM-8396	Linolenic acid (18:3), methyl ester (linolenate-U-$^{13}C_{18}$, 98%) CP 95%
DLM-10520	LYSO-PC 20:0 (eicosanoyl-12,12,13,13-D_4, 98%)
ULM-10521	LYSO-PC-20:0 (unlabeled)
CLM-10499	LYSO-PC 22:0 (docosanoyl-1,2,3,4,5,6-$^{13}C_6$, 99%)
DLM-10500	LYSO-PC 22:0 (docosanoyl-12,12,13,13-D_4, 98%)
ULM-10498	LYSO-PC-22:0 (unlabeled)
CLM-10496	LYSO-PC 24:0 (tetracosanoyl-1,2,3,4,5,6-$^{13}C_6$, 99%)
DLM-10497	LYSO-PC 24:0 (tetracosanoyl-12,12,13,13-D_4, 98%)
ULM-10495	LYSO-PC-24:0 (unlabeled)
CLM-9792	LYSO-PC 26:0 (hexacosanoyl-1,2,3,4,5,6-$^{13}C_6$, 99%)
ULM-9791	LYSO-PC 26:0 (unlabeled)
DLM-8375	Mixed triglycerides (U-D, 97%)
CLM-1844	Myristic acid (1-^{13}C, 99%)
CLM-3665	Myristic acid (1,2,3-$^{13}C_3$, 99%)
DLM-1039	Myristic acid (methyl-D_3, 98%)
DLM-7487	Myristic acid (13,13,14,14,14-D_5, 98%)
DLM-208	Myristic acid (D_{27}, 98%)
CLM-6228	Myristic acid, potassium salt (1-^{13}C, 99%)
CLM-8695	Myristic acid, sodium salt (1,2,3-$^{13}C_3$, 99%)

Fatty Acids and Lipids *(continued)*

Catalog No.	Description
CLM-8724	Nonanoic acid (U-$^{13}C_9$, 98%)
DLM-7490	Nonanoic acid (9,9,9-D_3, 98%)
DLM-9501	Nonanoic acid (D_{17}, 98%)
CLM-293	Octanoic acid (1-^{13}C, 99%)
CLM-293-MPT	Octanoic acid (1-^{13}C, 99%)
CLM-3827	Octanoic acid (1,2-$^{13}C_2$, 99%)
CLM-2721	Octanoic acid (1,2,3,4-$^{13}C_4$, 99%)
CLM-3981	Octanoic acid ($^{13}C_8$, 99%)
DLM-619	Octanoic acid-D_{15} (D, 98%)
CLM-3707	2-Octanoyl-1,3-distearin (octanoic-1-^{13}C, 99%)
CLM-3707-MPT	2-Octanoyl-1,3-distearin (octanoic-1-^{13}C, 99%)
CLM-4258	2-Octanoyl-1,3-distearin (octanoyl-1,2-$^{13}C_2$, 99%)
ULM-9722	*N*-Octanoyl-D-sphingosine (ceramide D18:1/8:0) (unlabeled)
DLM-6726	*N*-Octyl β-glucoside (D_{24}, 98%)
CLM-2492	Oleic acid (methyl-^{13}C, 99%)
CLM-149	Oleic acid (1-^{13}C, 99%)
CLM-149-MPT	Oleic acid (1-^{13}C, 99%)
CLM-460	Oleic acid (U-$^{13}C_{18}$, 98%)
CLM-460-MPT	Oleic acid (U-$^{13}C_{18}$, 98%)
DLM-689	Oleic acid (9,10-D_2, 97%)
DLM-689-MPT	Oleic acid (9,10-D_2, 97%)
DLM-1891	Oleic acid (D_{33}, 98%)
ULM-10649	Oleic acid (unlabeled)
DLM-8747	Oleic acid, ethyl ester (D_{33}, 98%) CP 95%
CLM-4337	Oleic acid, methyl ester (oleate-U-$^{13}C_{18}$, 98%)
CLM-4477	Oleic acid, potassium salt (1-^{13}C, 99%)
CLM-8856	Oleic acid, potassium salt (U-$^{13}C_{18}$, 98%) CP 95%
DLM-8837	Oleic acid, potassium salt (15,15,16,16,17,17,18,18,18-D_9, 98%)
CLM-6230	Oleic acid, sodium salt (1-^{13}C, 99%)
CLM-8763	Oleic acid, sodium salt (U-$^{13}C_{18}$, 98%)
CLM-9583	*N*-Oleoyl-D-sphingosine (ceramide d18:1/18:1 (9z)) (oleoyl-U-$^{13}C_{18}$, 99%) CP 95%
ULM-9581	*N*-Oleoyl-D-sphingosine (ceramide d18:1/18:1 (9z)) (unlabeled) CP 95%
CLM-150	Palmitic acid (1-^{13}C, 99%)
CLM-150-MPT	Palmitic acid (1-^{13}C, 99%)
CLM-2120	Palmitic acid (2-^{13}C, 99%)
CLM-214	Palmitic acid (1,2-$^{13}C_2$, 99%)
CLM-7896	Palmitic acid (1,2,3,4-$^{13}C_4$, 99%)
CLM-7896-MPT	Palmitic acid (1,2,3,4-$^{13}C_4$, 99%)
CLM-409	Palmitic acid (U-$^{13}C_{16}$, 98%)
CLM-409-MPT	Palmitic acid (U-$^{13}C_{16}$, 98%)
DLM-8673	Palmitic acid (12-D, 98%)
DLM-1153	Palmitic acid (2,2-D_2, 98%)
DLM-2890	Palmitic acid (9,9-D_2, 98%)
DLM-2891	Palmitic acid (13,13-D_2, 98%)
DLM-611	Palmitic acid (methyl-D_3, 98%)
DLM-2893	Palmitic acid (7,7,8,8-D_4, 98%)
DLM-2893-MPT	Palmitic acid (7,7,8,8-D_4, 98%)

Catalog No.	Description
DLM-2894	Palmitic acid (11,11,12,12-D_4, 98%)
DLM-9424	Palmitic acid (13,13,14,14,15,15,16,16,16-D_9, 98%)
DLM-2895	Palmitic acid (9,9,...16,16,16-D_{17}, 98%) CP 97%
DLM-215	Palmitic acid (D_{31}, 98%)
DLM-215-MPT	Palmitic acid (D_{31}, 98%)
ULM-10680	Palmitic acid (unlabeled)
CLM-3957	Palmitic acid, ethyl ester (palmitate-U-$^{13}C_{16}$, 98%) CP 95%
DLM-8793	Palmitic acid, ethyl ester (D_{31}, 98%)
CLM-8390	Palmitic acid, methyl ester (palmitate-U-$^{13}C_{16}$, 98%)
CLM-2241	Palmitoleic acid (U-$^{13}C_{16}$, 98%) CP 97%
CLM-3958	Palmitoleic acid, ethyl ester (palmitoleate-U-$^{13}C_{16}$, 98%) CP 97%
CLM-8391	Palmitoleic acid, methyl ester (palmitoleate-U-$^{13}C_{16}$, 98%) CP 97%
CLM-9582	*N*-Palmitoyl-D-sphingosine (ceramide d18:1/16:0) (palmitoyl-U-$^{13}C_{16}$, 99%) CP 95%
ULM-9580	*N*-Palmitoyl-D-sphingosine (ceramide d18:1/16:0) (unlabeled) CP 95%
DLM-1307	Pentadecanoic acid (methyl-D_3, 98%)
DLM-572	Pentanoic acid (D_9, 98%)
DLM-4341	DL-α-Phosphatidylcholine, dihexanoyl (DHPC) (D_{40}, 98%) CP 95%
DLM-605	L-α-Phosphatidylcholine, dimyristoyl (DMPC) (dimyristoyl-D_{54}, 97%) CP 95%
CLM-9668	DL-α-Phosphatidylcholine, dipalmitoyl (DPPC) (U-$^{13}C_{40}$, 98%) CP 95%
DLM-8256	DL-α-Phosphatidylcholine, dipalmitoyl (DPPC) (D_{80}, 98%) CP 95%
DLM-606	L-α-Phosphatidylcholine, dipalmitoyl (DPPC) (dipalmitoyl-D_{62}, 98%) CP 95%
DLM-7557	L-Phosphatidylglycerol, dipalmitoyl (DPPG) (dipalmitoyl-D_{62}, 98%)
DLM-6998	Phytanic acid (3-methyl-D_3, 98%) CP 95%
CLM-1889	Potassium palmitate (1-^{13}C, 99%)
CLM-6865	Potassium palmitate (1,2,3,4-$^{13}C_4$, 99%)
CLM-3943	Potassium palmitate (U-$^{13}C_{16}$, 98%)
CLM-3943-MPT	Potassium palmitate (U-$^{13}C_{16}$, 98%)
DLM-3773	Potassium palmitate (2,2-D_2, 97%)
DLM-3773-MPT	Potassium palmitate (2,2-D_2, 97%)
DLM-6199	Potassium palmitate (methyl-D_3, 98%)
DLM-6033	Potassium palmitate (7,7,8,8-D_4, 98%)
DLM-6033-MPT	Potassium palmitate (7,7,8,8-D_4, 98%)
DLM-8302	Pristanic acid (2-methyl-D_3, 98%) CP 95%
DLM-197	Sodium dodecyl sulfate (D_{25}, 98%)
CLM-1948	Sodium octanoate (1-^{13}C, 99%)
CLM-1948-MPT	Sodium octanoate (1-^{13}C, 99%)
CLM-3876	Sodium octanoate (1,2,3,4-$^{13}C_4$, 99%)
CLM-3980	Sodium octanoate (2,4,6,8-$^{13}C_4$, 99%)
CLM-9617	Sodium octanoate ($^{13}C_8$, 99%)
CLM-174	Sodium palmitate (1-^{13}C, 99%)
CLM-174-MPT	Sodium palmitate (1-^{13}C, 99%)
CLM-6059	Sodium palmitate (U-$^{13}C_{16}$, 98%)

MPT: microbiologically and pyrogen tested.

Chemical purity (CP) is 98% or greater, unless otherwise indicated.
For research use only. Not for use in diagnostic procedures.

Catalog No.	Description
ULM-9579	Sphingosine (unlabeled) CP 95%
CLM-490	Stearic acid (methyl-^{13}C, 99%)
CLM-676	Stearic acid (1-^{13}C, 99%)
CLM-6990	Stearic acid (U-$^{13}C_{18}$, 98%) CP 97%
DLM-1154	Stearic acid (methyl-D_3, 98%)
DLM-2712	Stearic acid (17,17,18,18,18-D_5, 98%)
DLM-379	Stearic acid (D_{35}, 98%)
CLM-8731	Stearic acid, ethyl ester (stearate-U-$^{13}C_{18}$, 98%)
CLM-8394	Stearic acid, methyl ester (stearate-U-$^{13}C_{18}$, 98%) CP 95%
CLM-6227	Stearic acid, potassium salt (1-^{13}C, 99%)
CLM-10365	Stearic acid, sodium salt (U-$^{13}C_{18}$, 98%) CP 97%
CLM-9932	Tetracosanoic acid (1,2,3,4,5,6-$^{13}C_6$, 99%) CP 96%
DLM-9952	Tetracosanoic acid (3,3,5,5-D_4, 98%) CP 95%
DLM-9179	Tetracosanoic acid (9,9,10,10-D_4, 98%)
DLM-7302	Tetracosanoic acid (D_{47}, 98%)
CNLM-8110	Tiglylglycine (glycine-$^{13}C_2$, 98%; ^{15}N, 98%)
DLM-1392	Tridecanoic acid (D_{25}, 98%)
CLM-162	Trioctanoin (1,1,1-$^{13}C_3$, 99%)
CLM-162-MPT	Trioctanoin (1,1,1-$^{13}C_3$, 99%)
CLM-163	Triolein (1,1,1-$^{13}C_3$, 99%)
CLM-163-MPT	Triolein (1,1,1-$^{13}C_3$, 99%)
CLM-164	Tripalmitin (1,1,1-$^{13}C_3$, 99%)
CLM-164-MPT	Tripalmitin (1,1,1-$^{13}C_3$, 99%)
CLM-350	Tripalmitin (2,2,2-$^{13}C_3$, 99%)
CLM-8445	Tripalmitin (glyceryl-$^{13}C_3$, 99%)
CLM-9468	Tripalmitin (1,1,1,2,2,2,3,3,3,4,4,4-$^{13}C_{12}$, 99%)
DLM-9986	Tripalmitin (glyceryl-D_5, 98-99%)
DLM-9462	Tripalmitin (trispalmitoyl-D_{93}, 98%)
DLM-9044	Tripalmitin (D_{98}, 98%)
DLM-7875	Tristearin (tristearoyl-D_{105}, 98%)
CLM-3399	Valproic acid (1,2,3,3′-$^{13}C_4$, 99%)
DLM-4291	Valproic acid (4,4,4′,4′-D_4, 98%)
DLM-7876	Valproic acid (propyl-1,1-D_2, pentanoic-3,3-D_2, 98%)
DLM-8875	Valproic acid (D_{15}, 98%)

➤ **Please visit isotope.com for a complete listing of fatty acids and lipids.**

See pages 29-33 for metabolite mixtures comprising fatty acids and lipids.

Flavonoids

Catalog No.	Description
CLM-9256	(+/-)-Catechin (2,3,4-$^{13}C_3$, 99%)
CLM-10554	(+/-)-Catechin gallate (2,3,4-$^{13}C_3$, 99%) CP 97%
CLM-9257	(+/-)-Epicatechin (2,3,4-$^{13}C_3$,99%) CP 97%
ULM-10550	(+/-)-Epicatechin (unlabeled) CP 97%
CLM-10553	(+/-)-Epicatechin gallate (2,3,4-$^{13}C_3$, 99%) CP 97%
CLM-10555	(+/-)-Epigallocatechin (2,3,4-$^{13}C_3$, 99%) CP 97%
CLM-10551	(+/-)-Epigallocatechin gallate (2,3,4-$^{13}C_3$, 99%) CP 97%
CLM-9756	Galangin (2,3,4-$^{13}C_3$, 99%) CP 95%
ULM-10281	Galangin (unlabeled)
CLM-10556	(+/-)-Gallocatechin (2,3,4-$^{13}C_3$, 99%) CP 97%
CLM-10552	(+/-)-Gallocatechin gallate (2,3,4-$^{13}C_3$, 99%) CP 97%
CLM-9755	Kaempferol (2,3,4-$^{13}C_3$, 99%) CP 95%
CLM-9754	Myricetin (2,3,4-$^{13}C_3$, 99%) CP 95%
CLM-9753	Quercetin (2,3,4-$^{13}C_3$, 99%) CP 95%
CLM-9259	Resveratrol (4-hydroxyphenyl-$^{13}C_6$, 99%)

MPT: microbiologically and pyrogen tested.

Chemical purity (CP) is 98% or greater, unless otherwise indicated.
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MRI/MRS Tracers

Catalog No.	Description
CLM-317	Acetic acid (1-^{13}C, 99%)
CLM-318	Acetic acid (2-^{13}C, 99%)
CLM-113	Acetic acid (1,2-$^{13}C_2$, 99%)
CLM-548	Choline chloride (1,2-$^{13}C_2$, 99%)
CLM-344†	Ethanol (1-^{13}C 99%) <6% H_2O
CLM-130†	Ethanol (2-^{13}C, 99%) <6% H_2O
CLM-551†	Ethanol (1,2-$^{13}C_2$, 99%) <6% H_2O
CLM-2291	Ethanolamine ($^{13}C_2$, 99%)
CLM-3911	Ethanolamine·HCl (1-^{13}C, 99%)
CLM-274	Ethanolamine·HCl (1,2-$^{13}C_2$, 99%)
CLM-522	Ethyl acetoacetate (1,3-$^{13}C_2$, 99%)
CLM-523	Ethyl acetoacetate (2,4-$^{13}C_2$, 99%)
CLM-1529	Fumaric acid ($^{13}C_4$, 99%)
CLM-4338†	DL-Glycerol (1-^{13}C, 99%)
CLM-1397	Glycerol (2-^{13}C, 99%)
CLM-1857	Glycerol (1,3-$^{13}C_2$, 99%)
DLM-10430†	Glycerol (2-D, 95-98%)
DLM-1229	Glycerol (1,1,2,3,3-D_5, 99%)
CLM-9675	1,2-Glycerol carbonate (carbonyl-^{13}C, 99%) CP >97%
CLM-8065	L-Malic acid ($^{13}C_4$, 99%)
CLM-1189	D-Mannitol (1-^{13}C, 98%)
CLM-646	Propionic acid (1-^{13}C, 99%)
CLM-647	Propionic acid ($^{13}C_3$, 99%)
CLM-8077	Pyruvic acid (1-^{13}C, 99%)
CLM-8849	Pyruvic acid (2-^{13}C, 99%) CP 95%
CLM-9505	Pyruvic acid (1,2-$^{13}C_2$, 99%)

Catalog No.	Description
CLM-156	Sodium acetate (1-^{13}C, 99%)
CLM-381	Sodium acetate (2-^{13}C, 99%)
CLM-440	Sodium acetate (1,2-$^{13}C_2$, 99%)
CLM-1256	Sodium butyrate (1-^{13}C, 99%)
CLM-10426	Sodium butyrate ($^{13}C_4$, 99%)
CLM-3706	Sodium D-3-hydroxybutyrate (2,4-$^{13}C_2$, 99%)
CLM-1577†	Sodium L-lactate (1-^{13}C, 99%) 20% w/w in H_2O
CLM-1578†	Sodium L-lactate (3-^{13}C, 98%) 20% w/w in H_2O
CLM-1579†	Sodium L-lactate ($^{13}C_3$, 98%) 20% w/w in H_2O
DLM-9071†	Sodium L-lactate (3,3,3-D_3, 98%) 20% w/w in H_2O
CLM-771	Sodium propionate (1-^{13}C, 99%)
CLM-1506	Sodium propionate (2-^{13}C, 99%)
CLM-4573	Sodium propionate (3-^{13}C, 99%)
CLM-3042	Sodium propionate (2,3-$^{13}C_2$, 99%)
CLM-1865	Sodium propionate ($^{13}C_3$, 99%)
CLM-1082	Sodium pyruvate (1-^{13}C, 99%)
CLM-1580	Sodium pyruvate (2-^{13}C, 99%)
CLM-1575	Sodium pyruvate (3-^{13}C, 99%)
CLM-1565	D-Sorbitol (1-^{13}C, 99%)
CLM-8529	D-Sorbitol ($^{13}C_6$, 98%)
CLM-9371	Succinic acid, disodium salt (2,3-$^{13}C_2$, 99%)

➤ **Please visit isotope.com for a complete listing of MRI/MRS products.**

Chemical purity (CP) is 98% or greater, unless otherwise indicated.
For research use only. Not for use in diagnostic procedures.

MS/MS Standards

Catalog No.	Description
DLM-10520	LYSO-PC 20:0 (eicosanoyl-12,12,13,13-D_4, 98%)
ULM-10521	LYSO-PC 20:0 (unlabeled)
CLM-10499	LYSO-PC 22:0 (docosanoyl-1,2,3,4,5,6-$^{13}C_6$, 99%)
DLM-10500	LYSO-PC 22:0 (docosanoyl-12,12,13,13-D_4, 98%)
ULM-10498	LYSO-PC 22:0 (unlabeled)
CLM-10496	LYSO-PC 24:0 (tetracosanoyl-1,2,3,4,5,6-$^{13}C_6$, 99%)
DLM-10497	LYSO-PC 24:0 (tetracosanoyl-12,12,13,13-D_4, 98%)
ULM-10495	LYSO-PC 24:0 (unlabeled)
CLM-9792	LYSO-PC 26:0 (hexacosanoyl-1,2,3,4,5,6-$^{13}C_6$, 99%)
DLM-10501	LYSO-PC 26:0 (hexacosanoyl-12,12,13,13-D_4, 98%)
ULM-9791	LYSO-PC 26:0 (unlabeled)
NSK-NI	Acid sphingomyelinase substrate and internal standard
NSK-KR	Galactocerebrosidase substrate and internal standard
NSK-FA	α-Galactosidase substrate and internal standard
NSK-GA	Glucocerebrosidase substrate and internal standard
NSK-MP	α-L-Iduronidase substrate and internal standard
NSK-PO	Lysosomal α-Glucosidase substrate and internal standard
CLM-3678	Adenosine (ribose-$^{13}C_5$, 98%) CP 97%
CNLM-3946	β-Alanine ($^{13}C_3$, 98%; ^{15}N, 96-99%)
CLM-9308	DL-Alanine (^{15}N, 98%)
CNLM-9007-CA	L-Argininosuccinic acid, barium salt·$2H_2O$ (arginine-$^{13}C_6$, 99%; $^{15}N_4$, 99%) CP 90%
ULM-9008-CA	L-Argininosuccinic acid, barium salt·$3H_2O$ (unlabeled) CP 90%
CLM-7933	Creatine (guanidino-^{13}C, 99%)
DLM-1302	Creatine (methyl-D_3, 98%)
DLM-3653	Creatinine (*N*-methyl-D_3, 98%)
CLM-4579	2′-Deoxyadenosine·H_2O (ribose-$^{13}C_5$, 99%)
DLM-6013	Ethylmalonic acid (methyl-D_3, 98%)

Catalog No.	Description
CLM-1570	D-Galactose (U-$^{13}C_6$, 99%)
DLM-9998	Guanidinoacetic acid (2,2-D_2, 97%)
DLM-3619	DL-Homocystine (3,3,3′,3′4,4,4′,4′-D_8, 98%)
CLM-8742	allo-Isoleucine ($^{13}C_6$, 97-99%)
DLM-1505	allo-Isoleucine (D_{10}, 98%)
CLM-2247-H	L-Lysine·2HCl ($^{13}C_6$, 99%)
DLM-2640	L-Lysine·2HCl (4,4,5,5-D_4, 96-98%)
DLM-2312	DL-2-methylcitric acid (methyl-D_3, 98%) CP 90%
CLM-8111	3-Methylcrotonylglycine (glycine-$^{13}C_2$, 98%; ^{15}N, 98%)
CLM-9426	Methylmalonic acid ($^{13}C_4$, 99%)
DLM-387	Methylmalonic acid (methy-D_3, 98%)
ULM-10578	Methylmalonic acid, disodium salt (unlabeled) CP 95%
CLM-4724	L-Ornithine·HCl ($^{13}C_5$, 98%)
DLM-2969	L-Ornithine·HCl (3,3,4,4,5,5-D_6, 98%)
NLM-1048	Orotic acid·H_2O (1,3-$^{15}N_2$, 98%)
CLM-10604	Phenylpyruvic acid, sodium salt ($^{13}C_9$, 99%)
CLM-2260	L-Proline ($^{13}C_5$, 99%)
DLM-487	L-Proline (D_7, 97-98%)
ULM-8333	L-Proline (unlabeled)
CLM-7944	3-(5-Methyl-1H-pyrazol-3-yl)propanoic acid (methyl-^{13}C, pyrazolyl-$^{13}C_3$, 3-^{13}C, 99%)
NLM-1072	Sarcosine (^{15}N, 98%)
CNLM-8183	Suberylglycine (glycine-$^{13}C_2$, 98%; ^{15}N, 98%) CP 95%
DLM-10758	Trisodium 2-methylcitrate (methyl-D_3, 98%) (racemic mixture of diastereomers) CP 90%
CLM-4290-H	L-Tryptophan ($^{13}C_{11}$, 99%)
DLM-6903	L-Tryptophan (D_8, 97-98%)

➤ **Please visit isotope.com for a complete listing of MS/MS standards.**

Neurotransmitters

Catalog No.	Description
DLM-11029	*N*-Acetyl-5-hydroxytryptamine (acetyl-D_3, 98%)
CLM-8666	4-Aminobutyric acid ($^{13}C_4$, 97-99%)
CLM-548	Choline chloride (1,2-$^{13}C_2$, 99%)
DLM-549	Choline chloride (trimethyl-D_9, 98%)
DLM-549-MPT	Choline chloride (trimethyl-D_9, 98%)
CLM-3368	Dopamine·HCl (2-(3,4-dihydroxyphenyl)- ethylamine·HCl) (1-^{13}C, 99%)
CLM-3369	Dopamine·HCl (2-(3,4-dihydroxyphenyl)- ethylamine·HCl) (ring-$^{13}C_6$, 99%)
DLM-2833	Dopamine·HCl (2-(3,4-dihydroxyphenyl)- ethylamine·HCl) (1,1-D_2, 93%) CP 96-98%
DLM-2834	Dopamine·HCl (2-(3,4-dihydroxyphenyl)- ethylamine·HCl) (2,2-D_2, 97-98%)
DLM-2181	Dopamine·HCl (2-(3,4-dihydroxyphenyl)- ethylamine·HCl) (ring-D_3, 98%)
DLM-2498	Dopamine·HCl (2-(3,4-dihydroxyphenyl)- ethylamine·HCl) (1,1,2,2-D_4, 97-98%)

Catalog No.	Description
DLM-2290	Dopamine·HCl (2-(3,4-dihydroxyphenyl)- ethylamine·HCl) (ring-D_3, 95%; 2,2-D_2, 95%)
CNLM-3445	Dopamine·HCl (2-(3,4-dihydroxyphenyl)- ethylamine·HCl) (1-^{13}C, 99%; ^{15}N, 99%)
CLM-674	L-Glutamic acid (1-^{13}C, 99%)
CLM-1800-H	L-Glutamic acid ($^{13}C_5$, 99%)
DLM-556	L-Glutamic acid (2,3,3,4,4-D_5, 98%)
CNLM-554-H	L-Glutamic acid ($^{13}C_5$, 99%; ^{15}N, 99%)
DLM-2911	Histamine·2HCl (α,β,β,β-D_4, 98%)
CLM-9936-C	5-Hydroxyindole-3-acetic acid (3α,4,5,6,7,7α-$^{13}C_6$, 98%)
DLM-3560	DL-Metanephrine·HCl (α,β,β-D_3, 98%)
DLM-2950	N-τ-Methylhistamine·2HCl (*N*-methyl-D_3, 98%)
DLM-8820	DL-Norepinephrine·HCl (ring-D_3,1,2,2-D_3, 99%)
DLM-8609	DL-Normetanephrine·HCl (α,β,β-D_3, 98%)
DLM-11030	Serotonin·HCl ($\alpha,\alpha,\beta,\beta$-$D_4$, 98%) CP 96%
DLM-8075	Tyramine·HCl (1,1,2,2-D_4, 98%)

➤ **Please visit isotope.com for a complete listing of neurotransmitters.**

MPT: microbiologically and pyrogen tested.

Chemical purity (CP) is 98% or greater, unless otherwise indicated.
For research use only. Not for use in diagnostic procedures.

Nucleic Acids

Catalog No.	Description
CLM-1654	Adenine (8-^{13}C, 95%)
NLM-6924	Adenine·HCl ($^{15}N_5$, 98%)
CLM-7674	Adenosine (3′-^{13}C, 98%)
CLM-3698	Adenosine (ribose-2-^{13}C, 99%)
CLM-3678	Adenosine (ribose-$^{13}C_5$, 98%) CP 97%
DLM-7676	Adenosine (ribose-1-D, 98%)
DLM-7677	Adenosine (ribose-2-D, 97%)
DLM-7678	Adenosine (ribose-5,5-D_2, 98%)
CNLM-3806-CA	Adenosine ($^{13}C_{10}$, 98%; $^{15}N_5$, 96-98%)
NLM-9750-SL	Adenosine (U-$^{15}N_5$, 96-98%)
CNLM-3802	Adenosine 5′-monophosphate ($^{13}C_{10}$, 98%; $^{15}N_5$, 96-98%)
NLM-3792-SL	Adenosine 5′-monophosphate, lithium salt (U-$^{15}N_5$, 96-98%)
DLM-7514-CA†	Adenosine 5′-triphosphate (ATP), ammonium salt (D, 97%) CP >90%
DLM-8815-CA†	Adenosine 5′-triphosphate (ATP), ammonium salt (2-D, 97%) CP >90%
DLM-8922-CA†	Adenosine 5′-triphosphate (ATP), ammonium salt (ribose-3′,4′,5′,5″-D_4,98%) CP >90%
NLM-3987-CA†	Adenosine 5′-triphosphate (ATP), ammonium salt ($^{15}N_5$, 98-99%) CP >90%
CNLM-4265-CA†	Adenosine 5′-triphosphate (ATP), ammonium salt ($^{13}C_{10}$, 98-99%;$^{15}N_5$, 98-99%) CP >90%
CLM-3605	Adenosine·H_2O (ribose-1-^{13}C, 99%) CP 95%
CLM-3611	Cytidine (ribose-1-^{13}C, 99%)
CLM-3699	Cytidine (ribose-2-^{13}C, 99%)
CLM-3679	Cytidine (ribose-$^{13}C_5$, 98%)
DLM-7681	Cytidine (ribose-5,5-D_2, 98%)
NLM-3797	Cytidine ($^{15}N_3$, 96-98%)
CNLM-3807	Cytidine ($^{13}C_9$, 98%; $^{15}N_3$, 96-98%)
NLM-3793-SL	Cytidine 5′-monophosphate, lithium salt (U-$^{15}N_3$, 96-98%) CP >90%
CNLM-3803-SL†	Cytidine 5′-monophosphate, lithium salt (U-$^{13}C_9$, 98%; U-$^{15}N_3$, 96-98%) (in solution) CP >90%
DLM-8924-CA†	Cytidine 5′-triphosphate (CTP), ammonium salt (5-D, ribose-3′,4′,5′,5″-D_4, 97%) CP >90%
DLM-9267-CA†	Cytidine 5′-triphosphate (CTP), ammonium salt (5,6-D_2, 97%) CP 90%
DLM-8594-CA†	Cytidine 5′-triphosphate (CTP), ammonium salt (cytosine-5-D, 6-H; ribose-1,2,3,4,5,5-D_6, 96-97%)
DLM-7515-CA†	Cytidine 5′-triphosphate (CTP), ammonium salt (D_8, 97%) CP >90%
NLM-4266-CA†	Cytidine 5′-triphosphate (CTP), ammonium salt ($^{15}N_3$, >96%) CP >90%
CNLM-4267-CA†	Cytidine 5′-triphosphate (CTP), ammonium salt ($^{13}C_9$, 99%; $^{15}N_3$, 96-98%) CP >90%
DLM-9101-CA	Cytidine·H_2O (5,6-D_2, 98%) CP 95%
CLM-1001	Cytosine (2-^{13}C, 99%)
CNLM-4424	Cytosine (2-^{13}C, 99%; 1,3-$^{15}N_2$, 98%)
DLM-4750	2-Deoxy-D-ribose (5,5-D_2, 98%)
NLM-3919-SL	2′-Deoxyadenosine 5′-monophosphate (U-$^{15}N_5$, 98%)
CNLM-3918-SL	2′-Deoxyadenosine 5′-monophosphate, lithium salt (U-$^{13}C_{10}$, 98%; U-$^{15}N_5$, 98%)
CNLM-6219-CA†	2′-Deoxyadenosine 5′-triphosphate (dATP) ($^{13}C_{10}$, 98%; $^{15}N_5$, 96-98%) CP >90%
DLM-7507-SL†	2-Deoxyadenosine 5′-triphosphate (dATP), lithium salt (U-D, 97%) CP >90%
NLM-6215-SL†	2′-Deoxyadenosine 5′-triphosphate (dATP), lithium salt (U-$^{15}N_5$, 98%) CP >90%
NLM-6829	2′-Deoxyadenosine phosphoramidite ($^{15}N_5$, 98%) CP 95%
CNLM-6828	2′-Deoxyadenosine phosphoramidite ($^{13}C_{10}$, 98%; $^{15}N_5$, 98%) CP 95%
CLM-3700	2′-Deoxyadenosine·H_2O (deoxyribose-1-^{13}C, 99%)
CLM-3701	2′-Deoxyadenosine·H_2O (deoxyribose-2-^{13}C, 99%)
CLM-7682	2′-Deoxyadenosine·H_2O (ribose-5-^{13}C, 98%)
CLM-4579	2′-Deoxyadenosine·H_2O (ribose-$^{13}C_5$, 99%)
DLM-7683	2′-Deoxyadenosine·H_2O (ribose-5,5-D_2, 98%)
NLM-3895	2′-Deoxyadenosine·H_2O ($^{15}N_5$, 96-98%)
NLM-3897	2′-Deoxycytidine ($^{15}N_3$, 96-98%)
NLM-3921	2′-Deoxycytidine 5′-monophosphate ($^{15}N_3$, 96%)
DLM-7508-SL†	2-Deoxycytidine 5′-triphosphate, lithium salt (U-D, 97%) CP >90%
NLM-6216-SL†	2′-Deoxycytidine 5′-triphosphate, lithium salt (U-$^{15}N_3$, 98%) CP >90%
CNLM-6220-SL†	2′-Deoxycytidine 5′-triphosphate, lithium salt (U-$^{13}C_9$, 98%;U-$^{15}N_3$, 98%) CP >90%
NLM-6827	2′-Deoxycytidine phosphoramidite ($^{15}N_3$, 97-98%) CP 95%
CNLM-6830	2′-Deoxycytidine phosphoramidite ($^{13}C_9$, 98%; $^{15}N_3$, 98%) CP 95%
CLM-3702	2′-Deoxycytidine·H_2O (deoxyribose-2-^{13}C, 99%)
CLM-7684	2′-Deoxycytidine·H_2O (ribose-1-^{13}C, 98%)
DLM-7685	2′-Deoxycytidine·H_2O (ribose-5,5-D_2, 98%)
CNLM-3900-CA	2′-Deoxyguanosine ($^{13}C_{10}$, 98%; $^{15}N_5$, 96-98%)
NLM-6835-SL†	2′-Deoxyguanosine 5′-monophosphate (U-$^{15}N_5$, 98%) CP >90%
CNLM-6836-SL	2′-Deoxyguanosine 5′-monophosphate (U-^{13}C, 98%; U-^{15}N, 98%)
NLM-6217-CA†	2′-Deoxyguanosine 5′-triphosphate (DTP), ammonium salt ($^{15}N_5$; 98-99%) CP >90%
CNLM-6221-CA†	2′-Deoxyguanosine 5′-triphosphate (DTP), ammonium salt ($^{13}C_{10}$, 98%; $^{15}N_5$, 96-98%) CP >90%
DLM-7509-SL†	2-Deoxyguanosine 5′-triphosphate (DTP), lithium salt (U-D, 97%) CP >90%
NLM-6217-SL†	2′-Deoxyguanosine 5′-triphosphate (DTP), lithium salt (U-$^{15}N_5$, 98%) CP >90%
NLM-6826	2′-Deoxyguanosine phosphoramidite ($^{15}N_5$, 98%) CP 95%
CNLM-6825	2′-Deoxyguanosine phosphoramidite ($^{13}C_{10}$, 98%; $^{15}N_5$, 98%) CP 95%
CLM-7686	2′-Deoxyguanosine·H_2O (ribose-1-^{13}C, 98%)
DLM-7687	2′-Deoxyguanosine·H_2O (ribose-5,5-D_2, 98%)
NLM-3899-CA	2′-Deoxyguanosine·H_2O ($^{15}N_5$, 98%) CP 95%
CNLM-8771-CA†	2′-Deoxyuridine, ammonium salt ($^{13}C_9$, 98-99%; $^{15}N_2$, 98-99%) CP 90%
DLM-4391	5,6-Dihydrothymine (5,6,6-D_3, methyl-D_3, 95%)
CNLM-4510	5,6-Dihydrouracil ($^{13}C_4$, 99%; $^{15}N_2$, 98%)
CNLM-3752	Fapyadenine (formyl-^{13}C, 98%; diamino-$^{15}N_2$, 98%)
NLM-798	5-Fluorouracil (1,3-$^{15}N_2$, 99%)
CNLM-3916	5-Fluorouracil ($^{13}C_4$, 99%; $^{15}N_2$, 98%)

*Compounds available in dry and solution forms.
† Compounds available in solution only.
‡ Compounds available in dry and solution forms; chemical purity varies 95-98%.

Chemical purity (CP) is 98% or greater, unless otherwise indicated.
For research use only. Not for use in diagnostic procedures.

Catalog No.	Description
DLM-1846	Guanidine·DCl (D_6, 98%)
CLM-1019	Guanine (8-^{13}C, 98%)
NLM-6925	Guanine ($^{15}N_5$, 98%)
CNLM-3990	Guanine (8-^{13}C, 98%; 7,9-$^{15}N_2$, 98%)
NLM-3798	Guanosine ($^{15}N_5$, 96-98%)
NLM-3794-SL	Guanosine 5′-monophosphate, lyophilized powder (U-$^{15}N_5$, 98%) CP >90%
CNLM-3804-SL*	Guanosine 5′-monophosphate, lithium salt (U-$^{13}C_{10}$, 98%; U-$^{15}N_5$, 98%) CP >90%
DLM-7516-CA†	Guanosine 5′-triphosphate (GTP), ammonium salt (D, 97%) CP >90%
DLM-8923-CA†	Guanosine 5′-triphosphate (GTP), ammonium salt (ribose-3′,4′,5′,5″-D_4, 98%) CP >90%
NLM-4268-CA†	Guanosine 5′-triphosphate (GTP), ammonium salt ($^{15}N_5$, 98-99%) (in solution) CP >90%
CNLM-4269-CA†	Guanosine 5′-triphosphate (GTP), ammonium salt ($^{13}C_{10}$, 99%; $^{15}N_5$, 98%) CP >90%
CLM-7688	Guanosine·H_2O (ribose-1-^{13}C, 98%)
DLM-7689	Guanosine·H_2O (ribose-5,5-D_2, 98%)
CNLM-3808-CA	Guanosine·H_2O ($^{13}C_{10}$, 98%; $^{15}N_5$, 96-98%)
NLM-6715	8-Hydroxy-2′-deoxyguanosine ($^{15}N_5$, 98%) CP 95%
CNLM-4392	5-Hydroxycytosine (2-^{13}C, 99%; 1,3-$^{15}N_2$, 98%)
CLM-8042	Hypoxanthine ($^{13}C_5$, 99%)
DLM-8658	Hypoxanthine (2,8-D_2, 98%)
DLM-2923	Hypoxanthine (2,8,9-D_3, OD, 98%)
NLM-8500	Hypoxanthine ($^{15}N_4$, 98%)
CNLM-7894	Hypoxanthine ($^{13}C_5$, 99%; $^{15}N_4$, 98%)
NLM-4264	Inosine ($^{15}N_4$, 95%)
NLM-8712-CA†	Inosine 5′-monophosphate, ammonium salt ($^{15}N_4$, 98-99%) CP >90%
DLM-7471	3-Methyladenine (methyl-D_3, 98%)
DLM-7473	6-*O*-Methylguanine (methyl-D_3, 98%)
DLM-7472	7-Methylguanine (methyl-D_3, 98%)
CLM-10671	Nicotinamide adenine dinucleotide (NAD^+), NH_4 salt (ribose-$^{13}C_5$, 98%) CP 96%
NLM-1048	Orotic acid·H_2O (1,3-$^{15}N_2$, 98%)
NLM-1048-MPT	Orotic acid·H_2O (1,3-$^{15}N_2$, 98%)
CNLM-10662	Orotic acid·H_2O (2-^{13}C, 99%; 1,3-$^{15}N_2$, 98%)
NLM-10907	Orotic acid, sodium salt ($^{15}N_2$, 98%)
CLM-9427-CA	1-(5′-Phosphoribosyl)-5-amino-4-imidazole-carboxamide salt·$2NH_4^+$ (ribose-$^{13}C_5$, 99%) CP 90%
CLM-3629	Ribothymidine (ribose-1-^{13}C, 99%)
NLM-7565-SL	RNA standard (^{15}N, 98%)
CLM-6622	Taurine (1,2-$^{13}C_2$, 98%)
DLM-8057	Taurine (D_4, 98%) CP 95%
NLM-4472	Taurine (^{15}N, 98%)
CLM-4289	Thymidine (deoxyribose-1-^{13}C, 99%)
CLM-3703	Thymidine (deoxyribose-2-^{13}C, 99%)
CLM-7692	Thymidine (deoxyribose-3-^{13}C, 99%)
CLM-3647	Thymidine (methyl-^{13}C, 98%)
DLM-7691	Thymidine (ribose-5,5-D_2, 98%)

GMP: good manufacturing practices grade
MPT: microbiologically and pyrogen tested.

*Compounds available in dry and solution forms.
† Compounds available in solution only.

Chemical purity (CP) is 98% or greater, unless otherwise indicated.
For research use only. Not for use in diagnostic procedures.

Catalog No.	Description
DLM-3327	Thymidine (methyl-D_3, ring-6-D, 97%) CP 95%
NLM-3901	Thymidine ($^{15}N_2$, 96-98%)
NLM-3901-MPT	Thymidine ($^{15}N_2$, 96-98%)
CNLM-3902	Thymidine ($^{13}C_{10}$, 98%; $^{15}N_2$, 96-98%)
NLM-3925	Thymidine 5′-monophosphate ($^{15}N_2$, 98%)
CNLM-3924-SL	Thymidine 5′-monophosphate (U-$^{13}C_{10}$, 98%; U-$^{15}N_2$, 98%)
DLM-7510-SL†	Thymidine 5′-triphosphate (TTP), lithium salt (U-D, 97%) CP >90%
NLM-6218-SL†	Thymidine 5′-triphosphate (TTP), lithium salt (U-$^{15}N_2$, 98%) CP >90%
CNLM-6222-SL†	Thymidine 5′-triphosphate (TTP), lithium salt (U-$^{13}C_{10}$, 98%;U-$^{15}N_2$, 98%) CP >90%
NLM-6823	Thymidine phosphoramidite ($^{15}N_2$, 96-98%) CP 95%
CNLM-6824	Thymidine phosphoramidite ($^{13}C_{10}$, 98%; $^{15}N_2$, 98%) CP 95%
CLM-3764	Thymine (6-^{13}C, 99%)
DLM-1089	Thymine (α,α,α,6-D_4, 98%)
NLM-3995	Thymine (1,3-$^{15}N_2$, 98%)
CNLM-6945	Thymine ($^{13}C_5$, 98%; $^{15}N_2$, 98%)
CLM-3276	Uracil (2-^{13}C, 99%)
CLM-3276-GMP	Uracil (2-^{13}C, 99%)
CLM-3276-MPT	Uracil (2-^{13}C, 99%)
CLM-692	Uracil (4,5-$^{13}C_2$, 99%)
DLM-8633	Uracil (5-D, 98%)
DLM-8502	Uracil (5,6-D_2, 98%)
NLM-637	Uracil (1,3-$^{15}N_2$, 98%)
CNLM-3917	Uracil ($^{13}C_4$, 99%; $^{15}N_2$, 98%)
NLM-1697	Uric acid (1,3-$^{15}N_2$, 98%)
NLM-1697-MPT	Uric acid (1,3-$^{15}N_2$, 98%)
CLM-3630	Uridine (ribose-1-^{13}C, 99%)
CNLM-3809	Uridine ($^{13}C_9$, 98%; $^{15}N_2$, 96-98%)
DLM-7693	Uridine (ribose-5,5-D_2, 98%)
NLM-812	Uridine ($^{15}N_2$, 98%)
NLM-3795	Uridine 5′-monophosphate ($^{15}N_2$, 96-98%)
CNLM-3805-SL†	Uridine 5′-monophosphate, lithium salt (U-$^{13}C_9$, 98%; U-$^{15}N_2$, 96-98%) (in solution) CP > 90%
DLM-8925-CA†	Uridine 5′-triphosphate (UTP), ammonium salt (5-D, ribose-3′,4′,5′,5″-D_4, 98%) (in solution) CP >90%
DLM-9100-CA†	Uridine 5′-triphosphate (UTP), ammonium salt (5,6-D_2, 98%) CP >90%
DLM-8637-CA†	Uridine 5′-triphosphate (UTP), ammonium salt (uracil-5-D, 6-H; ribose-1,2,3,4,5,5-D_6, 96-97%) CP >90%
DLM-7517-CA†	Uridine 5′-triphosphate (UTP), ammonium salt (D_8, 97%) CP 90%
NLM-4270-CA	Uridine 5′-triphosphate (UTP), ammonium salt ($^{15}N_2$, 98-99%) CP >90%
CNLM-4271-CA†	Uridine 5′-triphosphate (UTP), ammonium salt ($^{13}C_9$, 99%; $^{15}N_2$, 98%) CP >90%
NLM-1698	Xanthine (1,3-$^{15}N_2$, 98%) CP 90%
CLM-8700-CA†	Xanthosine-5′-monophosphate, ammonium salt ($^{13}C_{10}$, 98%) CP >90%

➤ **Please visit isotope.com for a complete listing of nucleic acids.**

See pages 31-33 for metabolite mixtures comprising nucleic acids.

Organic Acids, Their Derivatives, and Conjugate Salts

Catalog No.	Description
CLM-317	Acetic acid (1-^{13}C, 99%)
CLM-318	Acetic acid (2-^{13}C, 99%)
CLM-113	Acetic acid (1,2-$^{13}C_2$, 99%)
CLM-9878	*trans*-Aconitic acid (2,4,4′-$^{13}C_3$, 99%) CP 95%
CLM-11066	*cis*-Aconitic acid, tripotassium salt ($^{13}C_6$, 99%) CP 95%
CLM-7337	Citric acid (1,5-$^{13}C_2$, 98%)
CLM-148	Citric acid (2,4-$^{13}C_2$, 99%)
CLM-9876	Citric acid (1,5,6-carboxyl-$^{13}C_3$, 99%)
CLM-9021	Citric acid ($^{13}C_6$, 99%) CP 97%
DLM-3487	Citric acid (2,2,4,4-D_4, 98%)
ULM-10650	Citric acid (unlabeled)
DLM-10776	L-Citrulline (2,3,3,4,4,5,5-D_7, 98%)
CLM-7933	Creatine (guanidino-^{13}C, 99%)
DLM-1302	Creatine (methyl-D_3, 98%) CP 97%
DLM-1302-MPT	Creatine (methyl-D_3, 98%) CP 97%
CLM-1529	Fumaric acid ($^{13}C_4$, 99%)
DLM-1539	Fumaric acid (2,3-D_2, 98%)
DLM-7654	Fumaric acid (D_4, 98%)
CDLM-6062	Fumaric acid (1-^{13}C, 99%; 2,3-D_2, 98%)
CDLM-8473	Fumaric acid (1,4-$^{13}C_2$, 99%; 2,3-D_2, 98%)
ULM-10653	Fumaric acid (unlabeled)
CLM-10890	Fumaric acid, disodium salt ($^{13}C_4$, 99%)
CLM-10661	L-Glyceric acid, calcium salt dihydrate ($^{13}C_3$, 99%)
CLM-373	Homovanillic acid (1,2-$^{13}C_2$, 98-99%)
DLM-2738	Homovanillic acid (phenyl-D_3, 2,2-D_2, 96-98%)
COLM-376	Homovanillic acid (ring-$^{13}C_6$, 99%; 4-hydroxy-^{18}O, 90-95%)
CLM-10351	DL-2-Hydroxyglutaric acid, disodium salt ($^{13}C_5$, 99%)
ULM-10479	DL-2-Hydroxyglutaric acid, disodium salt (unlabeled)
DLM-9104	(RS)-2-Hydroxyglutaric acid, disodium salt (2,3,3-D_3; OD, 98%) CP 95%
CLM-6820	α-Ketobutyric acid, sodium salt (methyl-^{13}C, 99%)
CLM-6164	α-Ketobutyric acid, sodium salt ($^{13}C_4$, 98%)
CDLM-7318	α-Ketobutyric acid, sodium salt (methyl-^{13}C, 99%; 3,3-D_2, 98%)
CDLM-7353	α-Ketobutyric acid, sodium salt (4-^{13}C, 99%; 3,3,4,4-D_4, 98%)
CDLM-4611	α-Ketobutyric acid, sodium salt ($^{13}C_4$, 98%; 3,3-D_2, 98%)
CLM-2411	α-Ketoglutaric acid ($^{13}C_5$, 99%) CP >90%
DLM-9476	α-Ketoglutaric acid (D_6, 98%)
CLM-4442	α-Ketoglutaric acid, disodium salt (1,2,3,4-$^{13}C_4$, 99%) CP 97%
ULM-10648	α-Ketoglutaric acid, disodium salt, hydrate (unlabeled) CP 90%
CLM-2093	α-Ketoisocaproic acid, sodium salt (1-^{13}C, 99%)
CLM-4826	α-Ketoisocaproic acid, sodium salt (1,2-$^{13}C_2$, 99%)
CLM-4785	α-Ketoisocaproic acid, sodium salt ($^{13}C_6$, 99%)
DLM-1944	α-Ketoisocaproic acid, sodium salt (methyl-D_3, 98%)
DLM-1944-MPT	α-Ketoisocaproic acid, sodium salt (methyl-D_3, 98%)
DLM-4214	α-Ketoisocaproic acid, sodium salt (isopropyl-D_7, 98%)
CLM-6821	α-Ketoisovaleric acid, sodium salt (dimethyl-$^{13}C_2$, 99%)
CLM-4418	α-Ketoisovaleric acid, sodium salt ($^{13}C_5$, 98%)
DLM-4646	α-Ketoisovaleric acid, sodium salt (D_7, 98%)
CDLM-7317	α-Ketoisovaleric acid, sodium salt (3-methyl-^{13}C, 99%; 3,4,4,4-D_4, 98%)
CDLM-8446	α-Ketoisovaleric acid, sodium salt (dimethyl-$^{13}C_2$, 98%; 3-methyl-D_2, 4,4-D_2, 98%)
CDLM-7354	α-Ketoisovaleric acid, sodium salt (3-methyl-^{13}C, 99%; 3-methyl-D_2, 3,4,4,4,D_4, 98%)
CDLM-8100	α-Ketoisovaleric acid, sodium salt (1,2,3,4-$^{13}C_4$, 99%; 3,4′,4′,4′-D_4, 97-98%)
CDLM-4418	α-Ketoisovaleric acid, sodium salt ($^{13}C_5$, 98%; 3-D, 98%)
DLM-7842	L-Kynurenine sulfate (ring-D_4, 3,3-D_2, 97%) CP 95%
CLM-9884	L-Kynurenine sulfate·½H_2O ($^{13}C_{10}$, 99%)
DLM-1129	Maleic acid (2,3-D_2, 98%)
CLM-310	Maleic anhydride (1,4-$^{13}C_2$, 99%)
CLM-312	Maleic anhydride (2,3-$^{13}C_2$, 99%)
CLM-6019	Maleic anhydride ($^{13}C_4$, 99%)
DLM-1853	Maleic anhydride (D_2, 98%)
DLM-9045	DL-Malic acid (2,3,3-D_3, 98%)
CLM-8065	L-Malic acid ($^{13}C_4$, 99%)
CLM-10826	Malic acid, disodium salt monohydrate ($^{13}C_4$, 99%)
DLM-2312	DL-2-Methylcitric acid (methyl-D_3, 98%) CP 90%
CLM-4285	3-Methylglutaconic acid (2,4-$^{13}C_2$, 3-methyl-^{13}C, 99%)
CLM-9426	Methylmalonic acid ($^{13}C_4$, 99%)
DLM-387	Methylmalonic acid (methyl-D_3, 98%)
ULM-10578	Methylmalonic acid, disodium salt (unlabeled) CP 95%
CNLM-9247	3-Methyluric acid (2,4,5,6-$^{13}C_4$, 99%; 1,3,9-$^{15}N_3$, 98%)
CLM-3551	Potassium phosphoenol pyruvate (2-^{13}C, 99%)
CLM-2723	Potassium phosphoenol pyruvate (3-^{13}C, 99%)
CLM-3398	Potassium phosphoenol pyruvate (2,3-$^{13}C_2$, 99%)
CLM-646	Propionic acid (1-^{13}C, 99%)
CLM-647	Propionic acid ($^{13}C_3$, 99%)
DLM-2488	Propionic acid (2,2-D_2, 98%)
DLM-1137	Propionic acid (methyl-D_3, 98%)
DLM-1919	Propionic acid (D_5, 98%)
DLM-599	Propionic acid (D_6, 98%)
CLM-8077	Pyruvic acid (1-^{13}C, 99%)
CLM-8077-CTM	Pyruvic acid (1-^{13}C, 99%)
CLM-8849	Pyruvic acid (2-^{13}C, 99%) CP 95%
CLM-9505	Pyruvic acid (1,2-$^{13}C_2$, 99%)
DLM-10675	Pyruvic acid (D_4, 98%)
CDLM-10674	Pyruvic acid (1-^{13}C, 99%; D_4, 98%)
CLM-2471	Sodium acetate – ^{13}C depleted (1,2-$^{12}C_2$, 99.95%)
CLM-156	Sodium acetate (1-^{13}C, 99%)
CLM-156-CTM	Sodium acetate (1-^{13}C, 99%)
CLM-156-MPT	Sodium acetate (1-^{13}C, 99%)
CLM-381	Sodium acetate (2-^{13}C, 99%)
CLM-381-MPT	Sodium acetate (2-^{13}C, 99%)
CLM-440	Sodium acetate (1,2-$^{13}C_2$, 99%)
CLM-440-CTM	Sodium acetate (1,2-$^{13}C_2$, 99%)
CLM-440-MPT	Sodium acetate (1,2-$^{13}C_2$, 99%)
DLM-3126	Sodium acetate (D_3, 99%)
DLM-3126-MPT	Sodium acetate (D_3, 99%)
OLM-1077	Sodium acetate ($^{18}O_2$, 95%)
CDLM-611	Sodium acetate (1-^{13}C, 99%; D_3, 98%)

CTM: manufactured following ICH Q7, Section XIX
MPT: microbiologically and pyrogen tested.

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Catalog No.	Description
CDLM-1240	Sodium acetate (2-^{13}C, 99%; D_3, 98%)
CDLM-3457	Sodium acetate (1,2-$^{13}C_2$, 99%; D_3, 98%)
CLM-1256	Sodium butyrate (1-^{13}C, 99%)
CLM-4780	Sodium butyrate (2-^{13}C, 99%)
DLM-641	Sodium butyrate (3,3,4,4,4-D_5, 98%)
DLM-7616	Sodium butyrate (D_7, 98%)
CLM-583	Sodium formate (^{13}C, 99%)
OLM-8123	Sodium formate ($^{18}O_2$, 95%)
CLM-3706	Sodium D-3-hydroxybutyrate (2,4-$^{13}C_2$, 99%)
CLM-3706-MPT	Sodium D-3-hydroxybutyrate (2,4-$^{13}C_2$, 99%)
CLM-3853	Sodium D-3-hydroxybutyrate ($^{13}C_4$, 99%) CP 97%
CLM-3853-MPT	Sodium D-3-hydroxybutyrate ($^{13}C_4$, 99%) CP 97%
DLM-10415[†]	Sodium DL-3-hydroxybutyrate (D_4, 98%) CP 95%
CLM-10768	Sodium D-lactate ($^{13}C_3$, 98%) 20% w/w in H_2O
CLM-1577	Sodium L-lactate (1-^{13}C, 99%) 20% w/w in H_2O
CLM-1577-MPT	Sodium L-lactate (1-^{13}C, 99%) 20% w/w in H_2O
CLM-1578	Sodium L-lactate (3-^{13}C, 98%) 20% w/w in H_2O
CLM-1578-MPT	Sodium L-lactate (3-^{13}C, 98%) 20% w/w in H_2O
CLM-1579	Sodium L-lactate ($^{13}C_3$, 98%) 20% w/w in H_2O
CLM-1579-MPT	Sodium L-lactate ($^{13}C_3$, 98%) 20% w/w in H_2O
CLM-1579-N	Sodium L-lactate ($^{13}C_3$, 98%)
DLM-9071	Sodium L-lactate (3,3,3-D_3, 98%) 20% w/w in H_2O
DLM-9071-MPT	Sodium L-lactate (3,3,3-D_3, 98%) 20% w/w in H_2O
ULM-10651	Sodium L-lactate (unlabeled)
CLM-771	Sodium propionate (1-^{13}C, 99%)
CLM-771-MPT	Sodium propionate (1-^{13}C, 99%)
CLM-1506	Sodium propionate (2-^{13}C, 99%)
CLM-4573	Sodium propionate (3-^{13}C, 99%)
CLM-3042	Sodium propionate (2,3-$^{13}C_2$, 99%)
CLM-1865	Sodium propionate ($^{13}C_3$, 99%)
CLM-1865-MPT	Sodium propionate ($^{13}C_3$, 99%)
DLM-1601	Sodium propionate (D_5, 98%)

Catalog No.	Description
CLM-1082	Sodium pyruvate (1-^{13}C, 99%)
CLM-1082-MPT	Sodium pyruvate (1-^{13}C, 99%)
CLM-1580	Sodium pyruvate (2-^{13}C, 99%)
CLM-1575	Sodium pyruvate (3-^{13}C, 99%)
CLM-3507	Sodium pyruvate (2,3-$^{13}C_2$, 99%)
CLM-2440	Sodium pyruvate ($^{13}C_3$, 99%)
DLM-6068	Sodium pyruvate (D_3, 97-98%)
CLM-1084	Succinic acid (1,4-$^{13}C_2$, 99%)
CLM-1199	Succinic acid (2,3-$^{13}C_2$, 99%)
CLM-1571	Succinic acid ($^{13}C_4$, 99%)
DLM-584	Succinic acid (D_4, 98%)
DLM-831	Succinic acid (D_6, 98%)
ULM-10681	Succinic acid (unlabeled)
CLM-9371	Succinic acid, disodium salt (2,3-$^{13}C_2$, 99%)
DLM-2307	Succinic acid, disodium salt (D_4, 80%) CP 95%
ULM-10510	Trisodium 2-methylcitrate (unlabeled) (racemic mixture of diastereomers) CP 90%
NLM-1697	Uric acid (1,3-$^{15}N_2$, 98%)

➤ **Please visit isotope.com for a complete listing of organic acids and conjugate salts.**

See pages 30-34 for metabolite mixtures comprising organic acids.

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Other Compounds

Catalog No.	Description
CLM-173	Acetaldehyde (1,2-$^{13}C_2$, 99%)
DLM-112	Acetaldehyde (D_4, 99%)
CLM-1220	*N*-Acetylglucosamine (*N*-acetyl-1-^{13}C, 99%)
CLM-1827	*N*-Acetylglucosamine ($^{13}C_6$, 99%)
NLM-8810	*N*-Acetylglucosamine (^{15}N, 98%)
DLM-9262	*N,N'*-bis(3-Aminopropyl)-1,4-butanediamine·4HCl (1,1,2,2,3,3,4,4-D_8, 97%) CP 95%
ULM-10265	*N,N'*-bis(3-Aminopropyl)-1,4-butanediamine·4HCl (unlabeled) CP 95%
CLM-9435	*N*-(3-Aminopropyl) butane-1,4-diamine·3HCl (spermidine·3HCl) ($^{13}C_4$, 99%) CP 95%
DLM-9261	*N*-(3-Aminopropyl) butane-1,4-diamine·3HCl (1,1,2,2,3,3,4,4-D_8, 98%) CP 95%
ULM-10264	*N*-(3-Aminopropyl) butane-1,4-diamine (unlabeled) CP 95%
NLM-467	Ammonium chloride (^{15}N, 99%)
NLM-390	Ammonium nitrate ($^{15}N_2$, 98%)
NLM-390-10	Ammonium nitrate ($^{15}N_2$, 10%)
NLM-390-5	Ammonium nitrate ($^{15}N_2$, 5%)
NLM-711	Ammonium nitrate (ammonium-^{15}N, 98%)
NLM-711-10	Ammonium nitrate (ammonium-^{15}N, 10%)
NLM-712	Ammonium nitrate (nitrate-^{15}N, 98%)
NLM-712-10	Ammonium nitrate (nitrate-^{15}N, 10%)
DLM-1100	Ammonium sulfate (D_8, 98%)
NLM-713	Ammonium sulfate ($^{15}N_2$, 99%)
NLM-713-10	Ammonium sulfate ($^{15}N_2$, 10%)
NLM-713-5	Ammonium sulfate ($^{15}N_2$, 5%)
CLM-8141	Arsenobetaine bromide (carboxymethyl-$^{13}C_2$, 90%)
CNLM-9695	5-Azacytosine (4,6-$^{13}C_2$, 98%; $^{15}N_4$, 98%)
DLM-10766	Aztreonam (D_6, 98%) CP 95%
DLM-10665	Bilirubin (D_4, ~70-80%) CP 97%
NLM-499	Calcium nitrate ($^{15}N_2$, 98%)
NLM-499-10	Calcium nitrate ($^{15}N_2$, 10%)
CLM-10642	*P*-Coumaric acid (propyl-$^{13}C_3$, 99%) CP 99%
DLM-9786	*P*-Cresol sulfate, potassium salt (D_7, 98%) CP 95%
DLM-10544	Desethylamodiaquine (ethyl-D_5, 97%)
DLM-4	Deuterium oxide (D, 99.9%)
DLM-4-99.8	Deuterium oxide (D, 99.8%)
DLM-4-99	Deuterium oxide (D, 99%)
CLM-9255	1,3-Diaminobenzene ($^{13}C_6$, 99%) CP 95%
CLM-7254	*O,O'*-Dityrosine (ring-$^{13}C_{12}$, 99%)
CLM-344	Ethanol (1-^{13}C, 99%) <6% H_2O
CLM-130	Ethanol (2-^{13}C, 99%) <6% H_2O
CLM-551	Ethanol (1,2-$^{13}C_2$, 99%) <6% H_2O

Catalog No.	Description
CLM-2291	Ethanolamine ($^{13}C_2$, 99%)
DLM-552	Ethanolamine (1,1,2,2-D_4, 98%)
NLM-8722	Ethanolamine (^{15}N, 98%)
CLM-3911	Ethanolamine·HCl (1-^{13}C, 99%)
CLM-274	Ethanolamine·HCl (1,2-$^{13}C_2$, 99%)
CLM-10773	Ethyl-4-chloroacetoacetate (1,2,3,4-$^{13}C_4$, 99%)
DLM-10667	Ethyl hexacosanoate (hexacosanoyl-12,12,13,13-D_4, 98%)
NLM-6723	Guanidine·HBr ($^{15}N_3$, 98%)
DLM-2338	1-Hexene (D_{12}, 98%)
CLM-10368	Hydrocinnamic acid (1-^{13}C, 99%)
CLM-9260	4-Hydroxy-3-methoxycinnamic acid (ferulic acid) (1',2',3'-$^{13}C_3$, 99%)
CNLM-10399	DL-3-Hydroxykynurenine (1,2,3-$^{13}C_3$, 98%; α-amino-^{15}N, 98%) CP 95%
CNLM-10539	Mecamylamine·HCl (tetramethyl-$^{13}C_4$, 99%; ^{15}N, 98%)
CLM-359	Methanol (^{13}C, 99%)
DLM-1211	Methanol (D, 98%)
DLM-1209	Methanol (D_2, 98%)
CDLM-1035	Methanol (^{13}C, 99%; D_3, 98%)
CLM-10706	Methylcarbamate (1-^{13}C, 99%)
DLM-651	Methyl formate (formyl-D, 99%)
DLM-9039	Morpholine (3,3,5,5-D_4, 98%)
CLM-10700	Pentanoic acid, pentyl ester ($^{13}C_{10}$, 99%)
CLM-10410	Porphobilinogen (propanoic-1,2-$^{13}C_2$, 99%) CP 95%
NLM-765	Potassium nitrate (^{15}N, 99%)
NLM-765-10	Potassium nitrate (^{15}N, 10%)
CLM-222	Potassium thiocyanate (^{13}C, 95-99%) CP 95%
CNLM-3952	Potassium thiocyanate (^{13}C, 99%; ^{15}N, 98%)
DLM-10542	Resorufin (D_6, 98%) CP 96%
DLM-3579	Serotonin creatinine sulfate complex ($\alpha,\alpha,\beta,\beta$-$D_4$, 98%)
CLM-441	Sodium bicarbonate (^{13}C, 99%)
CLM-441-MPT	Sodium bicarbonate (^{13}C, 99%)
CLM-9676	Sodium isopropyl carbonate (carbonyl-^{13}C, 99%)
NLM-157	Sodium nitrate (^{15}N, 98%)
CLM-3780	Sodium dichloroacetate ($^{13}C_2$, 99%)
CLM-10417	Toxoflavin (3,4α,5,8α-$^{13}C_4$, 98%) CP 95%
CLM-10839	Triacetin (triacetyl-$^{13}C_6$, 99%)
CNLM-9258	1,2,4-Triazole (3,5-$^{13}C_2$, 99%; 1,2,4-$^{15}N_3$, 98%)
DLM-4779	Trimethylamine *N*-oxide (D_9, 98%)
CLM-10543	*cis*-Urocanic acid (1,2,3-$^{13}C_3$, 99%)

➤ **Please visit isotope.com for a complete product listing.**

MPT: microbiologically and pyrogen tested.

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Steroids and Hormones

Catalog No.	Description
DLM-8438*	Aldosterone (2,2,4,6,6,17,21,21-D_8)
ULM-9134‡	Aldosterone (unlabeled) CP 95%
CLM-10548	5α-Androstan-3,17-dione (androstanedione) (2,3,4-$^{13}C_3$, 98%)
ULM-8794*	5α-Androstan-3,17-dione (androstanedione) (unlabeled)
DLM-9769*	5α-Androstan-3α-ol-17β-diol (16,16,17-D_3, 98%) CP 95%
ULM-9752*	5α-Androstan-3α-ol-17β-diol (unlabeled)
DLM-10269	5α-Androstan-3β-ol-17-one (epiandrosterone) (2,2,4,4-D_4, 98%)
ULM-10270	5α-Androstan-3β-ol-17-one (epiandrosterone) (unlabeled)
DLM-8750	5β-Androstan-3α-ol-17-one (etiocholanolone) (16,16-D_2, 98%)
DLM-10008*	5β-Androstan-3α-ol-17-one (etiocholanolone) (2,2,3,4,4-D_5, 98%)
ULM-10009*	5β-Androstan-3α-ol-17-one (etiocholanolone) (unlabeled)
ULM-10732	5α-Androstane-3β,17β-diol (unlabeled)
DLM-9787	Androstanediol glucuronide, sodium salt (16,16,17-D_3, 98%) CP 97%
DLM-10397	4-Androsten-11β,17β-diol-3-one (9,11,12,12-D_4, 98%) CP 95%
DLM-10396	4-Androsten-11β-ol-3,17-dione (9,11,12,12-D_4, 98%)
DLM-9697	4-Androsten-11β-ol-3,17-dione (2,2,4,6,6,16,16-D_7, 98%)
DLM-10401	5-Androsten-3β,17β-diol (16,16,17-D_3, 98%) CP 95%
CLM-9135*	4-Androstene-3,17-dione (2,3,4-$^{13}C_3$, 98%)
DLM-8330	4-Androstene-3,17-dione (2,2,4,6,6-D_5, 98%)
DLM-7976	4-Androstene-3,17-dione (2,2,4,6,6,16,16-D_7, 97%)
ULM-8472*	4-Androstene-3,17-dione (unlabeled)
DLM-10420‡	4-Androstene-6β,17β-diol-3-one (16,16,17-D_3, 98%)
DLM-7937	Androsterone (5α-androstan-3α-ol-17-one) (16,16-D_2, 98%)
DLM-10402‡	Androsterone (5α-androstan-3α-ol-17-one) (2,2,4,4-D_4, 98%) CP 95%
ULM-10403*	Androsterone (5α-androstan-3α-ol-17-one) (unlabeled)
DLM-9137	Androsterone glucuronide, sodium salt (2,2,4,4-D_4, 98%)
ULM-9138	Androsterone glucuronide, sodium salt (unlabeled)
DLM-4700	Cholestane (3,3-D_2, 98%)
DLM-8276	Cholestenone (2,2,4,6,6-D_5, 98%)
CLM-804	Cholesterol (3,4-$^{13}C_2$, 99%)
CLM-804-CTM	Cholesterol (3,4-$^{13}C_2$, 99%)
CLM-9139*	Cholesterol (2,3,4-$^{13}C_3$, 99%)
CLM-9587*	Cholesterol (23,24,25,26,27-$^{13}C_5$, 99%)
DLM-1831	Cholesterol (3-D, 97%)
DLM-7260	Cholesterol (25,26,26,26-D_4, 98%)
DLM-2607‡	Cholesterol (2,2,3,4,4,6-D_6, 97-98%)
DLM-3057	Cholesterol (25,26,26,26,27,27,27-D_7, 98%)
OLM-7695	Cholesterol (^{18}O, 95%)
ULM-9140*	Cholesterol (unlabeled) CP 97%
CLM-3361	Cholesterol-3-octanoate (octanoate-1-^{13}C, 99%)
DLM-10416	Cholesterol-3-sulfate, sodium salt (25,26,26,26,27,27,27-D_7, 98%)

Catalog No.	Description
DLM-7347	Corticosterone (2,2,4,6,6,17α,21,21-D_8, 97-98%)
ULM-9988*	Corticosterone (unlabeled)
CLM-10371†	Cortisol (2,3,4-$^{13}C_3$, 99%)
DLM-2615	Cortisol (1,2-D_2, 98%)
DLM-2057	Cortisol (9,12,12-D_3, 98%)
DLM-2218	Cortisol (9,11,12,12-D_4, 98%)
ULM-9141*	Cortisol (unlabeled)
CLM-10536†	Cortisone (2,3,4-$^{13}C_3$, 98%) CP 97%
DLM-8863	Cortisone (1,2-D_2, 98%) CP 95%
DLM-9142*	Cortisone (2,2,4,6,6,12,12-D_7)
DLM-9976	Cortisone (2,2,4,6,6,9,12,12-D_8, 98%)
ULM-9202*	Cortisone (unlabeled)
CLM-10537†	Cortisone 21-sulfate, sodium salt (2,3,4-$^{13}C_3$, 98%) CP 95%
DLM-4216	7-Dehydrocholesterol (25,26,26,26,27,27,27-D_7, 98%)
DLM-10748	8-Dehydrocholesterol (25,26,26,26,27,27,27-D_7, 92%) CP 95%
CLM-10549*	Dehydroepiandrosterone (DHEA) (2,3,4-$^{13}C_3$, 99%)
DLM-7714	Dehydroepiandrosterone (DHEA) (16,16-D_2, 97%)
DLM-8049‡	Dehydroepiandrosterone (DHEA) (2,2,3,4,4,6-D_6, 98%) CP 97%
ULM-9143*	Dehydroepiandrosterone (DHEA) (unlabeled)
CLM-10784*	Dehydroepiandrosterone sulfate, sodium salt (DHEAS) (2,3,4-$^{13}C_3$, 98%)
DLM-8701	Dehydroepiandrosterone sulfate, sodium salt (DHEAS) (16,16-D_2, 97%)
DLM-8337*	Dehydroepiandrosterone sulfate, sodium salt (DHEAS) (2,2,3,4,4,6-D_6, 95%)
ULM-9144*	Dehydroepiandrosterone sulfate, sodium salt (DHEAS) (unlabeled)
CLM-10384*	11-Deoxycortisol (2,3,4-$^{13}C_3$, 99%) CP 97%
DLM-7209	11-Deoxycortisol (21,21-D_2, 96%)
DLM-8336*	11-Deoxycortisol (2,2,4,6,6-D_5, 98%)
ULM-9145*	11-Deoxycortisol (unlabeled)
DLM-8305	21-Deoxycortisol (2,2,4,6,6,21,21,21-D_8, 97%)
ULM-9987*	21-Deoxycortisol (unlabeled)
DLM-170*	Diethylstilbestrol (*cis*/*trans* mix) (ring-3,3′,5,5′-diethyl-1,1,1′,1′-D_8, 98%)
CLM-9146*	5α-Dihydrotestosterone (2,3,4-$^{13}C_3$, 99%) CP 97%
DLM-9041	5α-Dihydrotestosterone (2,2,4,4-D_4, 98%) CP 95%
ULM-8364*	5α-Dihydrotestosterone (unlabeled)
DLM-3023	Dihydrotestosterone (16,16,17-D_3, 98%)
CLM-9222*	L-3,3′-Diiodothyronine (T2) (phenoxy-$^{13}C_6$, 99%) CP 97%
ULM-9223*	L-3,3′-Diiodothyronine (T2) (unlabeled)
CLM-7401	L-Dopa (1-^{13}C, 99%)
CLM-1007	L-Dopa (ring-$^{13}C_6$, 99%)
CLM-7824	L-Dopa (1-^{13}C, ring-$^{13}C_6$, 99%)
DLM-2084	L-Dopa (ring-D_3, 98%)
COLM-2232	L-Dopa (2,3-$^{13}C_2$, 97%; 4-hydroxy-^{18}O, 95%)
CLM-7768	Epicholesterol (3,4-$^{13}C_2$, 99%)
DLM-9088	DL-Epinephrine (ring-D_3,1,2,2-D_3, 98%)
CNLM-7889	DL-Epinephrine (1,2-$^{13}C_2$, 99%; ^{15}N, 98%)

CTM: manufactured following ICH Q7, Section XIX

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‡ Compounds available in dry and solution forms; chemical purity varies 95-98%.

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Steroids and Hormones *(continued)*

Catalog No.	Description
CLM-803*	Estradiol (3,4-$^{13}C_2$, 99%)
DLM-3694	Estradiol (16,16,17-D_3, 98%) CP 95%
DLM-2487	Estradiol (2,4,16,16-D_4, 95-97%)
ULM-7449*	Estradiol (unlabeled)
CLM-9147*	Estriol (16α-hydroxyestradiol) (2,3,4-$^{13}C_3$, 99%) CP 97%
DLM-8586	Estriol (2,4,16-D_3, 98%) CP 96%
DLM-8343	Estriol (2,4,17-D_3, 98%) CP 96%
CLM-673‡	Estrone (3,4-$^{13}C_2$, 99%)
CLM-9148*	Estrone (2,3,4-$^{13}C_3$, 99%)
DLM-3976	Estrone (2,4,16,16-D_4, 97%)
CLM-8033	DL-Estrone 3-methyl ether (13,14,15,16,17,18-$^{13}C_6$, 99%)
DLM-4691	17α-Ethynylestradiol (2,4,16,16-D_4, 97-98%)
ULM-10267	7α-Hydroxycholesterol (unlabeled)
DLM-8646	7β-Hydroxycholesterol (25,26,26,26,27,27,27-D_7, 98%) CP 97%
ULM-10268	7β-Hydroxycholesterol (unlabeled)
DLM-9150‡	18-Hydroxycorticosterone (9,11,12,12-D_4, 98%) CP 95%
ULM-9151*	18-Hydroxycorticosterone (unlabeled) CP 95%
DLM-9149	6β-Hydroxycortisol (9,11,12,12-D_4) CP 95%
CLM-8012	DL-2-Hydroxyestradiol (13,14,15,16,17,18-$^{13}C_6$, 99%)
CLM-8016	DL-2-Hydroxyestrone-3-methyl ether (13,14,15,16,17,18-$^{13}C_6$, 99%)
CLM-9153*	16α-Hydroxyestrone (2,3,4-$^{13}C_3$, 99%)
ULM-9152*	16α-Hydroxyestrone (unlabeled)
CLM-8013	DL-4-Hydroxyestrone (13,14,15,16,17,18-$^{13}C_6$, 99%) CP 97%
CLM-9936*	5-Hydroxyindole-3-acetic acid (3α,4,5,6,7,7α-$^{13}C_6$, 98%)
DLM-7206	17α-Hydroxypregnenolone (21,21,21-D_3, 97%)
CDLM-9154*	17α-Hydroxypregnenolone (20,21-$^{13}C_2$, 98%; 16,16-D_2, 98%)
ULM-9155*	17α-Hydroxypregnenolone (unlabeled)
CLM-9157*	17α-Hydroxyprogesterone (2,3,4-$^{13}C_3$, 98%)
DLM-6598	17α-Hydroxyprogesterone (2,2,4,6,6,21,21,21-D_8, 98%)
ULM-9156*	17α-Hydroxyprogesterone (unlabeled)
DLM-8647	7-Ketocholesterol (25,26,26,26,27,27,27-D_7, 99%)
DLM-10395	11-Ketotestosterone (16,16,17-D_3, 98%) CP 95%
DLM-7101	Melatonin (acetyl-D_3, 98%)
CLM-8015	DL-2-Methoxyestradiol (13,14,15,16,17,18-$^{13}C_6$, 99%)
CLM-8014	DL-2-Methoxyestrone (13,14,15,16,17,18-$^{13}C_6$, 99%)
CLM-8017	DL-4-Methoxyestrone (13,14,15,16,17,18-$^{13}C_6$, 99%)
DLM-2646	5-Methoxytryptamine·HCl (α,α,β,β-D_4, 98%)
CLM-2468	Norethindrone (ethynyl-$^{13}C_2$, 99%)
DLM-3979*	19-Nortestosterone (16,16,17-D_3, 98%)
DLM-3754	5α-Pregnan-3α-ol-20-one (17,21,21,21-D_4, 96-98%) CP 95%
DLM-7492	5α-Pregnan-3β-ol-20-one (17α,21,21,21-D_4, 97%) CP 96%
ULM-8242	5α-Pregnan-3β-ol-20-one (unlabeled)
DLM-2294	5β-Pregnan-3α-ol-20-one (17,21,21,21-D_4, 96-98%)
DLM-8751	5β-Pregnan-3α,11β,17α,21-tetrol-20-one (9,11α,12-D_3, 95%)

Catalog No.	Description
DLM-8753	5β-Pregnan-3α,17α, 20-triol (20,21,21,21-D_4, 98%) mix of 20α and 20β
DLM-3910	5α-Pregnane-3α,21-diol-20-one (17,21,21-D_3, 95%)
DLM-3816	5α-Pregnane-3,20-dione (1,2,4,5,6,7-D_6, 95%)
ULM-10385	5α-Pregnane-3α,21-diol-20-one (unlabeled)
DLM-9901	5β-Pregnane-3,20-dione (2,2,4,4,17α,21,21,21-D_8, 98%) CP 97%
CLM-10411	5β-Pregnane-3α,20α-diol (2,3,4,20,21-$^{13}C_5$, 99%) CP 95%
DLM-10413	5β-Pregnane-3α,20α-diol (2,2,3,4,4-D_5, 98%)
CLM-10412	5β-Pregnane-3α,20α-diol glucuronide, sodium salt (2,3,4,20,21-$^{13}C_5$, 99%) CP 95%
CLM-10010*	4-Pregnen-21-ol-3,20-dione (2,3,4-$^{13}C_3$, 99%)
DLM-7228	4-Pregnen-21-ol-3,20-dione (2,2,4,6,6,17,21,21-D_8, 96%) CP 97%
ULM-10011*	4-Pregnen-21-ol-3,20-dione (unlabeled)
CDLM-9158*	Pregnenolone (20,21-$^{13}C_2$, 98%;16,16-D_2, 98%)
DLM-6896	Pregnenolone (17,21,21,21-D_4, 98%)
ULM-9159*	Pregnenolone (unlabeled)
CDLM-9160	Pregnenolone sulfate, sodium salt (20,21-$^{13}C_2$, 99%; 16,16-D_2, 98%)
ULM-9161	Pregnenolone sulfate, sodium salt (unlabeled)
CLM-457	Progesterone (3,4-$^{13}C_2$, 90%)
CLM-9162*	Progesterone (2,3,4-$^{13}C_3$, 99%)
CLM-10414	Progesterone (2,3,4,20,21-$^{13}C_5$, 99%)
DLM-7953*	Progesterone (2,2,4,6,6,17α,21,21,21-D_9, 98%)
DLM-3627†	Prostaglandin A2 (3,3,4,4-D_4, 98%)
DLM-3728†	Prostaglandin E1 (3,3,4,4-D_4, 98%)
DLM-3628†	Prostaglandin E2 (3,3,4,4-D_4, 98%)
DLM-3558†	Prostaglandin-F2α (3,3,4,4-D_4, 98%)
DLM-4200†	9α,11α-Prostaglandin F2 (3,3′,4,4′-D_4, 98%)
DLM-7457	Sodium 17β-estradiol 3-sulfate (2,4,16,16-D_4, 98%) stabilized with 50% w/w tris
DLM-9503	Stigmastanol (2,2,3,4,4-D_5, 98%)
CLM-159	Testosterone (3,4-$^{13}C_2$, 99%)
CLM-9164*	Testosterone (2,3,4-$^{13}C_3$, 99%)
DLM-683	Testosterone (1,2-D_2, 98%)
DLM-6224*	Testosterone (16,16,17-D_3, 98%)
DLM-8085*	Testosterone (2,2,4,6,6-D_5, 98%)
DLM-8265	Testosterone diacetate (testosterone-D_4, acetate methyl-D_6, 98%)
ULM-9163	3α,5β-Tetrahydroaldosterone (unlabeled)
CLM-6725	L-Thyroxine (tyrosine-ring-$^{13}C_6$, 99%) CP 90%
CLM-8931	L-Thyroxine (ring-$^{13}C_{12}$, 99%) CP 97%
ULM-8184	L-Thyroxine (unlabeled)
CLM-7185*	3,3′,5-Triiodo-L-thyronine·HCl (ring-$^{13}C_6$, 99%) CP >95%
DLM-6989	Tryptamine·HCl (α,α,β,β-D_4, 97%)

➤ **Please visit isotope.com for a complete listing of steroids and hormones.**

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Vitamins and Their Metabolites

Catalog No.	Description
CLM-6126	β-Carotene (10,10′,11,11′-$^{13}C_4$, 99%)
CLM-9641	β-Carotene (12,12′,13,13′,14,14′,15,15′,20,20′-$^{13}C_{10}$, 99%) CP >97%
DLM-3829	β-Carotene (19,19,19,19′,19′,19′-D_6, 98%)
DLM-2439	β-Carotene (10,10′,19,19,19,19′,19′,19′-D_8, 97%)
DLM-10279	Coenzyme Q10 (dimethoxy-D_6, methyl-D_3, 98%) CP 97%
ULM-9106*	1,25-Dihydroxyvitamin D2 (unlabeled) CP 95%
ULM-9109*	24,25-Dihydroxyvitamin D2 (unlabeled)
DLM-9107*	1,25-Dihydroxyvitamin D3 (6,19,19-D_3, 97%) CP 95%
ULM-9108*	1,25-Dihydroxyvitamin D3 (unlabeled) CP 95%
DLM-9404*	24*R*,25-Dihydroxyvitamin D3 (26,26,26,27,27,27-D_6, 98%) CP 97%
ULM-10610*	24*R*,25-Dihydroxyvitamin D3 (unlabeled) CP 97%
DLM-9481	3-*epi*-25-Hydroxyvitamin D2 (6,19,19-D_3, 98%)
ULM-9110*	3-*epi*-25-Hydroxyvitamin D2 (unlabeled)
CLM-9113†	25-Hydroxyvitamin D2 (25,26,27-$^{13}C_3$, 99%) CP 95%
DLM-9114*	25-Hydroxyvitamin D2 (6,19,19-D_3, 97%)
ULM-9115*	25-Hydroxyvitamin D2 (unlabeled)
DLM-10611†	25-Hydroxyvitamin D2 sulfate, sodium salt (6,19,19-D_3, 97%) CP 97%
ULM-10612†	25-Hydroxyvitamin D2 sulfate, sodium salt (unlabeled) CP 97%
CLM-10266*	3-*epi*-25-Hydroxyvitamin D3 (23,24,25,26,27-$^{13}C_5$, 99%)
DLM-9111*	3-*epi*-25-Hydroxyvitamin D3 (6,19,19-D_3, 98%)
DLM-10912	3-*epi*-25-Hydroxyvitamin D3 (26,26,26,27,27,27-D_6, 96%) CP 95%
ULM-9112*	3-*epi*-25-Hydroxyvitamin D3 (unlabeled)
CLM-10025*	25-Hydroxyvitamin D3 (23,24,25,26,27-$^{13}C_5$, 99%) CP 95%
DLM-9116*	25-Hydroxyvitamin D3 (6,19,19-D_3, 97%)
ULM-9117*	25-Hydroxyvitamin D3 (unlabeled)
DLM-7708*	25-Hydroxyvitamin D3 monohydrate (26,26,26,27,27,27-D_6, 98%) CP 97%
CLM-7613	*trans*-Lycopene (8,8′,9,9′,10,10′,11,11′,19,19′-$^{13}C_{10}$, 99%)
CLM-9548	5-Methyltetrahydrofolic acid (glutamic acid-$^{13}C_5$, 99%) CP 95%
CLM-7321-N	5-Methyltetrahydrofolic acid, calcium salt (glutamic acid-$^{13}C_5$, 98%) CP 95%
CLM-7321	(6S)-5-Methyltetrahydrofolic acid, calcium salt (glutamic acid-$^{13}C_5$, 90%) contains ~10% H_2O
CNLM-9757	Nicotinamide (2,6,carbonyl-$^{13}C_3$, 99%; ring-1-^{15}N, 98%)
DLM-9793-N	Pyridoxal phosphate (mix of 5-,3-isomers) (methyl-D_3, 97%)
CLM-7563	Pyridoxine·HCl (4,5-bis(hydroxymethyl)-$^{13}C_4$, 99%)
DLM-8754	Pyridoxine·HCl (5-hydroxymethyl-D_2, 98%)
CLM-320	Vitamin A (retinal) (10-^{13}C, 99%)
CLM-325	Vitamin A (retinal) (11-^{13}C, 99%)
CLM-326	Vitamin A (retinal) (14-^{13}C, 99%)
CLM-327	Vitamin A (retinal) (15-^{13}C, 98%)
DLM-7719	Vitamin A (retinal) (19,19,19,20,20,20-D_6, 96%)

Catalog No.	Description
CLM-331	Vitamin A (retinoic acid) (10-^{13}C, 99%)
CLM-328	Vitamin A (retinoic acid) (11-^{13}C, 98%)
CLM-329	Vitamin A (retinoic acid) (14-^{13}C, 99%)
CLM-330	Vitamin A (retinoic acid) (15-^{13}C, 99%)
CLM-4343	Vitamin A (retinoic acid) (10,11,14,15-$^{13}C_4$, 99%)
DLM-7720	Vitamin A (retinoic acid) (19,19,19,20,20,20-D_6, 96%)
DLM-9305	Vitamin A (retinol) (10,19,19,19-D_4, 96%)
CLM-10259	Vitamin A (retinol) (12,13,14,20-$^{13}C_4$, 99%)
DLM-8113	Vitamin A (retinol) (19,19,19,20,20,20-D_6, 97%)
DLM-9306	Vitamin A (retinol) (10,14,19,19,19,20,20,20-D_8, 90%) CP 96%
CLM-8870	Vitamin A acetate (retinal acetate) (12,13,14,20-$^{13}C_4$, 99%)
CLM-4831	Vitamin A acetate (retinal acetate) (8,9,10,12,13,14,19,20-$^{13}C_8$, 99%)
CLM-7277	Vitamin A acetate (retinal acetate) (8,9,10,11,12,13,14,15,19,20-$^{13}C_{10}$, 99%)
DLM-2244	Vitamin A acetate (retinal acetate) (10,19,19,19-D_4, 96%) 3-4% *cis*
DLM-3828	Vitamin A acetate (retinal acetate) (19,19,19,20,20,20-D_6, 96%) 3-4% *cis*
DLM-4203	Vitamin A acetate (retinal acetate) (10,14,19,19,19,20,20,20-D_8, 90%) 3-4% *cis*
CLM-10772	Vitamin A aldehyde (retinal) (12,13,14,20-$^{13}C_4$, 96%)
CLM-10838	Vitamin A palmitate (retinyl palmitate) (8,9,10,11,12,13,14,15,19,20-$^{13}C_{10}$, 99%) (all *trans*, <4% *cis*; butylated hydroxytoluene)
DLM-4902	Vitamin A palmitate (retinyl palmitate) (10,19,19,19-D_4, 96%) all *trans*, <4% *cis,* 50 ppm butylated hydroxytoluene
CLM-7667	Vitamin B_1 hydrochloride (thiamine hydrochloride) (4,5,4-methyl-$^{13}C_3$, 99%) CP 97%
ULM-10004	Vitamin B_1 hydrochloride (thiamine hydrochloride) (unlabeled)
DLM-8741	Vitamin B_1 pyrophosphate (thiamine pyrophosphate) (pyrimidyl-methyl-D_3, 98%)
CNLM-8851	Vitamin B_2 (riboflavin) ($^{13}C_4$, 99%; $^{15}N_2$, 98%) CP 97%
ULM-9123	Vitamin B_2 (riboflavin) (unlabeled) CP 97%
CNLM-10744	Vitamin B_2 phosphate (riboflavin phosphate) ($^{13}C_4$, 99%; $^{15}N_2$, 98%) CP >90%
CLM-9925	Vitamin B_3 (nicotinamide ($^{13}C_6$, 99%)
DLM-6883	Vitamin B_3 (nicotinamide) (D_4, 98%)
CNLM-9757	Vitamin B_3 (nicotinamide) (2,6,carbonyl-$^{13}C_3$, 99%; ring-1-^{15}N, 98%)
CLM-9954	Vitamin B_3 (nicotinic acid) ($^{13}C_6$, 99%)
CNLM-9512	Vitamin B_3 (nicotinic acid) (2,6,carboxyl-$^{13}C_3$, 99%; ^{15}N, 98%) CP 97%
CNLM-7694	Vitamin B_5, calcium salt·H_2O (calcium pantothenate·H_2O) (β-alanyl-$^{13}C_3$, 99%;^{15}N, 98%)
ULM-10003	Vitamin B_5, calcium salt·H_2O (calcium pantothenate·H_2O) (unlabeled)
DLM-9069	Vitamin B_6 (pyridoxal) (methyl-D_3, 98%)
ULM-9118	Vitamin B_6 (pyridoxal·HCl) (unlabeled)

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Vitamins and Their Metabolites *(continued)*

Catalog No.	Description
DLM-9119	Vitamin B_6 (pyridoxamine·2HCl) (methyl-D_3, 98%)
ULM-9120	Vitamin B_6 (pyridoxamine·2HCl) (unlabeled)
CLM-7563	Vitamin B_6 (pyridoxine·HCl) (4,5-bis(hydroxymethyl)-$^{13}C_4$, 99%)
DLM-8754	Vitamin B_6 (pyridoxine·HCl) (5-hydroxymethyl-D_2, 98%)
DLM-9121	Vitamin B_6 (pyridoxine·HCl) (methyl-D_3, 98%) CP 96%
ULM-9122	Vitamin B_6 (pyridoxine·HCl) (unlabeled) CP 96%
DLM-8806	Vitamin B_7 (biotin) (ring-6,6-D_2, 98%) CP 97%
DLM-9751	Vitamin B_7 (biotin) (3′,3′,4′,4′-D_4, 98%) CP 95%
ULM-9129	Vitamin B_7 (biotin) (unlabeled)
CLM-7861	Vitamin B_9 (folic acid) (glutamic acid-$^{13}C_5$, 95%) contains ~10% H_2O
CLM-7861-N	Vitamin B_9 (folic acid) (glutamic acid-$^{13}C_5$, 99%) CP 95%
CNLM-9564	Vitamin B_9 (folic acid) (glutamic acid-$^{13}C_5$, 99%; ^{15}N, 98%) CP 95%
CLM-9770†	Vitamin B_{12} (cyanocobalamin) ($^{13}C_7$, 99%) CP 95%
ULM-10005†	Vitamin B_{12} (cyanocobalamin) (unlabeled)
CLM-3085	Vitamin C (L-ascorbic acid) (1-^{13}C, 99%)
CLM-7283	Vitamin C (L-ascorbic acid) (U-$^{13}C_6$, 98%)
DLM-8985*	Vitamin D_2 (ergocalciferol) (6,19,19-D_3, 97%)
ULM-9124*	Vitamin D_2 (ergocalciferol) (unlabeled)
DLM-10478†	Vitamin D_2 sulfate, sodium salt (6,19,19-D_3, 98%) CP 97%
ULM-10477†	Vitamin D_2 sulfate, sodium salt (unlabeled) CP 97%
CLM-7850	Vitamin D_3 (cholecalciferol) (23,24-$^{13}C_2$, 99%) CP 90%
CLM-10470†	Vitamin D_3 (cholecalciferol) (23,24,25,26,26-$^{13}C_5$, 98%) CP 97%
DLM-8853†	Vitamin D_3 (cholecalciferol) (6,19,19-D_3, 97%) CP 97%
DLM-10749†	Vitamin D_3 (cholecalciferol) (26,26,26,27,27,27-D_6, 98%) CP 95%
ULM-9125*	Vitamin D_3 (cholecalciferol) (unlabeled)
DLM-10476†	Vitamin D_3 sulfate, sodium salt (26,26,26,27,27,27-D_6, 98%) CP 97%
DLM-10475†	Vitamin D_3 sulfate, sodium salt (6,19,19-D_3, 98%) CP 97%
ULM-10474†	Vitamin D_3 sulfate, sodium salt (unlabeled) CP 97%

Catalog No.	Description
CLM-10274	Vitamin E (DL-rac-2-tocopherol) (trimethyl-$^{13}C_3$, 99%) CP 96%
CLM-10273	Vitamin E (α-tocopherol) (trimethylphenyl-$^{13}C_3$, 99%) CP 96%
CLM-10275	Vitamin E (α-tocopherol) (phenyl-$^{13}C_6$, 99%) CP 96%
CLM-10276	Vitamin E (α-tocopherol) (trimethylphenyl-$^{13}C_9$, 99%) CP 96%
DLM-9126	Vitamin E (α-tocopherol) (5-methyl-D_3, 7-methyl-D_3, 98%)
ULM-9127	Vitamin E (α-tocopherol) (unlabeled) CP 96%
DLM-8847	Vitamin E acetate (tocopherol acetate) (acetyl-D_3, 98%)
CLM-9566	Vitamin K_1 (phylloquinone) (4α,5,6,7,8,8α-$^{13}C_6$, 99%)
DLM-7702	Vitamin K_1 (phylloquinone) (ring-D_4, 98%)
DLM-9130	Vitamin K_1 (phylloquinone) (D_7, 99%) CP 97%
ULM-9131	Vitamin K_1 (phylloquinone) (unlabeled) CP 97%
CLM-10376	Vitamin K_2 (menaquinone MK-4) (4',5,6,7,8,8'-$^{13}C_6$, 99%) CP 95%
DLM-10379	Vitamin K_2 (menaquinone MK-4) (5,6,7,8-D_4, 2-methyl-D_3, 98%) CP 95%
CLM-10377	Vitamin K_2 (menaquinone MK-7) (4',5,6,7,8,8'-$^{13}C_6$, 99%) CP 95%
DLM-10380	Vitamin K_2 (menaquinone MK-7) (5,6,7,8-D_4, 2-methyl-D_3, 98%) CP 95%
CLM-10378	Vitamin K_2 (menaquinone MK-9) (4',5,6,7,8,8'-$^{13}C_6$, 99%) CP 95%
DLM-10381	Vitamin K_2 (menaquinone MK-9) (5,6,7,8-D_4, 2-methyl-D_3, 98%) CP 95%
DLM-10382	Vitamin K_2 2,3-epoxide (menaquinone-4 2,3-epoxide) (5,6,7,8-D_4, 2-methyl-D_3, 98%) CP 95%
ULM-10383	Vitamin K_2 2,3-epoxide (menaquinone-4 2,3-epoxide) (unlabeled) CP 95%
DLM-9132	Vitamin K_3 (menadione) (D_8, 98%) CP 97%
ULM-9133	Vitamin K_3 (menadione) (unlabeled) CP 97%

➤ **Please visit isotope.com for a complete listing of vitamins and their metabolites.**

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Urea and Water

Catalog No.	Description
DLM-6	Deuterium oxide "100%" (D, 99.96%)
DLM-11	Deuterium oxide (D, 99.9%) low paramagnetic
DLM-4	Deuterium oxide (D, 99.9%)
DLM-4-99.8	Deuterium oxide (D, 99.8%)
DLM-4-99	Deuterium oxide (D, 99%)
DLM-4-70	Deuterium oxide (D, 70%)
CLM-311	Urea (^{13}C, 99%)
CLM-311-GMP	Urea (^{13}C, 99%)
CLM-311-MPT	Urea (^{13}C, 99%)
DLM-1269	Urea (D_4, 98%)
NLM-233	Urea ($^{15}N_2$, 98%)
NLM-233-MPT	Urea ($^{15}N_2$, 98%)
NLM-233-10	Urea ($^{15}N_2$, 10%)
NLM-233-5	Urea ($^{15}N_2$, 5%)
OLM-655	Urea (^{18}O, 95%)
CNLM-234	Urea (^{13}C, 99%; $^{15}N_2$, 98%)
COLM-4861	Urea (^{13}C, 99%; ^{18}O, 98%)
CNOLM-8871	Urea (^{13}C, 99%; $^{15}N_2$, 99%; ^{18}O, 99%)

Catalog No.	Description
DOLM-242	Water (D_2, 98%; ^{18}O, 97%)
OLM-240-99	Water (^{18}O, 99%)
OLM-240-97	Water (^{18}O, 97%)
OLM-240-10	Water (^{18}O, 10%)
OLM-782-90	Water (^{17}O, 90%)
OLM-782-70	Water (^{17}O, 70%)
OLM-782-40	Water (^{17}O, 35-40%)
OLM-782-20	Water (^{17}O, 20%)
OLM-782-10	Water (^{17}O, 10%)

GMP: good manufacturing practices grade
MPT: microbiologically and pyrogen tested.

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Sets, Mixtures, and Kits

Sets

Table 1. Standard products for MS/MS screening or tuning.

Catalog No.	Description
NSK-A	Labeled Amino Acid Standards Set A
NSK-A1	Labeled Amino Acid Standards Set A1
NSK-A-US	Unlabeled Amino Acid Standards Set A
NSK-B	Labeled Carnitine Standards Set B
NSK-B-US	Unlabeled Carnitine Standards Set B
NSK-B-G1	Labeled Carnitine Standards Supplement to NSK-B
NSK-B-G1-US	Unlabeled Carnitine Standards Supplement to NSK-B
NSK-AB	Labeled Standards Sets A & B
NSK-S-CAH	Labeled Steroid CAH Set S
NSK-T	Labeled Succinylacetone Standard Set T
NSK-T-US	Unlabeled Succinylacetone Standard Set T
NSK-A-TS	Labeled Amino Acid Tuning Standards Set A
NSK-PO-1	Lysosomal α-Glucosidase Substrate and Internal Standard
NSK-FA-1	α-Galactosidase Substrate and Internal Standard
NSK-GA-1	Glucocerebrosidase Substrate and Internal Standard
NSK-KR-1	Galactocerebrosidase Substrate and Internal Standard
NSK-MP-1	α-L-Iduronidase Substrate and Internal Standard
NSK-NI-1	Acid Spingomyelinase Substrate and Internal Standard

Table 2. Composition details of NSK-A, -B, and -B-G1. Please refer to isotope.com for additional information for other mixes.

NSK-A

Components	Conc. (μM)
L-Alanine (2,3,3,3-D_4, 98%)	500
L-Arginine·HCl (5-^{13}C, 99%; 4,4,5,5-D_4, 95%)	500
L-Aspartatic acid (2,3,3-D_3, 98%)	500
L-Citruline (5,5-D_2, 98%)	500
DL-Glutamatic acid (2,4,4-D_3, 98%)	500
Glycine (2-^{13}C, 99%; ^{15}N, 98%)	2500
L-Leucine (5,5,5-D_3, 99%)	500
L-Methionine (methyl-D_3, 98%)	500
L-Ornithine·HCl (5,5-D_2, 98%)	500
L-Phenylalanine (ring-$^{13}C_6$, 99%)	500
L-Tyrosine (ring-$^{13}C_6$, 99%)	500
L-Valine (D_8, 98%)	500

NSK-B

Components	Conc. (μM)
L-Carnitine (trimethyl-D_9, 98%)	152
O-Acetyl-L-carnitine·HCl (*N*-methyl-D_3, 98%)	38
O-Butyryl-L-carnitine·HCl (*N*-methyl-D_3, 98%) CP 97%	7.6
O-Isovaleryl-L-carnitine·HCl (*N,N,N*-trimethyl-D_9, 98%)	7.6
O-Myristoyl-L-carnitine·HCl (*N,N,N*-trimethyl-D_9, 98%)	7.6
O-Octanoyl-L-carnitine·HCl (*N*-methyl-D_3, 98%)	7.6
O-Palmitoyl-L-carnitine·HCl (*N*-methyl-D_3, 98%)	15.2
O-Propionyl-L-carnitine·HCl (*N*-methyl-D_3, 98%)	7.6

NSK-B-G1

Components	Conc. (μM)
O-Dodecanoyl-L-carnitine·HCl (*N,N,N*-trimethyl-D_9, 98%)	7.6
O-Glutaryl-L-carnitine·CLO_4 (*N*-methyl-D_3, 98%) CP 97%	152
3-Hydroxyisovaleryl-L-carnitine·CLO_4 (*N*-methyl-D_3, 98%)	7.6
O-3-DL-Hydroxypalmitoyl-L-carnitine·CLO_4 (*N*-methyl-D_3, 98%)	15.2
O-Octadecanoyl-L-carnitine·HCl (*N*-methyl-D_3, 98%)	15.2

Note: The concentration tolerances are ±20% (exception: *O*-Glutaryl-L-carnitine·CLO_4 at ±40%). Also, NSK-A1 is equivalent in composition to NSK-A, with the exception of the Orn labeling (i.e., 3,3,4,4,5,5,-D_6 in NSK-A1 vs. 5,5-D_2 in NSK-A.

➤ **Custom mixes can be formulated according to user specifications. Please inquire for details.**

Example References

Rodríguez-Colman, M.J.; Schewe, M.; Meerlo, M.; et al. **2017**. Interplay between metabolic identities in the intestinal crypt supports stem cell function. *Nature, 543(7645),* 424-427.

Huang, T.; Cao, Y.; Zeng, J.; et al. **2016**. Tandem mass spectrometry-based newborn screening strategy could be used to facilitate rapid and sensitive lung cancer diagnosis. *Onco Targets Ther, 9,* 2479-2487.

Wang, Q.; Sun, T.; Cao, Y. **2016**. A dried blood spot mass spectrometry metabolomic approach for rapid breast cancer detection. *Onco Targets Ther, 9,* 1389-1398.

Table 3. Sets of uniformly labeled dNTPs and rNTPs.

Catalog No.	Description	Conc. (μM)
NLM-7512-SL	Set of 4 2′-deoxyribonucleoside 5′-triphosphates (U-^{15}N, 98%) (Li salts/in soln) CP >90%	55 for dATP, dCTP, and TTP; 50 for dGTP
DLM-7511-SL	Set of 4 2′-deoxyribonucleoside 5′-triphosphates (U-D, 98%) (Li salts/in soln) CP >90%	50 for dATP, 60 for dCTP, 58 for dGTP, and 66 for TTP
CNLM-7513-SL	Set of 4 2′-deoxyribonucleoside 5′-triphosphates (U-^{13}C, 98%; U-^{15}N, 98%) (Li salts/in soln) CP >90%	100 for dATP, dCTP, dGTP, and TTP
NLM-7519-CA	Set of 4 2′-ribonucleoside 5′-triphosphates (U-^{15}N; 98%) (NH_4 salts/in soln) CP >90%	100 for ATP, CTP, GTP, and UTP
CNLM-7503-CA	Set of 4 2′-ribonucleoside 5′-triphosphates (U-^{13}C, U-^{15}N; 98-99%) (NH_4 salts/in soln) CP >90%	100 for ATP, CTP, GTP, and UTP
DLM-7518-CA	Set of 4 ribonucleoside 5′-triphosphates (U-D, 98%) (NH_4 salts/in soln) CP >90%	100 for ATP, CTP, GTP, and UTP

Example Reference

Song, Y.; Marmion, R.A.; Park, J.O.; et al. **2017**. Dynamic control of dNTP synthesis in early embryos. *Dev Cell, 42(3),* 301-308.

Chemical purity (CP) is 98% or greater, unless otherwise indicated.
For research use only. Not for use in diagnostic procedures.

Mixtures

Table 4. Algae-derived amino acid mixtures and whole cells.

Catalog No.	Description
CLM-1548	Algal amino acid mixture (U-^{13}C, 97-99%)
NLM-2161	Algal amino acid mixture (U-^{15}N, 98%)
DLM-2082	Algal amino acid mixture (U-D, 98%)
CNLM-452	Algal amino acid mixture (U-^{13}C, 97-99%; U-^{15}N, 97-99%)
DNLM-819	Algal amino acid mixture (U-D, 98%; U-^{15}N, 98%)
CDNLM-2496	Algal amino acid mixture (U-^{13}C, 97-99%; U-D, 97-99%; U-^{15}N, 97-99%)
ULM-2314	Algal amino acid mixture (unlabeled)
CLM-2065	Algal lyophilized cells (U-^{13}C, 98%)
NLM-2162	Algal lyophilized cells (U-^{15}N, 96-99%)
DLM-2066	Algal lyophilized cells (U-D, 98%)
CNLM-455	Algal lyophilized cells (U-^{13}C, 98%; U-^{15}N, 96-99%)
CDLM-3441	Algal lyophilized cells (U-^{13}C, 98%; U-D, 98%)
DNLM-839	Algal lyophilized cells (U-D, 98%; U-^{15}N, 96-99%)
CDNLM-3677	Algal lyophilized cells (U-^{13}C, 98%; U-D, 98%; U-^{15}N, 96-99%)
ULM-2177	Algal lyophilized cells (unlabeled)

Note: The algal strain is *Agmenelum quadriplicatum*. Also, the pH of the mixture may require adjustment after dissolution before its intended research use.

Example References

Wei, X.; Lorkiewicz, P.K.; Shi, B.; et al. **2017**. Analysis of stable isotope assisted metabolomics data acquired by high resolution mass spectrometry. *Anal Methods, 9(15),* 2275-2283.

Wei, X.; Shi, B.; Koo, I.; et al. **2017**. Analysis of stable isotope assisted metabolomics data acquired by GC-MS. *Anal Chim Acta, 980,* 25-32.

Millard, P.; Cahoreau, E.; Heuillet, M.; et al. **2017**. ^{15}N-NMR-based approach for amino acids-based ^{13}C-metabolic flux analysis of metabolism. *Anal Chem, 89(3),* 2101-2106.

Qiu, J.; Chan, P.K.; Bondarenko, P.V. **2016**. Monitoring utilizations of amino acids and vitamins in culture media and Chinese hamster ovary cells by liquid chromatography tandem mass spectrometry. *J Pharm Biomed Anal, 117,* 163-172.

Table 5. Uniform stable-isotope-labeled fatty acid mixtures.

Catalog No.	Description
CLM-8455	Mixed fatty acids (U-^{13}C, 98%)
DLM-8572	Mixed fatty acids (U-D, 96-98%)
CDLM-8376	Mixed fatty acids (U-^{13}C, 98%; U-D, 97%)
CLM-8381	Mixed fatty acid methyl esters (U-^{13}C, 98%) (terminal ester unlabeled) CP 95%
DLM-2497	Mixed fatty acid methyl esters (U-D, 96-98%)

➤ **Please inquire for composition of mixed fatty acids.**

Example References

Schoors, S.; Bruning, U.; Missiaen, R.; et al. **2015**. Fatty acid carbon is essential for dNTP synthesis in endothelial cells. *Nature, 520(7546),* 192-197.

Sharma, S.C.; Klinman, J.P. **2015**. Kinetic detection of orthogonal protein and chemical coordinates in enzyme catalysis: double mutants of soybean lipoxygenase. *Biochem, 54(35),* 5447-5456.

Table 6. Stable isotope-labeled canonical amino acid mix composition (MSK-CAA-1). Reconstituting in 1 mL solvent results in concentrations of 2.5 mM (exception L-cystine: 1.25 mM).

Compound	Abbrev.	Label and Enrichment
L-Alanine	Ala	$^{13}C_3$, 99%; ^{15}N, 99%
L-Arginine·HCl	Arg	$^{13}C_6$, 99%; $^{15}N_4$, 99%
L-Asparagine·H_2O*	Asn	$^{13}C_4$, 99%; $^{15}N_2$, 99%
L-Aspartic Acid	Asp	$^{13}C_4$, 99%; ^{15}N, 99%
L-Cystine	Cys-Cys	$^{13}C_6$, 99%; $^{15}N_2$, 99%
L-Glutamic Acid	Glu	$^{13}C_5$, 99%; ^{15}N, 99%
L-Glutamine*	Gln	$^{13}C_5$, 99%; $^{15}N_2$, 99%
Glycine	Gly	$^{13}C_2$, 99%; ^{15}N, 99%
L-Histidine·HCl·H_2O	His	$^{13}C_6$, 97-99%; $^{15}N_3$, 97-99%
L-Isoleucine	Iso	$^{13}C_6$, 99%; ^{15}N, 99%
L-Leucine	Leu	$^{13}C_6$, 99%; ^{15}N, 99%
L-Lysine·2HCl	Lys	$^{13}C_6$, 99%; $^{15}N_2$, 99%
L-Methionine	Met	$^{13}C_5$, 99%; ^{15}N, 99%
L-Phenylalanine	Phe	$^{13}C_9$, 99%; ^{15}N, 99%
L-Proline	Pro	$^{13}C_5$, 99%; ^{15}N, 99%
L-Serine	Ser	$^{13}C_3$, 99%; ^{15}N, 99%
L-Threonine	Thr	$^{13}C_4$, 97-99%; ^{15}N, 97-99%
L-Tryptophan*	Trp	$^{13}C_{11}$, 99%; $^{15}N_2$, 99%
L-Tyrosine	Tyr	$^{13}C_9$, 99%; ^{15}N, 99%
L-Valine	Val	$^{13}C_5$, 99%; ^{15}N, 99%

*Compounds absent in the MSK-A2-1.2 mix, which comprises 17 compounds and is supplied as a 1.2 mL solution (in 0.1 M HCl).

Example References

Chen, W.W.; Freinkman, E.; Sabatini, D.M. **2017**. Rapid immunopurification of mitochondria for metabolite profiling and absolute quantification of matrix metabolites. *Nat Protoc, 12(10),* 2215-2231.

Havelund, J.F.; Andersen, A.D.; Binzer, M.; et al. **2017**. Changes in kynurenine pathway metabolism in Parkinson patients with L-DOPA-induced dyskinesia. *J Neurochem, 142(5),* 756-766.

Mayers, J.R.; Torrence, M.E.; Danai, L.V.; et al. **2016**. Tissue of origin dictates branched-chain amino acid metabolism in mutant Kras-driven cancers. *Science, 353(6304),* 1161-1165.

Table 7. Stable isotope-labeled noncanonical amino acid mix composition (MSK-NCAA-1). Reconstituting in 1 mL solvent results in concentrations of 2.5 mM.

Compound	Abbrev.	Label and Enrichment
β-Alanine	β-Ala	$^{13}C_3$, 98%; ^{15}N, 96-99%
L-Azidohomoalanine·HCl	hAHA	1,2,3,4-$^{13}C_4$, 99%; 2,4-$^{15}N_2$, 98%
L-Citrulline	Cit	1,2,3,4,5-$^{13}C_5$, 98%
L-Dihydroxyphenylalanine	DOPA	1-^{13}C, ring-$^{13}C_6$, 99%
L-Homoarginine·HCl	Harg	$^{13}C_7$, 98%; $^{15}N_4$, 98%
L-Ornithine·HCl	Orn	$^{13}C_5$, 98%
Sarcosine·HCl	Sar	$^{13}C_3$, 99%; ^{15}N, 98%

Chemical purity (CP) is 98% or greater, unless otherwise indicated.
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Kits

The kits described below are all accompanied by user manuals that outline general procedures and processing examples for user reference. Additionally provided are troubleshooting notes and alternate method suggestions, as well as instructions and guides for data analysis.

Metabolomics QC Kit

Quality control (QC) of methods and processes is an essential factor toward the generation of reliable LC-MS data that can be reproduced by independent laboratories using untargeted or targeted MS technologies. Toward that, CIL offers a metabolomics QC kit (MSK-QC-KIT) for performance assessment of analytical workflows.

Table 8. Analyte composition of MSK-QC-KIT. Rehydrating each mix in 1 mL of solvent (e.g., 0.1% FA/5% ACN in water) yields the concentrations noted.

Components	Conc. (µg/mL)	Vial
L-Alanine ($^{13}C_3$, 99%)	4	1
L-Leucine ($^{13}C_6$, 99%)	4	1
L-Phenylalanine (ring-$^{13}C_6$, 99%)	4	1
L-Tryptophan ($^{13}C_{11}$, 99%)	40	1
L-Tyrosine (ring-$^{13}C_6$, 99%)	4	1
D-Glucose (U-$^{13}C_6$, 99%)	4	2
D-Sucrose (glucose-$^{13}C_6$, 98%)	4	2
Caffeine (trimethyl-$^{13}C_3$, 99%)	4	2
Stearic acid, sodium salt (U-$^{13}C_{18}$, 98%) CP 97%	0.4	2
Sodium octanoate ($^{13}C_8$, 99%)	4	2
Sodium propionate ($^{13}C_3$, 99%)	4	2
Sodium benzoate (ring-$^{13}C_6$, 99%)	4	2
Sodium citrate (1,5,6-carboxy-$^{13}C_3$, 99%)	4	2
Succinic acid, disodium salt ($^{13}C_4$, 99%)	4	2

➤ **Custom mixes can be formulated according to user specifications. Please inquire for details.**

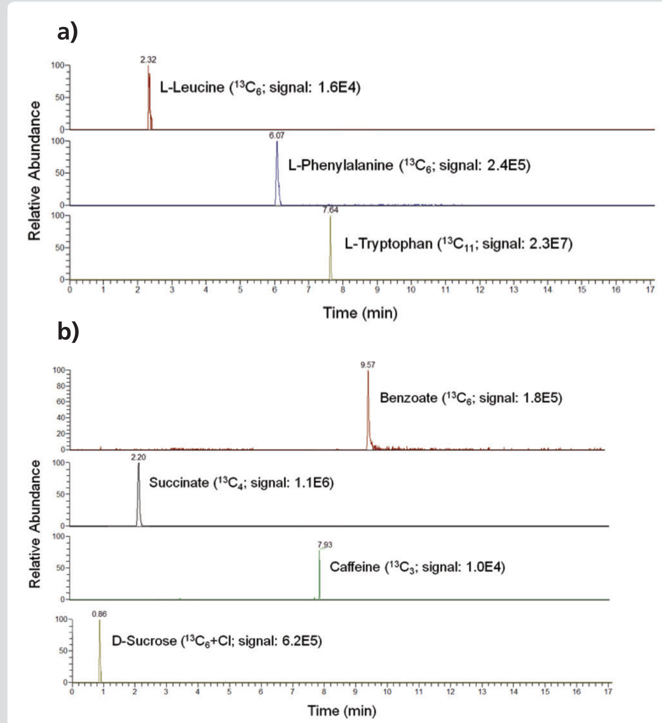

Figure 2. Representative XICs of a subset of kit metabolites – vial 1 in **a)** and vial 2 in **b)** – measured in human plasma by RP-LC-MS (negative ESI, Q Exactive). Procedurally, aliquots of the reconstituted vials were mixed then prepared/processed according to the user manual. Note that all isotopically labeled metabolites in the mixes co-eluted with their endogenous analytes in the plasma analyses and their *m/z* were predominantly [M-H]$^-$.

Chemical purity (CP) is 98% or greater, unless otherwise indicated.
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Metabolite Yeast Extract

In partnership with ISOtopic Solutions, CIL is pleased to offer an unlabeled and ^{13}C-labeled metabolite yeast extract for use as an internal or external standard in LC-/GC-MS studies. The unlabeled extract is designed for QC assessment and the isotopically enriched extract for quantitation of 100s of metabolites in a variety of samples (e.g., plasma, cells).

Catalog No.	Description
ISO1	Metabolite Yeast Extract (U-^{13}C, 98%)
ISO1-UNL	Metabolite Yeast Extract (unlabeled)

Dry extract of ~2 × 10^9 *Pichia pastoris* cells (~15 mg dry cell weight).

ISOtopic solutions

Table 9. Examples of reproducibly measured metabolites in ISO1 and ISO1-UNL (see CoA for specifics). Other metabolites have been identified with alternate methods and analysis techniques.

Amino Acids and Derivatives (L enantiomer where applicable)		
S-Adenosyl-homocysteine	Glutamate	Methionine
Alanine	Glutamine	(+/-)-3-Methyl-2-oxovalerate
α-Aminoadipate	Glycine	Ornithine
Arginine	Guanidineacetate	Phenylalanine
Argininosuccinate	Histidine	Proline
Asparagine	Homoserine	Sarcosine
Aspartate	Isoleucine	Serine
Betaine	α-Ketoisovalerate	Threonine
Citrulline	Kynurenine	Tryptophan
Cystathionine	Leucine	Tyrosine
Dihydroxyisovalerate	Lysine	Valine
Organic Acids		
cis-Aconitate	DL-2-Hydroxyglutarate	Malate
Citrate	Isocitrate	Pyruvate
Fumerate	Lactate	Succinate
Gluconate	α-Ketoglutarate	
Nucleobases, Nucleosides, and Nucleotides		
Adenine	Cytidine triphosphate	Inosine monophosphate
Adenosine	Deoxyadenosine monophosphate	5'-Deoxy-5'-methylthioadenosine
Adenosine diphosphate	Guanine	5-Methyluridine
Adenosine monophosphate	Guanosine	Pseudouridine
Adenosine triphosphate	Guanosine diphosphate	Uridine
Cyclic adenosine monophosphate	Guanosine monophosphate	Uridine diphosphate
Cyclic guanosine monophosphate	Guanosine triphosphate	Uridine monophosphate
Cytidine monophosphate	Inosine	Uridine triphosphate
Sugar and Sugar Phosphates (D enantiomer where applicable)		
Dihydroxyacetone phosphate	Glucose-6-phosphate	Ribose
Erythritol	Mannitol	Ribose-5-phosphate
Fructose	Mannose	Sedoheptulose-7-phosphate
Fructose-1,6-bisphosphate	Mannose-6-phosphate	Trehalose
Fructose-6-phosphate	6-Phosphogluconate	
Galactose	2-Phosphoglycerate	
Vitamins and Coenzymes		
Choline	Nicotinamide adenine dinucleotide, oxidized	Nicotinamide adenine dinucleotide phosphate, oxidized
Nicotinamide	Nicotinamide adenine dinucleotide, reduced	
Other Small Molecules		
Glutathione, oxidized	Glutamylcysteine	Mevalonate
Glutathione, reduced		

Chemical purity (CP) is 98% or greater, unless otherwise indicated.
For research use only. Not for use in diagnostic procedures.

Kits *(continued)*

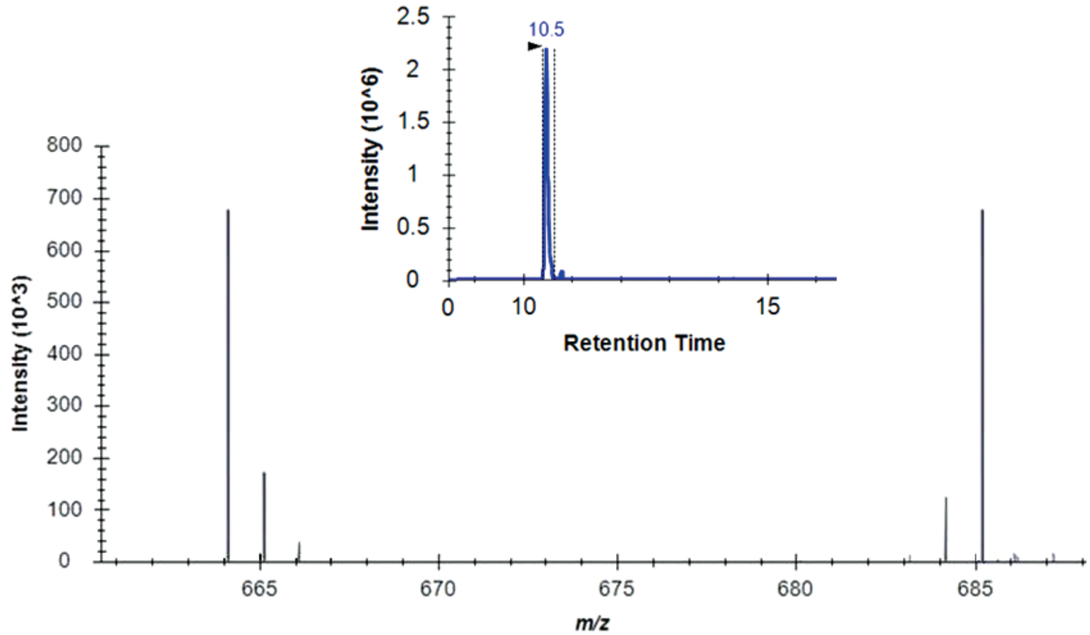

Figure 3. Mixed extract of ISO1 and ISO1-UNL measured by LC-MS on a Q Exactive HF. Procedurally, both ISO1 and ISO1-UNL were reconstituted in 2 mL of water before aliquot addition (100 µL each) to solvent (500 µL ACN and 300 µL water) and HILIC-MS measurement. Shown here is the MS1 spectrum of NAD^+ ($C_{21}H_{27}N_7O_{14}P_2$; *m/z* 664.1164 for unlabeled and 685.1869 for U-^{13}C), with its matching chromatogram in inset.

Example References

Rusz, M.; Rampler, E.; Keppler, B.K.; et al. **2019**. Single spheroid metabolomics: optimizing sample preparation of three-dimensional multicellular tumor spheroids. *Metabolites, 9(12).* pii: E304.

Zhang, Y.; Vera, J.M.; Xie, D.; et al. **2019**. Multiomic fermentation using chemically defined synthetic hydrolyzates revealed multiple effects of lignocellulose-derived inhibitors on cell physiology and xylose utilization in *Zymomonas mobilis. Front Microbiol, 10,* 2596.

Galvez, L.; Rusz, M.; Schwaiger-Haber, M.; et al. **2019**. Preclinical studies on metal based anticancer drugs as enabled by integrated metallomics and metabolomics. *Metallomics*, *11(10),* 1716-1728.

Demarest, T.G.; Truong, G.T.D.; Lovett, J.; et al. **2019**. Assessment of NAD^+ metabolism in human cell cultures, erythrocytes, cerebrospinal fluid and primate skeletal muscle. *Anal Biochem, 572,* 1-8.

Hermann, G.; Schwaiger, M.; Volejnik, P.; et al. **2018**. ^{13}C-labelled yeast as internal standard for LC-MS/MS and LC high resolution MS based amino acid quantification in human plasma. *J Pharm Biomed Anal, 155,* 329-334.

Guijas, C.; Montenegro-Burke, J.R.; Domingo-Almenara, X.; et al. **2018**. METLIN: a technology platform for identifying knowns and unknowns. *Anal Chem, 90(5),* 3156-3164.

Si-Hung, L.; Causon, T.J.; Hann, S. **2017**. Comparison of fully wettable RPLC stationary phases for LC-MS-based cellular metabolomics. *Electrophoresis, 38(18),* 2287-2295.

Schwaiger, M.; Rampler, E.; Hermann, G.; et al. **2017**. Anion-exchange chromatography coupled to high-resolution mass spectrometry: a powerful tool for merging targeted and non-targeted metabolomics. *Anal Chem, 89(14),* 7667-7674.

Ortmayr, K.; Hann, S.; Koellensperger, G. **2015**. Complementing reversed-phase selectivity with porous graphitized carbon to increase the metabolome coverage in an on-line two-dimensional LC-MS setup for metabolomics. *Analyst, 140(10),* 3465-3473.

Neubauer, S.; Chu, D.B.; Marx, H.; et al. **2015**. LC-MS/MS-based analysis of coenzyme A and short-chain acyl-coenzyme A thioesters. *Anal Bioanal Chem, 407(22),* 6681-6688.

Credentialed *E. coli* Cell Extract Kits

An exceeding challenge in optimizing metabolomic methods toward improved metabolome coverage has been the difficulty in comparing the number of metabolites profiled in each. This evaluation is challenged by artifactual (i.e., noncredentialed) features arising from sample contamination during metabolite extraction, background noise, and/or misannotation of data during bioinformatic processing. To help streamline method optimization/evaluation in untargeted metabolomics, Dr. Gary Patti and colleagues developed a credentialed platform that utilizes a simple software algorithm for interrogating *E. coli* extracts (see references below). To aid broad utility, CIL is proud to offer *E. coli* cell extract kits that can be applied for performance comparisons of 100s of metabolites across different metabolomic workflows and instrument platforms. The figure below illustrates a credentialed metabolite measured in the *E. coli* extract.

Catalog No.	Description
MSK-CRED-KIT	Credentialed *E. coli* Cell Extract Kit (solution)
MSK-CRED-DD-KIT	Credentialed *E. coli* Cell Extract Kit (dried down)

Note: Each kit contains two vials of *E. coli* cell extracts (K12 strain MG1655), with one grown in ^{13}C D-glucose (U-$^{13}C_6$, 99%) and the other in natural abundance D-glucose. Procedurally, these are to be mixed (at defined ratios) prior to LC-MS analysis and bioinformatic processing.

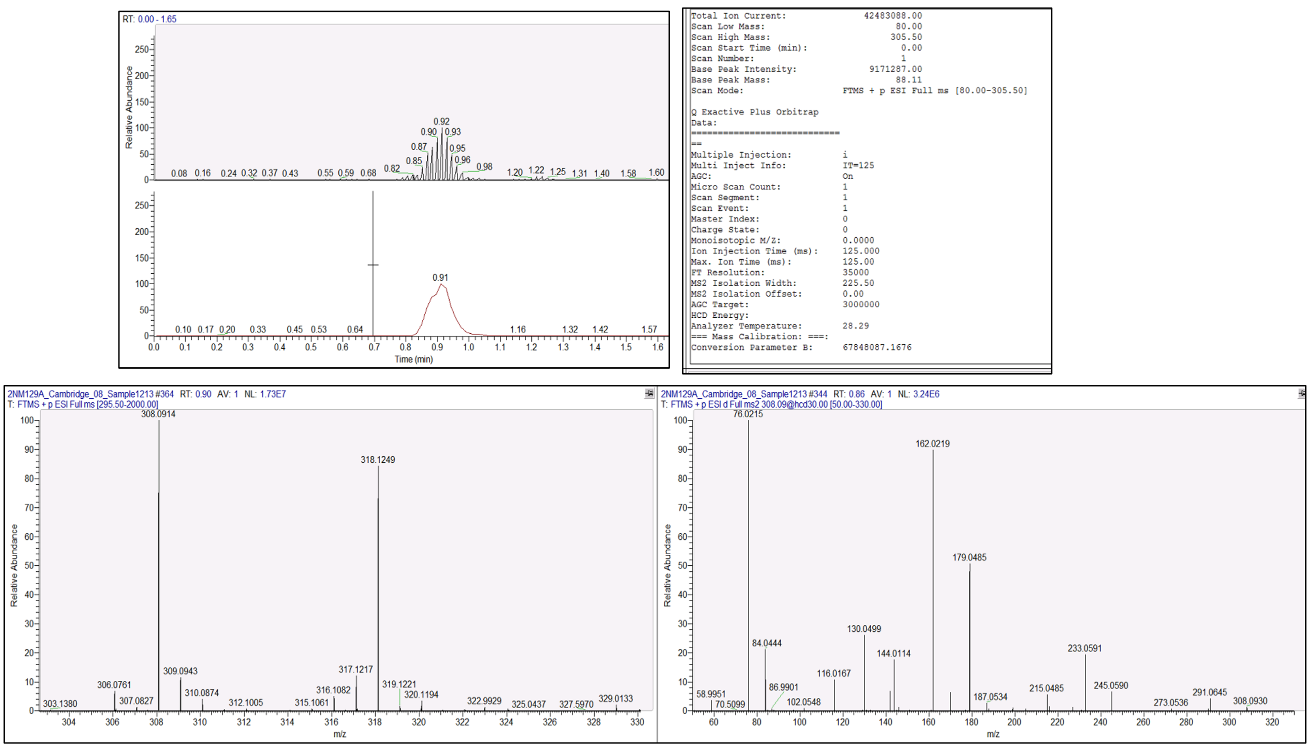

Figure 4. Credentialed extract measured by LC-MS on a Q Exactive Plus. Shown are the measured parameters and observed spectra for reduced glutathione ($C_{10}H_{17}N_3O_6S$; unlabeled CAS 70-18-8). The M+0 in the MS survey scan is at *m/z* 308.0914, while the M+U is at 318.1249.

Example References

Wang, L.; Naser, F.J.; Spalding, J.L.; et al. **2019**. A protocol to compare methods for untargeted metabolomics. *Methods Mol Biol, 1862,* 1-15.

Naser, F.J.; Mahieu, N.G.; Wang, L.; et al. **2018**. Two complementary reversed-phase separations for comprehensive coverage of the semipolar and nonpolar metabolome. *Anal Bioanal Chem, 410(4),* 1287-1297.

Mahieu, N.G.; Patti, G.J. **2017**. Systems-level annotation of a metabolomics data set reduces 25,000 features to fewer than 1000 unique metabolites. *Anal Chem, 89(19),* 10397-10406.

Benton, H.P.; Ivanisevic, J.; Mahieu, N.G.; et al. **201**5. Autonomous metabolomics for rapid metabolite identification in global profiling. *Anal Chem, 87(2),* 884-891.

Mahieu, N.G.; Huang, X.; Chen, Y.; et al. **2014**. Credentialing features: a platform to benchmark and optimize untargeted metabolomic methods. *Anal Chem, 86(19),* 9583-9589.

Kits *(continued)*

IROA® Biochemical Quantitation Kits

By using specific isotopic balances (e.g., 95% ^{13}C and 5% ^{13}C D-glucose in the basic protocol for control and experimental groups), IROA's quantitative assay kits can be used to study biomarkers, systems biology, and flux in a wide variety of cell populations and biological samples (see references below for general background and application examples). The reduced enrichment enables isotopic distributions to be detected by MS in a predictable and distinguishable manner. These distributions can then be used to: (i) differentiate biological signals from artifacts, (ii) calculate accurate molecular formulae, and (iii) determine relative concentrations of the metabolites of biological origin.

Catalog No.	Description	Protocol
IROA-100-50	IROA 100 for Yeast/Fungi Metabolic Profiling	Basic
IROA-200-50	IROA 200 for Bacterial Metabolic Profiling	Basic
IROA-300-250	IROA 300 for Mammalian Metabolic Profiling	Basic
IROA-PHENO-95-300	IROA 300 for Phenotypic Metabolic Profiling	Phenotypic
IROA-FLUX-05	IROA 300 for Fluxomic Metabolic Profiling	Flux

Note: Unlabeled bacterial (IROA-200-UL) and mammalian (IROA-300-UL) media are also available for cell-growth testing and adaptation.

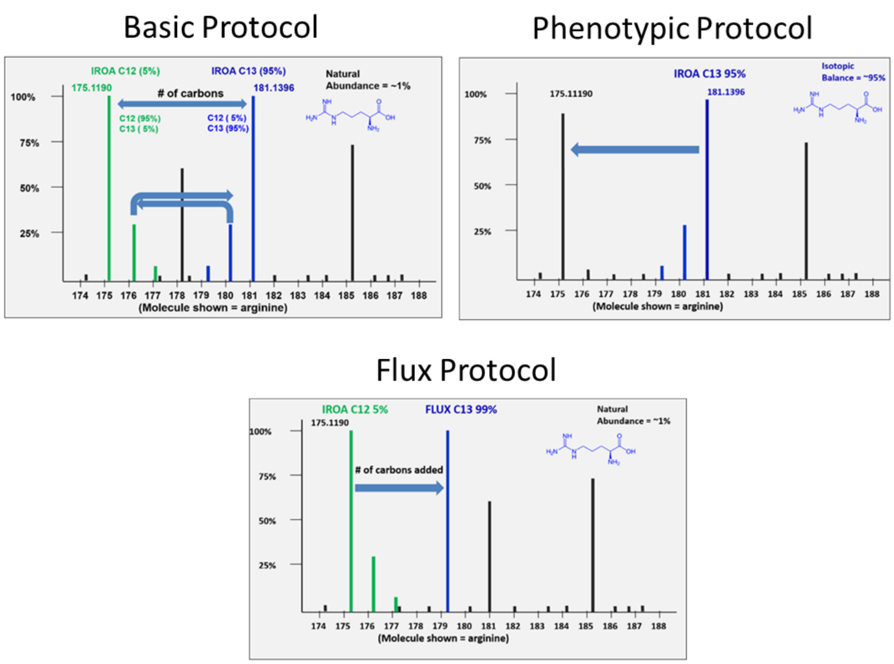

Figure 5. MS spectra for L-arginine ($C_6H_{14}N_4O_2$) measured by LC-MS under three types of IROA protocols. Briefly, the cell populations are grown with istopically labeled D-glucose for control and experimental samples in the basic protocol, control samples only in phenotypic, and experimental samples only in fluxomic (tracers added after harvest at 99% ^{13}C). **Note**: the control signals (at 95% ^{13}C) are illustrated in blue across all protocols and the experimental (at 5% ^{13}C in the basic and flux protocols or natural abundance in the phenotypic) in green (for the basic and flux protocols) or black (for the phenotypic protocol). IROA's ClusterFinder software is used for data analysis and the statistical interpretation.

Example References

Rahman, M.A.; Akond, M.; Babar, M.A.; et al. **2017**. LC-HRMS based non-targeted metabolomic profiling of wheat (*Triticum aestivum* L.) under post-anthesis drought stress. *Am J Plant Sci, 8,* 3024-3061.

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Additional Information

Research Use of Products

CIL manufactures highly pure research biochemicals that are produced for research applications. As a service to our customers, some of these materials have been tested for the presence of *S. aureus, P. aeruginosa, E. coli, Salmonella sp.,* aerobic bacteria, yeast, and mold, as well as the presence of endotoxin in the bulk material by taking a random sample of the bulk product. Subsequent aliquots are not retested. Presence of endotoxin is assessed by determining endotoxin content following established protocols and standardized limulus amebocyte lysate (LAL) reagents. Any materials listed in our catalog or website that are designated as "MPT" in the item product number (e.g., DLM-349-MPT) contain these tests as part of release specifications.

If a product does not have an "MPT" designation, CIL may be able to provide microbiological testing on the product. Depending on the compound and the quantity ordered, an additional fee may apply for the testing. Please note that microbiological-tested products are not guaranteed to be sterile and pyrogen-free when received by the customer, and microbiological testing does not imply suitability for any desired use. If the product must be sterile and pyrogen-free for a desired application, CIL recommends that the product be packaged or formulated into its ultimate dose form by the customer or appropriate local facility. The product should always be tested by a qualified pharmacy/facility prior to actual use.

CIL research products are labeled "For research use only. Not for use in diagnostic procedures." Persons intending to use CIL products in applications involving humans are responsible for complying with all applicable laws and regulations including but not limited to the US FDA, other local regulatory authorities and institutional review boards concerning their specific application or desired use.

It may be necessary to obtain approval for using these research products in humans from the US FDA or the comparable governmental agency in the country of use. CIL will provide supporting information, such as lot-specific analytical data and test method protocols, to assist medical research groups in obtaining approval for the desired use. An Enhanced Data Package (EDP) is also available (see next page for an overview of the technical package contents).

CIL will allocate a specific lot of a product to customers who are starting long-term projects requiring large amounts of material. Benefits from this type of arrangement include experimental consistency arising from use of only one lot, no delay in shipments, and guaranteed stock. Please note that some CIL products have a specific shelf life and cannot be held indefinitely. If interested, please contact your sales manager for further details.

Because of increasing regulatory requirements, CIL manufactures different grades of materials to help researchers with those requirements. Listed below are the grades of materials that CIL currently manufactures:

Catalog No.	Description
CLM-XXX-**PK**	Research grade
CLM-XXX-**MPT-PK**	Microbiologically and Pyrogen Tested
CLM-XXX-**CTM**	Manufactured following ICH Q7, Section XIX
CLM-XXX-**GMP**	Good Manufacturing Practices grade

➤ **For more information on controls in manufacturing and testing of the different grades, go to: Search → Literature → Product Quality Designations from the isotope.com home page.**

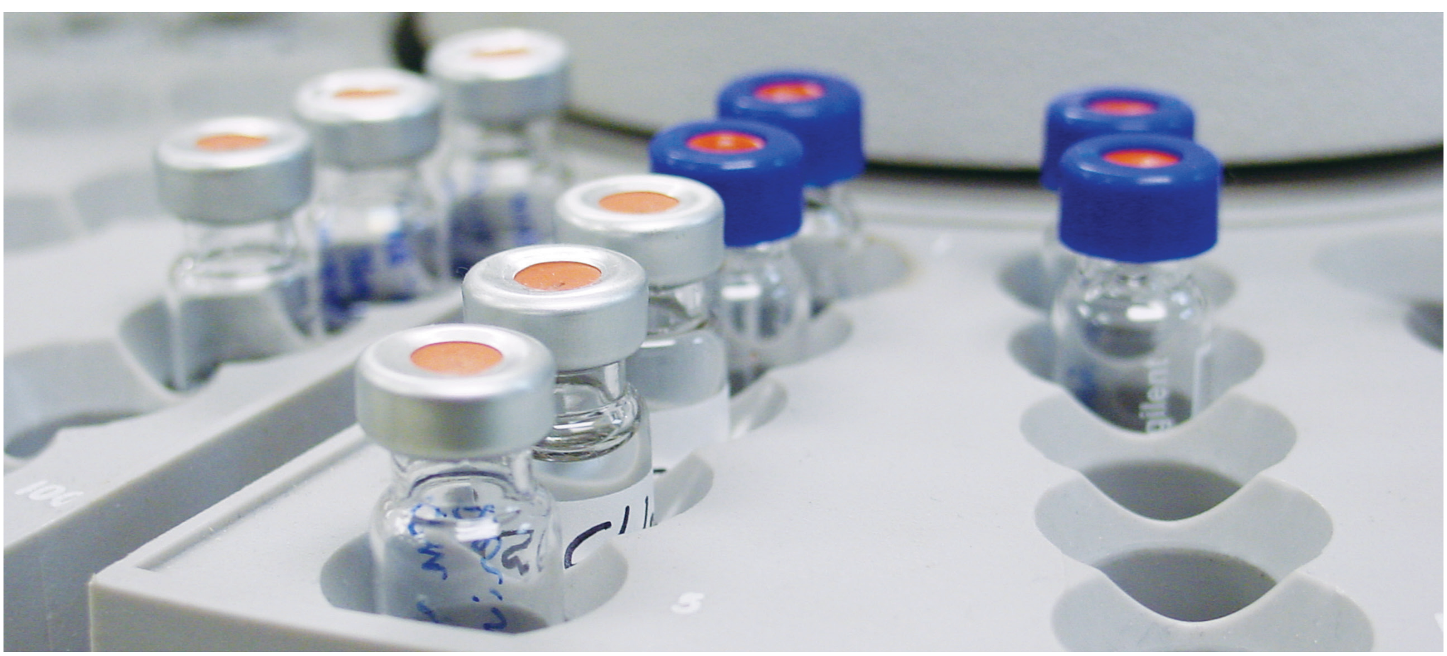


Image is for illustrative purposes only and may not be representative of actual product(s).

Enhanced Data Package (EDP)

CIL offers the option of an Enhanced Data Package (EDP). This technical data package is available for most MPT products. It includes all of the data currently included with the MPT products, as well as the additional information listed below. You have the option of purchasing this package at the time of order or at a later date.

Please note that if you choose to purchase at a later date, some of the information listed below may not be available. Also, the EDP may not be available for all lots. In some cases, only a partial EDP may be available. Please confirm availability and content prior to order.

EDP Contents

- Product description: structural formula, stereochemical description, molecular formula.
- Product physical properties: melting point, pH, optical rotation (mix of literature or measured values).
- Outline of the synthesis route (including details of solvents used).
- Data used to confirm structure and chemical purity.
- Additional testing data: products with an EDP have been tested to the specifications/monograph similar to those detailed in the USP or EP, but not using compendia methods.
- Impurities: available data on impurities detected and identified together with the method of detection and the cutoff applied.
- Residual solvents: measured residual solvents from the final synthetic step and purification.
- Certificates of Analysis of raw materials, where appropriate.
- Informal stability data: estimated and measured.
  - This will be either actual shelf life data, if it can be obtained from CIL history or by analysis of in-stock batches, or
  - If no data is available, CIL will commit to assaying the batch provided after six months and one year. Data will be provided after one year, unless the batch fails assay after six months. This option will not be available if the Enhanced Data Package is ordered at a later date.

cGMP Production Capabilities

With increasing requirements from institutional review boards (IRBs) and governmental agencies, partnering with CIL for your next stable isotope cGMP (current good manufacturing practices) project can help ensure your regulatory compliance. With the world's largest ^{13}C and ^{18}O isotope-separation plants, CIL is able to provide the raw materials necessary for your project. Your compound of interest most likely already appears in CIL's extensive list of research compounds – if not, CIL's team of PhD chemists can determine the best method of synthesis for incorporating ^{13}C, ^{15}N, D, ^{17}O, and/or ^{18}O into your compound.

CIL has manufactured bulk active pharmaceutical ingredients (APIs) since 1994. It recently added a 15,000-square-foot, state-of-the-art cGMP facility to complement its existing cGMP facilities. An additional team of experts – specializing in synthetic chemistry, customer support, quality control, and quality assurance – serves to provide technical guidance from beginning to end of your project. Partner with CIL to help you meet your increasing regulatory compliance requirements.

Products of Interest

Catalog No.	Description
CLM-804-CTM	Cholesterol (3,4-$^{13}C_2$)
DLM-349-CTM	D-Glucose (6,6-D_2)
CLM-2262-CTM	L-Leucine ($^{13}C_6$)
DLM-1259-CTM	L-Leucine (5,5,5-D_3)
CLM-762-CTM	L-Phenylalanine (1-^{13}C)
CLM-8077-CTM	Pyruvic acid (1-^{13}C)
CLM-156-CTM	Sodium acetate (1-^{13}C)
CLM-440-CTM	Sodium acetate (1,2-$^{13}C_2$)
CLM-311-GMP	Urea (^{13}C)

➤ **Other products may be available as CTM/cGMP. Please inquire for details.**

Manufacturing Capabilities

- Dedicated development facility
- Five production and two isolation suites
- Dedicated packaging room
- Production scale from milligrams to multikilograms
- Clinical trials to bulk API
- Customizable projects to meet your needs

Analytical Services

- Fully equipped, cGMP-dedicated analytical facility
- Method development and validation
- Raw material and final product testing
- Wet chemistry and compendial methods
- Stability studies and chambers
- Analytical instrumentation:
  - – High-field NMR (^1H, D, ^{13}C, ^{15}N, multinuclear)
  - – HPLC with UV, RI, ELSD, DA, Pickering, and MS detection
  - – GC with FID, ECD, and MS detection
  - – KF
  - – FT-IR
  - – Polarimetry
  - – TOC

Quality and Compliance

- Drug master files
- FDA-audited facility
- QA release of API product
- Follows FDA and ICH guidances
- CMC sections for NDA or IND

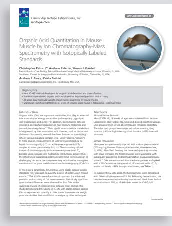
CTM: manufactured following ICH Q7, Section XIX
GMP: good manufacturing practices grade

Chemical purity (CP) is 98% or greater, unless otherwise indicated.
For research use only. Not for use in diagnostic procedures.

Application Note Examples

Application Note 47

Organic Acid Quantitation in Mouse Muscle by Ion Chromatography-Mass Spectrometry with Isotopically Labeled Standards



Organic acids (OAs) are important metabolites that play an essential role in an array of energy metabolism pathways (e.g., glycolysis and tricarboxylic acid cycle).[1,2] In addition, short chained OAs are emerging as important regulators of host immune responses and transcriptional regulation.[3,4] Their significance to cellular metabolism is heightened by their association with diseases, such as cancer and diabetes.[5-7] As a result, research has been focused on quantifying OAs in various biological samples (e.g., urine,[8] plasma,[9] serum[10]). In these studies, measurements of OAs were accomplished by liquid chromatography (LC) or capillary electrophoresis (CE) coupled to mass spectrometry (MS).[11,12] The commonly utilized modes of chromatography include reversed-phase (with C_{18} bonded silica), ion pair, and hydrophilic interactions. Despite that, the efficiency of separating polar OAs with these techniques can be challenging. An attractive complementary technique for untargeted metabolomics of polar metabolites is ion chromatography (IC)-MS.[13]In this note, a targeted IC-MS method using stable isotope-labeled standards (SIS) was used to quantify a panel of polar OAs in mouse muscle.[14] The SIS OAs served as internal standards for enhanced precision and accuracy of OA measurements. Statistically significant quantitative differences were observed for four OAs in the quadricep muscle of sedentary and fatigued mice. Overall, this study demonstrated the ability of IC-MS with stable isotope-labeled OAs to separate and quantify a collection of low molecular weight polar metabolites that are difficult to analyze by other techniques. Read more at isotope.com.

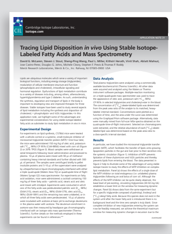
Application Note 43

Analysis of Whole-Body Branched-Chain Amino Acid Metabolism in Mice Utilizing 20% Leucine $^{13}C_6$ and 20% Valine $^{13}C_5$ Mouse Feed

Cancer cells have altered metabolism relative to normal cells. To date, most cancer metabolism research has focused on understanding the mechanisms of cell autonomous metabolic alterations such as the influence of different oncogenic signals on nutrient utilization and the effects of altered regulation of specific enzymes on metabolic fluxes through different pathways (Cairns, et al., 2011). While these studies have provided insight into metabolic needs of proliferating cancer cells (Vander Heiden, et al., 2009), they do not address potential interactions between tumor and normal tissues. Research on whole-body metabolic alterations associated with type 2 diabetes (T2DM) provides insight into how altered metabolite sensing can affect the metabolism of specific tissues. Intriguingly, there are clear epidemiological connections between diabetes and several types of cancer, especially pancreatic adenocarcinoma (PDAC) (Everhart and Wright, 1995; Wang, et al., 2003). Indeed, epidemiologic evidence indicates that pancreatic cancer can be both a consequence of longstanding diabetes (Ben, et al., 2011) and cause of new-onset cases (Huxley, et al., 2005). Methods to study metabolism across tissues are needed to understand how whole-body metabolic alterations influence tumor metabolism, and to understand the systemic changes associated with metabolic disease. Read more at isotope.com.

Application Note 31

Tracing Lipid Disposition *in vivo* Using Stable Isotope-Labeled Fatty Acids and Mass Spectrometry



Lipids are ubiquitous molecules which serve a variety of important biological functions, including energy storage (triglycerides), modulation of cellular membrane structure and function (phospholipids and cholesterol), intracellular signaling and hormonal regulation. Dysfunctions of lipid metabolism contribute to a variety of diseases including, among others, atherosclerosis, hypertriglyceridemia and type 2 diabetes. As such, understanding the synthesis, regulation and transport of lipids in the body is important to developing new and improved therapies for these diseases. Stable isotopes have been used to study several aspects of lipid metabolism including the synthesis and disposition of cholesterol, phospholipids and VLDL triglycerides.In this application note, we highlight some of the advantages and experimental considerations for using stable isotope-labeled fatty acids as substrates to study lipid metabolism *in vivo* in mice. Read more at isotope.com.

Custom synthesis and formulations are also available. Please inquire.

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Please visit isotope.com for a list of additional compounds.

Research products are distributed and sold worldwide via our extensive network.

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CIL provides additional testing on many products as a service to our customers. CIL also has cGMP capabilities and can manufacture products to meet your increasing regulatory compliance requirements. Please contact us to learn more.

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