



13C Mass Isotopomer Analysis - TCA
Service Code:13C-TCA

Summary: Profile of Central Metabolism, including glycolysis, pentose-phosphate shunt, TCA cycle and nucleotide pools. LCMS detection includes a one step liquid –liquid organic solvent extraction of cultured cells, tissues or plasma, and separation on a 1mm x150mm HILIC specific column in a 35 min cycle. Isotope enrichment of targeted metabolites are corrected for natural abundance and reported as ratios of M, M+1, M+2, M+3, etc.

Container: 1.5mL Micro Tube or equivalent

Normal Volume: Plasma (100 µL) Tissue (50-100 mg); Cell (1.5E7).

Minimal Volume: Plasma (50 µL) Tissue (30 mg); Cells (~2.5E6)

Sample Collection: Please see our detailed sample collection protocol on the Michigan Regional Comprehensive Metabolomics Resource Core (MRC²) website before preparing samples for analysis or contact the core director at the number below for details.

Reference: [Matthew A. Lorenz](#), [Charles F. Burant](#), and [Robert T. Kennedy](#) (2011) "Reducing Time and Increasing Sensitivity in Sample Preparation for Adherent Mammalian Cell Metabolomics", *Anal. Chem.* 83(9): 3406–3414.

Table I: Analytes reported (Additional Gly-TCA metabolites (Lactate, Fumarate, Alpha ketoglutarate) may be obtained for an additional cost by selecting the TCA-Supplement assay in MiCores.)

Analyte	Abbr.	Mol Formula
Acetyl-CoA	aCoA	C ₂₃ H ₃₈ N ₇ O ₁₇ P ₃ S
Citrate/Isocitrate combined	Cit/i-Cit	C ₆ H ₈ O ₇
Succinate	Suc	C ₄ H ₆ O ₄
Malate	Mal	C ₄ H ₆ O ₅
2-Phosphoglycerate/3-Phosphoglycerate combined	2PG/3PG	C ₃ H ₇ O ₇ P
Phosphoenolpyruvate	PEP	C ₃ H ₅ O ₆ P
Adenosine monophosphate	AMP	C ₁₀ H ₁₄ N ₅ O ₇ P
Adenosine diphosphate	ADP	C ₁₅ H ₂₃ N ₅ O ₁₄ P ₂
Adenosine triphosphate	ATP	C ₁₀ H ₁₆ N ₅ O ₁₃ P ₃
Flavin adenine dinucleotide	FAD	C ₂₇ H ₃₃ N ₉ O ₁₅ P ₂



Table I, continued:

Nicotinamide adenine dinucleotide	NAD	$C_{21}H_{28}N_7O_{14}P_2$
Nicotinamide adenine dinucleotide, reduced	NADH	$C_{21}H_{29}N_7O_{14}P_2$
Nicotinamide adenine dinucleotide phosphate	NADP	$C_{21}H_{29}N_7O_{17}P_3$
Nicotinamide adenine dinucleotide phosphate, reduced	NADPH	$C_{21}H_{30}N_7O_{17}P_3$
Erythrose 4-phosphate	E4P	$C_4H_9O_7P$
Ribulose 5-phosphate/Xylulose 5-phosphate/ribose-5-phosphate combined	R5P/X5P/Ru5P	$C_5H_{11}O_8P$
6-phosphogluconate	6PG	$C_6H_{13}O_{10}P$
Sedoheptulose 7-phosphate	S7P	$C_7H_{15}O_{10}P$
Fructose-6-phosphate + glucose-6-phosphate	F6P/G6P	$C_6H_{13}O_9P$
Fructose-bisphosphate	FBP	$C_6H_{14}O_{12}P_2$
Aspartate	ASP	$C_4H_7NO_4$
Glutamate	GLU	$C_5H_9NO_4$
Glutathione- Reduced (below LOD in some samples)	GSSH	$C_{10}H_{17}N_3O_6S$
Glutathione- Oxidized below LOD in some samples	GSSG	$C_{20}H_{32}N_6O_{12}S_2$

Metabolites in this assay may be below the detection limit in some samples, especially plasma and samples with less than 3 million cells.