North Carolina State Laboratory of Public Health Newborn Screening Normal Reference Ranges **Last Updated: October 27, 2026**

DISORDER	ABBREVIATION	ANALYTE		REFERENCE RANGE
FATTY ACID OXIDATION DISORDERS				
Carnitine Uptake Deficiency	CUD	Free carnitine (C0)		>7.0 µM
Short chain acyl-coA dehydrogenase deficiency	SCAD	Butyrlcarnitine (C4)		<1.50 µM
Glutaric Acidemia, type II	GA-II	Butyrlcarnitine (C4) Isovalerylcarnitine (C5)		<1.50 µM <1.40 µM
Medium chain acyl-CoA dehydrogenase deficiency	MCAD	Octanoylcarnitine (C8)		<0.40 µM
Medium chain keto acyl-CoA thiolase deficiency	MCKAT	Octanoylcarnitine/Decanoylcarnitine (C8/C10)		<2.50
Very long chain acyl-CoA dehydrogenase deficiency	VLCAD	Tetradecenoylcarnitine (C14:1) by age	0-7 days >7 days	<0.60 µM <0.20 µM
		Tetradecenoylcarnitine/Dodecenoylcarnitine Ratio (C14:1/C12:1) by age	0-7 days >7 days	<3.50 <3.50
Long chain 3-Hydroxy acyl-CoA dehydrogenase deficiency	LCHAD	3-Hydroxy-hexadecanoylcarnitine (C16OH)		<0.12 µM
Trifunctional Protein deficiency	TFP	3-Hydroxy-octadecanoylcarnitine (C18OH)		<0.06 µM
Carnitine palmitoyltransferase II deficiency	CPT-II	Hexadecanoylcarnitine (C16)		<10.00 µM
Carnitine/acylcarnitine translocase deficiency	CACT	Octadecenoylcarnitine (Oleylcarnitine) (C18:1)		<3.50 µM
Carnitine palmitoyltransferase I deficiency	CPT-I	C0/(C16+C18) by age	0-7 days >7 days	<68.00 <132.00
Medium/Short chain 3-Hydroxy acyl-CoA dehydrogenase deficiency	M/SCHAD	Malonylcarnitine\3-Hydroxy-butyrylcarnitine (C3DC+C4OH) by age	0-7 days >7 days	<0.93 µM <0.45 µM
ORGANIC ACIDEMIA DISORDERS				
Propionic acidemia Methylmalonic acidemia – (methylmalonyl-CoA mutase) Methylmalonic acidemia – (cobalamin disorders)	PA MMA-MUT MMA-CBL	Propionylcarnitine (C3) by age	0-7 days >7 days	<5.50 µM <3.50 µM
		Propionylcarnitine/Acetylcarnitine Ratio (C3/C2) by age	0-7 days >7 days	<0.35 <0.35
Isobutyrylglycinuria	IBG	Butyrlcarnitine (C4)		<1.50 µM
Isovaleric acidemia 2-Methylbutyrylglycinuria	IVA 2MBG	Isovalerylcarnitine (C5)		<1.40 µM
3-Hydroxy-3-methylglutaryl-CoA lyase deficiency 3-methylcrotonyl-CoA carboxylase deficiency Multiple carboxylase deficiency 3-Methylglutaconic aciduria	HMG 3MCC MCD 3-MGA	Methylmalonyl\3-Hydroxy-isovalerylcarnitine (C4DC+C5OH)		<0.78 µM
Glutaric acidemia type I	GA-I	Glutarylcarnitine\3-Hydroxy-hexanoylcarnitine (C5DC+C6OH) by age	0-7 days >7 days	<0.44 µM <0.34 µM
Β-Ketothiolase deficiency 2-Methyl-3-hydroxybutyric aciduria	BKT 2M3HBA	Tiglylcarnitine (C5:1)		<0.20 µM
Malonic acidemia	MAL	Malonylcarnitine\3-Hydroxy-butyrylcarnitine (C3DC+C4OH) by age	0-7 days >7 days	<0.93 µM <0.45 µM
AMINO ACID & UREA CYCLE DISORDERS				
Phenylketonuria	PKU	Phenylalanine (Phe)		<130 µM
Hyperphenylalaninemia		Phenylalanine/Tyrosine (Phe/Tyr)		<2.00
Biopterin cofactor defect of biosynthesis				
Biopterin cofactor defect of regeneration				
Maple syrup urine disease	MSUD	Leucine (Leu+Ile+Pro-OH)		<275 µM
		Valine (Val)		<275 µM
		Leucine/Phenylalanine (Leu+Ile+Pro-OH/Phe)		<5.00 µM
Tyrosinemia type I	TYR I	Succinylacetone (Suac)		<1.00 µM
Tyrosinemia type II/III	TYR II/III	Tyrosine (Tyr)		<450 µM
Homocystinuria Hypermethionemia	HCY/MET	Methionine (Met)		<105 µM
Citrullinemia, type I	CIT	Citrulline (Cit) by age	0-7 days	<64.0 µM

Citrullinemia, type II			>7 days	<72.0 µM
Argininosuccinic acidemia	ASA	Argininosuccinic Acid (Asa)		<1.00 µM
Argininemia	ARG	Arginine (Arg)		<115.0 µM
Guanidinoacetate methyltransferase deficiency	GAMT	Guanidinoacetate (GUAC) by age	0-3 days	<6.50 µM
			>3 days	<5.28 µM
		Guanidinoacetate/Creatine x 1000 (GUACx1000/CRE) by age	0-3 days	<25
			>3 days	<25

ENDOCRINE DISORDERS

Congenital Hypothyroidism	CH	Thyroxine (T4) Thyroid-stimulating Hormore (TSH)		≥5 µg/dL <20 UIU/mL
Congenital Adrenal Hyperplasia	CAH	17-Hydroxyprogesterone (17-OHP) by Birthweight	≥2300 g	<30 ng/mL
			1400-2299g	<50 ng/mL <73 ng/mL

METABOLIC DISORDERS

Classic galactosemia	GAL	Galactose-1-Phosphate Uridyltransferase Activity (GALT) Total	≥2.2 U/gHb
		Galactose (Tgal)	<7.3 mg/dL
		GALT Mutational Analysis	Mutations Not Detected
Biotinidase Deficiency	BIOT	Biotinidase Activity (Biot)	≥83.6 U/dL

OTHER DISORDERS

Hemoglobinopathies	S/S Disease Hgb C/D/E Disease	HGB	Hemoglobin	FA
Cystic Fibrosis		CF	Immunoreactive Trypsinogen (IRT) Cystic Fibrosis Transmembrane Conductance Regulator (CFTR)	<96th percentile CFTR Mutations Not Detected
Severe Combined Immunodeficiency		SCID	T-cell Receptor Excision Circles (TRECs)	TRECs Detected
Spinal Muscular Atrophy		SMA	Homozygous Deletion of Exon 7 in SMN1	Exon 7 Detected in SMN1
X-Linked Adrenoleukodystrophy		X-ALD	C26:0-lysophosphatidylcholine (C26:0-LPC)	<0.15 µM
Mucopolysaccharidosis Type I		MPS I	α-L-iduronidase (IDUA) Enzyme Activity	>8% of daily median
Mucopolysaccharidosis Type II		MPS II	iduronate 2-sulfatase (I2S) Enzyme Activity	>10% of the daily median
Pompe Disease		POMPE	Acid-α-glucosidases (GAA) Enzyme Activity	>15% of daily median
Krabbe Disease		KRABBE	Galactosylceramidase (GALC) Enzyme Activity	>12% of daily median