



## BIOCHEMICAL GENETICS AND METABOLIC TESTING

- ❖ The following metabolic tests require the *Clinical Data Sheet* provided by ChildLab Client Services to accompany specimens sent to the laboratory. This information is utilized to provide a comprehensive interpretation.
- ❖ If any of the following tests are ordered as a follow-up to a failed newborn screen, a copy of the state newborn screening results should be submitted with the specimen.

### ♥ Acylcarnitine Profile (ACP) – (Blood Spot Card, Plasma)

- The acylcarnitine profile is a test used to identify the species of acylcarnitine(s) produced by patients with suspected inborn errors of metabolism. Patients with metabolic disorders produce disease specific acylcarnitines correlating with the acyl-CoA compounds accumulating at the enzymatic block. This test is used to aid in the diagnosis of disorders of fatty acid and branched amino acid metabolism. Appropriate indications for utilization are: follow-up for several types of abnormal newborn screening results, subsequent to an abnormal urine organic acid or serum amino acid profile, and when fatty acid oxidation defects are suspected based on patient history.
- This profile includes free and total carnitine levels. Acceptable samples types are heparinized plasma (without gel separator) or blood spot analysis performed on filter cards obtained from ChildLab Client Services.

### ♥ Amino Acids – (Serum, Urine)

- Amino acids are organic compounds made of carbon, hydrogen, oxygen, nitrogen, and (in some cases) sulfur, bonded in characteristic formations. Strings of amino acids make up proteins, of which there are countless varieties. Twenty amino acids are required for manufacturing the proteins the human body needs, the body itself produces only 12. The other 8 amino acids the body requires are obtained through nutrition.
- Collect the specimen from infants just prior to feeding.
- Fasting specimens (3-4 hours) are preferred.
- Specimens from patients receiving total parenteral nutrition (TPN) or antibiotics may result in false positive elevations.

### ♥ Phenylalanine / Tyrosine – (Blood Spot Card, Serum)

- Phenylalanine is one of several essential amino acids needed in the diet. Phenylalanine can be degraded into simpler compounds by the enzymes of the body and is readily converted to the amino acid tyrosine. Phenylketonuria (PKU) is an inherited disease that if left untreated, results in retarded mental development in children. It has been shown to be associated with the lack of activity of the enzyme that converts phenylalanine to tyrosine.
- Fasting specimens (3-4 hours) are preferred.
- Do not submit specimens from patients receiving total parenteral nutrition (TPN).

### ♥ 7-Dehydrocholesterol – (Amniotic Fluid, Plasma)

- The Smith-Lemli-Opitz syndrome (SLOS) is a common birth defect caused by a mutation of the 7-dehydrocholesterol reductase gene that produces the enzyme that metabolizes 7-dehydrocholesterol to cholesterol. Because of this enzyme reduction, patients' plasma cholesterol levels are generally low while 7-dehydrocholesterol concentrations are markedly elevated.
- The 7-Dehydrocholesterol test done at ChildLab is limited to the diagnosis or exclusion of Smith-Lemli-Opitz syndrome (SLOS).

### ♥ Guanidinoacetate Profile – (Serum, Urine)

- Guanidinoacetate methyltransferase (GAMT) deficiency is an autosomal recessive disorder of creatine biosynthesis, characterized clinically by mental retardation, language delay, extrapyramidal movements, epilepsy, and autistic behavior. GAMT deficiency is characterized by depletion of creatine and accumulation of guanidinoacetate (GAA) in the brain and body fluids.

#### ♥ Maple Syrup Disease Monitor (MSUD) – (Urine)

- Maple syrup urine disease (MSUD) results from a deficient enzyme (branched-chain alpha-keto acid dehydrogenase, BCKD) necessary for the breakdown of the amino acids leucine, isoleucine, and valine. Without the BCKD enzyme, these amino acids build up to toxic levels in the body. Urine in persons with this condition smells like maple syrup.
- This test should be limited to patients with known MSUD. A serum quantitative amino acid profile (AAQS) is recommended for the follow up of abnormal newborn screens with MSUD
- Collect from infants just prior to feeding.
- Fasting specimens (3-4 hours) are preferred.
- Specimens from patients receiving total parenteral nutrition (TPN) or antibiotics may result in false positive elevations.

#### ♥ Methylmalonic Acid (MMA) & Ethylmalonic Acid (EMA) – (Plasma, Serum, Urine)

- MMA encompasses a heterogeneous group of disorders resulting in methylmalonyl-CoA mutase deficiency and disorders of intracellular cobalamin metabolism. These disorders are characterized by accumulation of methylmalonic acid and its by-products in biological fluids. MMA primarily is ordered, sometimes along with homocysteine, to help diagnose an early or mild B12 deficiency.
- High concentrations of ethylmalonic acid (EMA) occur in tissues and biological fluids of patients affected by deficiency of short-chain acyl-CoA dehydrogenase activity, as well as in other illnesses characterized by neurological and muscular symptoms.

#### ♥ Mucopolysaccharides Screening (MPSU) – (Urine)

- Mucopolysaccharides are gel-like substances found in body cells, mucus, and joint-lubricating fluids. When there is a deficiency of enzymes necessary to breakdown mucopolysaccharides, a condition called mucopolysaccharidosis (MPS) exists. Mucopolysaccharidosis are a group of genetic disorders that cause excess build-up of mucopolysaccharides in body tissues. This build-up results in many serious physical disorders. Usually, this results in various genetic deformities such as skeletal deformities (bone, cartilage, and connective tissue), abnormal facial features, mental retardation, and decreased life expectancy.
- These tests are only used for screening. If quantitative and qualitative identification for various mucopolysaccharides is required, please contact ChildLab Client Services.

#### ♥ Organic Acids (ORGUP) – (Urine)

- Organic acid disorders are a group of inherited metabolic conditions. Each organic acid disorder is associated with a specific enzyme deficiency that causes the accumulation of organic acids in blood and urine. The accumulated compounds or their metabolites are toxic, resulting in the clinical features of these disorders.
- Please document on the *Clinical Data Sheet* all medications being taken and if patient is being fed formula containing medium chain triglycerides (MCT).

#### ♥ Total Homocysteine (THCY) – (Serum or Plasma)

- Homocysteine (HCY) is a sulfur containing amino acid produced in the body as a breakdown product of another amino acid, methionine. When methionine-rich foods are eaten, the methionine is taken into the bloodstream and into cells where a methyl group (one carbon and three hydrogen atoms) is removed to produce homocysteine. Homocysteine circulates in the plasma as mixed disulfides involving homocysteine, homocysteine- thiolactone, free homocysteine, and protein-bound homocysteine.
- Total Homocysteine (THCY) represents the sum of all HCY species found in plasma or serum. **DO NOT** use this test as an initial follow-up for abnormal state screening for homocystinuria. Use the test, serum quantitative amino acid profile (QAAS), as a follow-up to the state newborn screen.
- This test is used to monitor patients with known homocystinuria.

**For More Information: For questions regarding test availability, specimen requirements, or to obtain Clinical Data Sheets, please contact ChildLab Client Services at 614)722-5477 or (800)934-6575 or visit our website at [www.childlab.com](http://www.childlab.com).**