Centro de Diagnóstico de Enfermedades Moleculares

Universidad Autónoma de Madrid
Facultad de Ciencias C-10 2ª planta
Av. Francisco Tomás y Valiente 7, 28049 Madrid

Tel.: 914974868 ó 914974589; Fax: 914974863
e-mail: cedem@cbm.csic.es
Página Web: http:/www.cbm.uam.es/cedem

Overview of diagnostic test for Special Assays in serum and in urine

This document summarizes a number of diagnostic tests commonly used by the ERNDIM participating labs to analyse special analytes in serum or urine relevant to the diagnosis of inborn errors of metabolism. Only the methods for analytes most commonly tested by ERNDIM participants have been included in this review.

Detailed protocols are not included here; these can be found in the literature references provided

1.Methods for Analytes from the Special Assays in Serum scheme

Lactate, Pyruvate and 3-Hydroxybutyrate: Enzymatic determination (Vassault A 2008); (Artuch et al. 1995)
Carnitine free: MS/MS (Matern 2014)
Homocysteine: HPLC-SBDF (Pfeiffer et al. 1999); LC-MS/MS (Magera et al. 1999); immunoassay (Frantzen et al. 1998; Shipchandler and Moore 1995)
VLFCA (C22:00; C24:0;C26:0): GC-MS, GC-MS methyl ester (Moser 1991); SID methyl ester (ten Brink et al. 1992)
MMA: MS/MS (Blom et al. 2007); GC-MS/SID (Jakobs et al. 1990)

2.Methods for Analytes from the Special Assays in Urine scheme

Carnitine free: MS/MS (Matern 2014)
Creatine and GAA: LC-MS/MS (Bodamer et al. 2001); (Cognat et al. 2004)
MPS: DMB test (de Jong et al. 1992)
Orotic acid: MS/MS (Ito et al. 2000); GC-MS SID (Jakobs et al. 1984); HPLC (Sebesta et al. 1994)
Succinylacetone: GC-MS (Sweetman 1991); GC-MS SID (Jakobs et al. 1988)

References

Artuch R, Vilaseca MA, Farre C, Ramon F (1995) Determination of lactate, pyruvate, beta-hydroxybutyrate and acetoacetate with a centrifugal analyser. Eur J Clin Chem Clin Biochem 33: 529-33

Blom HJ, van Rooij A, Hogeveen M (2007) A simple high-throughput method for the determination of plasma methylmalonic acid by liquid chromatography-tandem mass spectrometry. Clin Chem Lab Med 45: 645-50

Bodamer OA, Bloesch SM, Gregg AR, Stockler-Ipsiroglu S, O'Brien WE (2001) Analysis of guanidinoacetate and creatine by isotope dilution electrospray tandem mass spectrometry. Clin Chim Acta 308: 173-8

Universidad Autónoma de Madrid
Facultad de Ciencias C-10 2ª planta
Av. Francisco Tomás y Valiente 7, 28049 Madrid
Tel.: 914974868 ó 914974589; Fax: 914974863
e-mail: cedem@cbm.csic.es
Página Web: http:/www.cbm.uam.es/cedem

Cognat S, Cheillan D, Piraud M, Roos B, Jakobs C, Vianey-Saban C (2004) Determination of guanidinoacetate and creatine in urine and plasma by liquid chromatography-tandem mass spectrometry. Clin Chem 50: 1459-61

de Jong JG, Wevers RA, Liebrand-van Sambeek R (1992) Measuring urinary glycosaminoglycans in the presence of protein: an improved screening procedure for mucopolysaccharidoses based on dimethylmethylene blue. Clin Chem 38: 803-7

Frantzen F, Faaren AL, Alfheim I, Nordhei AK (1998) Enzyme conversion immunoassay for determining total homocysteine in plasma or serum. Clin Chem 44: 311-6

Ito T, van Kuilenburg AB, Bootsma AH, Haasnoot AJ, van Cruchten A, Wada Y, van Gennip AH (2000) Rapid screening of high-risk patients for disorders of purine and pyrimidine metabolism using HPLC-electrospray tandem mass spectrometry of liquid urine or urine-soaked filter paper strips. Clin Chem 46: 445-52

Jakobs C, Dorland L, Wikkerink B, Kok RM, de Jong AP, Wadman SK (1988) Stable isotope dilution analysis of succinylacetone using electron capture negative ion mass fragmentography: an accurate approach to the pre- and neonatal diagnosis of hereditary tyrosinemia type I. Clin Chim Acta 171: 223-31

Jakobs C, Sweetman L, Nyhan WL, Gruenke L, Craig JC, Wadman SK (1984) Stable isotope dilution analysis of orotic acid and uracil in amniotic fluid. Clin Chim Acta 143: 123-33

Jakobs C, Ten Brink HJ, Stellaard F (1990) Prenatal diagnosis of inherited metabolic disorders by quantitation of characteristic metabolites in amniotic fluid: facts and future. Prenat Diagn 10: 265-71

Magera MJ, Lacey JM, Casetta B, Rinaldo P (1999) Method for the determination of total homocysteine in plasma and urine by stable isotope dilution and electrospray tandem mass spectrometry. Clin Chem 45: 1517-22

Matern D (2014) Acylcarnitines. In: Blau N Duran M GK, Dionisi-Vici C (ed) Physician´s guide to the diagnosis, treatment, and follow-up of inherited metabolic diseases. Springer, Berlin Heidelberg, pp 775-784

Moser HW, Moser A.B. (1991) Measurement of saturated very long chain fatty acids in plasma. In: Hommes FA (ed) Techniques in Diagnostic Human Biochemical Genetics. A Laboratory Manual. Wiley-Liss, New York, pp 177-191

Pfeiffer CM, Huff DL, Gunter EW (1999) Rapid and accurate HPLC assay for plasma total homocysteine and cysteine in a clinical laboratory setting. Clin Chem 45: 290-2

Sebesta I, Fairbanks LD, Davies PM, Simmonds HA, Leonard JV (1994) The allopurinol loading test for identification of carriers for ornithine carbamoyl transferase deficiency: studies in a healthy control population and females at risk. Clin Chim Acta 224: 45-54

Shipchandler MT, Moore EG (1995) Rapid, fully automated measurement of plasma homocyst(e)ine with the Abbott IMx analyzer. Clin Chem 41: 991-4

Sweetman L (1991) Organic acid analysis. In: Hommes FA (ed) Techniques in Diagnostic Human Biochemical Genetics. Wiley-Liss, New York, pp 143-176

ten Brink HJ, Stellaard F, van den Heuvel CM, Kok RM, Schor DS, Wanders RJ, Jakobs C (1992) Pristanic acid and phytanic acid in plasma from patients with peroxisomal disorders: stable

Universidad Autónoma de Madrid
Facultad de Ciencias C-10 2ª planta
Av. Francisco Tomás y Valiente 7, 28049 Madrid
Tel.: 914974868 ó 914974589; Fax: 914974863
e-mail: cedem@cbm.csic.es
Página Web: http:/www.cbm.uam.es/cedem

isotope dilution analysis with electron capture negative ion mass fragmentography. J Lipid Res 33: 41-7

Vassault A (2008) Lactate, Pyruvate, Acetacetate and 3-Hydroxybutyrate. In: Blau N DM, Gibson KM (ed) Laboratory Guide to the Methods in Biochemical Genetics. Springer, Berlin Heidelberg, pp 35-51

Document prepared by:

Begoña Merinero, PhD
Clinical Biochemist
Centro de Diagnóstico de Enfermedades Moleculares
Universidad Autónoma de Madrid
28049 Madrid
Email: begonna.merinero@inv.uam.es