Amino Acidemias
Urea Cycle Disorders:

Disorder	Target	Medical Foods	Nutriceuticals	References
		Cyclinex-1		
		Cyclinex-2		
		WND 1		
		WND 2		**Brusilow SW**, Batshaw ML: Arginine therapy of argininosuccinase deficiency. Lancet 1979, 1:124-127.
		Milupa UCD 2		
		Essential Amino Acid Mix		**Corrales KM**, Utter Sl. Growth Failure. In: Samour PQ, King K, eds. Handbook of Pediatric Nutrition. 3rd ed. Sudbury, MA: Jonesand Bartlett Publishers; 2005:400.
		Essential Amino Acid		
		Pro-Phree		**Scaglia F**, Carter S, O'Brien WE, Lee B. Effect of alternative pathway therapy on branched chain amino acid metabolism in urea cycle disorder patients. Molec Gen and Metab. 2004:81:S79-S85.
		PFD 1		
Argininosuccinic acidemia		PFD 2		**Summar M**, Tuchman M. Proceedings of a consensus conference for the management of patients with urea cycle disorders. J Pediatr. 2001:138(1 Suppl):S6-10.
(ASA)	1	Supplement	L-Arginine	
		Cyclinex-1		
		Cyclinex-2		
		WND 1		
		WND 2		
		Milupa UCD 2		
		Essential Amino Acid Mix		
		Essential Amino Acid		
		Pro-Phree		**Brusilow SW**: Arginine, an indispensable amino acid for patients with inborn errors of urea synthesis. J Clin Invest 1984, 74:2144-2148.
		PFD 1		
Citrullinemia		PFD 2		**Singh RH**: Nutritional management of patients with urea cycle disorders. *J Inherit Metab Dis* 2007, 30:880-887.
(CIT)	1	Supplement	L-Arginine	
		Cyclinex-1		
		Cyclinex-2		
		WND 1		
		WND 2		
		Milupa UCD 2		**Prasad AN,** Breen JC, Ampola MG, Rosman NP. Argininemia: a treatable genetic cause of progressive spastic diplegia simulating cerebral palsy: case reports and literature review. J Child Neurol 1997; 12(5):301-309.
		Essential Amino Acid Mix		
		Essential Amino Acid		
		Pro-Phree		**Qureshi IA**, Letarte J, Ouellet R, Batshaw ML, Brusilow S. Treatment of hyperargininemia with sodium benzoate and arginine-restricted diet. J Pediatr 1984; 104(3):473-476.
		PFD 1		
Argininemia		PFD 2		**Snyderman SE**, Sansaricq C, Norton PM, Goldstein F. Argininemia treated from birth. J Pediatr 1979; 95(1):61-63.
(ARG)	2	Supplement		

Amino Acidemias

Disorder	Target	Medical Foods	Nutriceuticals	References
Homocystinuria (HCY)	1	Milupa HOM 2 Methionaid XMetT Analog XMet Maxamaid XMet Maxamum HCU Gel HCU Express HCU Cooler (per 130 ml cooler) Hominex 1 Hominex 2 Pro-Phree PFD 1 PFD 2	Vitamin B6 Vitamin B12 Betaine Cystine Folic Acid	**Yap S**, Naughten E: Homocystinuria due to cystathione-β-sythose deficiency in Ireland: 25 years' experience of a newborn screened and treated population with reference to clinical outcome and biochemical control. J Inher Metab Dis 1998; 21:378-747. **Carey MC**, Fennelly JJ, Fizgerald O: Homocystinuria II. Subnormal serum folate levels, increased folate clearance and effects of folic acid therapy. Am J Med 1968; 45:26-31. **Wilcken DE**, Wilcken B: The natural history of vascular disease in homocystinuria and the effects of treatment. JIMD 1997; 20:295-300. **Hollowell JG,** Coryell ME, Hall WK, et.al.: Homocystinuria as affected by pyridoxine, folic acid and vitamin B12. Proc Soc Exp Biol Med 1968; 129:327-333. **Surtees R**, Bowron A, Leonard J: Cerebrospinal fluid and plasma total homocysteine and related metabolites in children with cystalhionine beta snythase deficiency: the effect of treatment. Pediatr Res 1997; 42:577-582. **Singh RH**, Kruger WD, Wang L, et.al.: Cystathionine beta synthese deficiency: effects of betaine supplementation after methionine restriction in B6 non-responsive homocystinuria. Genet Med 2004; 6 **Calvert SM**, Rand J: A successful pregnancy in a patient with homocystinuria and a previous near-fat
Maple Syrup Urine Disorder (MSUD)	1	Ketonex-1 Ketonex-2 Complex MSUD Drink Mix Complex MSUD AA Blend Complex MSUD AA Bar (per 47g bar) BCAD 1 BCAD 2 Milupa MSUD 2 MSUD Analog MSUD Maxamaid MSUD Maxamum Acerflex MSUD Aid MSUD Gel MSUD Express MSUD Express Cooler (130mL) Duocal Pro-Phree PFD 1 PFD 2	L-Isoleucine Thiamin L-Valine	**Chuancy DT**, Shih VE. Maple Syrup Urine Disease (branced-chain ketoaciduria): In scriver C, Beaudet AL, Sly WS, Valle D. The Metabolic and Molecular Bases of Inherited Disease, 8th ed. McGraw-Hill Publishing Co., New York, 2001; pp197-2005. **Clow CL**, Reade TM, Scriver CR: Outcome of early and long-term management of classical maple syrup urine disease. Pediatr 1981; 68:856-862. **Hoffmann B**, Helbling C, Schadewoldt P, Wendel U: Impact of longitudinal plasma leucine levels on the intellectual outcome in patients with classic MSUD. Pediatr Res 2006; 59:2005:17-20. **Scriver CR**, MacKenzie S, Clow CL, Delvin E: Thiamin-responsive maple syrup urine disease. Lancet 1971; 1:310. **Kaplan P**, Mazur A, Field M, Berlin JA, Berry GT, Heidenreich R, Yudkoff M, Segal S: Intellectual outcome in children with maple syrup urine disease. J Pediatr 1991; 119(1(Pt 1)): 46-50. **Ellerine NP**, Herring WJ, Elasa LJ 2nd, McKean MC, Klein PD, Danner DJ: Thiamin-responsive maple syrup urine disease in a patient antigenically missing dihydrolipoamide acyltransferase. Biochem Med Metab Biol 1993; 49(3): 363-374. **Hoffmann B**, Helbling C, Shadewaldt P, Wendel V: Impact of longitudinal plasma leucine levels on th **Le Roux C**, Murphy E, Hallam P, et.al.: Neuropsychometric outcome pedictors for adults with maple s

Penylketonuria (PKU)	1	Phenex-2 (Vanilla and Unflavored) PhenylAde Drink Mix PhenylAde 40 drink mix PhenylAde AA Blend PhenylAde MTE AA Blend PhenylAde Bar- Chocolate Crispy (per 50g bar) PhenylAde Bar- Choc, White Choc (per 47g bar) Phenylade Essential Drink Mix Phenylade 60 drink mix. Phenyl-Free 1 Phenyl-Free 2 Phenyl-Free 2 HP Milupa PKU-2 Milupa PKU-2 Tomato Milupa PKU-3 XPhe Analog XPhe Maxamaid XPhe Maxamum XPhe Maxamum Drink (250 mL) Periflex Infant Periflex Junior Unflavored Periflex Junior Orange or Chocolate Periflex Advance Unflavored Periflex Advance Orange or Chocolate Add-Ins Lanaflex	Tyrosine	**Azen CG**, Koch R, Friedman EG, et. al.: Intellectual development in 12 year old children treated for phenylketonuria. Am J Dis Child 1991; 145:35-39. **Smith I**, Beasley MG, Ades AE: Intelligence and quality of dietary treatment in phenylketonuria. Arch Dis Child 1990; 65:462-478. **Dobson JC**, Williamson ML, Azen C, Koch R: Intellectual assessment of 111 four-year-old children with phenylketonuria. Pediatr 1977; 60:822-827. **Brumm VL**, Azen C, Moats RA, et.al.: Neuropsychological outcome of subjects participating in the PKU adult collaborative study: a preliminary review. JIMD 2004; 27:549-566. **Waisman SE**, Noel K, Fahrback K, et.al.: Phenylalanine blood levels and clinical outcomes in phenylketonuria: a systematic literature review and metaanalysis. Mol Genet Metab 2007; 92:63-70. **Smith I**, Glossop J, Beasley M: Fetal damage due to maternal phenylketonuria: Effects of dietary treatment and maternal phenylalanine concentrations around the time of conception. JIMD 1990; 13:651-657. **Koch R**, Hanley W, Levy H, et.al.: The maternal phenylketonuria international study: 1984-2002. Pediatr 2003; 112:1523-1529. **Matalon R**, Michals-Matalon K, Bhatia G, et.al.: Double blind placebo control trial of large neutral amir
Tyrosinemia type I (TYR I)	1	Tyrex-1 Tyrex-2 TYROS 1 TYROS 2 Milupa TYR 2 XPhe, XTyr Analog XPhe, XTyr Maxamaid XPhen,Tyr Maxamaid XPhen, Tyr Maxamum XPTM Analog Tyr Gel Tyr Express TYR Cooler (per 130 ml cooler)	Tyrosine	**Mitchell GA**, Grompe M, Lambert M, Tanguary RM: Hypertyrosinemia. In Scriver CR, Beaudet AL, Sly WS, Valle D. The Metabolic and Molecular Basis of Inherited Disease, 8th ed. McGraw-Hill Publishing Co., New York, 2001; pp 1777-1805. **Scott CR**: The genetic tyrosinemias. Am J Med Genet. C Seminar Med Genet 2006; 142:121-126. **Masurel-Paulet A**, Poggi-Bach J, Rolland MO, et. al.: NTBC treatment in tyrosinaemia type I: Long-term outcome in French patients. JIMD 2008; 31:81-87. **Held PK**: Disorders of tyrosine catabolism. Mol Genet Metab 2006; 88:103-106. **Macsai MS**, Schwartz TL, Hinkle D, et.al.: Tyrosinemia type III: nine cases of ocular signs and symptoms. Am J Ophtholmol 2001; 132:522-527. **Madan V**, Gupta V: Tyrosinemia type II with diffuse plantar keratoderma and self-mutilation. Clin Exp Dermatol 2006; 31:54-56. **Ellaway CJ**, Holme E, Standing S, et.al.: Outcome of tyrosinemia type III. JIMD 2001; 24:824-832. **Francis DE**, Kirby DM, Thompson DN: Maternal tyrosinemia type II: management and successful out come. Eur J Pediatr 1992; 151:196-199. **Cerone R**, Fantasia AR, Castellano E, et.al.: Pregnancy and tyrosinemia type II. JIMD 2002; 25:317-3

Biopterin cofactor bisynthesis, defects of (BIOPT BS)	2	PKU formulas may be used		**Longo N**: Disorders of biopterin metabolism. J Inherit Metab Dis 1009; [Epub ahead of print]. **Thony B**, Leimbacher W, Blau N, et.al.: Hyperphenylalaninemia due to defects in tetrahydrobiopterin metabolism: molecular characterization of mutation in 6-pyruvoyl=tetrahydropterin synthase. Am J Hum Genet 1994; 54:782-792.
Biopterin cofactor regeneration, defects of (BIOPT REG)	2	PKU formulas may be used		**Tanaka Y**, Kato M, Muramatsu T, et. Al.: Early initiation of L-dopa therapy enables stable development of executive function in tetrahydrobiopterin (BH4) deficiency. Dev Med Child Neurol 2007; 49:372-376. **Wang L**, Yu Wm, He C, et.al.: Long-term outcome and neuroradiological findings of 31 patients with 6-pyruvoyltetrahydropterin synthase deficiency. J Inherit Metab Dis 2006; 29:127-134. **Jaggi L**, Zurfluh MR, Schuler A, et.al.: Outcome and long-term follow-up of 36 patients with tetrahydrobiopterin deficiency. Mol Genet Metab 2008; 93:295-305.
Citrullinemia type II (CIT II)	2	Cyclinex-1* Cyclinex-2 WND 1 WND 2 Milupa UCD 2 Essential Amino Acid Mix Essential Amino Acid Supplement Pro-Phree PFD 1 PFD 2		**Mutoh K**, Kurokawa K, Kobayashi K, Saheki T. Treatment of a citrin-deficient patient at the early stage of adult-onset type II citrullinaemia with arginine and sodium pyruvate. J Inherit Metab Dis 2008; [Epub ahead of print]. **Saheki T**, Kobayashi K, Terashi M, Ohura T, Yanagawa Y, Okano Y, Hattori T, et.al.: Reduced carbohydrate intake in citrin-deficient subjects. J Inherit Metab Dis 2008; 31(3):386-394.

Hyperphenylalaninemia (HYPER-PHE)	2	Phenex-2 (Vanilla and Unflavored) PhenylAde Drink Mix PhenylAde 40 drink mix PhenylAde AA Blend PhenylAde MTE AA Blend PhenylAde Bar- Chocolate Crispy (per 50g bar) PhenylAde Bar- Choc, White Choc (per 47g bar) Phenylade Essential Drink Mix Phenylade 60 drink mix. Phenyl-Free 1 Phenyl-Free 2 Phenyl-Free 2 HP Milupa PKU-2 Milupa PKU-2 Tomato Milupa PKU-3 XPhe Analog XPhe Maxamaid XPhe Maxamum XPhe Maxamum Drink (250 mL) Periflex Infant Periflex Junior Unflavored Periflex Junior Orange or Chocolate Periflex Advance Unflavored Periflex Advance Orange or Chocolate Add-Ins Lanaflex		**Azen CG**, Koch R, Friedman EG, et. al.: Intellectual development in 12 year old children treated for phenylketonuria. Am J Dis Child 1991; 145:35-39. **Smith I**, Beasley MG, Ades AE: Intelligence and quality of dietary treatment in phenylketonuria. Arch Dis Child 1990; 65:462-478. **Dobson JC**, Williamson ML, Azen C, Koch R: Intellectual assessment of 111 four-year-old children with phenylketonuria. Pediatr 1977; 60:822-827. **Brumm VL**, Azen C, Moats RA, et.al.: Neuropsychological outcome of subjects participating in the PKU adult collaborative study: a preliminary review. JIMD 2004; 27:549-566. **Waisman SE**, Noel K, Fahrback K, et.al.: Phenylalanine blood levels and clinical outcomes in phenylketonuria: a systematic literature review and metaanalysis. Mol Genet Metab 2007; 92:63-70. **Smith I**, Glossop J, Beasley M: Fetal damage due to maternal phenylketonuria: Effects of dietary treatment and maternal phenylalanine concentrations around the time of conception. JIMD 1990; 13:651-657. **Koch R**, Hanley W, Levy H, et.al.: The maternal phenylketonuria international study: 1984-2002. Pediatr 2003; 112:1523-1529. **Matalon R**, Michals-Matalon K, Bhatia G, et.al.: Double blind placebo control trial of large neutral amir
Hypermethioninemia (MET)	2	Milupa HOM 2 Methionaid XMetT Analog XMet Maxamaid XMet Maxamum HCU Gel HCU Express HCU Cooler (per 130 ml cooler) Hominex 1 Hominex 2		**Mudd SH**, Levy HL, Kraus JP: Disorders of transsulfuration. In Scriver C, Beaudet AL, Sly WS, Valle D. Disorders of transoulfuration; 8th ed. McGraw-Hill Publishing Co., New York, 2001; pp2007-2056.

Tyrosinemia type II (TYR II)	2	Tyrex-1 Tyrex-2 TYROS 1 TYROS 2 Milupa TYR 2 XPhe, XTyr Analog XPhe, XTyr Maxamaid XPhen,Tyr Maxamaid XPhen, Tyr Maxamum XPTM Analog Tyr Gel Tyr Express TYR Cooler (per 130 ml cooler)		**Mitchell GA**, Grompe M, Lambert M, Tanguary RM: Hypertyrosinemia. In Scriver CR, Beaudet AL, Sly WS, Valle D. The Metabolic and Molecular Basis of Inherited Disease, 8th ed. McGraw-Hill Publishing Co., New York, 2001; pp 1777-1805. **Scott CR**: The genetic tyrosinemias. Am J Med Genet. C Seminar Med Genet 2006; 142:121-126. **Masurel-Paulet A**, Poggi-Bach J, Rolland MO, et. al.: NTBC treatment in tyrosinaemia type I: Long-term outcome in French patients. JIMD 2008; 31:81-87. **Held PK**: Disorders of tyrosine catabolism. Mol Genet Metab 2006; 88:103-106. **Macsai MS**, Schwartz TL, Hinkle D, et.al.: Tyrosinemia type III: nine cases of ocular signs and symptoms. Am J Ophtholmol 2001; 132:522-527. **Madan V**, Gupta V: Tyrosinemia type II with diffuse plantar keratoderma and self-mutilation. Clin Exp Dermatol 2006; 31:54-56. **Ellaway CJ**, Holme E, Standing S, et.al.: Outcome of tyrosinemia type III. JIMD 2001; 24:824-832. **Francis DE**, Kirby DM, Thompson DN: Maternal tyrosinemia type II: management and successful out come. Eur J Pediatr 1992; 151:196-199. **Cerone R**, Fantasia AR, Castellano E, et.al.: Pregnancy and tyrosinemia type II. JIMD 2002; 25:317-3
Tyrosinemia type III (TYR III)	2	Tyrex-1 Tyrex-2 TYROS 1 TYROS 2 Milupa TYR 2 XPhe, XTyr Analog XPhe, XTyr Maxamaid XPhen,Tyr Maxamaid XPhen, Tyr Maxamum XPTM Analog Tyr Gel Tyr Express TYR Cooler (per 130 ml cooler)		**Mitchell GA**, Grompe M, Lambert M, Tanguary RM: Hypertyrosinemia. In Scriver CR, Beaudet AL, Sly WS, Valle D. The Metabolic and Molecular Basis of Inherited Disease, 8th ed. McGraw-Hill Publishing Co., New York, 2001; pp 1777-1805. **Scott CR**: The genetic tyrosinemias. Am J Med Genet. C Seminar Med Genet 2006; 142:121-126. **Masurel-Paulet A**, Poggi-Bach J, Rolland MO, et. al.: NTBC treatment in tyrosinaemia type I: Long-term outcome in French patients. JIMD 2008; 31:81-87. **Held PK**: Disorders of tyrosine catabolism. Mol Genet Metab 2006; 88:103-106. **Macsai MS**, Schwartz TL, Hinkle D, et.al.: Tyrosinemia type III: nine cases of ocular signs and symptoms. Am J Ophtholmol 2001; 132:522-527. **Madan V**, Gupta V: Tyrosinemia type II with diffuse plantar keratoderma and self-mutilation. Clin Exp Dermatol 2006; 31:54-56. **Ellaway CJ**, Holme E, Standing S, et.al.: Outcome of tyrosinemia type III. JIMD 2001; 24:824-832. **Francis DE**, Kirby DM, Thompson DN: Maternal tyrosinemia type II: management and successful out come. Eur J Pediatr 1992; 151:196-199. **Cerone R**, Fantasia AR, Castellano E, et.al.: Pregnancy and tyrosinemia type II. JIMD 2002; 25:317-3

FAOD

Disorder	Target	Medical Foods	Nutriceuticals	References
Carnitine Uptake Defect (CUD)	1	ProViMin Beneprotein Protifar Polycose	L-Carnitine	**Lopriore E**, Gemke RJ, Verhoeven NM, et.al.: Carnitine-acylcarnitine translocase deficiency: phenotype residual enzyme activity and outcome. Eur J Pediatr 2001; 160:101-104.
Long-chain L-3-OH acyl-CoA dehydrogenase deficiency (LCHADD)	1	Portagen Pregestimil LIPIL Tolerex Monogen Lipistart MCT Pro-Cal EnfaPort	L-Carnitine MCT Oil	**Gillingham MB**, van Calcar S, Ney D, et.al.: Dietary management of long-chain 3-hydroxyacyl-CoA dehydrogluase deficiency [LCHADD]. A case report and survey. JIMD 1999; 22:123-130. **Gillingham MB**, Connor WE, Matern D, et.al.: Optimal dietary therapy of long-chain 3-hydorxyacyl-CoA dehydrogenase deficiency. Mol Genet Metab 2003; 79:114-123. **Gillingham MB**, Weleber RG, Neuringer M, et.al.: Effect of optimal dietary therapy upon visual function in children with long-chain 3-hydroxyacyl CoA dehydrogenase deficiency. Mol Genet Metab 2005; 86:124-133. **Gillingham MB**, Scott B, Elliott D, Harding CO: Metabolic control during exercise with and without medium-chain triglycerides in children with long-chain 3-hydroxyacyl-CoA dehydrogenase (LCHAD) or trifunctional protein (TFP) deficiency. MGM 2006; 89:58-63.
Medium-chain acyl-CoA dehydrogenase deficiency (MCADD)	1	Polycose	L-Carnitine	**Saudubray JM**, Martin D, deLonlay P, et.al.: Recognition and management of fatty acid oxidation defects: a series of 107 patients. JIMD 1999; 22:488-502. **Wilson CJ**, Champion MP, Collins JE, et.al.: Outcom of medium chain acyl-CoA dehydrogenase deficiency after diagnosis. Arch Dis Child 1999; 80:459-462. **Frazier D**: Medium-chain-acyl-CoA dehydrogenase deficiency [MCADD] nutrition guidelines 2008. www.gmdi.org/guidelines. **Iafolla AK**, Thompson RJ, Roe CR: Medium-chain acyl-Coenzyme A dehydrogenase deficiency: clinical course in 120 affected patients. J Pediatr 1994; 124:409-415
Trifunctional Protein Deficiency (TFP)	1	Portagen Pregestimil LIPIL Tolerex Monogen Lipistart MCT Pro-Cal EnfaPort Polycose ProViMin Protifar Beneprotien	L-Carnitine MCT Oil	**Gillingham MB**, van Calcar S, Ney D, et.al.: Dietary management of long-chain 3-hydroxyacyl-CoA dehydrogluase deficiency [LCHADD]. A case report and survey. JIMD 1999; 22:123-130. **Gillingham MB**, Connor WE, Matern D, et.al.: Optimal dietary therapy of long-chain 3-hydorxyacyl-CoA dehydrogenase deficiency. Mol Genet Metab 2003; 79:114-123. **Gillingham MB**, Weleber RG, Neuringer M, et.al.: Effect of optimal dietary therapy upon visual function in children with long-chain 3-hydroxyacyl CoA dehydrogenase deficiency. Mol Genet Metab 2005; 86:124-133. **Gillingham MB**, Scott B, Elliott D, Harding CO: Metabolic control during exercise with and without medium-chain triglycerides in children with long-chain 3-hydroxyacyl-CoA dehydrogenase (LCHAD) or trifunctional protein (TFP) deficiency. MGM 2006; 89:58-63.
Very long-chain acyl-CoA dehydrogenase deficiency (VLCADD)	1	Portagen Pregestimil LIPIL Tolerex Monogen Lipistart MCT Pro-Cal EnfaPort Polycose ProViMin Protifar Beneprotien	L-Carnitine MCT Oil	**Rohr F**, van Calcar S: Very long chain acyl-CoA dehydrogenase deficiency [VLCADD] nutrition guidelines. www.gmdi.org/guidelines. **Brown-Harrison MC**, Nada MA, Sprecher H, et.al.: Very long chain acyl-CoA dehydrogenase deficiency: successful treatment of acute cardiomyopathy. Biochem Mol Med 1996; 58:59-65. **Cox GF**, Souri M, Aoyama T, et.al.: Reversal of severe hypertrophic cardiomyopathy and excellent neuropsychologic outcome in very-long-chain acyl-coenzyme A dehydrogenase deficiency. J Pediatr 1998; 1337:247-253.

Carnitine palmitoyltransferase I deficiency (CPT IA)	2	Polycose	L-Carnitine MCT Oil	**Vorgerd M**. Therapeutic options in other metabolic myopathies. Neurotherapeutics 2008; 5(4):579-582. **Stoler JM**, Sabry MA, Hanley C, Hoppel CL, Shih VE. Successful long-term treatment of hepatic carnitine palmitoyltransferase I deficiency and a novel mutation. J Inherit Metab Dis 2004; 27(5):679-684. **Orngreen MC**, Ejstrup R, Vissing J. Effect of diet on exercise tolerance in carnitine palmitoyltransferase II deficiency. Neurology 2003; 61(4):559-561. **Scott TF**, Virella-Lopes M, Malone MJ. Hypertriglyceridemia in carnitien palmityl transferase deficiency: lipid profile and treatment with medium chain triglycerides. Muscle Nerve 1991, 14(7):676-677.
Carnitine palmitoyltransferase II deficiency (CPT II)	2	Portagen Pregestimil LIPIL Tolerex Monogen Lipistart MCT Pro-Cal EnfaPort Polycose ProViMin Protifar Beneprotien	L-Carnitine MCT Oil	**Vorgerd M**. Therapeutic options in other metabolic myopathies. Neurotherapeutics 2008; 5(4):579-582. **Stoler JM**, Sabry MA, Hanley C, Hoppel CL, Shih VE. Successful long-term treatment of hepatic carnitine palmitoyltransferase I deficiency and a novel mutation. J Inherit Metab Dis 2004; 27(5):679-684. **Orngreen MC**, Ejstrup R, Vissing J. Effect of diet on exercise tolerance in carnitine palmitoyltransferase II deficiency. Neurology 2003; 61(4):559-561. **Scott TF**, Virella-Lopes M, Malone MJ. Hypertriglyceridemia in carnitien palmityl transferase deficiency: lipid profile and treatment with medium chain triglycerides. Muscle Nerve 1991, 14(7):676-677.
Carnitine: acylcarnitine translocase deficiency (CACT)	2	Portagen Pregestimil LIPIL Tolerex Monogen Lipistart MCT Pro-Cal EnfaPort Polycose ProViMin Protifar Beneprotien	L-Carnitine MCT Oil	**Pierre G**, Macdonald A, Gray G, et.al.: Prospective treatment in carnitine-acylcarnitine translocase deficiency. J Inhert Metab Dis 2007; 30:815. **Iacobazzi V**, Pasquali M, Singh R, Matern D, Rinaldo P, et.al.: Response to therapy in carnitine/acylcarnitine translocase (CACT) deficiency due to a novel missense mutation. Am J Med Genet A 2004; 126A:150-155. **Parini R**, Invernizzi F, Menni F, Garavaglia B, et.al.: Medium-chain triglyceride loading test in carnitine-acylcarnitine translocase deficiency: insights on treatment. J Inherit Metab Dis 1999; 22:733-739. **Al Aqeel Al**, Rashed MS, Wanders RJ: Carnitine-acylcarnitine translocase deficiency is a treatable disease. J Inherit metab Dis 1999; 22:271-275. **Kerner J**, Hoppel C: Genetic disorders of carnitine metabolism and their nutritional management. Annu Rev Nutr 1998; 18:179-206.
Dienoyl-CoA reductase deficiency (DE RED)	2			none known
Glutaric acidemia type II (GA 2)	2		L-Carnitine	**De Visser M**, Scholte HR, Schutgens RB, et.al.: Riboflavin-responsive lipid-storage myopathy and glutaric aciduria type II of early adult onset. Neurology 1986; 36:367-372. **Gregersen N**, Christensen MF, Christensen E, Kolvraa S: Riboflavin responsive multiple acyl-CoA dehydrogenation deficiency. Assessment of 3 years of riboflavin treatment. Acta Paediatr Scand 1986; 75:676-681.

Medium/short-chain L-3-OH acyl-CoA dehydrogenase deficiency (M/SCHADD)	2		L-Carnitine	none known
Medium-chain ketoacyl-CoA thiolase deficiency (MCKAT)	2		L-Carnitine	none known
Short-chain acyl-CoA dehydrogenase deficiency (SCADD)	2		L-Carnitine Riboflavin	**Kmoch S**, Zeman J, hrebicek M, Ryba L, et.al.: Riboflavin-responsive epilepsy in a patient with SER209 variant form of short-chain acyl-CoA dehydrogenase. J Inherit Metab Dis 1995; 18:227-229. **Jethva R**, Bennett MJ, Vockley J: Short-chain acyl-coenzyme A dehydrogenase deficiency. Mol Genet Metab 2008; 95:195-200. **Waisbren SE**, Levy HL, Noble M, Matern D, et.al.: Short-chain acyl-CoA dehydrogenase (SCAD) deficiency: an examination of the medical and neurodevelopmental characteristics of 14 cases identified through newborn screening or clinical symptoms. Mol Genet Metab 2008; 95:39-45.

Organic Acidemias

Disorder	Target	Medical Foods	Nutriceuticals	References
3-Methylcrotonyl-CoA carboxylase deficiency (3MCC)	1	I-Valex-1 I-Valex-2 LMD XLeu Analog XLeu Maxamaid XLeu Maxamum	Glycine L-Carnitine	**Arnold GL**, Koeberl DD, Matern D, et. al.: A Delphi-based consensus clinical practice protocol for the diagnosis and management of 3-methylcrotonyl-CoA carboxylase deficiency. Mol Genet Metab 2008; 93:363-370. **Rutledge SL**, Berry GT, Stanley CA, et. al.: Glycine and L-carnitine therapy in 3-methylcrotonyl-CoA carboxylase deficiency. JIMD 1995; 18:299-305.
3-OH 3-CH3 glutaric aciduria (HMG)	1		L-Carnitine	**Dasouki M**, Buchanan D, Mercer N, et.al.: 3-hydroxy-3-methylglutaric aciduria: response to carnitine therapy and fat and leucine restriction. JIMD 1987; 10:142-146. **Stacey TE**, de Sousa C, Tracey BM, et.al.: Dixygotic twins with 3-hydroxy-3-methylglutaric aciduria: unusual presentation, family studies and dietary management. Eur J Pediatr 1985; 144:177-181. **Gibson KM**, Breuer J, Nyhan WL: 3-hydroxy-3-methylglutaryl-coenzyme A lyase deficiency: Review of 18 reported cases. Eur J Pediatr 1988; 148:180-186. **Berry HK**, Suchy F, Hunt M, Norman E: Treatment of 3-hydroxy-3-methylglutaric aciduria in first cousins. In Walser M, et.al. (eds). Metabolism and clinical implication of Branched Chain Amino Acids and Ketoacids. Elsevier, New York, 1981; pp 395-400.
Beta-Ketothiolase deficiency (BKT)	1		L-Carnitine	**Aramaki S**, Lehotay D, Sweetman L, et.al.: Urinary excretion of 2-methylaceto-acetate, 2-methyl-3-3hydroxy butyrote and tiglylglycine after isoleucine loading in the diagnosis of 2-methylacetoacetyl-CoA thiolase deficiency. JIMD 1991; 14:63-74. **Brown GK**, Hunt SM, Mitchell DK, Danks DM: Profound neurological illness relieved by protein restriction in a baby with a transient disturbance in the metabolism of ingested isoleucine. Eur J Pediatr 1987; 146:363-369. **Korman SH**: Inborn errors of isoleucine degradation: a review. MGM 2006; 89:289-299. **Fukao T**, Scriver CR, Kondo N: The clinical phenotype and outcome of mitochondrial acetoacetyl-CoA thiolase deficiency (β-ketothiolase or T2 deficiency) in 25 enzymatically proved and mutation defined patients. MGM 2001; 72:109-114. **Brown GK**, Hunt SM, Mitchell DK, Danks DM: Profound neurological illness relieved by protein restriction in a baby with transient disturbance in the metabolism of ingested isoleucine. Eur J Pediatr 1987; 146:363-369.
Glutaric acidemia type I (GA 1)	1	Glutarex-1 Glutarex-2 Xlys, XTrp Analog Xlys, XTrp Maxamaid Xlys, XTrp Maxamum GA gel Pro-Phree PFD 1 PFD 2	CoQ10 Glutamine L-Carnitine Lipoic Acid powder Riboflavin	**Monavari AA**, Naughten ER: Prevention of cerebral palsy in glutaric aciduria type I by dietary management. Arch Dis child 2000; 82:67-70. **Seccombe DW**, Booth JL: L-carnitine treatment in glutaric aciduria type I. Neurology 1986; 36:264-267. **Hoffman GF**, Zschocke J: Glutaric aciduria type I: From clinical, biochemical, and molecular diversity to successful therapy. J Inherit Metqab Dis 1999; 381-391. **Yannicelli S**, Rohr F, Warman ML: Nutrition support for glutaric academia type I. J Am Diet Assoc 1994; 94:183-191. **Hedlund GL**, Longo N, Pasquali M: Glutaric academia type I. Am J Med Genet C Semin Med Genet 2006; 142C(2):86-94. **Baric I**, Zchocke J, Christensen E, et.al.: Diagnosis and management of glutaric aciduria type I. JIMD 1998; 21:326-340.

Isovaleric acidemia (IVA)	1	Propimex-1 Propimex-2 OA 1 OA 2 OS 2 XMTVI Analog XMTVI Maxamaid XMTVI Maxamum MMA/PA Gel MMA/PA Express Pro-Phree PFD 1 PFD 2	L-Carnitine L-Glycine	**Cohn RM**, Yudkoff M, Rothman R, Segal S: Isovaleric academia: use of glycine therapy in neonates. N Engl J Med 1978; 299:996-999. Krieger I, Tanaka K: Therapeutic effects of glycine in isovaleric academia. Pediatr Res 1976; 10:25-29. **Naglak M**, Salvo R, Madsen K, et.al.: The treatment of isovaleric academia with glycine supplements. Pediatr Res 1988; 24:9-13. **Shih V**, Aubry RH, DeGrande G, et.al.: Maternal isovaleric academia. J Pediatr 1984; 105:77-78. **Spinty S**, Rogozinski H, Lealman GT, et.al.: Second case of a successful pregnancy in Maternal isovaleric academia. JIMD 2002; 25:697-698. **Heimler R**, Henner H, Khayata P, et.al.: Isovaleric acidemiz in a premature infant: Diagnosis and treatment. JIMD 1988; 11:313-314. **Lott IT**, Erickson AM, Levy HL: Dietary treatment of an infant with isovaleric academia. Pediatr 1972; 49:616-618. **Mayatepek E**, Kurczynski TW, Hoppel CL: Long-term carnitine treatment in isovaleric academia. Pediatr Neurol 1991; 7:137-140. **Fries MH**, Rinaldo P, Schmidt-Sommerfeld E, et.al.: Isovaleric acidemia: Response to a leucine load after three weeks of supplementation with glycine, L-carnitine therapy. J Pediatr 1996; 129:499-452.
Methylmalonic acidemia (Cbl A, B)	1	Propimex-1 Propimex-2 OA 1 OA 2 OS 2 XMTVI Analog XMTVI Maxamaid XMTVI Maxamum MMA/PA Gel MMA/PA Express Pro-Phree PFD 1 PFD 2	Betaine Folate L-Isoleucine L-Carnitine L-Valine Pyridoxine Vitamin B12	**Moras E**, Hosack A, Watkins D, Rosenblatt DS: Mitochondrial vitamin B12-binding proteins in patients with inborn errors of cobalamin metabolism. MGM 2007; 90:140-147. **Rosenblott DS**, Fenton WA: Inherited disorders of folate and cobalamin transport and metabolism. In Scriver CR, Beaudet AL, Sly WL, Valle D, eds. The Metabolic and Molecular Bases of Inherited Disease, 8th ed. (vol III). McGraw-Hill Publishing Co., New York, 2001, pp 3897-3933.
Methylmalonic acidemia (MUT)	1	Propimex-1 Propimex-2 OA 1 OA 2 OS 2 XMTVI Analog XMTVI Maxamaid XMTVI Maxamum MMA/PA Gel MMA/PA Express Pro-Phree PFD 1 PFD 2	Betaine Folate L-Isoleucine L-Carnitine L-Valine Pyridoxine Vitamin B12	**Mahoney MJ**, Bick B: Recent advances in the inherited methylmalonic acidemias. Acta Paediatr Scand 1987; 76:689-696. **Matsui SM**, Mahoney MJ, Rosenberg LE: The natural history of the inherited methylmalonic acidemias. N Engl J Med 1983; 308:857-861. **Roe CR**, Hoppel CL, Stacey TE, et.al.: Metabolic response to carnitine in methylmalonic aciduria. Arch Dis Child 1983; 58:916-920. **Solomon LR**: Oral pharmacologic doses of cobalamin may not be as effective as parenteral cobalamin therapy in reversing hyperhomocystinemia and methylmalonic academia in apparently normal subjects. Clin Lab Haematol 2006; 28:275-278. **Yannicelli S**, Acosta PB, Velazquez A, et.al.: Improved growth and nutrition status in children with methylmolonic or propionic academia fed an elemental medical food. Mol Genet Metab 2003; 80:181-188. **Touti G**, Volayannopoulos V, Mention K, et.al.: Methylmolonic and propionic acidurias: Management without or with a few supplements of specific amino acid mixture. JIMD 2006; 29:288-298.
Multiple carboxylase deficiency (MCD)	1			**Wolf B**, Hsia YE, Sweetman L, et.al.: Multiple carboxylase deficiency: clinical and biochemical improvement following neonatal biotin treatment. Pediatr 1981; 68:113-118. **Hou JW**: biotin responsive multiple carboxylase deficiency presenting as diabetic ketoacidosis. Chang Gung Med J 2004; 27:129-133.

Propionic Acidemia (PROP)	1	Propimex-1 Propimex-2 OA 1 OA 2 OS 2 XMTVI Analog XMTVI Maxamaid XMTVI Maxamum MMA/PA Gel MMA/PA Express Pro-Phree PFD 1 PFD 2	Biotin L-Carnitine L-Isoleucine L-Valine	**North KN**, Korson MS, Gopal YR, et.al.: Neonatal onset propionic academia: Neurologic and developmental profiles and implications for management. J Pediatr 1995; 126:916-922. Yannicelli S, Acosta PB, Velasquez A, et.al.: Improved growth and nutrition status in children with methylmalonic or propionic academia fed an elemental medical food. Mol Genet Metab 2003; 80:181-188. **Delgado C**, Macias C, de la Sierra Garcia-Valdecasas M, Perez M, del Portal LR, Jimenez LM: Subacute presentation of propionic academia. J Child Neurol 2007; 22(12):1405-1407. **Van Calcar SC**, Harding CO, Davidson SR, et.al.: Case reports of successful pregnancy in women with maple syrup urine disease and propionic academia. Am J Med 1992; 44:641-646. **Roe CR**, Millington DS, Maltby DA, Bohan TP: L-carnitine enhances excretion of propionyl coenzymes A in propionic academia. J Clin Invest 1984; 73:1785-1788.
2-Methyl 3-hydroxyl butyric aciduria (2M3HBA)	2			**Zschocke R**, Ruiter JP, Brand J, et.al.: Progressive infantile neurodegeneration caused by 2-methyl-3-hydroxybutyryl-CoA dehydrogenase deficiency: a novel inborn error of branched-chain fatty acid and isoleucine metabolism. Pediatr Res 2000; 48:852-855. **Perez-Cerda C**, Garcia-villoria J, Ofman R, et.al.: 2-methyl-3-hydroxybutyrul-CoA dehydrogenase (MHBD) deficiency: an x-linked inborn error of isoleucine metabolism that may mimic a mitochondrial disease. Pediatr 2005; 58:488-496.
2-Methylbutyryl-CoA dehydrogenase deficiency (2MBG)	2			
3 Methylglutaconic aciduria (3MGA)	2			**Duran M**, Beemer FA, Tibosch AS, Bruinvis L, Ketting D, Wadman SK. Inherited 3-methylglutaconic aciduria in two brothers—another defect of leucine metabolism. J Pediatr 1982; 101:551-554.
Isobutyryl-CoA dehydrogenase deficiency (IBG)	2			**Korman SH**. Inborn errors of isoleucine degradation: a review. Mol Genet Metab. 2006;89(4);298-299.
Malonic acidemia (MAL)	2			
Methylmalonic acidemia (Cbl C, D)	2	Propimex-1 Propimex-2 OA 1 OA 2 OS 2 XMTVI Analog XMTVI Maxamaid XMTVI Maxamum MMA/PA Gel MMA/PA Express Pro-Phree PFD 1 PFD 2	L-Carnitine Vitamin B12	**Andersson HC**, Shapria E: Biochemical and clinical response to hydroxocobalamin versus cyanocobalamin treatment in patients with methylmalonic academia and homocystinuria (cblC). J Pediatr 1998; 132:121-124. **Bartholomew DW**, Batshaw ML, Allen RH, et.al.: therapeutic approaches to cobalamin-C methylmalonic academia and homocystinuria. J Pediatr 1988; 112:32-39. **Moras E**, Hosack A, Watkins D, Rosenblatt DS: Mitochondrial vitamin B12-binding proteins in patients with inborn errors of cobalamin metabolism. MGM 2007; 90:140-147. **Powers JM**, Rosenblatt DS, Schmidt RE, Cross Ah, et.al.: Neurological and neuropathologic heterogeneity in two brothers with cobalamin C deficiency. Ann Neurol 2001; 49:396-400. **Rosenblott DS**, Fenton WA: Inherited disorders of folate and cobalamin transport and metabolism. In Scriver CR, Beaudet AL, Sly WL, Valle D, eds. The Metabolic and Molecular Bases of Inherited Disease, 8th ed. (vol III). McGraw-Hill Publishing Co., New York, 2001, pp 3897-3933.

Other Disorders

Biotinidase Deficiency (BIOT)			Biotin	**Moslinger D**, Stockler-Ipsiroglu S, Scheibenreiter S, et.al.: Clinical and neuropsychol outcome in 33 patients with biotinidase deficiency ascertained by newborn screening and family studies in Austria. Eur J Pediatr 2001; 160:277-282. **Weher P**, Scholl S, Baumgartner ER: Outcome in patients with profound biotinidase deficiency: relevance of newborn screening. Dev Med Child Neurol 204; 46:481-484. **Hendriksz CJ**, Preece MA, Chokrapani A: Successful pregnancy in a treated patient with biotinidase deficiency. JIMD 2005; 28:791-792.
Classical Galactosemia (GALT)		Soy formulas		**Komrower GM**, Lee DH: Long-term follow-up of galactosoemiz. Arch Dis Child 1970; 45:367-373. **Bosch AM**: Classical galactosemia revisited. JIMD 2006; 29:516-525. **Koch R**, Acosta P, Ragsdale N, Donnell G: Nutrition in the treatment of galactosemia. J Am Diet Assoc 1963; 43:216-222. **Walter JH**, Collins Je, Leonard JV: Recommendations for the management of galactosoemia. UK Galactosaemia Steering Group. Arch Dis Child 1999; 80:93-96.

Key:

Medical Foods: metabolic formula
Nutriceuticals: supplements including amino acids, L-Carnitine and vitamins like riboflavin and biotin
Target: refers to ACMG recommended NBS panel; 1 represents the 'core panel' and 2 represents the 'secondary panel'