

Disease Name	
GLUTARIC ACIDEMIA TYPE II (GA II)	
<i>(GLUTARIC ACIDURIA TYPE II; GA II; ETHYLMALONIC-ADIPIC ACIDURIA; ELECTRON TRANSFER FLAVOPROTEIN DEHYDROGENASE DEFICIENCY; ETF/ETF QO DEFICIENCY)</i>	
Classification:	Fatty acid oxidation defect
Genetic Information	
Inheritance:	Autosomal recessive.
Population Incidence:	Not a rare disease but incidence is unknown.
Ethnic Incidence:	No known population at increased risk.
Gene & Location:	ETF alpha subunit: 15q23-25 ETF beta subunit 19q13.3
Common Mutation:	No known common mutations.
OMIM #	*231680; *130410; *231675; #231680
Disease Information	
Symptom Onset:	Newborn to adult.
Symptoms:	<p>Three different phenotypes that stay consistent within families: Neonatal onset with congenital anomalies: Infants often premature, present during the first 24-48 hrs of life with hypotonia, hepatomegaly, hypoglycemia, metabolic acidosis, sweaty feet odor, kidneys often palpably enlarged and cystic, facial dysmorphisms, rocker-bottom feet, muscular defects of the anterior abdominal wall and anomalies of the external genitalia (hypospadias and chordee). Virtually all die within the first week of life.</p> <p>Neonatal onset without anomalies: Infants develop problems within the first few days of life with hypotonia, tachypnea, metabolic acidosis, hepatomegaly, hypoglycemia and sweaty feet odor. The few who have survived beyond the first week of life have died within a few months usually with severe cardiomyopathy. A few others have been hypoglycemic as newborns and later developed typical episodes of Reye syndrome-like illness and have survived somewhat longer.</p> <p>Mild or late onset is extremely variable in its course and age at presentation but typically include episodes of hypoketotic hypoglycemia and hepatic dysfunction. There is progressive lipid storage myopathy and carnitine deficiency, and few had progressive extrapyramidal movement disorders similar to GAI. There are reports of asymptomatic adults.</p>
Physical Findings:	In the congenital form the above described dysmorphisms.
Treatment:	Treatment of the severe neonatal presentations is not effective. Mainstay therapies include avoidance of fasting, a diet low in fat and protein and high in carbohydrates. Riboflavin supplementation in the milder cases has been curative in some cases. Additional supplements of glycine and L-carnitine have been used.
Natural History without treatment:	Variable, depending on age at presentation and severity of symptoms.
Natural History with	Treatment may not help infants with congenital or early onset, especially if there is cardiomyopathy. For individuals with the milder late onset type, therapy may prevent some of the neurological findings and the carnitine deficiency. One infant diagnosed at birth through

treatment:	newborn screening was alive and well at 4 years of age.	
Metabolic Information		
Missing Enzyme & Location:	Electron Transfer Flavoprotein (ETF) or ETF-ubiquinone oxidoreductase in the mitochondria, affects the acyl-CoA dehydrogenases of the various chain lengths.	
MS/MS profile:	C4; C5; C6; C8; C10- multiple elevations. C6 hexanoyl carnitine- mild elevations. C8 octanoyl carnitine- elevated. C16; C18:1- multiple elevations.	
Prenatal testing:	Yes, analyte analysis of amniotic fluid or enzyme analysis of amniocytes.	
Miscellaneous Information:	Urine organic acids may only be abnormal during acute episodes. The finding of 2-OH glutaric aciduria is useful as a diagnostic point as it distinguishes between GA I and GA II. Been implicated as a cause of SIDS. Mothers have been reported with HELLP syndrome.	
Credit:	<i>Prepared by the North West Regional Newborn Screening Program Judith Tuerck, RN, MS, and Lorinda Paradise at Oregon Health Services University in Portland, Oregon and by Sara Copeland MD, Iowa Neonatal Metabolic Screening Program.</i>	
Sites of Reference:	<p>National Organization for Rare Disorders - Glutaric Acidemia II www.rarediseases.org/search/rdbdetail_abstract.html?disname=Glutaricaciduria%20II</p> <p>OMIM - Glutaric Acidemia Type II www3.ncbi.nlm.nih.gov/htbin-post/Omim/dispmim?231680</p> <p>Glutaric Acidemia Type II, A Guide for Parents www.mchneighborhood.ichp.edu/pacnorgg/media/Metabolic/glut_acid_eng.pdf</p>	
Support Groups:	<p>FOD Family Support Group 805 Montrose Drive Greensboro, NC 24710 www.fodsupport.org/ Deb Lee Gould (336) 547-8682 FODgroup@aol.com</p>	<p>United Mitochondrial Disease Foundation P.O. Box 1151 Monroeville, PA 15146-1151 www.umdf.org/ (412) 793-8077 info@umdf.org</p>