



Newborn Screening ACT Sheet

Elevated C16-OH +/- C18:1-OH and Other Long Chain Acylcarnitines Long-chain 3-Hydroxyacyl-CoA Dehydrogenase Deficiency (LCHAD)

Differential Diagnosis: Long-chain 3-hydroxyacyl-CoA dehydrogenase (LCHAD) deficiency; Trifunctional protein (TFP) deficiency.

Condition Description: LCHAD and TFP deficiencies are fatty acid oxidation (FAO) disorders. FAO occurs during prolonged fasting and/or periods of increased energy demands (fever, stress) after glycogen stores become depleted and energy production relies increasingly on fat metabolism. Fatty acids and potentially toxic derivatives accumulate in FAO disorders, which are caused by deficiency in one of the enzymes involved in FAO.

You Should Take the Following IMMEDIATE Actions

- **Contact family to inform them of the newborn screening result and ascertain clinical status (poor feeding, vomiting, lethargy).**
- **Consult with pediatric metabolic specialist. (See attached list.)**
- **Evaluate infant (hepatomegaly, cardiac insufficiency; history of sudden unexpected death in a sibling; maternal liver disease during pregnancy; hypoglycemia).**
- **If signs are present or infant is ill, initiate emergency treatment in consultation with metabolic specialist.**
- **Initial testing: plasma acylcarnitine profile and urine organic acids.**
- **Repeat newborn screen if the second screen has not been done.**
- **Educate family about signs and symptoms of hypoglycemia and metabolic acidosis.**
- **Report findings to newborn screening program.**

Confirmation of Diagnosis: Hypoglycemia, elevated liver transaminases, bilirubin, lactate, ammonia, and creatine phosphokinase (CPK) are suggestive of LCHAD and TFP deficiencies. Plasma acylcarnitines and urine organic acid analysis are first-line tests to determine if the appropriate LCHAD/TFP profiles are present. Differentiation between both disorders requires further biochemical and molecular genetic testing in cultured fibroblasts derived from a skin biopsy.

Clinical Considerations: LCHAD and TFP deficiencies typically present acutely and are associated with high mortality unless treated promptly; milder variants exist. Hallmark features include hepatomegaly, cardiomyopathy, lethargy, hypoketotic hypoglycemia, elevated liver transaminases, lactic acidosis, and failure to thrive. Acylcarnitines may normalize on the second screen on affected babies, therefore an infant with an out of range first newborn screen and normal second newborn screen will still need a metabolic evaluation.

Additional Information:

Emergency Treatment Protocol

<http://www.childrenshospital.org/newenglandconsortium/NBS/LCHADD.html>

STAR-G/HRSA -LCHAD

<http://www.newbornscreening.info/Parents/fattyacid disorders/LCHADD.html>

<http://www.newbornscreening.info/Pro/fattyacid disorders/LCHADD.html>

TFP

<http://www.newbornscreening.info/Parents/fattyacid disorders/TFP.html>

Genetics Home Reference

LCHAD

<http://ghr.nlm.nih.gov/condition=longchain3hydroxyacylcoenzymeadehydrogenasedeficiency>

TFP

<http://ghr.nlm.nih.gov/condition=mitochondrialtrifunctionalproteindeficiency>



Newborn Screening FACT Sheet

Long Chain 3-Hydroxyacyl-CoA Dehydrogenase Deficiency (LCHAD)

What is LCHAD?

LCHAD is a type of fatty acid oxidation disorder. People with LCHAD have problems breaking down fat into energy for the body.

What Causes LCHAD?

Enzymes help start chemical reactions in the body. LCHAD happens when an enzyme called “long chain 3-hydroxyacyl-CoA dehydrogenase” is either missing or not working. This enzyme breaks down certain fats from the food we eat into energy. It also breaks down fat already stored in the body.

What Symptoms or Problems Occur with LCHAD?

[Symptoms are something out of the ordinary that a parent notices.]

LCHAD can cause mild problems in some people and more serious problems in others. Babies and children with LCHAD usually begin to show symptoms sometime from birth through age two. LCHAD causes periods of low blood sugar.

The first symptoms of low blood sugar are:

- extreme sleepiness or tiredness
- weakness
- nausea
- vomiting
- feeling irritable or jittery
- behavior changes (such as crying for no reason)

If low blood sugar is not treated, a child with LCHAD can develop:

- breathing problems
- swelling of the brain
- seizures
- coma, sometimes leading to death

Symptoms often show up after having nothing to eat for more than a few hours. They also show up when a child with LCHAD gets sick or has an infection. Nerve problems and vision problems can happen later.

What is the Treatment for LCHAD?

The following treatments are often used for children with LCHAD:

1. Do not go a long time without food – Babies and young children with LCHAD need to eat often to avoid low blood sugar. They should not go without food for more than 4 to 6 hours. Some babies need to eat even more often. It is important that babies be fed during the night.

Young children with LCHAD should have a starchy snack (such as bread, cereal, rice) before bed and another during the night. They need another snack first thing in the morning. Raw cornstarch mixed with water, milk, or other drink is a good source of long-lasting energy. Your dietitian can give you ideas for good night-time snacks. Dietitians know what are the correct foods to eat.

2. Diet – Sometimes a low-fat, high-carbohydrate (such as vegetables, bread, fruits) diet is advised. People with LCHAD cannot use certain building blocks of fat called “long chain fatty acids.” A dietitian can help create a food plan low in these fats.

3. MCT oil, L-carnitine and other supplements – People with LCHAD often use MCT oil. This special oil has medium chain fatty acids. It can be used in small amounts for energy. Doctors prescribe L-carnitine for some children. This is safe and natural and helps body cells make energy. It also helps the body get rid of harmful wastes. Some doctors suggest taking DHA. This may help prevent loss of eyesight.

Things to Remember

Always call your doctor when your child has any of the following:

- poor appetite
- low energy or too much sleepiness
- vomiting
- diarrhea
- an infection
- a fever
- continuing muscle pain or weakness
- reddish-brown color to the urine

Children with LCHAD need to eat extra starchy food and drink more fluids during any illness.



Newborn Screening FACT Sheet

Trifunctional Protein Deficiency (TFP)

What is TFP?

TFP is a type of fatty acid oxidation disorder. People with TFP deficiency can't break down fat into energy for the body.

What Causes TFP?

Enzymes help start chemical reactions in the body. TFP happens when a group of enzymes called "trifunctional protein" is missing or not working. TFP breaks down certain fats from the food we eat into energy. It also breaks down fat already stored in the body.

What Symptoms or Problems Occur with TFP?

[Symptoms are something out of the ordinary that a parent notices.]

Babies and children with early and childhood TFP have periods of illness called Metabolic Crises. Some of the first symptoms of a Metabolic Crisis are:

- too much sleepiness
- behavior changes (such as crying for no reason)
- irritable mood
- muscle weakness
- poor appetite

If a Metabolic Crisis is not treated, a child with TFP can develop:

- breathing problems
- seizures
- coma, sometimes leading to death

What is the Treatment for TFP?

The following treatments are often used for children with TFP deficiency:

1. Do not go a long time without food – Babies and young children with TFP need to eat often to avoid low blood sugar and Metabolic Crises.

They should not go without food for more than 4 to 6 hours. Some babies need to eat even more often. It is important that babies be fed during the night. Your dietitian can give you ideas for good night-time snacks. Dietitians know what are the right foods to eat.

2. Diet – Sometimes your child needs a diet low in fat (such as lean meat and low-fat dairy foods) and high in carbohydrates (such as bread, noodles, fruits, vegetables). People with TFP cannot use certain building blocks of fat called "long chain fatty acids." A dietitian can make a food plan low in these fats.

3. MCT oil and L-carnitine – MCT oil is often used for people with TFP. This special oil can be used in small amounts for energy. Sometimes the doctor will prescribe L-carnitine. This is safe and natural and helps body cells make energy. It also helps the body get rid of harmful wastes.

Do not use any medication without checking with your doctor.

Things to Remember

Always call your doctor when your child has any of the following:

- poor appetite
- low energy or too much sleepiness
- vomiting
- diarrhea
- an infection
- a fever
- continued muscle pain or weakness
- reddish-brown color to the urine