



## **Newborn Screening ACT Sheet [Decreased C0 and other acylcarnitines] Carnitine Uptake Defect (CUD)**

### **Differential Diagnosis:**

Carnitine uptake defect (CUD).

### **Condition Description:**

CUD is caused by a defect in the carnitine transporter that moves carnitine across the plasma membrane. Reduced carnitine limits acylcarnitine formation preventing transport of fatty acids into mitochondria, thereby limiting energy production. Tissues with high energy needs (skeletal and heart muscle) are particularly affected.

### **MEDICAL EMERGENCY: TAKE THE FOLLOWING IMMEDIATE ACTIONS:**

- Contact family to inform them of the newborn screening result and ascertain clinical status (poor feeding, lethargy, tachypnea).
- Consult with pediatric metabolic specialist.
- Evaluate the newborn (tachycardia, hepatomegaly, reduced muscle tone); initiate emergency treatment as indicated by metabolic specialist.
- Initiate timely confirmatory/diagnostic testing as recommended by specialist.
- Educate family about signs, symptoms and need for urgent treatment if infant becomes ill.
- Report findings to newborn screening program.

*(See flowchart for information concerning the specific actions)*

### **You Should Take the Following Actions:**

#### **Diagnostic Evaluation:**

Plasma and urine carnitine analysis will reveal decreased free and total carnitine (C0) in plasma and overexcretion of carnitine in urine. The newborns mother should be investigated as well because several cases of maternal CUD have been identified following an abnormal newborn screening result in their offspring. Transporter assays and OCTN2 gene sequencing establish the diagnosis.

#### **Clinical Considerations:**

Carnitine transporter defect has a variable expression and variable age of onset. Characteristic manifestations include lethargy, hypotonia, hepatomegaly, and cardiac decompensation due to cardiomyopathy. Hypoglycemia is typical in acute episodes.

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**CO (Free Carnitine) Low**

Decreased Free Carnitine (CO);  
Other ACs relatively low.

**\*\* Routine Labs:**  
Glucose, electrolytes, blood gas,  
ammonia, LFT, CPK

Assay free and total  
carnitine in plasma  
and urine

Plasma CO – Low  
Plasma Total Carnitine – Normal/Low  
Urine CO – High/Normal  
Urine Total Carnitine – High/Normal

Carnitine Uptake  
Defect (CUD)

**OPTIONAL  
CONFIRMATORY TESTS:**  
Transporter Assay, OCTN2  
gene analysis

Plasma CO – Normal  
Plasma Total Carnitine – Normal  
Urine CO – Normal  
Urine Total Carnitine – Normal

Infant healthy.  
Rule out maternal CUD

Actions are shown in shaded boxes; results are in the unshaded boxes.

**Abbreviations / Key:**

AC = acylcarnitine

LFTs = liver function tests

CPK = creatine phosphokinase

CUD = carnitine uptake disorder

OCTN2 = organic cation transporter 2

‡ - When the positive predictive value of screening is sufficiently high and the risk to the infant is high, some initiate diagnostic studies that are locally available at the same time as confirmation of the screening result is done.

*Disclaimer: These standards and guidelines are designed primarily as an educational resource for physicians to help them provide quality clinical services. Adherence to these standards and guidelines does not necessarily ensure a successful medical outcome. These standards and guidelines should not be considered inclusive of all proper procedures and tests or exclusive of other procedures and tests that are reasonably directed to obtaining the same results. In determining the propriety of any specific procedure or test, the healthcare provider should apply his or her own professional judgment to the specific clinical circumstances presented by the individual patient or specimen. It may be prudent, however, to document in the patient record the rationale for any significant deviation from these standards and guidelines.*