

## Newborn Screening ACT Sheet [Elevated Citrulline] Amino Acidemia/Urea Cycle Disorder

**Differential Diagnosis:** Citrullinemia type I, argininosuccinic aciduria, citrullinemia type II. Other rarer cause: pyruvate carboxylase deficiency

**Condition Description:** Elevated citrulline results from one of several defects affecting the urea cycle, the pathway that converts ammonia to urea. In addition to elevated citrulline, these conditions are associated with hyperammonemia which may be severe and life-threatening.

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

- Inform family of the newborn screening result.
- Ascertain clinical status (poor feeding, vomiting, lethargy, tachypnea).
- Consult with the pediatric metabolic specialist the same day.
- Evaluate the newborn (poor feeding, vomiting, lethargy, hypotonia, tachypnea, seizures, signs of liver disease). If any of these signs are present or if the newborn is ill, transport to the hospital for further treatment in consultation with the metabolic specialist.
- Initiate confirmatory/diagnostic testing and management, as recommended by the specialist.
- Provide family with basic information about the possible diagnoses and their management.
- Report final diagnostic outcome to newborn screening program.

**Diagnostic Evaluation:** **Plasma ammonia:** is markedly elevated in citrullinemia type I and is less pronounced in the other conditions. **Plasma amino acids:** Citrulline is usually markedly elevated in citrullinemia type I. Citrulline and other amino acids including tyrosine are elevated in citrullinemia type II. Citrulline and argininosuccinic acid are elevated in argininosuccinic aciduria. **Urine amino acids:** Argininosuccinic acid is more readily detected in urine than plasma and is elevated in argininosuccinic aciduria. **Molecular genetic or enzyme testing** may be required to differentiate the various disorders and establish the diagnosis.

**Clinical Considerations:** Citrullinemia and argininosuccinic aciduria can present acutely in the newborn period with hyperammonemia, seizures, failure to thrive, lethargy, and coma. Later signs include developmental delay and hepatic dysfunction. Although treatment with a low protein diet to prevent hyperammonemia helps optimize growth and development, the outcome can be variable. Citrin deficiency may present with cholestatic liver disease in the neonate. Pyruvate carboxylase deficiency produces coma, seizures, and life-threatening ketolacticacidosis.

**Additional Information:**

[How to Communicate Newborn Screening Results](#)  
[Emergency Protocols \(New England Consortium of Metabolic Programs\)](#)  
[Gene Reviews](#)  
[Medline Plus](#)  
[Condition Information for Families- HRSA Newborn Screening Clearinghouse](#)  
[ClinGen Actionability Report](#)

**Referral (local, state, regional, and national):**

[Find a Genetics Clinic Directory](#)  
[Genetic Testing Registry](#)

## State and Other Resources

### State Newborn Screening Program

Newborn Screening Program, Utah Department of Health and Human Services  
801-584-8256, [newbornscreening.health.utah.gov/](http://newbornscreening.health.utah.gov/)

### Genetics/Metabolic Consultants

Pediatric Medical Genetics, University of Utah Department of Pediatrics  
801-213-3599, [healthcare.utah.edu/pediatrics/programs-services/genetics.php](http://healthcare.utah.edu/pediatrics/programs-services/genetics.php)

### Information for Clinicians and Families

Utah Medical Home Portal (see Newborn Disorders and Parents & Families sections)  
[ut.medicalhomeportal.org/newborn/citrullinemia-type-i](http://ut.medicalhomeportal.org/newborn/citrullinemia-type-i)

### Parent/Family Support

National Urea Cycle Disorders Foundation  
[www.nucdf.org/](http://www.nucdf.org/)

## National Resources (with web addresses)

### Additional Information

How to Communicate Newborn Screening Results  
[www.hrsa.gov/sites/default/files/hrsa/advisory-committees/heritable-disorders/Resources/achdnc-communication-guide-newborn.pdf](http://www.hrsa.gov/sites/default/files/hrsa/advisory-committees/heritable-disorders/Resources/achdnc-communication-guide-newborn.pdf)

Emergency Protocols (New England Consortium of Metabolic Programs)  
[www.newenglandconsortium.org/argininosuccinic-acid-synthetase-deficiency-citrullinemia-as](http://www.newenglandconsortium.org/argininosuccinic-acid-synthetase-deficiency-citrullinemia-as)

Gene Reviews  
[www.ncbi.nlm.nih.gov/books/NBK1458/](http://www.ncbi.nlm.nih.gov/books/NBK1458/)

Medline Plus  
[medlineplus.gov/genetics/condition/citrullinemia/](http://medlineplus.gov/genetics/condition/citrullinemia/)

Condition Information for Families-HRSA Newborn Screening Clearinghouse  
[newbornscreening.hrsa.gov/conditions/citrullinemia-type-i](http://newbornscreening.hrsa.gov/conditions/citrullinemia-type-i)

### Referral (local, state, regional and national)

Find a Genetics Clinic Directory  
[clinics.acmg.net](http://clinics.acmg.net)

Genetic Testing Registry  
[www.ncbi.nlm.nih.gov/gtr/](http://www.ncbi.nlm.nih.gov/gtr/)