(PKU) PHENYLKETONURIA

Amino Acid Disorder

Definition

Phenylketonuria, or PKU, is an autosomal recessive defect in phenylalanine metabolism caused by the absence of the liver enzyme phenylalanine hydroxylase. Infants with this disorder cannot convert phenylalanine, an amino acid found in all dietary protein, to tyrosine. If not treated, phenylalanine accumulates to toxic levels in the blood and body organs and causes damage to the brain and central nervous system.

Incidence

The incidence of PKU is 1 in 12,000 live births.

Inheritance

PKU is inherited as an autosomal recessive metabolic disorder.

Characteristics

At birth, the baby with classical PKU appears completely normal. However, the blood phenylalanine level quickly elevates from a normal level of less than 3 mg% to greater than 20 mg% within a matter of days after birth. (mg/dL=mg%) The baby usually progresses as expected for the first few months of life, but then begins to show signs of developmental delay. There may be vomiting, feeding difficulties, eczema, autistic-like behaviors, microcephaly, poor growth, seizures, and a musty smelling body odor. Inadequate production of tyrosine (a precursor to pigment formation) results in lighter hair and skin than other family members. Most individuals (96-98%) with untreated PKU will have an I.Q. of less than fifty and will require lifelong care.

Variant Forms

Hyperphenylalaninemia refers to any consistent elevation of phenylalanine levels and includes classic phenylketonuria where the phenylalanine level is >20 mg% on a regular diet. There are also several intermediate forms of hyperphenylalaninemia in which the serum phenylalanine levels are moderately elevated (3-20 mg%). These individuals need to be followed by a metabolic team and may need dietary restriction of phenylalanine if the phenylalanine levels remain consistently higher than 6 mg%. All individuals with hyperphenylalaninemia of any degree require specialized follow-up and need to be monitored. Referral to a metabolic treatment center is necessary where definitive tests can differentiate these variant forms of PKU.

Newborn Screening Methodology

The laboratory method used is tandem mass spectrometry for the amino acid phenylalanine.

RESULT	ACTIONS
Within Normal Limits (<2.69 mg/dL phenylalanine)	Normal report is sent to submitter.
Presumptive Positive	The program follow-up staff will notify

(≥2.69 mg/dL phenylalanine	attending physician.

Confirmation
Abnormal results are confirmed by quantitative plasma amino acids. Consultation with a Pediatric Metabolic Specialist or Geneticist should be made for confirmation and diagnosis, (319) 356-2674.

Treatment and Outcome
With early and proper treatment, mental retardation is preventable. Treatment should be started as soon as possible after confirmation and should be continued for life. Delaying treatment for only a few weeks lowers the final adult IQ. Phenylalanine is selectively restricted in the diet except for the precise amount needed for growth and development. This is achieved by use of a special formula and diet low in phenylalanine but adequate in other nutrients. Growth and development are followed closely, in conjunction with monitoring of the diet and phenylalanine levels at frequent intervals by a team of metabolic specialists. Early diagnosis in conjunction with successful treatment and close follow-up can result in normal physical and mental development.

Screening Practice Considerations
- Any baby with an abnormal PKU screen should be referred to a metabolic treatment center.
- It is very important that no infant with an abnormal PKU screen be placed on any kind of protein restriction or special diet prior to referral and a medical work-up by a Pediatric Metabolic Specialist or Geneticist.
- Collection of the newborn screen prior to 24 hours of age can result in a false negative result. Another specimen should be collected.
- Total parenteral nutrition is the most common cause of false positive results.

Other Sites of Reference
Phenylketonuria (PKU)
Website: www.web.ukonline.co.uk/nspku/healthvisitor.htm

National Coalition for PKU and Allied Disorders:
Website: www.pku-allieddisorders.org

PKU Listserv:
Website: www.listserv.emory.edu/archives/pku-support-l.html

Children's PKU Network
Website: www.pkunetwork.org/

Support Groups
Tyler for Life Foundation
Website: www.tylerforlife.com/index.html

A Place of our Own, For Teens
Website: www.peds.umn.edu/pku/

Chats and PKU information
Website: www.pkudamon1978.homestead.com