Alberta Health Services

Newborn Metabolic Screening

Information for Health Professionals

Phenylketonuria (PKU)

(metabolic condition: amino acid disorder)

Also known as:

- phenylalanine hydroxylase deficiency
- hyperphenylalaninemia – classic type

What are amino acid disorders?

Amino acid disorders are a group of inherited metabolic conditions in which certain amino acids cannot be broken down. This leads to an accumulation of toxic metabolites in the body which can cause serious health problems.

What is PKU?

PKU is an amino acid disorder resulting from an enzyme defect in the breakdown of the amino acid phenylalanine to tyrosine. Phenylalanine is a component of all proteins. The clinical features of PKU result from accumulation of phenylalanine which is toxic to the brain.

What causes PKU?

Most cases of PKU result from mutations in the gene for phenylalanine hydroxylase (PAH) which cause absent or decreased enzyme activity. PAH requires a cofactor, biopterin, to function normally. A minority of PKU patients have defects in the synthesis of this cofactor.

How common is PKU?

The incidence of PKU is about 1 in every 12,000 infants born in Canada. It is the most common inherited metabolic condition of amino acid breakdown. Although PKU occurs in all ethnic groups, it is more common in people of Irish, northern European, Turkish, or Native American ancestry.

What are the clinical features of PKU?

Infants with PKU appear normal at birth and for the first few weeks of life. Without treatment, clinical features include developmental delay, a "mousy" smell, skin rash and pale skin with fair hair due to a defect in pigmentation. There are milder variants of PKU.

Women with PKU whose diet is poorly controlled are at risk for having infants with maternal PKU syndrome, resulting from toxic levels of phenylalanine crossing the placenta in pregnancy. Features include microcephaly (small head) and heart defects.

What is the screening test for PKU?

An increased concentration of phenylalanine is detected on the newborn blood spot screen. Newborn blood spot screening is not 100% perfect. Infants with clinical symptoms need timely assessment and diagnostic testing even if their screen result is normal.

How is the diagnosis confirmed?

The diagnosis is confirmed by measurement of phenylalanine and tyrosine in blood. Biopterin pathway defects can be diagnosed by measurement of intermediates and enzymes in the biopterin synthetic pathway. The diagnosis can be confirmed by mutation analysis of the PAH gene. Specialists at the clinics listed below will arrange diagnostic testing.

How is PKU treated?

PKU is treated by a low protein diet and a special formula low in phenylalanine. PKU patients with BH4 deficiency may need treatment with tetrahydrobiopterin and other medications. Parent education is an important component of treatment, including advising parents on actions to be taken when their child develops a minor illness. The treatment is lifelong.

What is the outcome of treatment for PKU?

The outcome of PKU is excellent if recognized and treated early along with frequent monitoring. The risk of maternal PKU syndrome can be minimized by strict adherence to the diet before conception and throughout pregnancy.

Is PKU inherited?

PKU is inherited as an autosomal recessive trait. Parents of a child with PKU are carriers of the condition and have a 1 in 4 chance of having another affected child in each subsequent pregnancy. PKU carriers are healthy. Genetic counselling and prenatal testing is available to all families with PKU.

For additional resources, please call:

Clinical & Metabolic Genetics Program (Edmonton)

8-53 Medical Sciences Building
8440 – 112 St. NW
Edmonton, AB T6G 2H7
Phone: 780-407-7333
Fax: 780-407-6845

Emergency consultations:
Phone 780-407-8822 and ask for the specialist on call for metabolic diseases.

Clinical & Metabolic Genetics Program (Calgary)

Alberta Children's Hospital
28 Oki Drive NW
Calgary, AB T3B 6A8
Phone: 403-955-7587
Fax: 403-955-3091

Emergency consultations:
Phone 403-955-7211 and ask for the specialist on call for metabolic diseases.