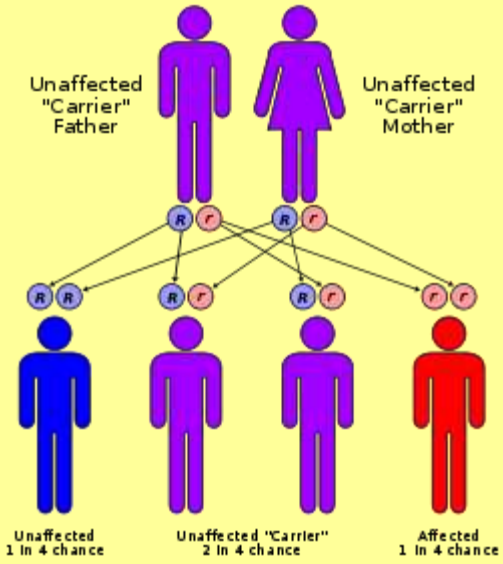
Phenylketonuria



What is phenylketonuria?

- Phenylketonuria, also called PKU, is an inherited condition where the body cannot break down certain foods
- Normally, the liver makes many enzymes (proteins) that break down substances, such as phenylalanine.
- Phenylalanine is important for making other proteins, which are needed for normal growth. It is found in many foods, such as meat, poultry, fish, eggs, milk, cheese, beans, nuts, and seeds.

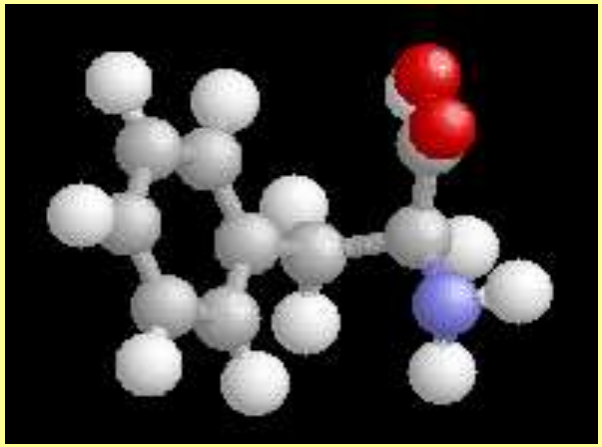
- With PKU, the enzyme that breaks down phenylalanine may be present only in small amounts or none at all.
- Phenylalanine may build up in the body and cause brain damage. This may lead to serious growth and learning problems, such as mental retardation.

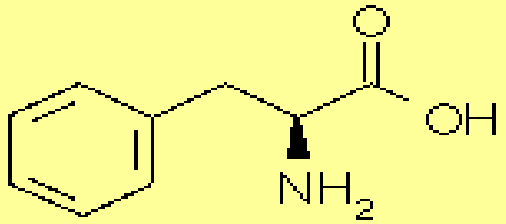
WHAT IS PKU?

PKU (phenylketonuria), in its "classic" form, is a rare, inherited metabolic disease that results in mental retardation and other neurological problems when treatment is not started within the first few weeks of life. .

PHENYLALANINE

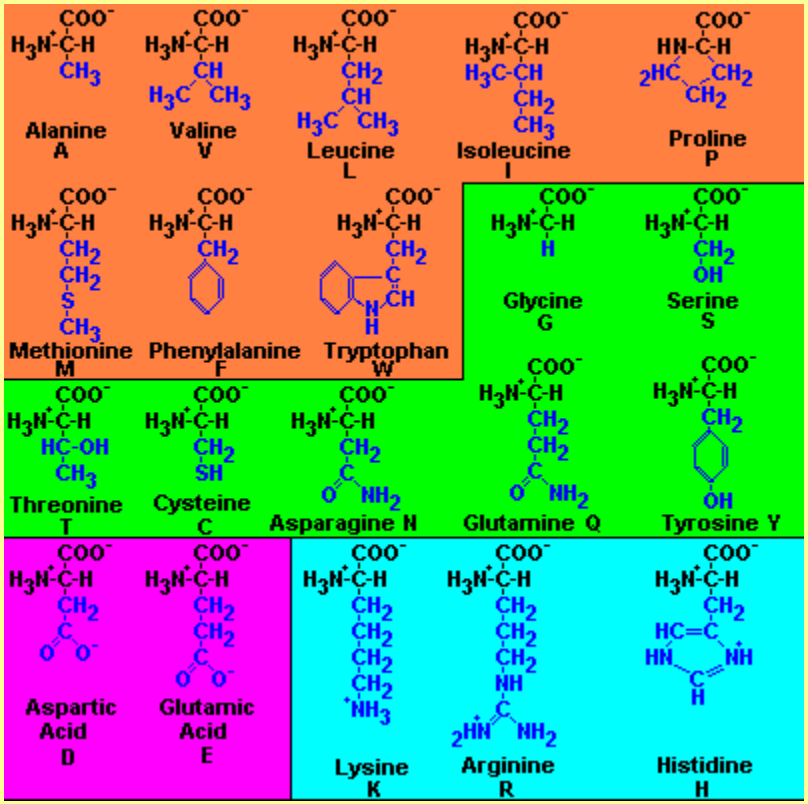
PKU is characterized by the inability of the body to utilize the essential amino acid phenylalanine.





phe f Phenylalanin

WHATS THE DIFFERENCE BETWEEN ESSENTIAL AND NON-ESSENTIAL AMINO ACIDS?



Amino acids are the building blocks for body proteins.

Essential amino acids can only be obtained from the food we eat as our body does not normally produce them.

ENZYMATIC ACTIVITY

- In cases of PKU, the enzyme that breaks down phenylalanine, phenylalanine hydroxylase, is completely or nearly completely deficient.
- This enzyme normally converts phenylalanine to another amino acid, tyrosine, which is utilized by the body.
- When this enzyme, phenylalanine hydroxylase, is absent or deficient, phenylalanine and its breakdown chemicals from other enzyme routes, accumulate in the blood and body tissues.

LEVELS OF BLOOD PHENYLALANINE

- A normal blood phenylalanine level is about 1mg/dl.

- In cases of PKU, levels may range from 6-80mg/dl, but are usually greater than 30mg/dl.

What causes phenylketonuria?

- Phenylketonuria is caused by a defect in the gene that makes the enzyme phenylalanine hydroxylase (PAH). A gene contains the information needed to make a certain substance. For a child to inherit PKU, both parents must have the defective gene. If the child gets only one defective gene, he may only be a PKU carrier. A carrier is usually not affected in any way.

INCIDENCE OF PKU

- PKU affects about one out of every 10,000 to 20,000 Caucasian or oriental births. The incidence in African Americans is far less.

- The PKU disorder is as frequent in men as it is in women.

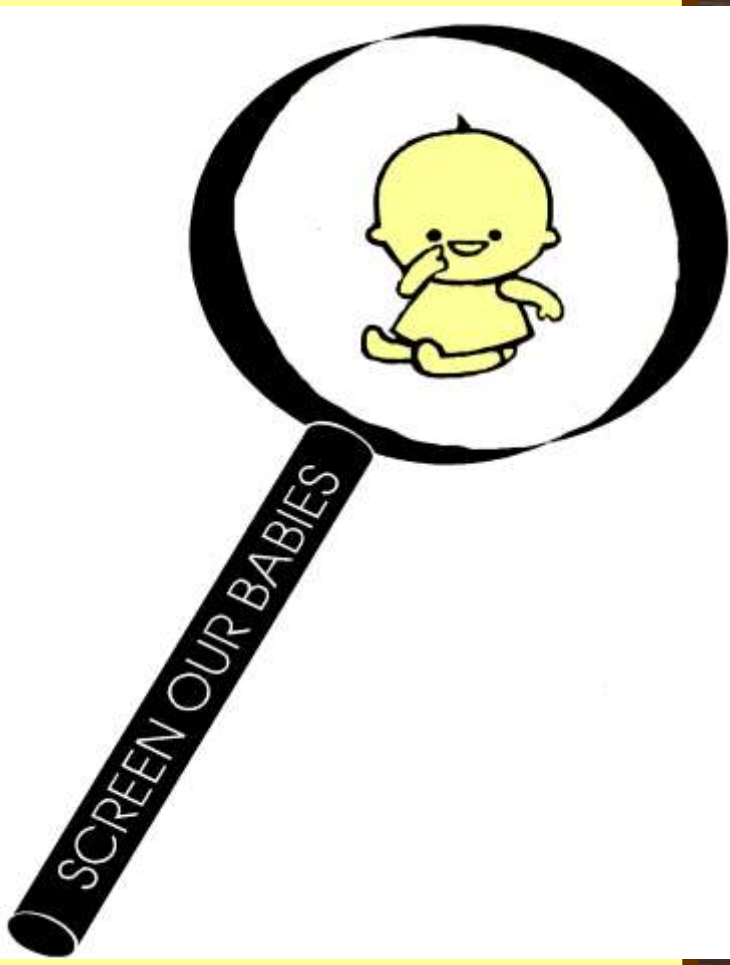
What are the signs and symptoms of phenylketonuria?

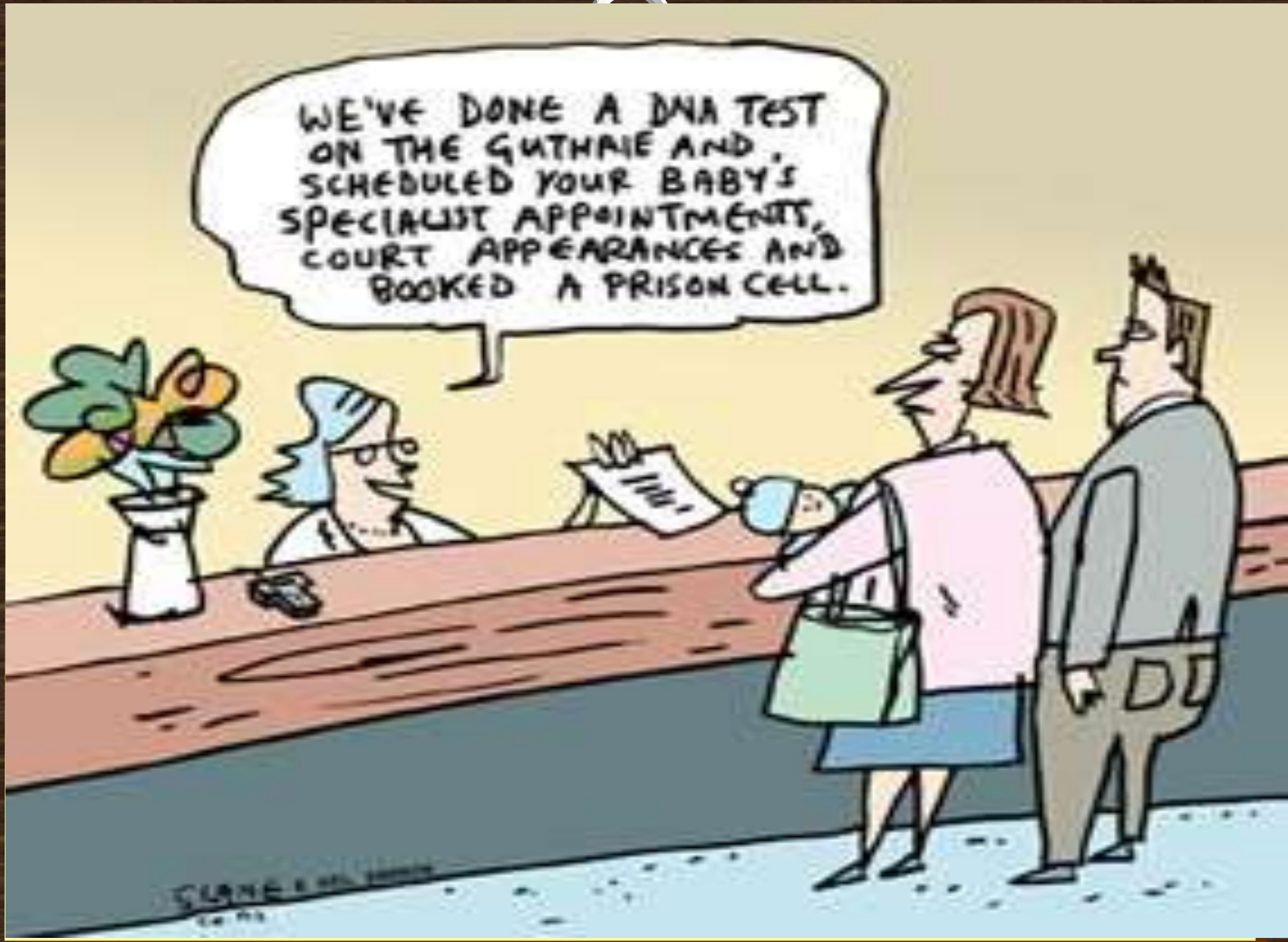
- A child with PKU may look normal and completely healthy for the first few months of life.
- If left untreated, signs and symptoms may appear between 3 to 6 months of age.
- Child may begin to be less active and do things later than other children. He may lose interest or not pay attention to things around him.

- **Learning, speech, or behavior problems.**
- **More irritable, fussy, or restless than normal.**
- **Musty or mousy odor of his breath, hair, skin, or urine.**
- **Fair skin.**
- **Short stature (height) or small head.**
- **Skin may be dry or have rashes, such as eczema.**
- **Vomiting (throwing up), muscle stiffness, or seizures (convulsions).**

How is phenylketonuria diagnosed?

- **Blood tests:** A newborn screening test is usually done during your first days of life. A sample of child's blood is taken and sent to the lab.




WE'VE DONE A DNA TEST ON THE GUTHRIE AND SCHEDULED YOUR BABY'S SPECIALIST APPOINTMENTS, COURT APPEARANCES AND BOOKED A PRISON CELL.

Guthrie test

- The **Guthrie test**, also known as the **Guthrie bacterial inhibition assay**, is a medical test performed on newborn infants to detect phenylketonuria, an inborn error of amino acid metabolism.

- A drop of blood is usually obtained by pricking the heel of a newborn infant in a hospital nursery on the sixth or seventh day of life (end of the first week). The blood is collected on a piece of filter paper and sent to a central laboratory.

- **CT scan:**. It may be used to look at child's bones, muscles, brain, body organs, and blood vessels. child may be given dye by mouth or in an IV before the pictures are taken. The dye may help child's caregiver see the pictures better. People who are allergic to iodine or shellfish (lobster, crab, or shrimp) may be allergic to some dyes. Tell the caregiver if child is allergic to shellfish, or has other allergies or medical conditions.

- **Genetic tests:** Genetic testing may be needed to check child's genes. This test helps caregivers learn how child's genes may affect him. This may also help child's caregivers decide on a treatment plan.

- **Magnetic resonance imaging scan:**
- **Urine tests:**

How is phenylketonuria treated?

- **Diet:** A special diet is needed to keep the amount of phenylalanine in the body low.

This diet is different from one child to another. It is started as early as the first few days of life or a few weeks after birth. This special diet may need to be followed for life.

- **Medicines:** child may be given medicines to treat his symptoms. Medicines may be given to treat his rash, vomiting, to control his seizures, or to relax his muscles.

  Special formulas or products: These are also called protein substitutes that have little or no phenylalanine. These formulas have the right amino acids, calories, vitamins, and minerals your child needs.

Galactosemia

- Galactosemia is a condition in which the body is unable to use (metabolize) the simple sugar galactose

Causes

- Galactosemia is an inherited disorder. This means it is passed down through families.

- It occurs in approximately 1 out of every 60,000 births among Caucasians. The rate is different for other groups.

There are three forms of the disease:

- Galactose-1 phosphate uridyl transferase deficiency (classic galactosemia, the most common and most severe form)
- Deficiency of galactose kinase
- Deficiency of galactose-6-phosphate epimerase

- People with galactosemia are unable to fully break down the simple sugar galactose. Galactose makes up half of lactose, the sugar found in milk. The other sugar is glucose.

- If an infant with galactosemia is given milk, substances made from galactose build up in the infant's system. These substances damage the liver, brain, kidneys, and eyes.

- Persons with galactosemia cannot tolerate any form of milk (human or animal). They must be careful about eating other foods containing galactose.

Symptoms

- Infants with galactosemia can develop symptoms in the first few days of life if they eat formula or breast milk that contains lactose. The symptoms may be due to a serious blood infection with the bacteria *E. coli*.

- Convulsions
- Irritability
- Lethargy
- Poor feeding (baby refuses to eat formula containing milk)
- Poor weight gain
- Yellow skin and whites of the eyes (jaundice)
- Vomiting

Exams and Tests

- Signs include:
- Amino acids in the urine and/or blood plasma (aminoaciduria)
- Enlarged liver (hepatomegaly)
- Fluid in the abdomen (ascites)
- Low blood sugar (hypoglycemia)

Tests include

- Blood culture for bacteria infection (*E. coli sepsis*)
- Enzyme activity in the red blood cells
- Ketones in the urine

- Prenatal diagnosis by directly measuring the enzyme galactose-1-phosphate uridyl transferase
- "Reducing substances" in the infant's urine, and normal or low blood sugar while the infant is being fed breast milk or a formula containing lactose
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Treatment

- People with this condition must avoid all milk, milk-containing products (including dry milk), and other foods that contain galactose for life. It is essential to read product labels and be an informed consumer.

- Infants can be fed with:
- Soy formula
- Meat-based formula or Nutramigen (a protein hydrolysate formula)
- Another lactose-free formula
- Calcium supplements are recommended.

Outlook (Prognosis)

- People who get an early diagnosis and strictly avoid milk products can live a relatively normal life. However, mild intellectual impairment may develop, even in people who avoid galactose.

Possible Complications

- Cataracts
- Cirrhosis of the liver
- Death (if there is galactose in the diet)
- Delayed speech development
- Irregular menstrual periods, reduced function of ovaries leading to ovarian failure

- Mental retardation
- Severe infection with bacteria (*E. coli sepsis*)
- Tremors and uncontrollable motor functions

Prevention

- is helpful to know your family history. If you have a family history of galactosemia and want to have children, genetic counseling will help you make decisions about pregnancy and prenatal testing. Once the diagnosis of galactosemia is made, genetic counseling is recommended for other members of the family.

- Many states screen all newborns for galactosemia. If parents learn that the test indicates possible galactosemia, they should promptly stop giving their infant milk products and ask their health care provider about having a blood test done for galactosemia.