PHENYLKETONURIA

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Annotation:
Recently there is a growing interest in hereditary diseases identified by neonatal screening, and phenylketonuria is one of those diseases. This article illustrates diagnosis and diet therapy of disease treatment, and also the other ways of treatment for children's phenylketonuria.

Key words:
Phenylketonuria, PKU, diet therapy

Phenylketonuria (phenylpyruvic oligophrenia Folling's disease) is connected to low levels of enzyme phenylalanine hydroxylase, found by Folling in 1934. Folling's biochemical examination was to test the urine of two children who had intellectual disability and he identified that their urine smelled like "mouse odor". When he added 5 percent of Iron III hydrochloric acid solution and acetic acid to the children's urine and the urine turned green. This substance is not found in a healthy body. Nowadays it is being studied as a hereditary disease and the disease occurs in many countries, including Uzbekistan. To identify the diseases every baby undergoes neonatal screening. The occurrence of PKU on population is variety, one from 3500 people up to 100000, in Uzbekistan the average number is one from 1200 people.

The PKU autosomal recessive-inherited disease gene is inherited in locus 12q22-12q24.1 of chromosome 12. Phenylalanine is one of the major amino acids, because it does not have the ability to synthesize a benzene ring in animal tissues. Phenylalanine is converted into tyrosine by the enzyme 4 hydroxylase. The content of phenylalanine and its products in human blood and urine increases, it reaches 80 mg / dl in the blood (normally 1-4 mg / dl). Under these conditions, most of the phenylala is converted to phenylpyruvate and phenylactate. As a result of metabolic defect of the enzyme, phenylalanine and its derivatives in the blood and tissues poison the body. Children are born healthy, may not show any symptoms in the first month, and may develop well in terms of weight. Interestingly, 90% of children have blonde hair, white body and blue eyes (this belongs to most European races). Some babies become weak and sleepy from the day of birth, they pay no attention to toys and also different sounds. The first sign of the disease is vomiting and this begins when baby is 2 - 6 months old. The below symptoms and signs of the phenylketonuria can be observed from the child: weakness, indifference, symptoms of whimsy, decrease in muscle toning, subsequent decline, allergic dermatitis, eczema symptoms, presence of a peculiar odor on the body and urine, slow physical and mental development, Disorders of pigmentation of hair, skin, rainbow in the appearance of the child, vascular tension, violation of coordination, muscular dystrophy, gradually taking a spastic-ataxic step, inability to look at the light, cases of mental retardation of various degrees such as excessive sweating, low blood pressure and constipation. A sick child is much slower to sit and walk than his peers (for example, a 10-year-old child may have difficulties to walk; besides he only knows a few words to communicate), about those children, teething lasts from 11 to 12 months, sometimes up to 18 months. Enamel may not develop well. Due to the decrease in muscle tone, there can be considered a bending of the arms, bending of the legs. Small steps often cause stumbling, which can lead to the development of Tetany in children. PKU can result in Parkinson's disease, Albinism, Alkaptonuria and Creatinism. At the present, the microbiological Guthrie test is used to diagnose phenylketonuria disease. In this case, the patient's blood is injected into the environment with the addition of an inhibitor of phenylalanine B then depending on the growth of bacteria in it, the disease is diagnosed. The patient is under constant biochemical examination. Differential diagnosis of the disease is carried out in relation to transient hyperphenylalaninemia, leukinosis, perinatal encephalopathy and hereditary microcephaly syndrome. Currently, the most effective way to treat this disease is to diet. When

organizing diet therapy for patients with PKU, it is necessary to exclude animal proteins so that the child's nerve cells are not exposed to the toxic effects of phenylalanine and its derivatives. If phenylalanine is removed from the child at first week of his/her life, brain activity develops healthy. Nutrients that children need to replace natural protein products include: peptides (milk proteins broken down by enzymes), free amino acids (tyrosine, tryptophan, cystine, taurine, histidine). Patients with PKU can be breastfed by the mother only on a strict diet. Protein products are excluded from the diet of pre-school and school-age children. Permitted products include: vegetables, fruits, starch, potatoes, corn, honey and jam from confectionery, vegetable oils. Unauthorized products: meat, eggs, milk, cottage cheese, cereals, millet, flour and flour products. Supplementation begins at third month. The patient's diet begins with giving 5-10 drops, then from 30-50 ml per day to 100 ml of fruit puree at the end of the year from three and half month of age. From 4 or four and half month age, vegetable puree starts to be given. At the age of 5-month, 10 percent porridge is added to the diet. Non-milk products which are made by rice flour can be added to list of eating. They contain no more than 1 g of protein in a 100 ml container. From 6-7 months, ice cream, jelly, prepared using swollen starch and fruit juice with Amylopectin, is included in the diet. Special compounds without phenylalanine - Afenilak, Lofenalak, Nofemix are given to replenish protein reserves. After 1 year Phenylri, Nofelan, Bigrofen, Tetrafen, PK mil PKU-3 and others are given. After 6 months, special drinks Loprofin, Nutrugen and other substances are used to consume. Pasta, protein-free bread can also be eaten.

Today, new directions in the treatment of PKU are being developed: for example, in the field of genetic engineering, the introduction of an artificially created simple gene responsible for phenylalanine 4-hydroxylase, separation of phenylalanine from food by the method of large neutral amino acids, injection into the brain using a special drug. These treatments are not widely used, but studies are already underway to confirm their effectiveness. In the treatment of Medicomentosis drugs are recommended that improve microcirculation and metabolism, such as vitamins and trace elements in tissues with nootropic and promediate effect.

All infants in the country undergo mass neonatal screening. If the baby is born healthy, on days 4-5, and on premature birth on days 7-6, blood drops are taken from a vein on a special form in the maternity hospital and sent to the Screening Center. If a PKU is detected in a child, then monitored by dispenser, after that the following operations are performed: genetic examination 1 time per quarter, psychological examination 3 times a year, biochemical examination of blood 1 time per quarter, Folling test 1 time per month for children under 1 year of age, General blood test every quarter after 1 year of age, neurophysiological examinations 3 times a year, determination of protein and its fractions in the blood (every 6 months).

According to the latest news about the disease Russian scientists I. Kant and Kamerova of **IKBFU** (Immanuel Kant Baltic Federal University) developed the composition of the capsule shell for the enzyme needed in the treatment of PKU. It is said that new approach helps in the treatment of the disease and also the study was published in the journal Helyon. The study shows that optimum temperature for the capsule was found to be 25 degrees Celsius and related to this under cold 4 degrees or hot 30 degrees, the enzyme activity is significantly reduced. In the next phase of the study it is devoted that the study of mechanisms of capsule destruction by L-phenylalanine-ammonium-liase in the model conditions similar to the condition of the human gastrointestinal tract, because the capsules produced in the future will be used in the effective treatment of the disease. And also Olga Babich, director of the Institute of Living Organisms of IKBFU, stated that “Processed capsules are used in the body for therapeutic treatments to replace phenylketonuria”.

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