What is Maternal PKU?

PKU is an inherited metabolic disorder in which the person has high levels of phenylalanine (PHE) in the blood. When a woman with PKU becomes pregnant this is referred to as maternal PKU. Persons with PKU cannot break down dietary PHE, a component of food proteins. Diagnosis of PKU is part of newborn screening programs. Early intervention with a PHE-restricted diet prevents the intellectual and developmental disability seen in individuals who are not managed adequately by diet. It is estimated that one out of 10,000 live births has decreased phenylalanine hydroxylase (PAH),¹ the enzyme deficient in PKU. With proper dietary management, girls with PKU grow normally and have healthy children.

With proper dietary management women with PKU can have healthy children. During pregnancy, PHE readily passes from the mother to the developing baby through the placenta. In the baby, high PHE levels interfere with normal growth and development. About 90% of babies born to mothers with prolonged high PHE of >600 µmol/L (>10 mg/dL) levels during pregnancy have intellectual and developmental disability. Most have a small head size and low birth weight¹. Many have heart defects. These findings in an infant are referred to as Maternal PKU Syndrome. Thus, high PHE levels can cause lifelong damage to the baby. It is important for the health of the unborn baby that a woman with PKU is on a strict PKU diet, ideally before conception and throughout pregnancy.

PAH deficiency most accurately describes the range of clinical phenotypes* ranging from Classic PKU to hyperphenylalaninemia, and based on the new American College of Medical Genetics and Genomics (ACMG) guidelines is the term that will be most likely used.

Can a woman with PKU have a healthy baby?

The best outcomes for babies have been with mothers who are on a PHE-restricted diet and in good metabolic control prior to pregnancy². Recommendations are to obtain a maternal PHE level <360 µmol/L (6 mg/dL) prior to conception and for a maintenance PHE level of <360 µmol/L throughout pregnancy². Studies have shown that when PHE levels are within ranges recommended above, babies born to women with PKU are as likely to be as healthy as babies born to women without PKU.

Should a woman with PKU go on a PHE-restricted diet if she is already pregnant?

The sooner a woman with PKU starts on diet and has PHE levels in recommended range during pregnancy the higher the chances are of having a child unaffected with maternal PKU syndrome. For this reason, it is very important for a woman with PKU to reach out immediately to her metabolic team as soon as she finds out she is pregnant. Ideally, a planned pregnancy is best to allow for preconception PHE control.

A PHE-free metabolic formula provides the majority of the body’s required protein for patients with PKU. In the first trimester, protein intake is going to be connected to the baby’s birth measurements; i.e. head circumference, body length and weight. Protein and calorie intake have a direct relationship to the head circumference of the baby³.

Eating too little protein or calories can cause the breakdown of protein in the body (i.e. catabolism) which will increase PHE levels. Every PHE-free metabolic formula has a different amount of protein and calories; therefore an individualized diet prescription is necessary.

Nutricia North America provides a range of medical formulas as well as low protein foods. Please contact us for more information. Your dietitian will help you decide which products are best.

*Phenotype- observable traits, outward appearances, development or behavior
Will a baby born to a woman with PKU have PKU herself?

Having maternal PKU does not mean the baby will have PKU. In order for the baby to have PKU, then the father must be a carrier of the PKU gene as well. Please refer to the pictogram on page one.

Does a woman with maternal “mild” PKU have to be managed by diet?

“Mild” PKU is referred to as “hyperphenylalaninemia” and is differentiated from classic PKU in that the genetic defect is milder and more enzyme activity is available. Some women with hyperphenylalaninemia can maintain adequate levels of blood PHE without being on a strict PHE-restricted diet. The reason is that women with mild hyperphenylalaninemia may have some low-level PAH activity that helps break down PHE. However, some women with mild hyperphenylalaninemia may have elevated blood PHE levels which requires a special PKU diet. It is important to talk with the metabolic team and prenatal care providers (e.g. obstetrician, midwife, family practice physician or general practice physician) about the best course of management.

What is the role of the prenatal health care provider in the management of women with PKU?

It is important for a woman with PKU to share her knowledge of PKU with her prenatal health care provider, if possible before pregnancy, as many prenatal health care providers are not familiar with PKU. The prenatal health care provider will help manage the pregnancy and provide prenatal care. They will work closely with the patient and her metabolic team in order for her to have a healthy baby. Attaining good control of blood PHE levels before and during the pregnancy is ideal; the metabolic team can help provide the necessary guidance to the obstetrician or other prenatal care provider. The metabolic clinic professionals are able to help women with PKU have healthy babies. It is best to be seen by the metabolic team before pregnancy occurs to help facilitate a healthy pregnancy and outcome. Regular obstetrician visits will be necessary for routine pregnancy care. Before pregnancy occurs it is important to continue birth control until blood PHE levels are considered safe enough to become pregnant.

Are there any special recommendations for a woman with PKU from an obstetric point of view?

For any pregnancy of a mother with PKU, periodic ultrasound examinations and a fetal echocardiogram are recommended given there is a risk of congenital heart disease. Generally the echocardiogram is performed between 18 and 22 weeks of pregnancy. Serial ultrasound examinations to monitor general fetal growth and to check the growth of the head of the unborn baby into the third trimester are also recommended. If there is a problem with growth of the head, it may not be seen until the third trimester of pregnancy. Otherwise prenatal care is no different from that of other women. Additional routine prenatal testing as suggested for all pregnant women is also recommended.

What should a woman with PKU do to plan for a pregnancy?

- Contact the metabolic clinic for consultation.
- Consult with the metabolic dietitian to assess diet management and reduce blood PHE levels
- Contact the prenatal healthcare provider.

If an individual has been off diet, time and patience may be necessary to initiate dietary care, obtain PHE levels, obtain formula and low protein products and coordinate insurance coverage for all aspects of needed care.

What if there are other questions about maternal PKU?

The metabolic clinic staff is the best resource for helping plan for a healthy pregnancy.

References


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Maternal Phenylketonuria (PKU)