

## GENETIC SCREENING

During your first and second trimester you will be offered genetic screening. These are screening tests that are done at a facility that is equipped to perform and interpret the test results. These tests are only for screening purposes, and it is very important to remember what a screening test is before getting one performed. This will help alleviate some of the anxiety that can accompany test results. Screening tests do not look only at results from the blood test. They compare a number of different factors (including age, ethnicity, results from blood tests, etc...) and then estimate what a person's chances are of having an abnormality. These tests DO NOT diagnose a problem; they only signal that further testing should be done.

*What are the reasons to test or not test?*

The reasons to pursue further testing or not vary from person to person and couple to couple. Performing further testing allows you to confirm a diagnosis and then provides you with certain opportunities:

- Pursue potential interventions that may exist (i.e. fetal surgery for spina bifida)
- Begin planning for a child with special needs
- Start addressing anticipated lifestyle changes
- Identify support groups and resources
- Make a decision about carrying the child to term

Some individuals or couples may elect not to pursue testing or additional testing for various reasons:

- They are comfortable with the results no matter what the outcome
- Because of personal, moral, or religious reasons, making a decision about carrying the child to term is not an option
- Some parents choose not to allow any testing that poses any risk of harming the developing baby

## Cell-Free DNA Testing (cfDNA)

The cell-free fetal DNA (cfDNA) test is a relatively new test that may be used to assess the risk of a pregnant woman's developing baby (fetus) having a chromosome disorder, such as Down syndrome (trisomy 21), Edwards syndrome (trisomy 18), or Patau syndrome (trisomy 13). It may be used to identify other rare conditions resulting from an extra chromosome or missing piece of chromosome (microdeletion).

Cell-free fetal DNA is genetic material that is released by the placenta and circulates in a woman's blood during pregnancy. It is present in small quantities starting in the first trimester and increases throughout pregnancy. CfDNA generally reflects the genetic makeup of the developing baby.

The cfDNA test is currently the most accurate non-invasive genetic screening available to pregnant women.

*How is the cfDNA test performed?*

The cfDNA test is a blood test that involves drawing blood from the mother, which takes about 5 to 10 minutes. The blood sample is then sent to the laboratory for testing. Results are typically received within two weeks.

*What are the risks and side effects to the mother or baby?*

Except for the discomfort of drawing blood, there are no known risks or side effects associated with the cfDNA test.

There are times that the cfDNA test cannot be resulted. If, after two attempts, your cfDNA test cannot be resulted, you will be offered other genetic screening options.

*When is the cfDNA test performed?*

The cfDNA test is performed anytime during or after the 10th week of pregnancy.

*What does the cfDNA test look for?*

The cfDNA is able to identify abnormal fetal chromosomes that may indicate Down's Syndrome, Trisomy 18, Trisomy 13, or disorders of the sex chromosomes.

*What do the cfDNA results mean?*

A "low risk" result on the cfDNA test does not guarantee that your baby does not have any of these disorders, but that your baby is at a lower risk of having them. A "high risk" result does not mean that your baby does have any of these disorders, but that further testing is warranted.

## **FIRST TRIMESTER SCREEN**

The First Trimester Screen is a new, optional non-invasive evaluation that combines a maternal blood screening test with an ultrasound evaluation of the fetus to identify risk for specific chromosomal abnormalities, including Down's Syndrome, Trisomy-21, and Trisomy-18.

In addition to screening for these abnormalities, a portion of the test (known as the nuchal translucency) can assist in identifying other significant fetal abnormalities, such as cardiac disorders. The screening test does not detect neural tube defects. The first trimester screen has been available in the U.S. for several years, but has only recently been determined an effective means of early chromosomal abnormality screening.

The combined accuracy rate for the screen to detect the chromosomal abnormalities mentioned above is approximately 85% with a false positive rate of 5%. This means that:

- Approximately 85 out of every 100 babies affected by the abnormalities addressed by the screen will be identified.

- Approximately 5% of all normal pregnancies will receive a positive result or an abnormal level.
- A positive test means that you have a 1/100 to 1/300 chance of experiencing one of the abnormalities.

It is important to realize that a positive result does not equate to having an abnormality, but rather serves as a prompt to discuss further testing. The screen should not be confused with screens performed during the second trimester (often known as the Quad Screen or Triple Screen). These screening methods are less accurate and are performed between 15-20 weeks.

The blood screen measures two pregnancy related hormones: hCG and PAPP-A. The ultrasound evaluation measures nuchal translucency (fluid beneath the skin behind baby's neck). This non-invasive procedure combines the results from the blood tests and the ultrasound, along with the mother's age, to determine risk factors.

*How is the First Trimester Screen performed?*

The blood screen involves drawing blood from the mother, which takes about 5 to 10 minutes. The blood sample is then sent to the laboratory for testing. The ultrasound is performed by an ultrasound specialist or perinatologist and takes between 20 and 40 minutes. The results are calculated within a week of the testing.

*What are the risks and side effects to the mother or baby?*

Except for the discomfort of drawing blood, there are no known risks or side effects associated with the First Trimester screen. There is a 5% false positive rate for the test. Parents should be aware of the possibility of receiving abnormal results and then finding, after further testing, that the baby is normal.

*When is the First Trimester Screen performed?*

The First Trimester Screen is performed between the 11th and 13th week of pregnancy. Because the test is performed so early, it is often used to determine whether a mother should consider undergoing an early (first trimester) diagnostic test, such as chorionic villus sampling, or second trimester amniocentesis.

*What does the First Trimester Screen look for?*

In babies who are at an increased risk for chromosomal abnormalities, increased fluid is often found in the nuchal translucency. Abnormally high or low hCG and PAPP-A levels are also often found. The first trimester screen combines the results from these three measurements (nuchal translucency, hCG, and PAPP-A) with maternal age risk factors and determines an overall risk factor for chromosomal abnormalities.

*What do the First Trimester Screen results mean?*

It is important to remember that the First Trimester Screen is a screening test and not a diagnostic test. This test only notes that a mother is at risk of carrying a baby with a genetic disorder. Many women who experience an abnormal test discover later that the test proved false.

You will not be given specific quantitative values for the separate parts of the First Trimester screen. Instead, you will be told whether your results are “normal or abnormal”, and you will be given a risk level by your genetic counselor. The counselor will give you your risk factor for chromosomal abnormalities based on the test results (for example 1/250, 1/1300).

Abnormal test results warrant additional testing for making a diagnosis. Your genetic counselor will discuss the results with you and assist you in deciding about diagnostic tests, such as CVS or amniocentesis.

These invasive procedures should be discussed thoroughly with your healthcare provider and between you and your partner. Additional counseling may prove helpful.

## **CHORIONIC VILLUS SAMPLING (CVS)**

Chorionic villus sampling, often referred to as CVS, is a diagnostic test for identifying chromosome abnormalities and other inherited disorders. This test may be recommended by your health care provider if you or your partner has family medical histories that reveal potential risks.

*How is the chorionic villus sampling (CVS) performed?*

CVS is a diagnostic procedure which involves removing some chorionic villi cells from the placenta at the point where it attaches to the uterine wall. There are two ways that samples are collected.

**Transcervical:** An ultrasound guides a thin catheter through the cervix to your placenta. The chorionic villi cells are gently suctioned into the catheter. This is the most common method.

**Transabdominal:** An ultrasound guides a long thin needle through the abdomen to your placenta. The needle draws a sample of tissue and then is removed. This procedure is similar to that of amniocentesis.

The CVS procedure collects larger samples and provides faster results than amniocentesis. Results may be received between one to seven days.

*When is chorionic villus sampling (CVS) performed?*

CVS is usually performed between 10 and 13 weeks from your last menstrual period. CVS may be chosen over amniocentesis because it may be performed earlier in the pregnancy.

*What does the chorionic villus sampling (CVS) test look for?*

Chorionic villus sampling detects chromosome abnormalities (i.e. Down syndrome) and genetic disorders (i.e. cystic fibrosis.). This test is different from amniocentesis in that it does not allow for testing for neural tube defects.

Chorionic villus sampling also provides access to DNA for paternity testing prior to delivery. DNA is collected from the potential father and is compared to DNA obtained from the baby during chorionic villus sampling. The results are accurate (99%) for determining paternity.

*What do chorionic villus sampling (CVS) results mean?*

CVS is a diagnostic test that detects chromosome abnormalities and genetic disorders with high levels of accuracy (98-99%). Although the probabilities of identification are high, this test does not measure the severity of these disorders. This test does not help identify neural tube defects.

*What are the risks and side effects to the mother or baby?*

Although CVS is considered to be a safe procedure, it is recognized as an invasive diagnostic test that does pose potential risks. Miscarriage is the primary risk related to CVS occurring 1 out of every 100 procedures.

CVS is not recommended for women who:

- Have an active infection (i.e. STD)
- Are carrying twins
- Have experienced vaginal bleeding during pregnancy

Transcervical CVS is not recommended for women who:

- Have uterine fibroids
- Have a tilted uterus which impedes the catheter

Following the procedure, the mother may experience one or more of the following side effects:

- Infection
- Spotting
- Cramping and pain at puncture point

Contact your healthcare provider if these symptoms remain or get worse. You should also contact your healthcare provider if you experience:

- Fever
- Chills
- Leaking of amniotic fluid

There is a 1% chance of getting false positive results. A false positive occurs when the test indicates that the fetus has an abnormality, but it actually does not.

## SECOND TRIMESTER SCREEN

Second trimester screening is done between 15 and 20 weeks of pregnancy. If the results are abnormal you will be referred to a facility that is equipped to perform and interpret the additional tests.

### **Triple Screen**

\*Also Known as Triple Test, Multiple Marker Screening and AFP Plus

The triple screen test is a maternal blood screening test that looks for three specific substances: AFP, hCG, and Estriol.

**AFP:** *alpha-fetoprotein* is a protein that is produced by the fetus.

**hCG:** *human chorionic gonadotropin* is a hormone produced within the placenta

**Estriol:** *estriol* is an estrogen produced by both the fetus and the placenta

It is a non-invasive procedure done through a blood test with little to no known risk to the mother or developing baby.

*How is the triple screen test performed?*

The triple screen test involves drawing blood from the mother which takes about 5 to 10 minutes. The blood sample is then sent to the laboratory for testing. The results usually take a few days to receive.

*What are the risks and side effects to the mother or baby?*

Except for the discomfort of drawing blood, there are no known risks or side effects associated with the triple screen test.

*When is the triple screen test performed?*

The triple screen test is performed between the 15th and 20th week of pregnancy although results obtained in the 16th-18th week are said to be the most accurate. All pregnant women should be offered the triple screen, but it is recommended for women who:

- Have a family history of birth defects
- Are 35 years or older
- Used possible harmful medications or drugs during pregnancy
- Have diabetes and use insulin
- Had a viral infection during pregnancy
- Have been exposed to high levels of radiation

*What does the triple screen test look for?*

The triple screen is measuring high and low levels of AFP and abnormal levels of hCG and estriol. The results are combined with the mother's age, weight, ethnicity and gestation of pregnancy in order to assess probabilities of potential genetic disorders. High levels of AFP may suggest that the developing baby has a neural tube defect such as spina bifida or anencephaly. However, the most common reason for elevated AFP levels is inaccurate dating of the pregnancy.

Low levels of AFP and abnormal levels of hCG and estriol may indicate that the developing baby has Trisomy 21 (Down's Syndrome), Trisomy 18 (Edwards Syndrome) or another type of chromosome abnormality.

Although the primary reason for conducting the test is to screen for genetic disorders, the results of the triple screen can also be used to identify:

- A multiples pregnancy
- Pregnancies that are more or less advanced than thought

*What do the triple test results mean?*

It is important to remember that the triple test is a screening test and not a diagnostic test. This test only notes that a mother is at a possible risk of carrying a baby with a genetic disorder. The triple screen test is known to have a high percentage of false positive results.

Abnormal test results warrant additional testing for making a diagnosis. A more conservative approach involves performing a second triple screen followed by a high definition ultrasound. If the testing still maintains abnormal results, a more invasive procedure like amniocentesis may be performed.

Invasive testing procedures should be discussed thoroughly with your healthcare provider and between you and your partner. Additional counseling and discussions with a counselor, social worker or minister may prove helpful.

## Quad Screen Test

The quad screen test is a maternal blood screening test that looks for four specific substances: AFP, hCG, Estriol, and Inhibin-A.

**AFP:** *alpha-fetoprotein* is a protein that is produced by the fetus

**hCG:** *human chorionic gonadotropin* is a hormone produced within the placenta

**Estriol:** *estriol* is an estrogen produced by both the fetus and the placenta

**Inhibin-A:** *inhibin-A* is a protein produced by the placenta and ovaries

The quad screen is a maternal blood screening test that is similar to the triple screen test (also known as AFP Plus and the Multiple Marker Screening). However, the quad screen looks for not only the three specific substances evaluated in those tests (AFP, hCG, and Estriol) but also a fourth substance known as Inhibin-A.

The screen is essentially the same as the screening tests that look for only three substances, except the likelihood of identifying pregnancies at risk for Down Syndrome is higher through the evaluation of Inhibin-A levels. The false positive rate of the test is also lower.

*How is the quad screen test performed?*

The quad screen test involves drawing blood from the mother, which takes about 5 to 10 minutes. The blood sample is then sent to the laboratory for testing. The results usually take a few days to receive.

*What are the risks and side effects to the mother or baby?*

Except for the discomfort of drawing blood, there are no known risks or side effects associated with the quad screen test.

*When is the quad screen test performed?*

The quad screen test is performed between the 16th and 18th week of pregnancy. All pregnant women should be offered the quad screen, but it is recommended for women who:

- Have a family history of birth defects
- Are 35 years or older
- Used possible harmful medications or drugs during pregnancy
- Have diabetes and use insulin
- Had a viral infection during pregnancy
- Have been exposed to high levels of radiation

*What does the quad screen test look for?*

The quad screen measures high and low levels of AFP, abnormal levels of hCG and estriol, and high levels of Inhibin-A. The results are combined with the mother's age and ethnicity in order to assess probabilities of potential genetic disorders. High levels of AFP may suggest that the developing baby has a neural tube defect such as spina bifida or anencephaly. However, the most common reason for elevated AFP levels is inaccurate dating of the pregnancy.

Low levels of AFP and abnormal levels of hCG and estriol may indicate that the developing baby has Trisomy 21(Down syndrome), Trisomy 18 (Edwards Syndrome) or another type of chromosome abnormality.

*What do the quad screen results mean?*

It is important to remember that the quad screen is a screening test and not a diagnostic test. This test only notes that a mother is at risk of carrying a baby with a genetic disorder. Many women who experience an abnormal test result go on to deliver healthy babies.

Abnormal test results warrant additional testing in order to make a diagnosis. A more conservative approach involves performing a second quad screen followed by a high



definition ultrasound. If the testing still maintains abnormal results, a more invasive procedure such as amniocentesis is performed.

Any invasive procedure should be discussed thoroughly with your healthcare provider and between you and your partner. Additional counseling and discussions with a counselor, social worker or minister may prove helpful.

## **Amniocentesis**

Amniocentesis is a diagnostic test that may be recommended by your health care provider following an abnormal triple test result. Inherited or genetic concerns lead some parents to choose amniocentesis to determine if specific genetic disorders may be present in their baby.

### *How is amniocentesis performed?*

An ultrasound is used as a guide to determine a safe location for the needle to enter the amniotic sac so the fluid may be safely removed. A sample of amniotic fluid is collected through the needle. The procedure takes about 45 minutes, although the collection of fluid takes less than five minutes. The amniotic fluid, which contains cells shed by the fetus, is sent to the laboratory for analysis. Results can take anywhere from a few days to a couple weeks to be returned.

### *When is amniocentesis performed?*

Amniocentesis is usually performed between 14 and 20 weeks. Some medical facilities may perform amniocentesis as early as 11 weeks.

Amniocentesis can be used later in the third trimester for a few reasons. Your healthcare provider may recommend the procedure if your membranes have ruptured prematurely to assess for uterine infections. Amniocentesis may also help determine the severity of fetal anemia in babies with Rh disease and assist your physician determine whether the fetus requires lifesaving blood transfusions.

Amniocentesis is sometimes done to assess lung maturity. If so, this is done shortly before delivery.

### *What does the amniocentesis test look for?*

Amniocentesis detects chromosome abnormalities, neural tube defects and genetic disorders. Down syndrome or Trisomy 21 is the most common chromosome abnormality. Genetic disorders include disorders like cystic fibrosis. The most common neural tube defect is spina bifida.

Amniocentesis is occasionally used late in pregnancy to assess whether the baby's lungs are mature enough for the baby to breathe on his own.

### *What do amniocentesis results mean?*

Amniocentesis is a diagnostic test that detects chromosome abnormalities, neural tube defects and genetic disorders with high levels of accuracy (98-99%). Although the probabilities of identification are high, this test does not measure the severity of these birth defects. Alpha-fetoprotein levels and advanced level ultrasounds may assist in assessing the severity.

### *What are the risks and side effects to the mother or baby?*

Although amniocentesis is considered to be a safe procedure, it is recognized as an invasive diagnostic test that does pose potential risks. According to the Mayo Clinic, it is performed approximately 200,000 times a year.

Miscarriage is the primary risk related to amniocentesis. The risk of miscarriage ranges from 1 in 400 to 1 in 200. In facilities where amniocentesis is performed regularly, the rates are closer to 1 in 400. Miscarriages can occur because of infection in the uterus, the water breaks or labor is induced prematurely.

Although extremely rare, it is possible for the needle to come in contact with the baby. Great precautions are taken by using a sonogram to guide the needle away from the baby.

The mother may experience a sharp pain when the needle enters the skin and again when it enters the uterus. Following completion of the procedure, the mother may experience other side effects that include:

- Cramping
- Leakage of fluid
- Minor irritation around the puncture site

Contact your healthcare provider if these complications continue or get worse.

For all testing during the pregnancy it is important to discuss the risks and benefits of testing thoroughly with your healthcare provider. Your healthcare provider will help you evaluate if the benefits from the results could outweigh any risks from the procedure.

**Compiled using information from the following sources:**

<http://americanpregnancy.org/prenataltesting/>

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