

# **Prenatal Diagnosis of fetal sex using cell free fetal DNA in the maternal blood**

## **Information for Parents**

### **Background**

Some genetic conditions only occur in male babies, and some others only in female babies. For families at risk of these sex-linked conditions it can be useful to know the sex of the baby in early pregnancy so that definitive genetic testing can be planned. In the past fetal sex has been determined in the first trimester using invasive procedures such as Chorionic Villus Sampling (CVS). Invasive testing gives very accurate results because genetic material obtained directly from the pregnancy is used for analysis. However as the procedure involves inserting a needle into the womb to obtain this genetic material it carries a small but significant risk of causing a miscarriage.

Ultrasound can also be used to determine fetal sex, however it is usually not considered accurate enough to be diagnostic until the second trimester of pregnancy. This means that if a pregnancy is at risk of a sex-linked condition and there is a need to know the sex early in pregnancy in order to decide whether or not a test for a genetic condition is needed, ultrasound is not a good test to use.

It has been known for some time now that DNA from the baby can be detected in the mother's bloodstream during pregnancy. This means that safer prenatal diagnosis without the need for an invasive test, non-invasive prenatal diagnosis (NIPD), is now a real possibility.

### **What is cell free fetal DNA (ffDNA)?**

DNA is the genetic material that is in each and every cell in our body. The pattern of DNA makes up the genes that code for our characteristics, such as hair and eye colour, and any genetic conditions we may have or carry. ffDNA is genetic material which comes from the baby but can be detected in the mother's blood during pregnancy. The exact mechanism as to how the baby's DNA – the ffDNA - finds its way into the maternal bloodstream is not clear. However scientists have discovered that ffDNA is present from 6 weeks of pregnancy and is undetectable 2 hours after the baby is born.

### **How is ffDNA used to determine fetal sex?**

A simple blood sample is taken from the mother from as early as 7 weeks of pregnancy. Scientists use advanced techniques to search the mother's blood for genetic material that is only present in males, SRY or DYS14. As these genes are only present in males, if one is detected in the pregnant mother's blood it means the baby is a boy. If these genes are not detected, then the baby is probably a girl. However, because only a very small amount of the total free DNA found in a mother's blood comes from the baby (about 3%) failure to detect the male genes could also be because we have not extracted enough ffDNA. Other tests are being developed to check that ffDNA has been

extracted and tested, but these are not yet developed sufficiently to be used routinely. At the moment, our results indicate that if the test is done after 7 weeks there is usually sufficient ffDNA and results are reliable.

### **Who can have the test?**

The test is only available to some women, for example women with a family history of a genetic condition that affects a particular sex or if the fetal sex is unclear on ultrasound scan, indicating a possible underlying genetic condition. It can only be requested by a healthcare professional and, in the UK, is currently unavailable in the private sector.

### **How long do the results take?**

Approximately a week, it will take longer if a second sample is requested and marker analysis is performed.

### **When can the test be performed?**

It can be performed from as early as 6 weeks of pregnancy, but we know that it becomes more accurate after 7-8 weeks when more ffDNA is present. We would recommend an ultrasound dating scan is performed to confirm the age of the pregnancy before the test is performed.

### **How accurate is the test?**

The test is still relatively new and as such is under close monitoring. However, much research has gone into the test and studies so far have demonstrated the test to be highly accurate (approaching 100% from 7 weeks but specificity dropped to 85% when including samples at 5-6 weeks) We do know that because the amount of ffDNA increases as the pregnancy progresses the accuracy improves with increasing gestation. We are currently monitoring all pregnancies in the UK where this test is done so that we can give very precise figures for accuracy. Because of this we would like to contact your doctor when the baby is born to confirm the sex of the baby.

### **Is it wise to check the fetal sex with ultrasound?**

Yes, this is particularly important in cases where the baby is predicted to be female or when the test was done before 7 weeks'. Sexing the baby using ultrasound can be done in some units from around 12 weeks, but most would recommend doing it around 15 – 16 weeks gestation. Some hospitals do not routinely sex babies on ultrasound scan so this may need to be requested by your doctor.

### **Where can I get further information?**

For further information please contact your genetics service or obstetrician. Further information can also be found at [www.safenoe.org](http://www.safenoe.org)