



**prænatal.de**

Praenatal-Medizin  
und Genetik

# **Information** on prenatal diagnostics

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## Dear patient,

Your gynaecologist has explained to you the various prenatal screening methods. It could be that you have not yet decided whether and which of these screenings are worth considering.

We, the cooperation partner of your gynaecologist and doctor are providing a summary in this brochure of what prenatal diagnostics offer and the legal regulations applicable to them. In addition, detailed information can be found on our website

[praenatal.de](http://praenatal.de)

## Prenatal diagnostics

Prenatal diagnostics encompasses medical screenings that are used to check the health of the unborn baby in the womb.

### The particular method employed depends on

- your week of pregnancy (WG)
- specific issues, e.g. your age, family history, your own previous conditions, adverse ultrasound findings

→ None of these screenings, however, can guarantee a completely healthy child.

### When is genetic counselling necessary?

Your gynaecologist will know whether there are any circumstances in either your own or your family's history to indicate a potential risk for your unborn child. In this case, you will be referred for a genetic counselling session where we will discuss whether, given your history and your family tree, it makes sense to perform specific screenings. Your doctor will also tell you about the genetic counselling before a scheduled screening between your 11th and 14th week of pregnancy. If there are no special circumstances surrounding either you or your family, the genetic counselling session will deliver additional findings only in rare cases. On the other hand, before a scheduled amniocentesis or placenta screening, a genetic counselling session is helpful to jointly decide the scope of the screening.

## Causes of diseases in the unborn child

### Chromosomal abnormalities

Every cell of a healthy person's body has 46 chromosomes, 23 of which are inherited from the mother and 23 from the father. All chromosomes therefore occur in pairs. The number or the structure of the chromosomes, however, can be altered. Replication errors can cause chromosomes to occur in threes instead of twos. This is called trisomy. The most common is the trisomy of chromosome 21, which is known as Down's syndrome.

The number of the sex chromosomes (XY chromosomes) can also be altered. Anomalies in the structure of chromosomes can also affect the development of the unborn child. Every pregnancy carries a slight risk of such random chromosomal abnormalities.



Normal set of human chromosomes

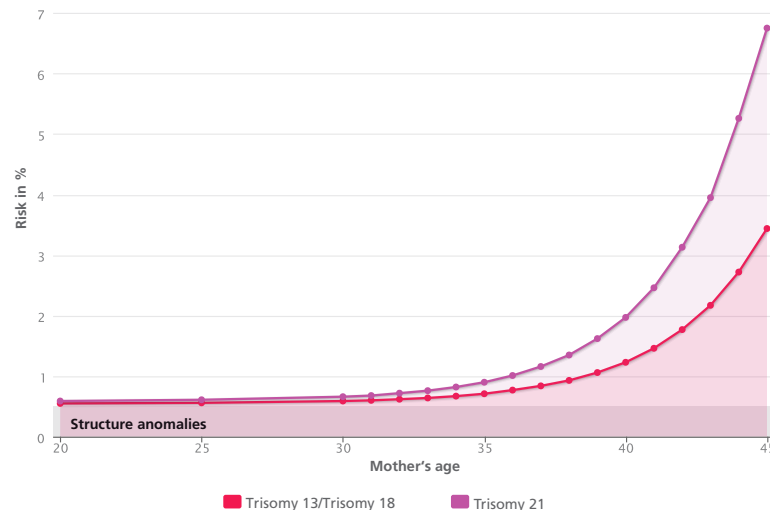
### Age risk for trisomy 21 (for a pregnancy in the 12th week)

20 years	1 : 1068	36 years	1 : 196
25 years	1 : 946	38 years	1 : 117
30 years	1 : 626	40 years	1 : 68
32 years	1 : 461	42 years	1 : 38
34 years	1 : 312	44 years	1 : 21

Detailed information can be found at [praenatal.de](http://praenatal.de)

This is not influenced by either your family's history or your own lifestyle. However, the risk of some chromosomal abnormalities increases with age (see Table).

### Frequency of chromosomal abnormalities at 12 weeks



## Hereditary diseases

Hereditary diseases are caused by genetic modifications. They occur for the first time or already exist undetected in one, more often in both parents. Both metabolic functions and physical build can be affected.

The potentials of detecting a hereditary disease prenatally and consequences must be clarified beforehand in a human genetic counselling session. Many diseases can be diagnosed before birth using molecular genetics.

## Foetal organ malformations

The majority of these malformations occur during the second and third month of pregnancy. Kidneys, urinary tract, heart and brain are the most commonly affected.

Often, no cause can be found. In rare cases, external factors such as medication, exposure to radiation or maternal infections can play a role. It is highly likely that an ultrasound scan will reveal organ malformations. However, a clear screening does not always rule out the existence of these malformations.

## Screenings methods

Screening optimum	time
Early organ screening (with risk calculation for trisomies where applicable)	<b>12+0 - 13+2 WG</b>
Chorionic villus sampling	<b>from WG 11 + 0</b>
Amniocentesis	<b>from WG 15 + 0</b>
Alpha-Feto-Protein (AFP)	<b>from WG 15 + 0</b>
Cordocentesis	<b>from WG 18 + 0</b>
Ultrasonic differential screening / echocardiography	<b>19 + 0 - 20 + 6 WG</b> (or earlier if recommended by your doctor)
Doppler ultrasound	<b>from WG 26 + 0</b>

**Explanation:** WG 13+2 means 13 complete weeks plus 2 days, i.e. the same as the 2nd day of the 14th week

## Early organ screening (11 - 14 WG)

This screening has gained increasing importance in recent years. Early organ screening is not part of the regular check-ups during pregnancy. The costs are therefore only paid by public health insurance for medically-required screenings. Your doctor will discuss with you whether she/he will perform this screening or refer you to us. The focal point of early diagnostics is a detailed ultrasound screening.

Good screening conditions provide us with a host of information about your child's development and organs.

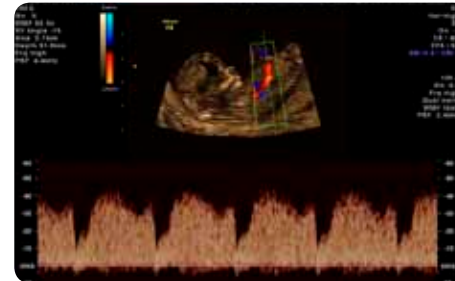
→ **We recommend that this screening is performed between 12+0 and 13+2 week of pregnancy.**



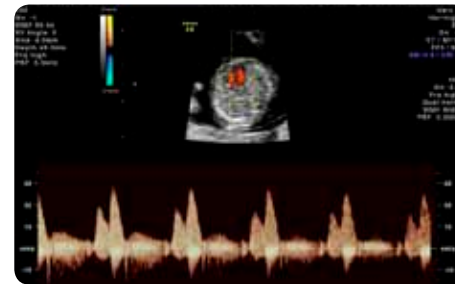
Foetus at 13th WG  
Measurement of the crown-rump length (CRL)

## Risk calculation

Trisomy 21 (Down's syndrome) in the unborn child can occur whatever the age of the mother, although the probability increases with the mother's age. If you want us to calculate your personal risk for a trisomy 21, we will record additional markers (nasal bone, tricuspid valve, ductus venosus) during the screening and carry out a risk calculation according to the method of the Fetal Medicine Foundation (FMF) London ([www.fetalmedicine.com](http://www.fetalmedicine.com)).



Clear ductus venosus flow at 13th WG



Clear tricuspid valve at 13th WG

### However, you should be aware that

- A clear ultrasound scan cannot guarantee a healthy child. The result of the risk analysis is not a clear indication of whether your child has a chromosomal abnormality or not.
- The risk calculation records only the likelihood for a trisomy of chromosomes 21, 13 and 18.

It is very important that you understand beforehand how helpful a pure probability analysis will be for you and what conclusions you would draw from a high or low risk value. If you want to safely rule out the most frequent chromosome abnormalities, we recommend a chromosome analysis on your child's cells.

This requires either a chorionic villus sampling (from WG 11 + 0) or an amniocentesis (from WG 15 + 0). We will be happy to explain the potentials and risks of these screenings to you in a genetic counselling session.



Measuring the nuchal transparency and the nasal bone at 13th WG

### How is the risk for trisomy calculated?

The first trimester screening can be performed only between WG 11+1 and 13+6. Ultrasound is used to measure what we refer to as the nuchal translucency (also called nuchal fold or NT) of the unborn child. If the NT is enlarged, the probability of your child having a disease increases. In parallel, two values (the concentration of the protein PAPP-A and of the hormone free  $\beta$ -HCG) can be determined in the mother's blood.

The determined risk is given as a ratio:

A 1 in 500 risk for Down's syndrome means that out of every 500 pregnant women, one will have a child with Down's syndrome. If we include the markers of nasal bone, tricuspid valve and ductus venosus, the accuracy of the first trimester screening is around 90%.

According to the German Genetic Diagnosis Act (GenDG) in force since February 2010, an ultrasound scan followed by a risk calculation is considered a genetic screening. Just like before amniocentesis, your doctor is under an obligation to explain the screening to you, offer you genetic counselling and provide you with written information. You must declare your consent or refusal in writing.

At every genetic screening, you can revoke your consent to the test or to the results being stored at any time.

### Other causes of enlarged nuchal transparency

Other reasons for an enlarged nuchal transparency include heart defects, diaphragm/umbilical hernia, skeletal or metabolic defects. In some cases, there is no particular reason and the pregnancy continues without complications. Besides the first trimester screening, other additional tests on the mother's blood are offered although these are less relevant. Low values of the protein PAPP-A can also indicate an increased risk of problems with the placenta function and the mother's blood pressure as the pregnancy progresses.

#### → Please note:

In normal pregnancies, the first trimester screening is not part of the regular check-ups. The costs for consultation, ultrasound scans and lab screenings are not paid by public health insurance.

### Early detection of preeclampsia

Preeclampsia (PE) is a complication that occurs during pregnancy by which around one in 100 women is affected. Symptoms are high blood pressure, water retention in the tissues and protein in the urine. In many cases, the unborn child is at risk due to failure of the placenta. For one in 200 women, delivery is necessary before the 35th week to protect both mother and child. If the condition is detected in the first half of the pregnancy, your doctor will take preventive measures and arrange for the necessary check-ups. It therefore makes sense to be screened for preeclampsia risks during the first trimester screening.

#### To determine the risk, we require a few details about previous pregnancies and medical history.

- Height and weight
- Blood pressure measurements taken from both arms
- Doppler flow measurements in the arteries supplying the uterus
- PAPP-A value (also measured in the first trimester screening to calculate the trisomy risk)

One in 200 pregnant women develops severe preeclampsia. Currently at international level, an individual risk of 1 to 20 (5%) or more is reason to recommend taking acetylsalicylic acid (ASS). Screening for blood clotting can also be wise in certain cases.



## Screening for trisomy in the mother's blood

Circulating in the blood plasma of every human being are minute pieces of genetic substance (DNA). In pregnant women, a small amount of this DNA derives from the placenta of the unborn child. In recent years, laboratory tests have been developed to enable genetic diseases to be detected using these chromosomes from the mother's blood.

Since 2012, such tests for trisomy are offered in Germany. These screening tests show detection rates for trisomy 21 between 98 and 99%. We can answer any questions you may have about this test in a one-to-one consultation.

We arrange for this blood test, just like all other prenatal genetic screenings, **only in conjunction** with an individual **genetic consultation** and a precise ultrasonic differential screening of the foetus.

## Ultrasonic differential screening



Between **18th and 21st weeks of pregnancy**, we can conduct a detailed organ scan. This is much more extensive than the ultrasound scan set out in the German Maternity Guidelines during this period. Besides special equipment, it also requires the physician to have a great deal of experience. Your gynaecologist will decide whether there are reasons to refer you to ultrasonic differential screening. If not, you can of course have this screening as a self-payer service.

We look at all reproducible organs and features of the unborn child:

- the child's growth
- the appearance and function of all visible organs
- the amount of amniotic fluid
- the position and appearance of the placenta

In some cases, the detailed ultrasound scan can reveal features that increase the statistical risk of a trisomy. These irregularities are not malformations and they do not impair the organs concerned.

This screening also involves assessing your baby's heart with the large blood vessels by means of an echocardiography.

#### We monitor:

- The heart's position, size and symmetry
- Anatomy of the heart's structures
- Function of the heart valves and chambers
- Heart rate
- Position of the large arterial and venous vessels

The blood flow in the umbilical cord, blood vessels of the child's circulation and in the blood vessels in the womb are also shown in colour and acoustically using the Doppler ultrasound scan.

The **Doppler ultrasound scan of the child's and mother's blood vessels** is used mainly during late pregnancy (WG 26 – 38) if an acute or chronic deficiency in the supply to the unborn child is suspected.



Colour-coded echocardiography at 22nd week of pregnancy: Four chamber view

More and more pregnant women are interested in the potentials of the 3D/4D ultrasound scan. Their main aspect is the fascinating image. We consider this modern procedure a complementary method when special issues arise.

For that reason, we use 3D/4D imaging only if we can expect it to deliver additional diagnostic findings. We do not perform 3D/4D imaging without an organ scan at the same time.

**Please note:**

- Even with good equipment quality and care, it is not possible to completely rule out malformations and diseases. Ultrasound technology reaches its limits under poor screening conditions or in case of very minor defects such as a small defect in the ventricular septum or minor defects in the area around the spinal column.

An ultrasound scan can never rule out the possibility of chromosomal abnormalities as such diseases do not necessarily involve organ defects.



Child's face  
at 30th WG,  
3D imaging

## Amniocentesis (from WG 15 + 0)

The baby's cells can be taken from the amniotic fluid and the chromosomes analysed. In this way, numerous chromosome abnormalities can be ruled out with a very high degree of certainty. We perform an amniocentesis sometime after the 15th week of pregnancy.

### What does amniocentesis entail?

Under continuous ultrasound monitoring, a very fine needle (0.7 mm diameter) is inserted through the mother's abdominal wall and into the amnion in such a way that no injury to the unborn baby can occur. Around 10 ml of amniotic fluid are removed. That's less than a tenth of the entire amount.

The puncture itself lasts one to two minutes and only causes a slight pull in the abdomen. Immediately after the puncture, the minute injection canal closes again as the tissue is highly elastic. The baby's cells from the amniotic fluid are used to create cultures that require some time for cell growth.

### Which diseases can be detected from the amniotic cells?

An analysis of the amniotic fluid cells reveals microscopically visible chromosomal abnormalities. If special circumstances exist, molecular-genetic, invisible chromosomal changes and a number of hereditary diseases can be diagnosed. To rule out spina bifida with a high degree of certainty, a protein (Alpha-Feto-Protein, AFP) and an enzyme (Acetylcholinesterase, AChE) are investigated in the amniotic fluid.

### Array CGH screening (Chip Analysis)

The array CGH screening is a wise addition to the conventional chromosomal analysis. The new computer-supported analysis methods can be used to verify the slightest chromosomal changes, which would not be discovered with the previous screening methods. The array CGH analysis, then, can provide new insights even with normal genetic findings.

In prenatal diagnostics, the array CGH is becoming a very important screening method that permits, within just a few days, a reliable statement on numerical chromosomal changes and much more precise information on micro-changes in the genome.

Use of the array CGH in prenatal diagnostics for foetal abnormalities must still be approved by the health insurance companies on a case-by-case basis. This screening is usually carried out only if certain clinical criteria are met (e.g. indications of developmental disorders, which cannot be detected using chromosomal analysis). With normal foetuses, the array CGH can be taken as an optional service.

### What risks does amniocentesis carry?

The risks are often overestimated. Every pregnancy – even without intervention – carries a natural risk of loss. In very rare instances, amniotic fluid is lost through the vagina after a puncture.

In most cases, however, this defect in the amniotic sac closes again and the pregnancy continues normally. During the last 20 years, we have performed more than 80,000 amniocenteses. A puncture from the 15th week increases the risk of a natural miscarriage by an average of 0.3%.

In uncomplicated pregnancies without heavy previous bleeding, the individual risk is much lower, in a range of 1 to a 1000. We discuss with you your personal risk and the ways you can reduce it, by taking an antibiotic for example, during the consultation.

### Quick test after amniocentesis

To ease the waiting time until the final result is available, we offer you a quick test (PCR). The result, usually available within a working day of the puncture, safely rules out the most common chromosomal abnormalities (trisomy 13, 18, 21) and can determine your baby's sex.

**The final chromosomal findings are available 10-14 days following the puncture.**

To conduct the PCR quick test, we require only minute quantities of genetic material (DNA), which means that no additional amniotic fluid needs to be removed. The costs for the quick screening are paid by public health insurance only when there are serious irregularities and they are not always paid by private insurers.



Amniocentesis

## Chorionic villus sampling (from WG 11 + 0)

As the placenta (called chorion during the early weeks of gestation) comes from the fertilised ovum, cells taken from it can be used to analyse your baby's chromosomes.

A chorionic villus sampling makes sense if a chromosomal analysis is required in the very early stages of pregnancy, e.g.:

- if the ultrasonic image shows irregularities
- if the first trimester screening reveals a high risk
- in the case of hereditary disease or metabolic disorders
- if you request an early examination

We perform a chorionic villus sampling any time from the end of the 11th WG. This screening does not provide any information on spina bifida.

### What does a chorionic villus sampling entail?

After a careful ultrasound scan, a fine needle is inserted under constant visual monitoring through the mother's abdominal wall into the placenta and minute pieces of tissue are removed. The puncture usually lasts only one to two minutes. During the operation, most women feel a sharp pull in the abdomen.

The cells are used to create cultures that require some time for cell growth and replication. The result is available after about ten days. If the amount of tissue is adequate, a short-time test is performed, which is able to rule out the most common chromosomal abnormalities just two working days following the puncture.

### What risks does a chorionic villus sampling carry?

The risks of a chorionic villus sampling are very similar to those of amniocentesis. The risk of natural loss is increased by an average of 0.3%. As with amniocentesis, the individual risk is lower in uncomplicated pregnancies.



Chorionic villus sampling

## Cordocentesis (from WG 18 + 0)

The umbilical cord puncture is used only when there are special circumstances, e.g. baby's anemia, infection or irregularities discovered relatively late. With some diseases, blood or medicines are injected into the baby's circulation.



Cordocentesis

## How safe is it to screen the baby's cells?

Screening cells taken from the amniotic fluid, the placenta tissue or the unborn baby's blood is still the only possibility to rule out numerous chromosomal abnormalities and genetic defects (though not all) with a high degree of certainty.

However, all parents carry a so-called basic 4-7% risk for their child to be born with more or less severe malformations or diseases. The risk of a severe malformation or disease depends on the age of the parents and is around 1%.

Even if invasive screening has eliminated the possibility of certain chromosomal abnormalities, a basic risk of other diseases and malformations still exists. Physical malformations, mental handicaps or metabolic diseases usually cannot be ruled out by chromosomal analysis.

- Changes in minute parts of chromosomes or individual genes cannot be detected under the microscope
- If, in very rare cases, a smaller part of a foetus's cells carries an abnormal set of chromosomes (mosaic), this cannot always be reliably detected.
- In just a handful of cases, cell cultures grow very slowly, meaning that the results are available later than expected.
- In extremely rare, isolated cases, the mother's cells instead of the child's can be screened.
- Very rarely, no analysis is possible. In that case, we would have to discuss the consequences with you and your doctor. If a quick-test has been performed, it may be possible to dispense with a new puncture.

## What should I do after a puncture?

Immediately after any puncture (chorionic villus sampling, amniocentesis, cordocentesis), you should lie quietly in our relaxation room for at least half an hour. Any complications occurring after a puncture will usually appear within the first 24 hours. We therefore recommend that you stay at home and rest on the day of the puncture and the day after.

On the day of the puncture and the day after, avoid physical exertion (e.g. sport, heavy lifting, frequently climbing stairs). If you work, ask your gynaecologist to write you a sick note for these two days. One to two days after the puncture, you should see your gynaecologist for a check-up.

If after a puncture you lose fluid or blood or suspect this, experience severe lower abdominal pain or other discomfort, you should visit your doctor or your clinic immediately. If no complications occur after the puncture, you can safely continue to play sport, fly and have sex – unless your doctor has already recommended otherwise.

## What happens if the result is abnormal?

Although the vast majority of children are born healthy, we diagnose an abnormality or disease in a small percentage of unborn children. In this case, we will not of course leave you alone with this result. In this situation, it is important that you get both medical and non-medical advice and support.

**We, a team of gynaecologists, genetic scientists and psychosocial counsellors, will find out with you the best way forward for you and your unborn child.**

Counsellors from donum vitae are engaged in our practices in Dueseldorf and Cologne. If necessary, we consult experts from other areas, such as paediatricians, cardiologists or paediatric surgeons. Whenever you have to make decisions, we offer you all the support you need.



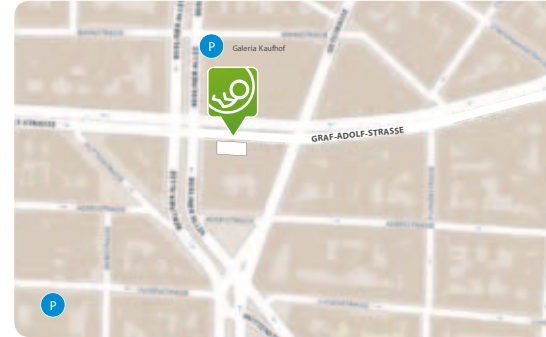


## praenatal.de in Duesseldorf

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### Parking options Duesseldorf

Kaufhof Galeria  
directly across from the  
clinic, Open 24h

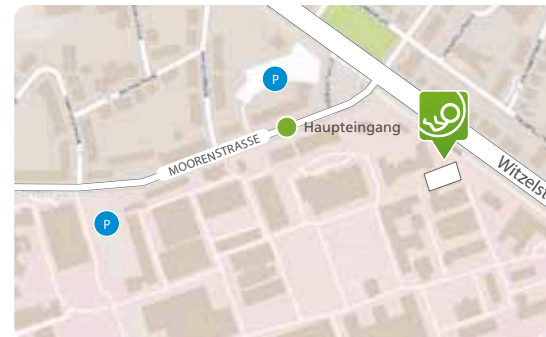
Parkhaus Jecht,  
Luisenstraße 33,  
Open 24h

## praenatal.de at the Universitaetsklinikum Duesseldorf

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Universitaets-Frauenklinikum  
Moorenstraße 5  
Building 14.24 (Ground floor)  
40225 Düsseldorf

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Fax +49 (0)211 3845733  
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### Parking options Universitaetsklinik

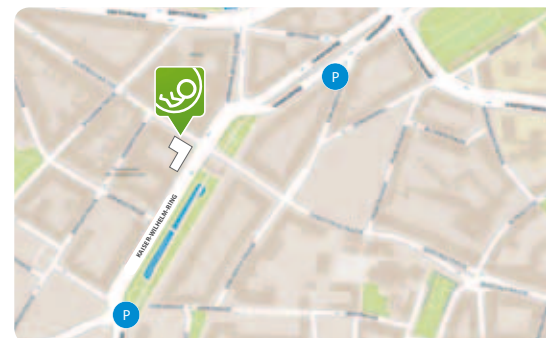
Parking on the clinic's  
property is subject to  
a charge

## praenatal.de in Cologne

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### Parking options Cologne

Underground car park  
Kaiser-Wilhelm-Ring,  
Open 24h

## **Praenatal-Medizin und Genetik**

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