ULTRA SOUND

Human hearing has a range between 20 and 20 000 Hz. Ultrasound is above 20 000 Hz, so we cannot hear it. However, some animals such as bats and dolphins can hear ultrasound and use it to communicate and locate food.

Ultrasound in itself is not an invention from Lund, but its use within medicine, known as diagnostic ultrasound, did originate in Lund. Inge Edler, a cardiologist at the hospital in Lund, was searching for a method to investigate the heart without the need for surgery. Together with Professor Helmuth Hertz from Lund University, he developed echocardiography in 1953, which became the first clinical application for ultrasound.

Picture 1: The first ultrasound by Inge Edler and Helmuth Hertz.

How does ultrasound work?

To understand how it works, you need a little knowledge about sound. Sound actually consists of waves which propagate in a medium. When we speak, our vocal cords vibrate, the vibration generates a wave which causes air molecules to oscillate, producing a sound. These waves behave differently depending on the medium in which they propagate. For example, sound is perceived differently in water from how you perceive it in air. Moreover, everyone who has heard an echo knows that sound can bounce. This happens when the soundwave strikes a medium which is harder than the one in which it originated; the wave then bounces instead of being absorbed. You can try this yourself by speaking in a completely empty room and comparing it to speaking in a room with a lot of carpets and curtains.

The ultrasound sends sound waves into the body using the transducer. As the body contains tissues with different acoustic properties (sound bounces, or is absorbed, to different degrees) the sound waves will be reflected back to the transducer accordingly and, with a little processing, the resulting echoes can be converted into an image.

Ultrasound is a non-invasive method, i.e. it does not require the body to be opened to allow examination, which is why this method of examination is used a great deal within medicine. Ultrasound allows physicians to examine almost all the organs in the body; they can observe the thickness of blood vessels, see blood flow, look for tumours or examine a foetus.

In order to establish whether there is an increased risk of Down's syndrome, it is possible to measure the thickness of the fluid in the neck of the foetus, a test known as nuchal translucency. This is one of many indicators that can be checked in the foetus to find out whether it is developing as it should.

Picture 2: One of the first pictures your mother and father saw of you probably looked a lot like this one.
Picture 3: Imaging technology has improved considerably and today, with a bit of luck, it is possible to produce really good 3D images of the inside of the body.

Picture 4: To the right is a profile image of a baby. The red lines are the area shown in the 3D image on the left.
Picture 5: Still image of a healthy heart.
Picture 6: The white patch visible in the left ventricle is a lump of coagulated blood, known as thrombosis or a blood clot.

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