**Foetal Monitoring Techniques – Notes**

* Any technique used to **gauge prenatal health**.
* Some give an **image** of the foetus e.g., ultrasound, MRI, X-rays and fetoscopy.
* Others **analyse chromosomes, DNA or chemicals** taken **from foetal tissue samples** e.g., amniocentesis, chorionic villus sampling, foetal blood sampling and biomechanical (marker protein) analysis.

Ultrasound:

* Uses **inaudible, high-frequency sound waves** to produce an image of the foetus.
* Based on the principle of **sound wave echoes**.
* Sound waves travel **from the probe to the object, pass through it and are continuously reflected back to the probe** from multiple points inside the object (human body).

Chorionic villus sampling (CVS):

* Involves **extracting fluids and tissue** from the **chorion foetal membrane**.
* Testing can occur between **9-19 weeks of pregnancy**.
* This provides an **analysis of chromosome content** and can give information regarding any chance of a congenital disorder.
* An advantage of the technique is that it provides **early analysis**.
* A disadvantage is that the **risk of miscarriage** following the procedure is 2%.
* Can detect **genetic disorders** and **biochemical abnormalities** but can’t diagnose spina bifida.

Amniocentesis:

* Involves taking out **10-20mL of amniotic fluid** which **contains foetal cells**.
* Can be done between **16-20 weeks of pregnancy**.
* Diseases which can be detected by this technique include Down syndrome, cystic fibrosis, neural tube defects, sickle cell disease, tumours, etc.
* Involves a **small risk of infection, miscarriage or damage to the baby**.
* Only used if the pregnant woman is thought to be at a **high risk of bearing a child with a birth defect**.

Blood tests:

* Samples of blood can be used to extract and culture more foetal cells which can be used to **examine chromosome content for defects**.
* Can be performed earlier amniocentesis and CVS (**6 weeks after conception**).
* Samples can be taken from the **mother’s blood, placenta or foetus’s blood**.
* Blood sample from the mother is treated with **several antibodies** that **adhere only to the few foetal cells contained within the mother’s blood**.
* The antibodies have **magnetic beads** attached to them to **enable foetal cells to be isolated form the other cells** in the blood using a magnet.

Fetoscopy:

* Involves the insertion of a small camera (fetoscope) through the abdominal wall into the uterus.
* A visual image allows gynaecologists to see any physical deformities e.g., cleft lip, deformed limbs, missing limbs, spinal abnormalities, etc.

Magnetic resonance imaging (MRI):

* Uses radio waves and powerful magnets connected to the computer to produce clear pictures of the internal tissue structures of the foetus.
* Only “safe” to use after the first trimester of pregnancy.

Biomechanical analysis:

* Involves taking marker proteins from tissue samples and determines if there are abnormal levels of particular proteins.
* Can warn of phenylketonuria (PKU) by detecting excessive levels of phenylalanine in the blood or for phenyl pyruvic acid in the urine.
* A marker protein called alpha-fetoprotein (AFP) can be measured in samples of amniotic fluid; the concentration of this protein is very high when the foetus has a malformation of the spinal cord.

DNA probes:

* A segment of DNA is used that’s structurally identical to the gene being tested.
* Involves extracting DNA and using probes that are genetically identical to the gene sequence taken.
* Some of the units in the DNA segment are “labelled” with a dye or radioisotope.
* These probes are joined to the extracted DNA (the gene in question) and used to match up with the DNA sequence from the sample to determine any missing or abnormal DNA sequence(s).
* If the gene is normal, the DNA probe joins with the extracted DNA and shows them up.
* If it’s an abnormal gene, it doesn’t show up and is identifiable as a gap in the DNA being tested.

Foetal monitoring:

* Regular recording of a foetus’s heart rate.
* Usually takes place during labour and birth using ultrasound and electrocardiography.
* Electrocardiography: Procedure for recording electrical changes in the heart.

Teratogens: Any agent that causes physical defects in the developing embryo or foetus e.g., some hormones, antibiotics, chemical and drugs e.g., anticoagulants, LSD, alcohol, marijuana, etc.

Congenital defects: Defects or diseases that are present at birth.

Infections:

* Rubella virus prefers to grow in tissue just forming. This can cause deafness, blindness, heart defects and/or brain damage.
* HIV causes slow growth rate.
* Influenza ma be limited to brain damage.
* Viruses can pass across the placenta.

Maternal dietary deficiencies:

* Lack of folic acid can cause spina bifida.

Diet deficiencies:

* Calcium is needed for bone growth.
* Vitamin A is required for cell growth.
* The mother must avoid all foods that may contain the Listeria bacteria.

Alcohol:

* Excessive alcohol intake during pregnancy can cause low birth weights, slow growth, small heads, retardation, limb deformities and defects of the heart and other organs.
* Also causes behavioural problems e.g., hyperactivity, nervousness and poor attention spans.

Smoking:

* Seems to be a link between smoking and SIDS.
* Babies have lower birth weights.
* Increased risk of natural abortion.
* Babies of breast feeding mothers that smoke tend to have digestive problems.

Chemicals:

* Thalidomide causes limb and heart defects by acting on the embryonic germ layers.
* Lead and mercury damage the developing cells of the prenate.