MODULE 9 : Reproductive System

Biochemistry – Undergraduate Programme

Faculty of Medicine and Allied Sciences
Rajarata University of Sri Lanka

Broad Objectives

At the end of this course, a student is expected to

1. know the male and female sex hormones and their action.
2. know the synthesis of eicosanoids and their important functions.
3. know the tests for screening prostate and breast cancers.
4. know the tests done to detect pregnancy and the action of hormones responsible for lactation and milk synthesis.
5. know the tests done to assess foetal development.
6. be aware of inborn errors of metabolism and some of the tests used for their detection.

Specific Objectives

1. Sex Hormones

1.1 Recall that the testes and the ovaries are bifunctional and produce germ cells and sex hormones.
1.2 Recall that the ovaries produce oestrogen and progesterone and the testes produce testosterone as the major sex hormones.
1.3 Recall that oestradiol and dihydrotestosterone are the active metabolites of oestrogen and testosterone.
1.4 Explain the mechanism of action of a typical steroid hormone.
1.5 Recall that cholesterol is a precursor of steroid hormones and that LDL is the major supplier.
1.6 Recall that the rate limiting step in the synthesis of gonadal steroids is the cholesterol side chain cleavage step.
1.7 Explain the change in the ability to synthesise testosterone in the testes in relation to age related changes in the male.
1.8 Recall the route and the mechanisms involved in the disposal of the sex hormones.
1.9 Recall that oestrogens stimulate the development of tissues involved in reproduction.
1.10 Recall that the oestrogens stimulate the size and the number of cells by increasing the rate of synthesis of protein, RNA and DNA.
1.11 Explain the action of testosterone in muscle development and positive N balance.
1.12 Recall that a reduction in the blood oestrogen level will result in loss of body calcium and osteoporosis.
1.13 Recall that oestrogen has blood cholesterol lowering action and its importance during the reproductive phase of a female.

2. Eicosanoids

2.1 Recall that eicosanoids are compounds derived from eicosa-(20 carbon) polyenoic fatty acids that are derived from the essential fatty acids linoleic and □-linolenic acid or directly from arachidonic and eicosapentaenoic fatty acid.
2.2 Recall that they are very potent and act as local hormones with short half lives.
2.3 Recall the different groups of eicosanoids and the major variations between the groups.
2.4 Recall the important steps in the two major pathways involved in the synthesis of eicosanoids.
2.5 Explain the mode of action of eicosanoids via the G-proteins.
2.6 Describe the various functions of eicosanoids in the body.
2.7 Explain the use of prostaglandins in clinical practice.
2.8 Describe the role of aspirin in pain and inflammation control and ischaemic heart disease.
2.9 Explain how fish oils lower the incidence of ischaemic heart disease.

3. Screening for and monitoring malignancy

3.1 Recall that markers used to detect malignancy are normal products of cell metabolism
3.2 Recall that certain enzymes and proteins are released by tumour cells into the blood and that these are used as markers for diagnostic purposes.
3.3 Recall that some tumour markers expressed in adult life are those of foetal origin.
3.4 Recall that prostate acid phosphatase and prostate specific antigen (PSA) are used as markers to detect and monitor prostate cancer and the basis behind these tests.
3.5 Recall that markers are used to monitor cancers associated with the breasts and the ovaries.

4. Pregnancy & Lactation

4.1 Explain the basis of the dipstick method in urinalysis to detect pregnancy.
4.2 Recall that programming of genes takes place in intrauterine life.
4.3 Describe the effects of nutrition in intrauterine life on the emergence of hypertension and diabetes.
4.4 Recall that prolactin initiates lactation and that it requires the presence of insulin and thyroxine for its full potential.
4.5 Recall that prolactin converts non-lactating tissue to lactating tissue and results in the synthesis of new proteins such as □-lactalbumin and casein.
4.6 Explain the function of □-lactalbumin in lactose synthesis in the lactating mammary tissue.

5. Foetal Development

5.1 Explain why RT_3 (reverse T_3) in amniotic fluid is considered to be indicative of active foetal thyroid and not T_3 .
5.2 Explain the use of cells in amniotic fluid for investigation of genetic abnormalities.

6. Inborn Errors

6.1 Explain the genetic basis of inborn errors.

6.2 Recall that inborn errors may result in abnormal function of enzymatic or non-enzymatic protein.
6.3 Recall that most inborn errors are caused by recessive genes.
6.4 List and explain the metabolic defects associated with inborn errors due to defects in non-enzymatic proteins.
6.5 List and explain the metabolic defects associated with inborn errors due to defects in enzymatic proteins.
6.6 Recall the most common inborn errors of metabolism in Sri Lanka.
6.7 Explain the difference between the sickle cell trait and sickle cell anaemia.
6.8 Explain how abnormal haemoglobins could lead to methaemoglobinaemia.
6.9 Explain why the incidence of people with abnormal haemoglobins is higher in malarial areas.
6.10 Explain why the incidence of G-6PD deficiency is higher in the males than in the females.
6.11 Perform tests with blood and urine to diagnose common inborn errors of metabolism and explain the basis of such tests.

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