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DEPARTMENT: MEDICAL LABORATORY SCIENCE

LEVEL: 200

COURSE: BCH 202

1. Differentiate between DNA and RNA clearly.
2. Explain the biosynthesis of calcitriol.
3. Review vitamins and different form, write on metabolism of one known vitamin and its active form.
4. Detail write up on cell and functions of important cell organelles.

ANSWER

1. .

DNA	RNA
DNA is double-stranded	RNA is single stranded
DNA contains deoxyribose as sugar	RNA contains ribose as sugar
DNA contains thymine	RNA contains uracil
DNA is stable under alkaline solutions	RNA is not stable under alkaline solutions
DNA is responsible for storing and transferring genetic information	RNA directly codes for amino acids and acts as a messenger between DNA and ribosomes to make protein

2. Calcitriol is the active form of vitamin D which is normally produced in the kidney. A manufactured form is used to treat kidney diseases with low blood calcium, osteoporosis, osteomalacia and others. Calcitriol increases blood calcium mainly by increasing the uptake of calcium from the intestines. Calcitriol is produced in the cells of the proximal tubule of the nephron in the kidneys by the action of 25-hydroxyvitamin D₃ 1-alpha-hydroxylase, a mitochondrial oxygenase and an enzyme which catalyzes the hydroxylation of 25-hydroxycholecalciferol in the 1-alpha position. Calcitriol maintains normal plasma levels of calcium and phosphorus by acting on intestine, kidneys and bones. In the intestine, calcitriol increases the plasma calcium and phosphorus concentration by stimulating the absorption of calcium and phosphorus from the intestine by enhancing the synthesis of calcium binding proteins calbindins. This protein increases the calcium uptake by the intestine.

In the kidney, calcitriol stimulates the reabsorption of calcium and phosphorus from the kidney and decreases their excretion. In the bone, calcitriol along with PTH stimulates the mobilization of calcium and phosphorus from the bone by stimulating the synthesis of osteocalcin. This causes elevation of plasma calcium and phosphorus levels.

3. Vitamins are organic nutrients required in small amounts for general biochemical processes and cannot be synthesized in the body but can only be gotten in the diet. Some vitamins can be synthesized by intestinal microorganisms but in quantities that are not sufficient to meet our needs. Classifications or forms of vitamins are;
- **Water soluble vitamins**: These vitamins are soluble in water which include B complex vitamins. Thiamine(B₁), Riboflavin(B₂), Niacin(B₃), Pantothenic acid(B₅), Pyridoxine(B₆), Biotin, Folic acid, Cobalamin(B₁₂) and Vitamin C.
 - **Fat soluble vitamins** : These vitamins are soluble in fats. They include; Vitamin A, Vitamin D, Vitamin E, and Vitamin K.

METABOLISM OF FOLIC ACID TO ITS ACTIVE FORM

Folic acid → Dihydrofolate(DHF) → Tetrahydrofolate(THF)