**Food Constituents -2**

Vitamins are required in small quantity in human body for normal growth and maintenance. These are involve in chemical and biochemical reactions.

Vitamins are generally classified into 2 groups based on their solubility in fat or water.

1-fat soluble vitamins

These are soluble in fats, included vitamin A, D, E, K. these vitamins stored in the body fat and can be drawn whenever needed.

* 1. **Vitamin A**

Vitamin A is a pale-yellow solid found in foods of animal origin and also in plants. Vitamin A is also called Retinol. Beta carotene is act as a precursor for it.

Sources:

Animal: liver oil, beef liver, butter, egg, cheese and eggs.

Plants: carrots, spinach, tomatoes, cabbage, peas.

Functions:

It act as anti-infective and essential for cells growth.it aids the eyes to adjust vision in dim light.it also keeps the skin smooth. Deficiency of it can cause retarded growth in children.

* 1. **Vitamin D**

It is also known as cholecalciferol its natural form is vit D-3 is a white crystalline compound.

Sources: fish liver oil, eggs, butter, liver, cheese.

Functions:

It is also produced in human body by the action of UV rays of sun.it helps in absorption of calcium and phosphorus in body. It is heat stable so don not affected during cooking. Its deficiency cause softening of bones, a condition known as rickets in kids and osteomalacia in adults.

* 1. **Vitamin E**

It is also called tocopherol, seven different forms of it are known.it act as anti-oxidants so used as preservative in fats and oils to prevent oxidation.

Sources: seeds oil, eggs, milk and wheat germ.

Functions:

It is essential for reproductive function regulation. It plays important role in maintenance of healthy immune system.it prevents degeneration of tissues.it is heat sensitive may lost during processing.

* 1. **Vitamin K**

Vitamin K is a complex of vit K-1, K-2, and K-3.it is a yellow viscous oil crystallize as yellow needles.

Source: cabbage, kale, spinach, beef liver oil, soya bean oil and olive oil.

Functions:

It is anti-hemorrhagic and help in blood clotting. This vitamin is a photo reactive and little is known of its chemical behavior in foods. Its deficiency will cause liver damage and leads to hemorrhagic condition.

2**- Water soluble vitamins**

This group is consists of vitamin B and C. These are required in minute quantity and not stored in the body. Vitamin B is group of enzyme are thiamine, riboflavin, folic acid, choline and inositol etc.,

**2.1- Thiamine**

Vitamin B1 and thiamine is a white solid soluble in water.it is found in all cereals grain, meat, potatoes, peas, pulses, nuts and milk.

Functions:

It act as co-enzyme in the oxidation of glucose. It keeps the nerves in healthy condition and promote good appetite and digestion. Its deficiency causes beri beri, palpitation of heart and degeneration of nerves.

**2.2- Riboflavin**

Vitamin B-2 or riboflavin is a yellow crystalline water soluble compound.it is naturally occur in free form or as co-enzyme, flavin adenine dinucleotide (FAD).

Sources: milk, liver, kidney, heart, lean meat, egg, cheese and green vegetables.

Functions:

It involve in release of energy in the cell.it keeps the eyes healthy and the skin around the mouth and nose. Its deficiency cause glossitis in man- a condition in which the tongue and lips are swollen and scaliness at the corners of the mouth.

**2.3- Nicotinic Acid**

 It is also called as niacin is a white crystalline solid.it is involve in the formation of tryptophan. It is found in liver, lean meat, pulses, beans and leafy vegetables.it helps in glucose oxidation. It improves health of skin, tongue, digestive tract, and nervous system. Its deficiency cause pellagra.

**2.4- Vitamin B-6**

 Pyridoxine, pyridoxal are related compounds of Vitamin B-6. Pyridoxine is crystalline in nature. This vitamin is found in rice bran, yeast, seeds, cereals, egg yolk and meat.

Functions:

It is the part of enzyme system and involve in transamination, a vital step in amino acids metabolism.

**2.5 - Folic acid**

It is soluble in hot water found in liver, kidney, and green vegetables. It is concerned with the synthesis of nucleic acid and formation of RBCS. Its deficiency results in anemia in which synthesis of red blood cells decreased.

**Ascorbic acid**

Ascorbic acid or vitamin C is a white crystalline substance, which is highly soluble in water.

Sources: citrus fruit, mango, guava, spinach, spinach, tomatoes, potatoes, green chilies.

Functions:

It is essential for the formation of all tissues in the body and helps to strengthen the blood vessels. It aids in in the absorption of iron in intestine, in healing of wounds. Its deficiency cause scurvy, bleeding gums and anemia.

**Experiment #2**

**DETERMINATION OF CRUDE FAT IN A FOOD SAMPLE**

**Purpose:**

To teach students the method of estimation of fat or oil in a food sample.

**Preparing the sample:**

Dry the product and remove moisture in order to facilitate entry of the organic solvent, because moisture restricts the entry of organic solvent. Then size reduction is done to increase the surface area of food particles of sample. After this, we go for acidic hydrolysis which helps in breaking of protein fat emulsion and increases the availability of fat for the solvent.

**Requirements:**

Weighing balance, Soxhlet apparatus, Drying oven, Thimble, Heating mantle, Glass rod, Desiccator with silica gel, Diethyl ether (Boiling temperature 60°-80°c), Cotton plugs

**Procedure:**

* Weigh 5 gram of grounded and dried sample and place it in the thimble.

Place the thimble in the soxhlet extractor.

* Take a 150ml round bottom flask and clean it and fill the flask with 75-100 ml diethyl ether.
* Place the whole apparatus on a heating mantle and allow the diethyl ether to boil.
* Continue the extraction process for 8-12 hours.
* Separate the condensing unit from extraction unit and allow the sample to cool down.
* Place the thimble with sample in the oven and after removing it place in the desiccator.
* Weight the thimble with sample.

**Calculation:**

* Empty thimble = w1
* Thimble with sample = w2
* Weight of sample = p

Crude fat (%) = Weight of thimble with sample – weight of empty thimble × 100

Weight of sample