**YEAR 12 HOME ECONOMICS**

 **STRAND: HEC 12.1 SUBSTRAND: HEC 12.2.3 MICRONUTRIENTS**

**CLO: HEC 12.2.3.1 Explore the utilization of micronutrients and the effects of malconsumption by individuals.**

**LESSON 76**

WATER SOLUBLE VITAMINS

This is a group of vitamins which share some functions and which are found in similar foods. There are six important vitamins in the group.

Thiamine (B1) Pyridoxine (B6) Riboflavin (B2)

 Folic acid Nicotinic Acid Cyanocobalamin (B12)

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| Vitamin  | Function  | Food sources | Characteristics |
| **Thiamine B1**  | * Essential for release of energy from carbohydrates.
* Essential for upkeep of nerves.
* Necessary for appetite.
 | Unprocessed cereals, wheat germ. Yeast, breakfast cereals (fortified) Heart, liver, kidney, carcass meat. Milk, eggs, vegetables. | * Extremely water soluble
* Unstable at high temperature
* Sensitive to alkalis
* 70% loss during milling/ processing
 |
| **Riboflavin (B2)**  | * Involved in metabolism of metabolism of proteins, lipids, and carbohydrates.
* Essential for up – keep of tissues – e.g. skin, eyes tongue
* Necessary for growth and good health**.**
 | Beef, liver, kidney, heart. Yeast, yeast extract. Milk, eggs, cheese Green and sprout vegetables and seeds | Water solubleFairly stable in heatDestroyed by alkalis* Affected by light eg milk in bottles
 |
| **Nicotinic acid (Niacin)** | * Involved in energy release from food.
* Essential for healthy skin
* Prevents pellagra
 | Meat, offal, meat extract. Yeast, bran, wheat germ, flour, fish, pulses, dried fruits Some manufactured by bacteria in gut from tryptophan | Water soluble* Stable to heat
* Fairly stable to acids and alkalis 80 – 90% loss in milling
 |

**LESSON 77**

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| **Pyridoxine (B6)** | * Acts as co – enzymes in the metabolism of protein
* Assists in the formation of haemoglobin and structural protein
 | Most foods: liver, cereals, wheat germ, fish, yeast, seeds are good sources. | Water solubleReasonably heat stable Affected by high temperatures Sensitive to oxidation |
| **Folic acid**  | * Involved in the formation of red blood cells ( works with vitamin B12)
 | Offal, wholegrain cereals Dark green vegetables Pulses Some are manufactured in the gut | Water soluble Stable in an acid environment Fairly heat stable.Sensitive to light and oxidation |
| **(Cyano) Cobalamin B12**  | * Essential for formation of red blood cells
* Helps form protective myelin sheath around the nerves
* Helps treat pernicious anaemia.
 | Plentiful in foods such as liver, kidney and other meat, fish, cheese. No B12 in plant foods, therefore there is a high risk of deficiency among vegans and vegetarians. | Water solubleStable in heat up to 100˚C Affected by strong acids and alkalis Affected by light. |
| **Vitamin C(ascorbic acid)** | * Necessary for the connective tissues and collagen which binds cells of skin, bones etc. together.
* Essential for formation of strong blood vessels.
* Helps wounds heal. Necessary for proper absorption of iron.
* Necessary for proper cell metabolism.
* Prevents scurvy.
* Acts as antioxidant.
* It helps prevent infection
 | Most fresh fruits and vegetables Best Fruit Sources Best Vegetable Sources Rose hip syrup Capsicum Blackcurrants parsley, watercress Citrus fruits broccoli, cabbage and other greens Strawberries tomatoes Bean sprouts | 1. It is an acid, crystalline substances with a sweet – sour taste. 2. It is water soluble. 3. Ascorbic acid is reducing agent and acts as an antioxidant. 4. Being water soluble, it is not stored by the body. A regular supply is therefore essential for good health. |

**LESSON 78**

**MICRONUTRIENTS**

MINERALS

* Our body requires about twenty mineral elements. Each has a specific function and is found in certain foods. A good varied diet should supply all essential minerals.
* Minerals are lost into the water during cooking. Principal mineral elements are Calcium, phosphorous, sodium, iron, magnesium, iodine, potassium, sulphur and chlorine.
* Trace elements are: copper, fluorine, zinc, cobalt and nickel

|  |  |  |
| --- | --- | --- |
| Functions of mineral  | Dietary sources | Factors which helps absorption  |
| **CALCIUM** * Necessary for development of strong bones and teeth
* Necessary for normal clotting of blood
* Necessary for normal functioning of muscles and nerves.
 | Milk, cheese, fish, meatFortified flour | * Vit D ample supply through diet sunlight is necessary.
* Phosphorous, an essential ingredient in calcium phosphate, must be available in correct proportion.
* Parathormone: a hormone produced in parathyroid in the neck controls the calcium balance in the blood.
* Vitamin C (ascorbic acid) is useful in absorption because acid environment improves solubility
 |
| **PHOSPHORUS*** Necessary for bone and tooth formation.
* Essential component of DNA which determines heredity.
* Essential component of cell, blood, many enzymes and hormones.
* Necessary for all metabolism.
* Forms part of the ATP and ADP which are involved in energy in the cells.
 | Meat Fish Eggs Dairy product Whole cereals Green vegetables | * Absorbed more efficiently than calcium, 70% is absorbed through intestine.
* Needs calcium, vitamin D and activity of parathyroid hormone (PTH) which regulates metabolism of phosphorous and calcium.
* Most is deposited in the bones, a little goes to the teeth. Rest is contained in the Red Blood Cells.
* Absorption may be decreased by antacids, iron, aluminium, magnesium which may form insoluble phosphates and be eliminated in the faeces,
* Caffeine causes increased phosphorous excretion.
 |
| **IRON** Necessary for the formation of haemoglobin in red blood cells to pick up oxygen in the lungs and transport it to the tissues for oxidation. | liver, kidney and red meat Whole cereals, brown bread. Dark green leafy vegetable. | * Only 10% of iron is absorbed based on the following factors: Vitamin C, because it is a reducing agent hence increase the absorption of iron by reducing it from the ferric state found in most foods to its absorbable ferrous state.
 |
| **IODINE** * Essential for manufacture of thyroxin – a hormone produced by thyroid gland which controls the rate of metabolism.
 | In soil with high iodine content, it will be present in vegetables, cereals and milk. Sea fish, seaweed and iodized salt. | * Is easily absorbed in the form of iodide ions through the walls of digestive tract in the stomach and small intestine.
* After it is absorbed, most of it concentrates in the thyroid gland. Some accumulates in the ovaries, skin and salivary glands, gastric juice and mammary glands
 |
| **SODIUM** * Essential for correct water balance of the body.
 | Common salt, added at cooking or at table. Bacon, smoked fish, cheese and snack foods. | 95% ABSORBED* Keeps blood and body fluid alkaline.

Maintains osmotic pressure in body fluids. |
| **SULPHUR**  | From dietary protein such as fish, grass fed beef and free range poultry. Lower amounts in eggs and vegetables. |  |
| **POTASSIUM** Maintains optimum cell environment.  | Most foods, good sources – soya beans, nuts, fish, bacon, bread. | Necessary for cell formation.  |
| **CHLORINE**  | Table salt, sea salt, seaweed, rye, tomatoes, lettuce, celery and olive |  |
| **MAGESIU M**  | Dark green vegetables, nuts, seed, fish, beans, whole grains, avocados, yoghurt, bananas, dried fruit and dark chocolate. |  |
| **COPPER**Helps form haemoglobin and enzymes and hydrochloric acid in the stomach. | Sesame seeds, soya beans, mushrooms, lentils, sunflower seeds, walnuts, lima beans, etc. | Necessary for protein synthesis, enzyme and muscle activity |
| **FLUORINE** Forms part of enamel coating of tooth.  | Sea, fish, tea Drinking water | Prevents tooth decay |

**LESSON 79**

**MICRONUTRIENTS**

WATER

Water makes up to two – thirds of body weight, forming the main ingredient in the blood, lymph, cell liquid, extracellular fluid and digestive secretion.

Functions of water

* Transport: water (as blood) transports nutrients, oxygen, carbon dioxide, blood cells, hormones and enzymes around the body.
* Helps to control body temperature by evaporating perspiration from the skin.
* Distributes heat generated by metabolism.
* Dissolves food, aids digestion (hydrolysis) and absorption.
* Assists in the removal of waste through kidneys
* Essential ingredient of all body cells.
* It reduces thirst

Daily requirement

As 2 – 2.5 litres of water are lost daily by excretion, perspiration and breathing, and equal amount is required to avoid dehydration.

DIETARY FIBRE

* Dietary fibre or ‘roughage’ comprises the edible parts of plant that cannot be digested or absorbed in the small intestine and passes into the large intestine unchanged.

Sources

It is mainly found in the skin of vegetables, fruits. In pulses, nuts and wholegrain cereals.

Dietary Fibre and Health

* Ingested dietary fibre moves along into the large intestine where it is partially or completely fermented by gut bacteria.
* During the fermentation process several by-products, short chain fatty acids and gases, are formed and which contribute the beneficial effects of dietary fibre on health.

**LESSON 80**

Functions of Dietary Fibre

* Bowel Functions – particularly insoluble fibre helps prevent constipation by increasing stool weight and decreasing gut transit time. This effect is enhanced if fibre intake is parallel by an increase an increase in water intake.
* Blood glucose level – soluble fibre can show digestion and absorption of carbohydrates and hence lower the rise in blood glucose that follows a meal and insulin response. This helps people with diabetes to improve their blood glucose level.
* Blood cholesterol – it helps in the prevention of coronary heart disease (CHD) by improving blood lipid profiles.
* Other – helps in weight management by having satiating effect on appetite.

**REVISION QUESTION**

1. Discuss as why vitamins are supplemented through food.

2. List two sources of retinol.

3. i. Rosa recently had a sever accident. She is now recovering and the doctor has advised for her to take vitamin K rich foods. State a reason for this advice.

 ii. Name two sources for vitamin K.

 4. Discuss any two characteristics of Vitamin E.

 5. For the following nutrients, discuss their deficiencies:

1. Vitamin C ii. Vitamin B1  iii. Iodine

6. State one function of retinol.

7. List two food sources of calciferol.

8. Discuss the relationship between:

 i. Vitamin E and heart disease

 ii. Ascorbic acid and cold/fever

9. Shirani is an anaemic patient. She mostly includes liver, bele, rourou, fish, nuts in her diet. However, she still feels weak. Discuss the possible reason for this.

10. Chlorine and sodium are characterized as **electrolytes.** Discuss the statement and state one food source for chlorine and sodium.

 11. Briefly describe the importance of folate on the following:

 i. Pregnant mother

 ii. Growing foetus