**B4 – NUTRITION**

**4.3 Animal Nutrition**

1. **State the term balanced diet & describe how balanced diet is related to age, sex & activity of an individual.**

Balanced diet: A diet that contains all the main nutrients (carbohydrate, fats, protein, vitamins, minerals, fibre & water) in the correct amounts and proportions.

* Dietary requirements depend on your age, sex and activity;
* The amount of energy needed is provided by our carbohydrate and fat intake;
* Generally, males use more energy than females;
* And generally the energy demand increases as we get older until we stop growing;
* Someone doing physical work will use up more energy than an office worker;
* While children are growing they need more protein per kilogram of body weight than adults do;
* Pregnant women need extra nutrients for the development of the fetus.
1. **Describe the effects of malnutrition in relation to starvation, coronary heart disease, constipation and obesity.**

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| *Disease* | *Cause of malnutrition* | *Symptoms and consequences* |
| Obesity | Too much food  | Heart disease, strokes, diabetes |
| Coronary heart disease | Too much saturated fat (causes high cholesterol levels in the blood) | Cholesterol sticks to the walls of coronary arteries, so not enough blood can get to the heart, leads to heart attack |
| Starvation (e.g. in anorexia nervosa) | Too little food (e.g. intense fear of gaining weight) | Weight loss, organ damage, death (depression, loneliness, insecurity) |
| Constipation  | Lack of fibre | Unable to defecate, pain |

1. **Define ingestion.** Taking substances (e. g. food and drink) into the body through the mouth.
2. **Define egestion.** Passing out of food that has not been digested, as faeces, through the anus.

1. **Identify the main regions of the alimentary canal and the associated organs including mouth, salivary glands, oesophagus, stomach, small intestine: duodenum and ileum, pancreas, liver, gall bladder, large intestine: colon and rectum , anus.**



1. **Describe the functions of the regions of the alimentary canal listed above, in relation to ingestion, digestion, absorption, assimilation and egestion of food.**

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| **Region** | **Functions** |
| Mouth | Food is ingested here; mechanical digestion by cutting, chewing and grinding of teeth; Saliva added - contains amylase to digest starch.  |
| Oesophagus | Boluses of food pass through by peristalsis, from mouth to stomach. |
| Stomach | Gastric juice added- contains protease to digest protein and hydrochloric acid to maintain pH 2 and kill bacteria. |
| Duodenum | Receives pancreatic juice containing protease, lipase and amylase. Juice also contains sodium hydrogen carbonate which neutralizes acid from the stomach - giving pH of 8. |
| Pancreas | Secretes pancreatic juice into the duodenum.  |
| Liver | Makes bile, which is stored in gall bladder; bile contains salts that emulsify fats; digested food is assimilated here, e.g. glucose is stored as glycogen. |
| Ileum | Epithelial lining secretes enzymes which breakdown maltose and peptides; contains villi which increase the surface area for absorption of digested food. |
| Colon | Main function is reabsorption of water from undigested food |
| Rectum | Stores faeces until it is egested |
| Anus | This has sphincter muscles to control when faeces is egested from the body |

1. **Define digestion.** Digestion is the breakdown of large, insoluble food molecules into small, water- soluble molecules using mechanical and chemical processes.
2. **Identify the types of human teeth and describe their structure and functions**



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| **Type of teeth** | **Structure** | **Function** |
| Incisor (4 in each jaw) | Chisel-shaped(sharp edge) | Biting off pieces of food |
| Canine (2 in each jaw) | Slightly more pointed than incisors | Similar function to incisors and also helps in tearing flesh in carnivores |
| Premolar (4 in each jaw) | Have 2 pointed cusps; have 1-2 roots | Chewing and Grinding food  |
| Molar (6 in each jaw) | Have 4-5 cusps; have 2-3 roots. | Chewing and Grinding food |

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| *Section through a molar tooth* | *Description* |
| https://upload.wikimedia.org/wikipedia/commons/thumb/2/2e/Tooth_Section.svg/220px-Tooth_Section.svg.png | 1. Part embedded in the gum called root.
2. Part which can be seen is called crown covered with enamel.
3. Enamel hardest substance made by animals but can be dissolved by acids.
4. Under enamel is dentine which contains living cytoplasm; dentine is hard.
5. Middle of the tooth is pulp cavity containing nerve and blood vessels which supply dentine with food and oxygen.
6. Root is covered with cement; it has fibres growing out of it which attach the tooth to the jawbone, but allow slight movement when biting or chewing.
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1. **State the causes of dental decay and describe the proper care of teeth.**
* Bacteria are present on the surface of our teeth;
* Food deposits and bacteria form a layer called plaque;
* Bacteria in the plaque may infect the gums causing gum disease;
* Bacteria in the plaque feed on sugars in the food, producing acid;
* This acid dissolves enamel, forming a hole;
* Dentine underneath the enamel is softer and dissolves more rapidly;
* If the hole reaches the pulp cavity, bacterial infection can get to the nerve;
* This results in toothache and possibly an abscess (an infection in the jaw).

 *Tooth decay and gum disease can be prevented*

* Avoid sugary food, especially between meals, so bacteria cannot make acid
* Clean teeth regularly to remove plaque (a fluoride toothpaste hardens tooth enamel);
* Use dental floss or a toothpick to remove pieces of food and plaque trapped between teeth;
* Visit a dentist regularly so any tooth decay is treated early and any stubborn plaque is removed.
1. **State the significance of chemical digestion in the alimentary canal in producing small, soluble molecules that can be absorbed.**
* Chemical digestion involves breaking down large, insoluble molecules into small, soluble ones;
* Enzymes speed up the process;
* Enzymes work efficiently at body temperature (370C) and at a suitable pH;
* Small, water soluble molecules of food is easily absorbed into the blood capillaries in the intestine.
1. **State where in the alimentary canal, amylase, protease and lipase enzymes are secreted.**
2. **State the functions of a typical amylase, protease and lipase, listing the substrate and end-products.**

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| **Enzyme** | **Site of action** | **Special conditions** | **Substrate** | **End products** |
| Amylase | Mouth, duodenum | Slightly alkaline | Starch | Maltose, glucose |
| Protease | Stomach,duodenum | Acid in stomach, alkaline in duodenum | Protein | Amino acids |
| Lipase | Duodenum | alkaline | fat | Fatty acids and glycerol |

1. **Outline the role of bile in emulsifying fats, to increase the surface area for the action of enzymes.**
* Bile is made in the liver, stored in gall bladder and then flows along bile duct into duodenum;
* Bile does not contain any enzymes;
* Bile helps to digest fat by breaking the large drops of fat into very small ones;
* This makes it easier for lipase to digest them;
* This is called emulsification (a kind of mechanical digestion) and is done by bile salts.
1. **Define absorption**

Absorption is movement of digested food molecules through the wall of the intestine into the blood.

1. **Describe the significance of villi in increasing the internal surface area of the small intestine.**
* Villi are finger-like projections that increase the surface area for absorption of small molecules.
* The larger the surface area, the faster nutrients can be absorbed.

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**STRUCTURE & FUNCTION OF VILLI**

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| **FEATURE** | **FUNCTION** |
| Each villus is covered with cells which have even smaller projections on them called microvilli | This gives inner surface of the small intestine a very large surface area – nutrients can be absorbed even faster. |
| Villi have walls only one cell thick | Nutrients can diffuse across the wall to reach the blood capillaries and lacteals faster. |
| Villi contain blood capillaries | Absorbs small molecules such as amino acids and glucose |
| Villi contain lacteals, which are part of the lymphatic system | Absorbs fatty acids and glycerol |

1. **Identify the small intestine as the region for the absorption of digested.**
2. **Describe the structure of a villus, including the role of capillaries and lacteals**

See above.

1. **Describe the role of liver in the metabolism of glucose.**
* If there is more glucose than necessary in the blood, the liver will convert some of it to the polysaccharide called glycogen and store it.
1. **Describe the role of fat as an energy storage substance.**
* Fat may be used in respiration as a source of energy, or stored;
* Fatty acids & glycerol are absorbed by the lacteal in the villi;
* They are carried in the bloodstream to body cells;
* Here the fat molecules are reformed;
* Fat is a good storage compound as when respired, it releases twice as much energy as carbohydrates.