THE ANIMAL AND ITS FOOD

WATER

Water is a necessary compound of plants and animals. Growing plants contain 70-80% water and animals contain 70-90% water. Water has several important functions in the animal body such as regulation of body temperature, carrier of nutrients, regulation of tissue structure etc. Water is needed to make saliva for swallowing feed and for chewing the cud, for feed to be digested, to cool the body when it is too hot and to remove waste materials from the body in the urine and faeces. In addition, a milking cow (and also suckling cows, camels and donkeys) needs water for milk production. Lack of water will kill an animal faster than lack of any other nutrient. Lack of sufficient amounts of water or provision of poor quality water will seriously reduce animal performance.

DRY MATTER (DM)

The dry matter (DM) of foods is conveniently divided into organic and inorganic material, although in living organisms there is no such sharp distinction. Many organic compounds contain mineral elements as structural components. Proteins, for example, contain Sulphur, and many lipids and carbohydrates contain phosphorus. that the main component of the DM of pasture grass is carbohydrate, and this is true of all plants and many seeds. The oilseeds, such as groundnuts, are exceptional in containing large amounts of protein and lipid material. In contrast, the carbohydrate content of the animal body is very low. One of the main reasons for the difference between plants and animals is that, whereas the cell walls of plants consist of carbohydrate material, mainly cellulose, the walls of animal cells are composed almost entirely of lipid and protein. Furthermore, plants store energy largely in the form of carbohydrates such as starch and fructans, whereas an animal's main energy store is in the form of lipid.

The lipid content of the animal body is variable and is related to age, the older animal containing a much greater proportion than the young animal. The lipid content of living plants is relatively low, that of pasture grass, for example, being 40–50 g/kg DM. In both plants and animals, proteins are the major nitrogen-

containing compounds. In plants, in which most of the protein is present as enzymes, the concentration is high in the young growing plant and falls as the plant matures. In animals, muscle, skin, hair, feathers, wool and nails consist mainly of protein. Like proteins, nucleic acids are also nitrogen-containing compounds and they play a basic role in the synthesis of proteins in all living organisms. They also carry the genetic information of the living cell.

The organic acids that occur in plants and animals include citric, malic, fumaric, succinic and pyruvic acids. Although these are normally present in small quantities, they nevertheless play an important role as intermediates in the general metabolism of the cell. Other organic acids occur as fermentation products in the rumen, or in silage, and these include acetic, propionic, butyric and lactic acids.

Vitamins are present in plants and animals in minute amounts, and many of them are important as components of enzyme systems. An important difference between plants and animals is that, whereas the former can synthesise all the vitamins they require for metabolism, animals cannot, or have very limited powers of synthesis, and are dependent upon an external supply.

The inorganic matter contains all those elements present in plants and animals other than carbon, hydrogen, oxygen and nitrogen. Calcium and phosphorus are the major inorganic components of animals, whereas potassium and silicon are the main inorganic elements in plants.

Mechanisms of nutrition include:

Digestion – absorption – circulation – respiration –metabolism- excretion.

Animal body is that what u see: - (cell – tissue – organ –system –animal body).

Enzymes: organic catalysts which alter the speed of chemical reaction without becoming involved in the reaction.

Types of enzymes:

1- exogenous (digestive systems).

2- endogenous (inside the cell itself).

Properties of enzymes:

1-specific (amyl lytic act on carbohydrate – proteolytic act on protein).

2- can be used over and over again.

3-they require specific condition for optimum activity (pepsin, hydrolyze protein from digestive tract optimum ph range 1.8 -2).

Definition of terms:

A nutrient is any chemical element or compound in the diet that is required for normal reproduction, growth, lactation, maintenance of life processes. it is difficult to give a completely accurate short definition of a nutrient, for example, some compounds such as starch are readily utilized by most species as a source of energy (and thus provide nourishment), yet starch is not specifically required by an animal as a source of energy or for any other function.

Nutrients required by plants and animals:

Plants:

In contrast to animals, the nutrient requirements of plant are simple. in general plants take up nitrogen (N) in the form of nitrate or ammonia, and they synthesize complex proteins by incorporating these forms of (N) into amino acids and other intermediate products.

Animals:

Depending on animal age and species, animals require a source of N in the form of essential amino acids, fat in the form of essential fatty acids, essential mineral elements, fat-soluble and water-soluble vitamins, and a source of energy that may vary from primarily fat and protein for carnivorous animals to coarse fibrous plant tissue for some herbivorous animals. the amounts and proportions of nutrients required are influenced by the type of gastrointestinal tract, the age of the animal, its level and type of productivity (maintenance of body tissues, work, growth, milk, eggs and pregnancy).

A simplified list of elements and compounds that may present in food

1. Organic compounds
2. Nitrogenous
3. Proteins
4. Amino acids
5. Peptides
6. Amines and amides
7. Nucleic acids
8. Nitrates
9. Urea
10. Lipids
11. Fatty acids
12. Phospholipids (lecithin, sphingomyelin)
13. Triacylglycerol (triglycerides)
14. Sterols (hormones, cholesterols, vitamin D)
15. Terpenoids (carotene, xanthophyll)
16. Waxes
17. Carbohydrate
18. Monosaccharides (glucose, xylose)
19. Disaccharides (sucrose, lactose)
20. Oligosaccharides
21. Polysaccharides, fibrous (hemicellulose, cellulose, xylans)
22. Polysaccharides, no fibrous (starches, dextrin, pectin)
23. Vitamins
24. Fat soluble
25. Water soluble
26. Polyphenol (lignin)
27. Organic acid
28. Compounds contributing to color, flavor, odor, toxins, inhibitors.

Glossary and its definition to aid your introduction to nutrition ….

Ruminant: any of a group of hoofed mammals that have a four – compartment stomach and that ruminant or chew a cud such as cattle, buffalo, camel, sheep, goat.

Non- ruminant: a simple stomached animal that does not ruminant such as duck, horses, dogs, swine, poultry, turkey, geese, rabbit and also human.

Rumen: also called the fore stomach or paunch, it is the first compartment of four compartment of a ruminant animal's stomach. the rumen serves as the primary site of food fermentation in the entire digestive tract. nonstructural carbohydrate (including starch, sugar and pectin) and structural carbohydrates (including cellulose and hemi cellulose) are fermented and digested by ruminal microbes for the duration of their time in the rumen.

Microflora: the gross overall bacterial population present, it sometimes used to include the protozoa as well as the bacteria.

Hay: the aerial part of finer stemmed forage crops stored in the dry form for animal feeding. such as alfalfa hay, barley plant hay, yellow corn plant hay, clover hay wheat hay.

Silage: the feed resulting from the storage and fermentation of green or wet crops under anaerobic conditions. for example, are green fodder, alfalfa silage, barely plant silage, yellow corn plant silage, grasses silage.

Straw: the part of manure plant remaining after removal of seed by threshing or combining, for example are wheat straw, barley straw, rice straw.

Concentrate: feeds high in energy and also high (more than about 60%) in total digestible nutrients T.D.N on air-dry basis and low in (less than 20%) in crude fiber, opposite of roughage.

Roughage: any feed high (more than about 60%) in crude fiber and low in (less than 20%) in T.D.N on air –dry basis, opposite of concentrate.

Hormone: a chemical substance secreted into the body fluids by an endocrine gland that has a specific effect on other tissues.

Antibody: a substance produced in the body that acts against disease.

Antibiotic: a substance produced by one microorganism that has an inhibiting effect on the growth of another.

In vitro: refers to a feed sample that is digested in test tubes or tested outside the animal, an in vitro digestion study occurs in the laboratory, not in the animal.

In vivo: refers to a digestion study of feed that is tested inside the animal's rumen or stomach.

Amino acid: any one of a class of organic compounds that contain both the amino group NH_2 and the carboxyl COOH.

Essential amino acid: any one of several amino acids that are needed by farm animals and cannot be synthesized by them in the amount needed and so must be present in the protein of the feed such as methionine, lysine, tryptophan, phenylalanine …. etc.

Non-essential amino acid: any one of several amino acids that are required by animals but can be synthesized in adequate amount by an animal in its tissues from other amino acids.

Dry matter: the part of feed that is not water (DM). sometimes referred to as substances or total solids .it is the sum of crude protein, crude fiber, ether extract, nitrogen free extract and ash.

Organic matter: the total weight of the feed minus the weight of the mineral matter (or ash) in feed.

Cellulose: one of the major structural materials in the plant cell walls that can be utilized by microorganism in rumen.

Hemicelluloses: polysaccharide fraction existing in the cell wall of plant .it is similar to cellulose but only partially digestible in the rumen.

Starch: the main carbohydrate component of the dry matter in grain. it consists long chain of glucose molecules, which are easily broken down by rumen microbes.

Calorie: the amount of energy as heat required to raise the temp. of 1 gm of water 1° C.

Food: is an edible material that provides nutrient.

Feed: (noun) refers to food but more commonly is used to designate animal food.

Lipids: a broad term for fats and fat like substances.

Oil: usually a mixture of pure fats that is liquid at room temp.

Fat: the product formed when three fatty acids combine with one glycerol. the glycerol ester of a fatty acid such as stearin, palmitic and oleic.

Fatty acid: any one of several organic compounds containing carbon, hydrogen and oxygen, which combine with glycerol to form fat.

Volatile fatty acid (VFA): any one of several volatile organic acids found especially in rumen contents and silage such as acetic acid, propionic acid and butyric acid are ordinarily the most prevalent.