# Importance of Meeting Nutritional Needs

Water and feed contain substances called nutrients that are needed by an animal for its body to function. The monogastric and ruminant digestive systems are able to extract these elements through digestion. To ensure proper growth and efficiency in production, it is important to provide the proper levels of nutrients for an animal's nutritional needs.

## Nutrients

Nutrients are elements or chemical compounds that support the life processes of an animal. They allow the animal to maintain its bodily functions by entering the cells of the body and fueling their growth and function. Nutrients are found in water, grain, roughage, and other food substances taken into the digestive system through the mouth.

## Six Basic Nutrients

Six basic nutrients are essential for the survival of the animal. They are water, proteins, carbohydrates, fats, vitamins, and minerals. The lack of any one of these nutrients could cause problems for the animal.

Water is a liquid combination of hydrogen and oxygen. Since the body is made mostly of water, water has many important functions. For example, it plays a role in biochemical reactions like respiration, digestion, and assimilation (the transformation of nutrients from feed into body tissues). The transportation of nutrients and wastes through the body is also done by water. Water regulates body temperature and gives the body its form.

Proteins are compounds made up of substances called amino acids that contain the elements carbon, hydrogen, oxygen, and nitrogen; iron, phosphorus, or sulfur are also sometimes included. Protein is the only source of nitrogen for an animal. The amino acids can be divided into essential and nonessential amino acids (Table 3.1). Essential amino acids must be provided in the diet because they are not found in animal tissues. Nonessential amino acids can be synthesized in animal tissues from other amino acids and therefore do not have to be supplied by the diet.

Protein has several functions. Protein is important because amino acids are the building blocks of body tissues. It develops and repairs body organs and tissues like muscles, nerves, skin, hair, hooves, and feathers. Protein is also used to produce milk, wool, and eggs. The fetus is developed and some enzymes and hormones are generated by the action of protein. It also forms a part of DNA.

Carbohydrates are made up of the elements carbon, hydrogen, and oxygen. A carbohydrate may be a sugar, starch, or fiber. Sugars and starches are easily digested, while fiber, which forms the cell wall material of plants, is more difficult to digest. The main function of carbohydrates is to provide the energy that powers muscle movement. Energy for muscular movement is required not only for exercise but for many essential functions of the body, such as breathing, digestion, and the beating of the heart. Carbohydrates also produce body heat, and extra carbohydrates are stored as body fat.

Fats, like carbohydrates, are an energy source. The elements found in fats are the same as carbohydrates – carbon, hydrogen, and oxygen. The difference between fats and carbohydrates is in the level of energy that they provide, with fats producing 2.25 times more energy than carbohydrates. In addition to serving as a valuable energy source, fats also provide body heat and carry some vitamins.

Table 3.1 - Essential and Nonessential Amino Acids

| Essential Amino Acids | Nonessential Amino Acids |
|---|---|
| Arginine | Alanine |
| Histidine | Aspartic acid |
| Isoleucine | Citrulline |
| Leucine | Cysteine |
| Lysine | Cystine |
| Methionine | Glutamic acid |
| Phenylalanine | Glycine |
| Threonine | Lodogorgoic acid |
| Tryptophan | Proline |
| Valine | Serine |
| | Tyrosine |
| | Hydroxyglutamic acid |
| | Hydroxyproline |

Minerals are inorganic elements that are utilized by the body. They include both macro- and microminerals; macrominerals are required in much larger amounts than microminerals. Minerals supply materials for building the skeleton and teeth and are a part of body regulators such as enzymes and hormones. They also assist in transmitting impulses through the nervous system, the development of the body tissues, and muscular activity. Table 3.2 provides a listing of the minerals needed by the body.

Vitamins are fat- or water-soluble organic substances. The fat soluble vitamins, carried by fats, are vitamin A, D, E, and K, which contain hydrogen, oxygen, and carbon. Water-soluble vitamins are vitamin C and the B-complex vitamins; they contain hydrogen, oxygen, carbon, chlorine, nitrogen, and cobalt or sulfur. Vitamins do not become a part of the body like the other nutrients. Instead, they regulate body functions. Vitamins regulate the digestion, absorption, and metabolism of nutrients. They also regulate the formation of new cells and the development of vision, bones, hair, feathers, skin and muscles. Vitamins help protect against diseases and develop and maintain the nervous system.

**Nutritional Needs of Animals**

Nutritional needs vary depending on the needs of the animal for health and the life stages of maintenance, conception and gestation, lactation, and growth and development. When a female is in the gestational period, for example, nutritional needs are different than during lactation. Figure 3.1 demonstrates how the nutrient requirements of a mature female vary through different life stages.

Of the life stages, simple maintenance has the lowest level of nutritional requirements, and they must be met before other nutrients needs are considered. At this level, nutrients are used to maintain vital life processes and normal body temperature, with no weight gain or loss and no production (such as reproduction or fattening). The amount of feed needed to maintain an animal depends on the size of its body.

The main concern during conception and gestation is meeting additional nutritional needs to ensure good fetal growth and maintain the health of the mother. Most of the growing done by the fetus is done in the last trimester. During this time the female needs additional nutrients for herself and the fetus. The amount needed is equal to the nutrient needs of the young animal after birth and the maintenance needs of the female.

Table 3.2 - Macro- and Microminerals

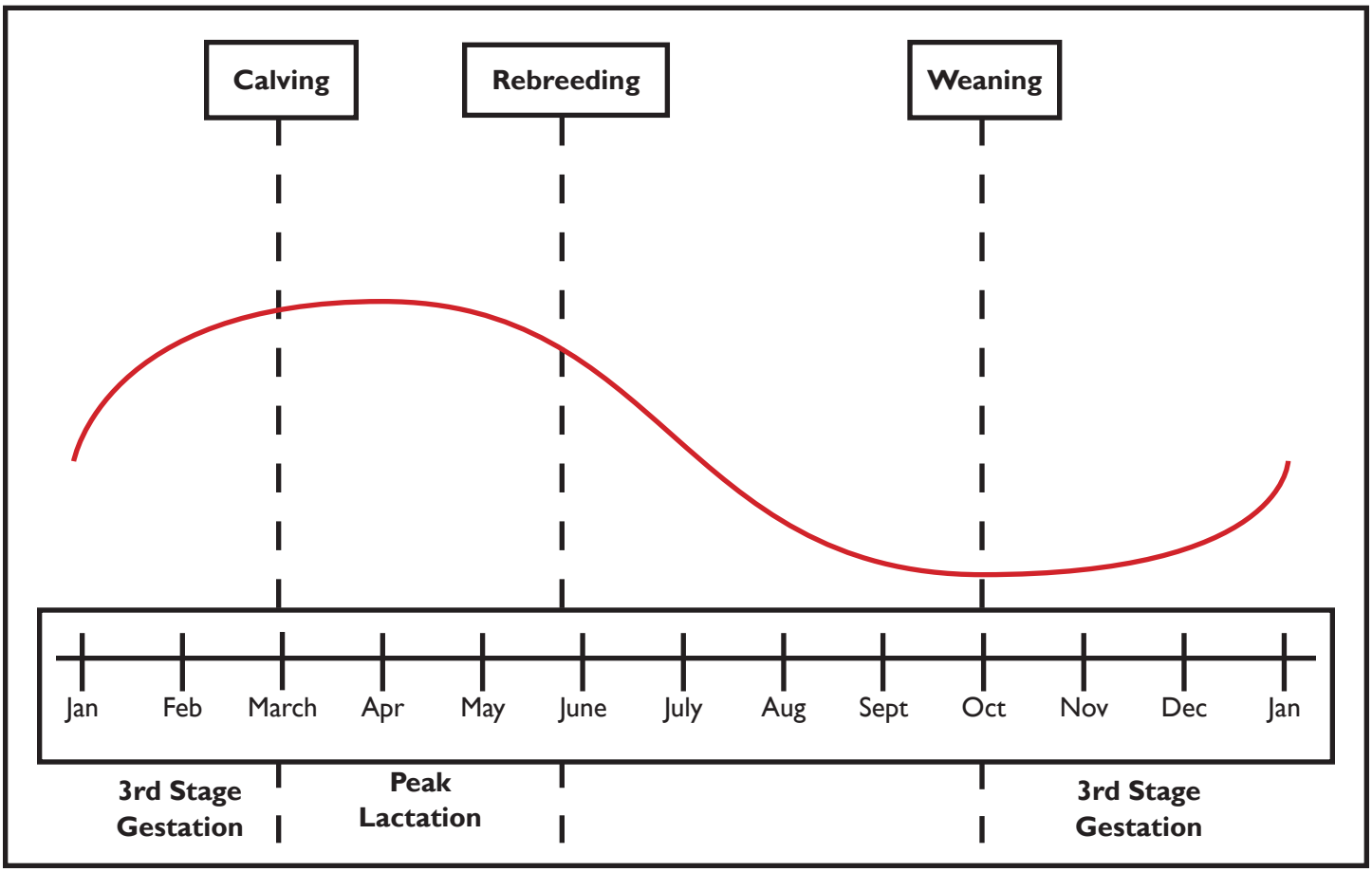
| Macrominerals | Microminerals |
|---|---|
| Calcium (Ca) | Iron (Fe) |
| Phosphorus (P) | Iodine (I) |
| Sodium (Na) | Copper (Cu) |
| Potassium (K) | Cobalt (Co) |
| Chlorine (Cl) | Fluorine (Fl) |
| Magnesium (Mg) | Manganese (Mn) |
| Sulfur (S) | Zinc (Zn) |
| | Molybdenum (Mo) |
| | Selenium (Se) |
| | Chromium (Cr) |

Lactation is milk production. Many additional nutrients are needed to produce milk, including proteins, minerals, vitamins, fats, and carbohydrates. Protein is important, since milk contains three percent protein. The energy supplied by fats and carbohydrates is vital for lactation. Water is also needed. Two minerals needed during lactation are calcium and phosphorus. Vitamin A and the B-complex vitamins are necessary as well when a female is lactating. If the animal is indoors, vitamin D may be needed.

An animal also has special nutrient requirements for growth and development. As it grows, the animal increases the number of cells at the tissue level. Muscles are built, and bone and connective tissues are produced. To accomplish this task, an increased amount of protein is needed. The minerals calcium and phosphorus are also required for bone growth. In addition, higher quantities of vitamins are required, especially vitamin D. An energy source is supplied by including more fats and carbohydrates in the animal's diet. If these nutrient requirements are not met while the animal is growing, the adult will be less productive.

Nutrients are important in maintaining the health or well-being of the animal in all of the life stages. Nutrients are needed to carry out vital bodily functions. An animal in the maintenance stage may not be gaining or losing weight, but it may not be as healthy as it could be.

Figure 3.1 - Nutrient Requirements for a Cow through Life Stages




An animal must be healthy in order to be at its most productive.

**Summary**

Nutrients are elements and chemical compounds that nourish the body. The six basic nutrients are water, proteins, carbohydrates, fats, vitamins, and minerals. Each nutrient meets a specific need for maintenance, conception and gestation, lactation, growth and development, and health.

**Credits**

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