

Water in Animal Nutrition

They gain water not only through the action of drinking but also from the food they eat. Water is needed by the animal in order to keep its body at a relatively stable temperature. It keeps the body cool through the production and evaporation of sweat. Water is necessary for digestion and absorption of feed, and aids in the hydrolysis of nutrients like carbohydrates, fats and proteins.

Water is the single most important nutrient in the animal body. It is essential for all metabolic processes, chemical reactions, temperature regulation, eliminating waste from the body, and ultimately, health and survival.

Cattle need an adequate, accessible and frequent supply of fresh water to facilitate physical and chemical processes of the body. For example, water is needed to produce saliva, which helps breakdown and lubricate feed so it can easily pass through the digestive system.

Among the consequences of too little water is a weakened immune system. Moreover, where water becomes scarce, there soon will be no grazing land. The animals become weak and undernourished – easy targets for parasites and infectious diseases.

How much water do animals need to survive?

Temperatures play a large role in the amount of water that animals consume on a daily basis.

Females that are nursing young will also have additional water requirements in order to produce adequate quantities of milk. As temperatures increase from 500 to 900 Fahrenheit, Water requirements can more than double.

Forage moisture will also have a large influence on the amount of water required by animals each day. Sheep and goats can often meet their daily needs when grazing lush forage in the spring of the year.

Livestock Species	Water Needed Per Animal 50 Degree Day	Water Needed Per Animal 90 Degree Day
Dry Beef Cows	8-12 Gallons	20-30 Gallons
Lactating Beef Cows	12-20 Gallons	25-35 Gallons
Lactating Dairy Cows	20-30 Gallons	30-40 Gallons
600 Pound Weaned Calves	6-9 Gallons	10-15 Gallons
Horses	8-12 Gallons	20-25 Gallons
Sheep and Goats	2-3 Gallons	3-4 Gallons

*A **gallon** is a unit of measurement for liquids, and a US gallon equals 3.78 liters. While the gallon, which is used in Australia, Canada, New Zealand and the United Kingdom. It equals 277,420 cubic inches, which is equivalent to 4,546.09 cubic centimeters of fluid (about 4.5 liters).

*c ° to f °: $((c + 40) \times 1.8) - 40 = f$.

The water needs of livestock are filled from three major sources:

(1) free drinking water. (2) water contained in feed. (3) metabolic water produced by oxidation of organic nutrients.

The catabolism of 1 kg of fat, carbohydrate, or protein produces 1190, 560, or 450 g of water, respectively.

Animal metabolism produces about 107-110 grams of water per 100 grams of fat, 41-42 grams of water per 100 g of protein and 60 grams of water per 100 g of carbohydrate.

Preformed water includes the water absorbed from food and drinks whereas metabolic water includes the water from cellular respiration and dehydration.

Obligatory Water Loss: it is water loss that always occurs via breathing, through the skin, feces, and urine.

Facultative Water Loss: it is controlled water loss and hormonally regulated in kidney nephrons. Define Fluid Imbalance. -when fluid output does not equal intake.

Insensible fluid loss is the amount of body fluid lost daily that is not easily measured, from the respiratory system, skin, and water in the excreted stool. The exact amount is unmeasurable.

Water is formed when hydrogen and oxygen react to form H₂O during the electron transport chain, which is the final stage of cellular respiration

Water intoxication may occur as a result of a sudden ingestion of large amounts of water after a short period of deprivation and is due to the slow adaptation of the kidneys to the high water load. Water restriction reduces feed consumption and is very stressful for animals.

Properties and function of water

1. Water is considered a diffusive medium because it is a good solvent and has the ionization ability necessary for cellular reactions.
2. Water is characterized by its high quality, which helps in absorbing the heat resulting from cellular reactions
3. Water has an essential role in transporting metabolites and excreta of metabolic wastes
4. Water participates in the structural and destructive changes that occur in intermediate metabolism processes.
5. Water also contributes to other general functions, including facilitating joint movement and maintaining brain tissue and other components of the nervous system that help in transmitting sound waves as well as its role in vision.

Source of lack of water from animal body

Water is lost naturally from the animal's body, and that loss is affected by body size, food type and nature compounds produced during metabolism, and sources of water loss from the animal's body include the following:

1. Loss through the skin: This loss is considered one of the most important means of eliminating excess heat from the body the method of evaporation of water to regulate its temperature, and this loss is increased by an increase in muscle activity and an increase in air temperature. The absence of sweat glands or being few in most types of animals, the lungs can play an important role the process of eliminating body heat by the process of eliminating water vapor by way of exhalation.

2. Loss through the digestive system: Water is lost during the processes of digestion and absorption, and the amount depends water lost on the type of feed increases with an increase in the proportion of coarse feed intake and by an increase in the proportion of non-feed portions. Digested food, and that amount varies according to the type of animal, so cows lose more water compared to Sheep, where the percentage of water in the feces of cows is 80% water, while the feces of sheep are drier.

3. Loss through the kidneys: The two kidneys regulate the volume and composition of body fluids, and they also regulate the volume of water excreted according to the volume of the amount consumed from it, the amount of water used in the organs, and the concentration of compounds produced from metabolism catabolism, such as inorganic elements and nitrogenous compounds such as urea, in which water is used, and for the kidneys the ability to filter and hold the filtrate and absorb water again and thus it works to reduce water lost to a minimum. The body's needs of water increase with the increase in the loss, which is proportional to the amount of mineral elements and protein in the food, and the reason is due to the lack of metabolic water produced when consuming high content feeds high protein in comparison with the amount of metabolic water produced from the

catabolism of fats and carbohydrates. In birds, ammonia, which is the final product of protein metabolism, is converted into uric acid which is thrown as a solid with a loss of a small amount of water to dilute it in addition to the demolition of protein and its expression in this way saves more metabolic water compared to the amount of metabolic water produced from catabolism of protein in the form of urea as is the case with mammals, and on this basis the needs of the birds from the water are less than the needs of the mammals, and accordingly, the birds are less sensitivity to temporary shortage of water. As for mammals, it can withstand hunger more than it can withstand thirst.