

Water

Water is the chemical substance with chemical formula H_2O : one molecule Of water has two hydrogen atoms covalently bonded to a single oxygen atom.

Water is a tasteless, odorless liquid at standard temperature and pressure. The color of water and ice is, intrinsically, a very slight blue hue, although water appears colorless in small quantities. Ice also appears colorless, and water vapor is essentially invisible as a gas

Water is necessary for an animal's survival. An animal can live longer without food than without water. Water makes up about 75 percent of the weight of a mature animal and as much as 90 percent of a newborn. It is found in every cell of the body. The amount of water needed by an animal is related to the activity the animal performs and to its stage of growth or production (lactation, gestation, etc.).

Water can enter the body in many different ways. Most of it enters by drinking. Water is also found in the feed an animal consumes and may be produced through biochemical reactions.

Water may be lost from the body through urine, feces, sweat, and vapor from the lungs. Water taken in by an animal should be clean and fresh. Water should be available to animals at all times.

Body water content (e.g., swine)

Stage/day	%
Embryo	95
At birth	75-80
7 d	77
15 d	75
30 d	73
60 d	67
90 d	62
120 d	60
Market weight.	50

There are four main functions of water in the body:

- (a) The elimination of waste products of digestion and metabolism results in a substantial and continuing loss of water. The feces of healthy cattle often contain 75—85% water, and though sheep feces are usually drier
- (b) The regulation of blood osmotic pressure
- (c) Water is a major component of secretions (milk; saliva and other digestive fluids) as well as in the products of conception and in body growth.
- (d) Thermoregulation, effected by evaporation of water from the respiratory tract and from the skin surface.

Functions of Water

1. Water is essential constituent of the animal body .
2. It is an essential part of foodstuff. it makes the food soft and palatable.
3. It helps in regulating body temperature.
4. It helps in absorption and transportation of nutrients to different parts of the body .
5. It is an essential constituent of almost all the juices and secretion of the body .
6. It helps in the excretion of waste production in the form of urine, feces and perspiration from the animal body.
7. It acts as a solvent of many constituent of body nutrients all the biochemical and physiological reaction take place in liquid medium .
8. It provides shape to the body cell and essential for cell nutrient. the metabolic water produced inside the body help in transportation of nutrients inside the body cell.
9. During the period of hibernation, metabolic water keep the animal.
10. It help in maintaining the acid - base balance of the body .
11. It help in the hearing by the ears and vision by the eye .
12. It acts as a cushion for tissue cell and nervous system and protect the various vital organ against shocks and injuries.

Sources of water

- A. Drinking water :- it is consumed by the animals from the outside source .
- B. Feed :- moisture content of all the feeds supplies the water requirement of the animal.
- C. Metabolic / Oxidation water it is the water which is produced due to metabolism of nutrients . it meets 100% of water requirement in hibernating (السبات) animal and embryo 5-10 % in domestic animal and 16-26% desert (الصحراء) animal .A 100 g of each fat, carbohydrate and protein metabolism produce 107,60 , and 40 g metabolic water, respectively .
- D. Bound water the water, which is combined with the constituents of protoplasm by either physical or chemical means . it cannot separated easily from protoplasm by freezing at low temperature or by evaporation at high temperature or under dry conditions .

Requirements

Vary according to species, physiological and environmental conditions Affected by:

- 1) Ambient temperatures,
- 2) Stage of growth and(or) body size,
- 3) Physiological state - e.g., dry or lactating,
- 4) Diarrhea,
- 5) Dietary salt & also protein
- 6) Feed intake level,
- 7) Type of diets,
- 8) Stress, etc.

Daily average water requirements of domestic Animal

Cattle	30-40kg
Milking cattle	30-40kg+1.8kg per kg milk
Buffalo	40-50 kg
Horse	30-40 kg
Sheep ,Goat and Pig	4-10 kg
Poultry	200-400 g
Rabbit	300 g
Guinea pig	30 g
Rat	6-10 g

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Factors affecting water requirement:

- a) Environmental : Increased environmental temperature and humidity enhanced the water requirement in comparison to cold environment because of increased evaporation losses in hot and humid environment.
- b) Dietary factor : high fibrous diet like dry roughages increases water requirement than less fibrous diet. salt and uric acid excretion requires more water .so intake of salt and protein whose end product is uric acid increase the water requirement.
- c) Animal factor : Age, stage of growth, level of production , activity, health condition and pregnancy has a direct effect on water requirement. Other factors are salinity and sulfate content of water, temperature of water, frequency and periodicity of watering social or behavioral interactions of animal with environmental, and other quality factors such as PH and toxic substances affect water requirement and intake . birds require less water as compared to mammals because uric acid is the end product of protein metabolism in birds as urea in mammals.

Requirement of Swine & poultry:

- 1) Should be provided on ad libitum basis, and generally consume twice as much water as dry feed:
 - a) 2:1 - Minimum, and wider ratios are needed for young & lactating swine.
 - b) The ratio may increase to 5:1 during the summer or when environmental temperatures are high.
- 2) Broilers increase water consumption .7%/each 1°C increase the temperature above 21°C.
- 3) Swine - Daily feed intake is the best indicator of ad libitum water intake for ad libitum-fed pigs

Water metabolism

- i. Absorption : absorption takes place from all the part of GIT mainly large intestine . organs of the digestive tract absorb most of the water ingested by an animal. A number of factors like osmotic relation inside the small intestine and nature of the carbohydrate component of the feed determine the extent to which absorption actually occurs . water is most readily absorbed when it is taken alone as beverage, or when taken with food that after digestion forms a solution with osmotic pressure lower than that of blood plasma.

Homeostasis : it is maintenance of uniformity and stability of water. Water balance is affected by total intake of water and losses arising from urine, feces, milk, saliva, sweating and vaporization from respiratory tissues.

iii. Excretion : water is excreted from body by evaporation through skin, perspiration through expired air, and through faeces, urine, milk, tear and saliva. Amount lost via various routes are affected by amount of milk produced, ambient temperature, humidity physical activity of the animal, respiration rate, water consumption and dietary factor.

Symptoms of deprivation of water

Anorexia, discomfort and inco-ordination in movement, decreased blood pressure and cardiac output, increased respiration rate, shriveled skin, increased body temperature, delirium and death if deficiency of water continue.

Toxic Elements in Water

Water may carry many essential elements, but at the same time it may contain toxic materials.

Composition of surface water

	Mean	Maximum	Minimum
Phosphorus, mg/L	0.087	5.0	0.001
Calcium, mg/L	57.1	173.0	11.0
Magnesium, mg/L	14.3	137.0	8.5
Sodium, mg/L	55.1	7,500.0	0.2
Potassium, mg/L	4.3	370.0	0.06
Chloride, mg/L	478.0	19,000.0	0.0
Sulfate, mg/L	135.9	3,383.0	0.0

