

Puberty in Dairy Cattle and Buffalo

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Introduction

The Indian economy is mainly based on agriculture and its allied components which contributes about 18.8% share of gross value added to the total economy (Economy Survey, 2021-22). Among all the allied sectors, livestock contributes about 4.11% of GDP and 25.6% of total agriculture GDP. There is a clear indication of importance of livestock in economy. Livestock yields benefits in terms of their production cycles. More the number of production cycles, greater the output per animal. Production from the dairy animal can be obtained when it reaches at its pubertal age. Puberty is the phase when the reproductive organs are functionally active and well developed. It is the intricate physiological process that involves physical and behavioral changes associated with activation of the hypothalamic-pituitary-ovarian axis and subsequent establishment of reproductive cyclicity (Sisk and Foster, 2004). Various hormonal changes results in physical and physiological growth of the animal which directs towards the production phase. Among all the factors like nutrition, breed, age, genetic makeup, photoperiod, environment, etc., nutrition plays a pivotal role in attaining early puberty. Also, the nutrition constitutes about 60-70% of the total farm input, so it's better to first focus on the major economy controlling factor for the optimum output.

The goal of this article is to indicate the profound effect of nutrition on performance and reproductive life cycle of animals, which directly correlates with the profits of the farmer or of the farms.

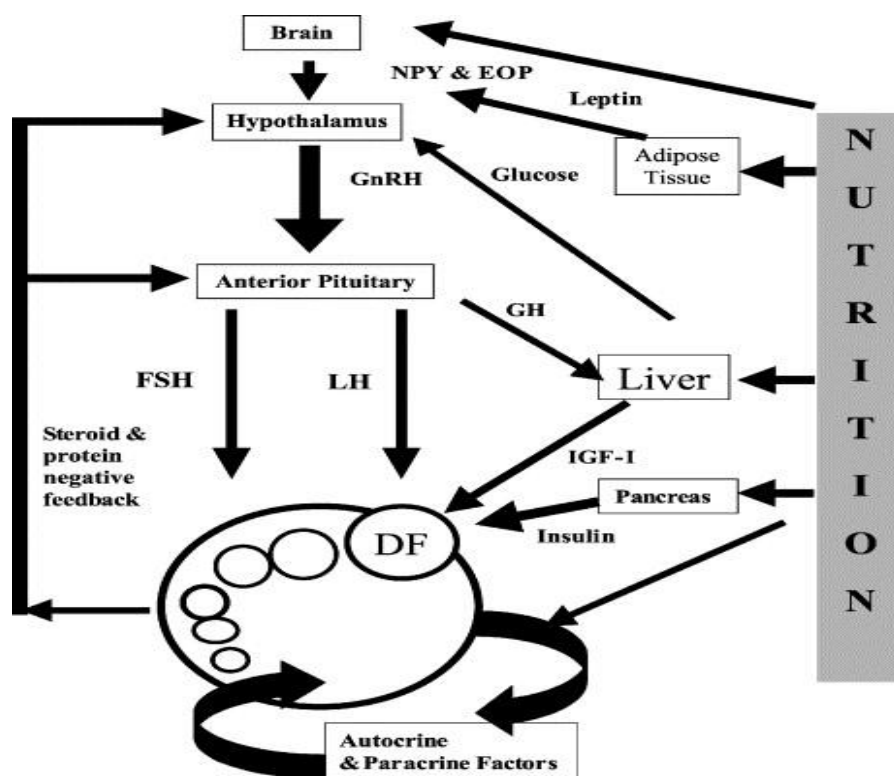
Puberty

Puberty, in reference to the heifers, can be characterized by first ovulation and plasma progesterone levels above 1ng/ml (Evans et al., 1995). There is common misconception among the people that the puberty is the age-related factor. Various studies showed that puberty depends on more on body weight of the heifers rather than their age. About 60 to 65% of mature body weight may be regarded as optimum during the initiation of breeding season in heifers (Endecott et al., 2013). This

early body weight gain can be achieved if the animals in younger age are well supplied with the nutrients in accordance to their requirements. Puberty is marked by the changes in the levels of key hormones like GnRH, FSH and LH, all which determines sexual maturity of the animal. Nutrition impacts synthesis and release of these hormones due to its action on hypothalamus and anterior pituitary (Vasantha et al., 2016).

Nutrition

A well-balanced diet along with the other management practices can be the foremost effective step in attaining better growth and precocious puberty. The plan of nutrition changes the metabolic status of the animal body which in turn changes the metabolic hormone levels resulting in the onset of the puberty (Gupta et al., 2016).



The prime step is the access of colostrum (either naturally or assisted) to the newborn calves just after birth. It provides the natural immunity to the young one. Delay in colostrum feeding could be not as beneficial as it to be, because of the gut closure condition (loss of ability of the intestinal epithelium to absorb immunoglobulins) after 24 hours of the parturition. After that, calf starter with 18.8-19.5% DCP and 75% TDN should be fed for proper rumen development and successful weaning (Reddy, 2020). The most crucial nutrients influencing the growth rate of the calves are energy and protein. They are required for the build-up of the body mass. Cholesterol and amino acids are needed for hormonal production. Minerals and vitamins play their respective roles in biochemical reactions either directly or indirectly (via enzymes). It all functions in well-orchestrated manner. Any deviation in one factor would change the whole process and results in disturbances.

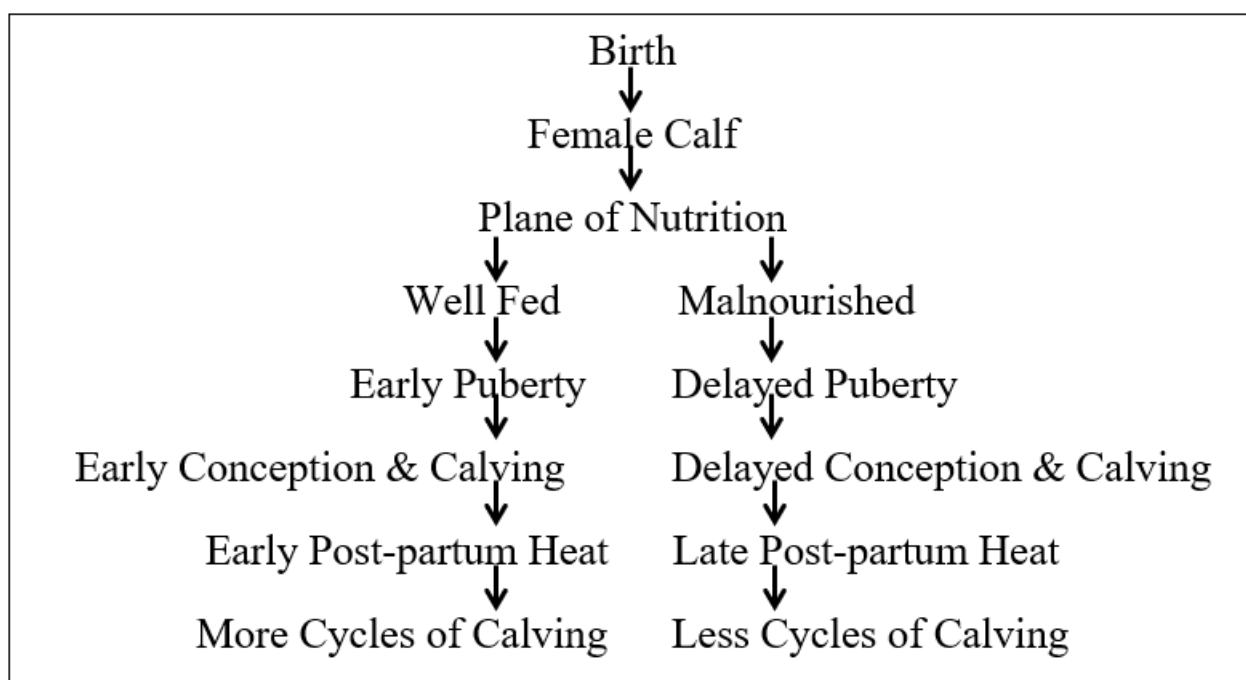
The heifers showed higher body weight and reached puberty at early age when fed rations



having higher protein contents in comparison to those fed low protein diets (Oyedipe et al., 1982). Supplementation of varying energy and protein levels in accordance to the requirements of the growing calves' results in the optimal growth of the animal for attaining early puberty.

Economic Impact

The goal of every sustainable dairy farm enterprise is to gain maximum benefit with the minimum possible inputs. Not only for dairy farms, but also for a common person, livestock should be beneficial otherwise there will be loss of interest in keeping dairy animals. Among the all dairy farm operations, heifer production is the most expensive part. It requires more inputs for a longer period of time with no visible returns than any other farm operations. Yet it needed to be expended. Because delayed pubertal age results in lower productive lifespan of the animal. Delayed puberty as one of the major causes in anestrus and prolong calving interval has been noticed (Soni et al., 2015).



To get more calves per animal in reproductive lifespan, gaining early puberty is the utmost important. Sooner the sexual maturity, earlier the conception and calving rates, greater is the fecundity. There is a negative correlation between plane of nutrition and pubertal age.

Conclusion

Reproductive together with productive life of an animal is greatly influenced by the pubertal age. Animal is said to be at puberty when it gains about 60% of adult body weight, which directly depends on the nutritional status rather than age of the animal. Various hormonal changes are well supported by balanced diet supplied from calving to maturity age. Low levels of nutrition during pre-pubertal period leads to delay in reaching adolescence. Immense economic losses which surface later in the productive lifespan of the animal are related to the impediment of pubertal age. Early nutritional condition of the calves should be focused correspondingly to the requirements.

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