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NUTRITION FOR BOVINE CALVES

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ABSTRACT

Sound calf feeding and management practices start with the mother, two months prior to calving. The majority of calf growth takes place during the last two months of gestation and the dam provides the nutrients required for growth. Also, the management practices of the dam affects the quality and amount of antibodies found in her colostrum, or first milk, which directly influences the calf health after birth. Calves should be reared carefully to obtain an optimum gain in body weight so that they attain about 70 to 75 percent of their mature body weight at puberty. Poor feeding of young calves leads to a higher age at first calving and higher mortality, thus an overall loss of productivity.

INTRODUCTION

Calves are born with little immunity against disease. They acquire resistance to disease from their dam through timely and adequate intake of high-quality .Initial protection of calf through Ig in colostrum colostrum i.e their mother's first milk. Colostrum is vital to the newborn calf because, it contains antibodies called immunoglobulins (IgG, IgM and IgA) which provide immunity. It is also rich in energy (carbohydrate, fat) and nutrients like Vitamins (A, D and E) and Minerals (Ca, Mg, Fe and P) that are essential for growth. Hormones (insulin) and growth factors (IGF-1) in colostrum also aid metabolism. The 3Qs of colostrum management i.e. Quality, Quantity and Quickly are required to be followed for better calf growth.

QUALITY

High-quality colostrum contains at least 50g / L of IgG and ensure cows are milked as soon as possible after calving so that the best possible colostrum is collected and fed to newborn calves. Three types of immunoglobulins (Ig) in colostrum are of utmost importance. Immunoglobulin G (IgG) makes up 70-80 percent of the immunoglobulins and helps identify and destroy invading pathogens. Immunoglobulin M (IgM) comprises 10-15 percent of immunoglobulins and serves as the first line of defence against septicaemia. Immunoglobulin A (lgA) comprises the remaining 15 percent of immunoglobulins in colostrum and protects the mucosal surfaces, such as the intestine, from invasive pathogenic bacteria.

Immune status of dam, length of dry period and dry cow nutrition are some major factors that affect IgG concentration in colostrum.

QUANTITY AND QUICKLY

To optimise immunity, the calf must receive their first colostrum (1 / 10 th of their body weight) feed as soon as possible after birth, ideally within two hours because the ability of calves to absorb Ig (immunoglobulins) fall drastically after 12 hours and is blocked at 24 hours of age. It also has laxative action and helps the calf in evacuating accumulated faecal matter (meconium).from intestine. Feeding colostrum to calves over several days is beneficial for building immunity and fighting against infections.

IMPORTANCE OF COLOSTRUM FEEDING

1) Provide passive immunity.
2) Laxative effect.
3) Antitrypsin action.
4) Excellent source of Vit A, D and E.
5) Excellent economic diet for both the neonates and older calves.
6) Contain antibacterial substances- lactoferrin, lactoperoxidase and lysozyme.

KEY POINTS TO BE REMEMBER

Feed appropriate quantity of good quality colostrum to calf as soon as possible after birth. Remember the major factors

• Quantity - 1 / 10 th of body weight
• Quality-contains at least plus/minus 50 * g / L * of lgG
• Quickly-within two hours of birth

WHOLE MILK FEEDING

The best measure of a successful calf rearing system is production of a healthy calf that has reached its targeted weaning weight. Traditionally, the recommendation to feed calves at 10% of body weight and then translated into feeding two litres of milk twice daily. Whole milk is the natural follow- on from colostrum. This does not provide growing calves with sufficient energy. Feed whole milk or a suitable milk replacer @10-15% of calf body weight to suffice the energy requirements.

CONSIDERATION WHILE FEEDING

1) Milk with high bacterial contamination, e.g. high SCC, risk of Johne's disease, Salmonella and E. coli should only be fed to calves after pasteurisation.

2) Milk from cows administered with antibiotics and still within the withdrawal period, should never be fed to calves as it can affect the milk taste leading to calves not drinking as much milk, with resultant lower weight gains. More importantly, bacteria that are resistant to these antibiotics can develop and if animals need to be treated with these antibiotics they may not work as effectively.
3) Teat feeding is more natural. Drinking from teat help calves satisfy their urge to suckle but artificial teat feeders can also be used.

MILK REPLACER

Milk needs of young calves can be replaced by milk replacer. During first three weeks of life, calves can be fed with milk replacer that contains all milk proteins made from dried skim milk or whey products and it is more economical than whole milk feeding. Milk replacer powders are reconstituted with warm water and make an excellent liquid feed for baby calves. Milk replacers should contain a minimum of 18 to 22% crude protein, 10 to 22% crude fat, and less than 0.5% crude fiber. Milk replacer has almost all the essential nutrients, similar to milk. It comprises of skim milk powder, soybean meal, edible oils, grains, vitamins, mineral mixture, preservatives, etc. (Table 2).

- **Advantages of using milk replacer**Reduces risk of disease transfer (e.g. Johne's disease and BVD).
- Consistency of product, when mixed correctly-l
- **Disadvantages of using milk replacer**Products with plant-based proteins have lower digestibility in calves under 3 weeks old.

SOURCES OF MILK REPLACER PROTEIN

- Milk-based (ex. dried skimmed milk, dried whey, delactosed whey, casein)
- Egg based
- Plant-based (ex. soya, wheat gluten, pea)

The new borne calf can digest protein in milk and 14 day onwards they are able to digest non-milk proteins. After four weeks of age microbes in the rumen may digest some feed.

OIL AND FAT

- Generally, vegetable fats (palm oil, coconut or soybean) have similar digestibility to milk fat in calves over three weeks old

FIBRE

- Fibre is an indicator of protein quality.
- Products with less than 0.15% fibre contain milk or egg
- Fibre levels over 0.20% indicate the inclusion of plant proteins

VITAMIN AND MINERALS

Calves require many of the same vitamins as monogastric, including vitamin K and the water- soluble B vitamins: thiamine, riboflavin, niacin, choline, biotin, pyridoxine, folic acid, B_{12} and pantothenic acid. These vitamins can be added in milk and milk replacer.

ASH

- Ash indicates the overall level of minerals
- The ash content should not be higher than 8%.

CALF STARTER

- At birth, the first three compartments of stomach I e. rumen, reticulum and omasum are undeveloped and do not aid in digesting feeds
- When the calf starts digesting calf starter (mixture of grains, protein source, vitamins and minerals) and water, the rumen starts to develop.
- Calf starter should be introduced from second week onward.
- Calf starter should be formulated to include palatable ingredients and to contain adequate protein, minerals, and vitamins.
- It should have C P(min) 23-26%, DCP (min) 18.8-19.5% and TDN (min) 75%.
- Feeding calf starter and good quality leguminous hay stimulate early development of rumen papillae essential for rumen function and favours digestion of large proportion of fodder at an early age.
- Calf starter ration should contain traditionally available highly palatable ingredients such as soybean meal, decorticated cotton seed meal, crushed maise, wheat bran, rice polish, molasses, skim milk powder, etc. After three weeks of eating calf starter, the rumen will have enough microbes to ferment the feed and supply the calf with energy.

Calf starter increases the number and variety of rumen bacteria and protozoa. These microorganisms grow rapidly on grain carbohydrates and produce volatile fatty acids i. e butyrate and propionate. These acids provide nutrients for calf and stimulate rumen development. Dietary requirements during early age are best met with high quality diets formulated from sources of carbohydrates, proteins and fats, having good digestibility. Proteins supply in calf helps in maintaining biological processes on daily basis, as well as germinal regeneration, enhance growth and form blood. Animal proteins, such as fish meal, are more valuable to calves than plant proteins because their amino acid makeup more closely matches those of the rapidly growing calf.

The followings should be considered while selecting calf starter:

PHYSICAL FORM

Select whole, coarsely ground, cracked, crushed, rolled, steam-flaked, or texturised grains. Do not feed high-moisture corn in a calf starter as it often heats and gets mouldy. Avoid dusty, mouldy or off-flavour feeds.

a) Pellet quality: Avoid pellets that are too hard or too soft; pellets at both extremes will affect intake.

b) Fines: Finely ground mixtures are not recommended as fine feeds tend to cake together when wet and deteriorate intake

c) Protein sources: Protein sources like, urea, raw soybeans and feather meal should be avoided. The inclusion of Vit. -B complex is necessary.

d) Molasses or molasses-based products: It can be included between 5 to 8 percent of total mixture because higher levels can adversely affect handling and storage, especially when bags become cold in the winter months.

e) Coccidiostats: Must be included to increase shelf life and viability.

Care should be given that After six months of age, calf starter should be replaced with calf growth meal which is more economical.

HAY FEEDING IN CALVES

The concentrate feed is significantly more important than the roughage to develop the calf's stomach but forages are a good source of fibre, which promotes the growth of muscular layer of the rumen and helps to maintain the health of rumen lining. In addition to starter, good quality forage should be offered from week onwards, little and often basis to ensure freshness and encourage intake. Amount should be increased gradually. The forage/hay should be of good quality and free of mould. Do not feed haylage or forages with protein levels exceeding 22 percent as these feeds can contain high levels of non-protein nitrogen. Young calves are not very efficient at processing non-protein nitrogen because the rumen is not fully functioning. Calves fed forages high in non-protein nitrogen will often scour and look unthrifty with symptoms similar to coccidiosis. Calves need small quantities of roughage-hay or straw. This is more important if feeding a pelleted ration. Avoid feeding too much as it can result in pot belly condition. There is a greater risk of this with overeating of hay. Where pot bellies (or hay bellies) are observed it indicates that the rumen is packed with hay which can't be digested properly,

WATER

- Water accounts for 70-75% of a calf's body weight. Water should be provided free-choice starting at four days of age.

- Feeding calves free-choice water increases starter intake and weight gain.
- As per reported study, calves deprived of drinking water decreased starter intake by 31% and decreased weight gain by 38% over those calves provided water free-choice.
- Providing warm water (16-18°C) during cold weather may stimulate starter intake.
- In hot weather, particularly in temperatures above 25° C the calf's water intake will increase to maintain hydration and normal body function.
- During periods of scours, dehydration will result in reduced feed intake, feed conversion and growth.
- Scouring calves will consume greater volumes of water so must be provided with continual access to water.
- By 20 days of age, water intake increases dramatically and in parallel with reductions in feeding of milk replacer and increasing starter intake.
- Calves require four times more water than feed (dry matter) or a water to feed intake ratio of 4:1 (kg basis).

It should be noted that for supplementation of electrolyte is often needed for calves to replace lost fluids, restore acid- base balance and furnish nutrients and energy to the calf with moderate to severe scours.

GROWTH RATE

Growth rate measurement of young calves provides useful information about how well they are growing. Indirectly it measures the efficiency of feed conversion. Meeting growth rate targets ensures maximum return on investment. Growth is at its most efficient in the first two months of life, so high growth rates should be targeted during milk feeding. Monitoring growth from birth can guide continual management improvements to ensure that every calf is pregnant recommended for cow health and calf's growth as well as daily weight gain.

BENEFITS OF RECORDING GROWTH

- Maximise growth efficiency cost-effectively.
- Identification of poor-performing and sick calves.
- Achieve targeted growth rates for breeding.
- Determination of Management status.

For growth calculation at least two measurements should have to be done. Initial weight (birth weight) of the calf should be recorded first as this figure provide a baseline against which average daily gain (also known as daily live weight gain, DLWG) is recorded.

EFFECTIVE DEWORMING OPTIMISES GROWTH

Deworming ensures the utilisation of nutrients for better and effective weight gain and improved immune status of calves. Worms like Ascaris and Toxocara vitulorum in addition to neonatal diarrhoea and pneumonia are major causes of calf mortality. Nematode infestation is commonly reported in India and Southeast countries hence special attention should be paid to effective prevention by following the prescribed deworming protocol. It is advocated to follow rotational deworming system to minimise parasitic resistance.

CONCLUSIONS

Enhanced colostrum intake and a subsequent biologically normal (intensive) milk feeding programme support body growth and organ development in dairy calves. Only providing traditional restricted feeding is detrimental to animal immunity, life-time performance and leaves calves hungry for long periods of time. This practise is therefore not consistent with animal welfare principles. Other contentious practices in the dairy industry, like early cow-calf separation and subsequent individual housing of the dairy calf are gaining increasing attention from the general public. Scientific evidence does not support the common opinion, that these practices are beneficial for the health of calf or cow. Profound changes in current calf management practices are needed to improve dairy calf health and survival, enhance long-time performance of dairy heifers and satisfy consumer interests in farm animal welfare.

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