Rev. Bras. Saúde Prod. Anim., Salvador, v.25, 01 - 19, 20240001, 2024
http://dx.doi.org/10.1590/S1519-994020240001

Animal Production and Environment
Received on: 18/01/2024
Accepted on: 01/03/2024

Management of buffalo calves

Manejo de bezerras bubalinas

SILVA, Yasmin Aparecida da[1]
http://orcid.org/0009-0000-9271-1720

SILVA-NETO, Carlos de Melo[3]
http://orcid.org/ 0000-0001-8624-3836

FERRO, Rafael Alves da Costa[2]
http://orcid.org/0000-0002-3722-1005

TOMAZELLO, Danilo Augusto[2]
http://orcid.org 0000-0001-8194-0181

FERRO, Diogo Alves da Costa[2]
http://orcid.org/0000-0001-5135-6734

FREITAS, Paulo Vitor Divino Xavier de[2]
http://orcid.org/ 0000-0003-2671-1030

[1]Universidade Tecnológica Federal do Paraná – UTFPR – PPZ - Campus Dois Vizinhos, Estrada Boa Esperança, km 4 – Zona Rural, Dois Vizinhos – PR, Brasil
[2]Universidade Estadual de Goiás – UEG, Campos Oeste, R. da Saudade, 56 - Vila Eduarda, São Luís de Montes Belos/GO, Brasil
[3]Instituto Federal de Goiás – IFG, Polo de Inovação, Goiânia - GO, Brasil
* Mail for correspondence: paulo.freitas@ueg.br

ABSTRACT

One of the main stages in bubalinoculture is breeding calves, because this phase is defined by the quality of the animals that will be the future property matrices. The breeding phase extends from birth to weaning, and is delicate and precise; consequently, attending to characteristics of extreme importance in dairy farming activity such as behavioral and health aspects will aid these animals to express all of their genetic potential. Since this life phase of the animal does not generate immediate economic return to the producer, it ends up not receiving the necessary attention, contributing to low zootechnical indices and high production costs. Adopting adequate management practices is essential for the productive development of the animal that will guarantee the future good productivity of the farm. In view of the above, the objective of this study is to present the management of buffalo calves through a literature review, emphasizing that proper feeding, correct management and disease prevention are fundamental to ensuring the well-being and health of calves. These factors, together with a clean and safe environment, can maximize the productive potential of these animals. It is therefore essential that producers are well-informed and prepared to properly care for these animals during this crucial phase of their lives.
Keywords: dairy activity; buffaloes; create; animal development.

RESUMO

Uma das principais etapas na bubalinocultura leiteira é a criação de bezerras, pois nesta fase é definido pela qualidade quais animais serão as futuras matrizes da propriedade. A fase de cria se estende do nascimento ao desmame, é delicada e precisa, consequentemente, atender as características de extrema importância na atividade leiteira como, aspectos comportamentais e sanitários, favorecendo com que esses animais expressem todo seu potencial genético. Devido ao fato dessa fase de vida do animal não gerar retorno econômico imediato ao produtor, ela acaba não recebendo a atenção necessária, contribuindo para índices zootécnicos baixos e custos de produção elevados. A adoção de práticas adequadas de manejo é essencial para o desenvolvimento produtivo do animal que garantirá no futuro a boa produtividade da fazenda. Diante do exposto, objetivou-se apresentar, por meio de revisão de literatura, o manejo de bezerras bubalinas, ressaltando que a alimentação adequada, o manejo correto e a prevenção de doenças são fundamentais para garantir o bem-estar e a saúde das bezerras. Esses fatores, juntamente com um ambiente limpo e seguro, podem maximizar o potencial produtivo desses animais. Portanto, é essencial que os produtores estejam bem informados e preparados para cuidar adequadamente desses animais durante essa fase crucial de suas vidas.
Palavras-chave: atividade leiteira; búfalos; cria; desenvolvimento animal.

INTRODUCTION

The buffalo (*Bubalus bubalis*) was originally introduced in small quantities in the northern region of Brazil at the end of the 19th century to be used for towing. These animals were imported from Asia and Europe (BERNARDES, 2006).

Buffalo farming began to gain notoriety around 1980, a period in which its zootechnical indexes became known, especially in less fertile soils in areas which made the growth of cattle farming impossible (BORGHESE, 2005).

With the increase in exploring buffalo characteristics, it was observed that these animals had the potential to be introduced into areas used for cattle farming, and were in turn started to be used for milk and meat (BERNARDES, 2007).

Based on current data from the Brazilian Institute of Geography and Statistics (2021), the Brazilian buffalo herd is around 1.5 million animals, distributed across all five regions, with breeding predominating in the North of the country.

Dairy buffalo farming is an activity which has become popular worldwide in recent years, mainly due to the milk characteristics which has a higher protein and fat content compared to buffalo milk, thus becoming the second most exploited milk in the world. These characteristics make buffalo milk a raw material for producing high-value-

added derivatives (DOMENICO & MOTTA, 2022).

The future of success in the dairy industry is linked to the management of animals, which despite being rustic and easily adapted to different conditions and locations, need care, especially in the early stages of life. Calf management in the breeding phase in particular plays an important role in the development of the dairy sector. Although they are the future of livestock farming, calves are often neglected in daily management as they do not offer immediate capital returns to the producer, but care for this phase of the animal's life is essential (KHARKAR et al., 2019).

As the performance of buffalo dairy tomorrow is a reflection of today's breeding, the necessary care for buffalo calves is essential, providing adequate management, nutrition and health at this stage of life, ensuring successful production and the sustenance of the dairy industry (SIDDHAPARA et al., 2022).

In view of the above, the objective of this study was to gather theoretical support via a literature review on the management of buffalo calves, emphasizing their applications in the practical field.

DEVELOPMENT

Buffalo dairy farming in Brazil

According to the Brazilian Association of Buffalo Breeders (*Associação Brasileira de Criadores de Búfalos* - ABCB), the introduction of buffaloes in Brazil occurred in 1890 through Dr. Vicente Chermont de Miranda, who purchased some buffaloes of the *Carabao* breed for Marajó Island. These buffaloes belonged to fugitives from French Guiana who were shipwrecked on the coasts of the Island (ABCB, 2023).

Four buffalo breeds are currently recognized by the ABCB, namely *Carabao*, *Jafarabadi*, *Mediterranean* and *Murrah*. They are known for their triple aptitude (meat, milk and work production), in addition to showing rusticity, high docility, resistance and good adaptability (VIEIRA et al., 2011). According to ABCB (2023), *Murrah* is the most abundant breed in Brazil and is a great investment for those who want to produce mozzarella, with milk production of around 1,650 liters measured in 305 days.

According to data from FAO (2020), dairy buffalo farming in Brazil produces around 14% of the milk consumed in the country. This is a sector with great potential in the dairy market, as buffalo milk has attractive qualities, including its white color obtained due to the low concentration of carotenoid pigments and a slightly sweet flavor (BORGHESE, 2013).

In addition to visual and palatable parameters, buffalo milk has unique characteristics, presenting higher mineral and protein levels when compared to cow's milk, as shown in Table 1, making it important for human health (SILVA et al., 2021).

Another important factor is that there is a beta-casein variant of type A2 in the

composition of buffalo milk and not type A1, thus producing a smaller amount of beta-casomorphin-7. Histidine is established in the A1 variant that occupies position 67 of the beta casein chain, which benefits the release of BCM-7 during the enzymatic digestion process, and constitutes a fact that does not occur in the A2 variant, as histidine is replaced by proline and the release of beta-casomorphin-7 is not produced, or occurs in insignificant quantities (shown in Figure 1), resulting in milk production which is easier to digest (JIANQIN et al., 2016).

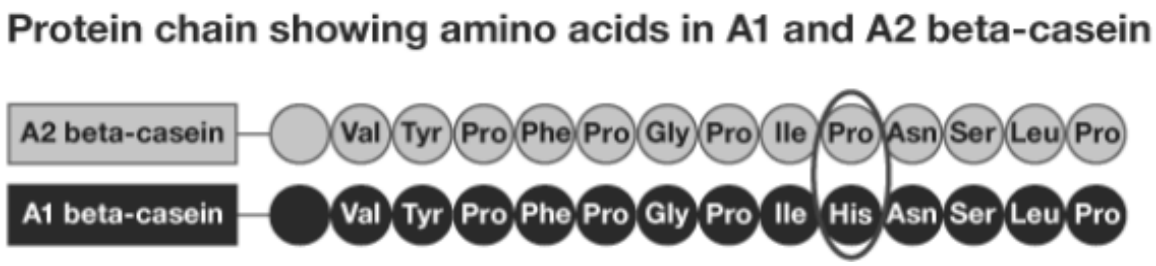

Figure 1 – Difference between A1 and A2 beta variants – milk casein
Source: WOODFORD, (2007).

Table 1. Chemical composition of cow milk and buffalo milk.

Milk components	Cow milk	Buffalo milk
Proteins (%)	3.70	4.50
Fat (%)	3.68	8.16
Lactose (%)	4.70	4.90
Water	88.00	83.00
Ashes (%)	0.70	0.70
Total dry extract (%)	12.00	17.00
Vitamin A (U.I)	185.49	204.27
Phosphorus (mg)	82.00	120.00
Calcium (mg)	107.00	180.00
Iron (mg)	0.07	0.12
Total cholesterol (mg%)	319.00	214.00

Source: Adapted from (VERRUMA & SALGADO, 1994).

Buffalo milk has already gained a prominent place in the dairy market through its physical and chemical characteristics, mainly through the development of its derivatives which add a lot of value to the milk. Products such as ricotta, yogurt, dulce de leche, cottage and fresh cheese, butter, cream cheese, provolone cheese and the traditional buffalo mozzarella are already found on the consumer market (DADARIO et al., 2018).

Management of buffalo calves

Raising calves is one of the many challenges faced by the dairy industry that most farms neglect, with the false belief that as little money as possible should be spent on these animals because they are not in their production phase (TEIXEIRA et al., 2017).

However, the calves have crucial value given that they will be future replacement matrices as they come from the farm's genetic improvement programs. Therefore, care for calves from birth to weaning is extremely necessary, as it is at this stage that the highest mortality rate occurs (COELHO, 2009).

Inadequate management during this period can increase the length of service and even the age at first birth, which will directly affect the production cost of this animal when replaced. It is important to highlight that failures during this period also negatively contribute to the development of productive potential, directly affecting the entire milk production chain (OLIVEIRA et al., 2019).

Contrary to popular belief, care for calves begins even before they are born. Therefore, it is necessary that the people involved in management are qualified and bear in mind the importance of care in the pre-partum period and during the period after birth until weaning for a good result and so that failures do not occur and harm animal growth (OLIVEIRA et al., 2005; SILVA, 2017).

Gestational and pre-delivery period

The buffalo species has striking characteristics such as rusticity and adaptability, as well as reproductive efficiency. Buffaloes can produce and reproduce up to 20 years of age, with a birth rate of more than 80% and a mortality rate of less than 3% per year (MOREIRA et al., 1994). According to Pereira et al. (2007), although buffaloes have a longer reproductive life, they reach puberty later than cattle, showing their first estrus between 15-18 months of age.

Buffalo pregnancy lasts around ten months, or 315 days on average (FONSECA, 1986). These animals have a birth interval of approximately 361 days, however this period can change depending on the reproductive biotechnologies involved and environmental factors (MORAES et al., 2014). One of the peculiarities of this species is that they are seasonal polyestrous with short days, but they can be in heat all year round in the equatorial zone (CAMPANILE et al., 2010).

The first care for the calf begins before birth in the pre-partum period, a delicate phase due to the fetus development and colostrum production by the buffalo's mammary glands (TAO & MONTEIRO, 2016).

This period can also be called the dry period, comprising the last 60 days of pregnancy, when milking stops and the animal is not producing. Buffaloes rest at this stage and prepare their mammary gland for the next lactation (CAIXETA & CARMO, 2020).

The colostrogenesis process takes place during the last week of pregnancy (colostrum production), where antibodies (igG) are transferred to the mammary gland. The mammary gland undergoes cell renewal during this period, making rest between lactations a key factor for the buffalo to produce quality colostrum in good quantity (CARVALHO et al., 2017).

In addition to the dry period, a vaccination strategy during pregnancy is essential to both prevent diseases in buffaloes and to increase specific antibodies that will guarantee passive immunity in calves after ingestion of colostrum. It is very important to vaccinate against *Salmonella* sp and *Pasteurella haemolytica* during the dry period, as these pathogens are the main causes of diarrhea and respiratory problems in newborn calves (BITTAR et al., 2018).

Reproductive vaccines must be present in the form of a vaccination protocol and not only aim at the health of the buffalo, but also at the development of the calf. The main ones are: against Infectious Bovine Rhinotracheitis, Bovine Viral Diarrhea, Campylobacteriosis and Leptospirosis (FISCHER, 2018).

When the buffalo is close to giving birth in the final days of pregnancy, it is recommended that it be transferred to a paddock/pasture where it has easy access to food and water, that the place is dry and shady, cozy and free from cold so that the birth can happen smoothly (CALDATO, 2019).

Birth is a critical event which can compromise the well-being of the mother and the calf, therefore adequate monitoring is necessary to prevent complications and progression to a dystocic birth. For this, it is essential to identify the beginning of labor (NAPOLITANO et al., 2020).

The main signs of pre-partum in buffaloes include: enlargement of the udder (more noticeable in primiparous females), the effect of which is noticeable during the two to three days prior to parturition through visualizing tense mammary veins; edema of the vulva (appears very flaccid) during the 24 to 36 hours before birth, and the occurrence of watery diarrhea that resolves after birth (DAS et al., 2013).

First care for the newborn

The neonatal period is a phase of extraordinary importance in the lives of calves, and lasts until 30 days of age. After birth, calves are exposed to extrauterine life and need to adapt to numerous physiological changes. Certain care is necessary for the animal to have good health and good development (SOARES, 2020).

Colostrum

Buffaloes have syndesmochorial placentas, which prevent the passage of antibodies from the mother to the fetus. Therefore, calves are vulnerable at birth, being agammaglobulinemic or hypogammaglobulinemic with little or no transplacental passage of immunoglobulins (SOUZA et al., 2019).

The immune system needs to be guaranteed in the first days of life by the absorption of colostral immunoglobulins to ensure passive protection against infectious diseases (diarrhea, respiratory diseases, etc.) and for the health and future growth of the animal (WOODING et al., 1997).

Newborn calves need nutrients such as fat, proteins, vitamins, minerals, lactoferrin, immune cells, cytokines and immunoglobulins (Ig) to promote healthy growth (ZARCULA et al., 2010). The average chemical composition of buffalo colostrum is presented in Table 2.

Table 2. Chemical composition of buffalo colostrum.

Nutrient	Mean
Fat (%)	11.31
Protein (%)	8.73
Lactose (%)	3.73
Total solids (%)	25.31
Ashes (%)	0.94
pH	6.01

Source: Adapted from (COROIAN et al., 2013).

The composition of colostrum is variable and depends on many factors, such as the time elapsed since birth, parity (primiparous females have different immune content), age of the animal, feeding during the dry period and the dry period duration of the buffaloes (WERNER, 2003).

Colostrum contains insulin-like growth factors (IGF-1 and IGF-2) in high quantities, improving the gastrointestinal tract development and function in the newborns, in addition to stimulating the growth of the animal's tissues and body (PENCHEV, 2008). Another function of colostrum is to be a laxative, as it allows the animal to begin to form its immunity by contributing to adequate expulsion of meconium (DAS et al., 2015).

Colostrum also has the function of helping with thermoregulation for the survival of newborns; for example, in studies by Silva et al. (2021), newborn calves fed higher colostrum volumes exhibited increased thermoregulatory responses, better growth performance and immunity.

It is important to emphasize that calves need to consume colostrum soon after birth, given that the animal's ability to absorb immunoglobulins from colostrum decreases from six hours after birth, and the antibodies that are transmitted through colostrum can protect the calf for up to six weeks. During this period, the animal comes into contact with infectious agents in the environment which gradually stimulate the development of its immune system (PUPPEL et al., 2019).

Navel care

The navel is a structure responsible for communication between mother and fetus during pregnancy. Maternal blood carries oxygen and nutrients to the fetus through the umbilical cord, and eliminates the catabolites generated by the fetus (TEIXEIRA, 2018).

The umbilical cord anatomically consists of three important structures: the arteries, which act as those responsible for the calf's blood circulation, the vein that communicates with the liver, and the urachus that connects with the bladder. The umbilical cord is cut at birth, the arteries, veins and urachus are retracted and positioned close to the abdominal wall, while the skin that connects these structures does not retract, forming the umbilical stump. The umbilical stump represents a gateway for disease-causing agents (SIGNORETTI, 2018).

The animal's umbilical cord must be inspected immediately after birth and cut if it is long, so that it is no more than ten cm long, followed by aseptic treatment with 10% iodine solution on the first day of life and the following days until the umbilical cord is completely mummified (PAULA & RODRIGUES, 2020).

If the navel is not treated immediately after birth, it can cause serious complications characterized by infection with a systemic inflammatory response. Umbilical infections can be related to the environment, health, trauma and congenital factors. They can cause hernias, persistent urachus and neoplasms, caused by infectious or non-infectious bacteria. There are also abdominal problems such as omphalophlebitis, omphaloarteritis, urachitis, omphaloarteriophlebitis, or umbilical panvasculitis (TEIXEIRA et al., 2021).

Weighing and identification

Weighing is the main tool for nutritional adequacy and checking animal weight gains. The first weighing must be done shortly after birth using a scale (NASCIMENTO, 2019).

Individual identification of animals is an important step in any registration system and must be done as quickly as possible, preferably during the first days of the calves' life or after birth. To do this, a code is assigned identified by a combination of letters, numbers or both, which must be unique for each animal (CAIXETA & CARMO, 2020).

The identification process must be performed by a properly trained team, minimizing the animal's suffering. Furthermore, it must be carried out in suitable facilities and equipment in good working order. Advance planning allows for greater security in carrying out the operation (SCHMIDEK et al., 2009).

Management in the first months of life

The management of calves continues after birth in order to reduce the morbidity and mortality rates of the animals. It is essential to implement adequate hygiene and feeding practices in these first months, which will guarantee the success of raising calves. (COSTA, 2006).

Food management

The digestive system of ruminant animals at birth, as in the case of buffaloes, is physiologically similar to that of monogastric animals. There is stimulation of the glossopharyngeal nerve, a tubular channel called the esophageal gutter, through which swallowed milk is delivered directly from the esophagus to the abomasum, so that the abomasum is the only fully developed and functional stomach. As a result, only liquid feed can be effectively used by pre-ruminant calves a few days old (WATTIAUX, 2011).

The anatomical, physiological and metabolic changes that occur in the pre-ruminant digestive system are characterized by the transition from monogastric to ruminant digestion. Each of these changes can be accelerated or altered by changing the diet to which these animals are exposed. Later, when the calf begins to consume solid foods, they first pass through the rumen, causing anatomical and physiological changes in the pre-stomachs (CHURCH, 1974).

Liquid diet

After providing colostrum, transitional milk must be provided for at least two days, as although it no longer has immunological function, it has greater nutritional value than regular milk. Transition milk is the milk secretion produced by buffaloes during the transition from colostrum to marketable whole milk (SILVA et. al., 2014).

The consumption of solids in the first days of life is low or none, therefore the nutrients necessary for the calves' development are provided by the liquid diet, obtained from milk or milk replacer (AZEVEDO et al., 2016).

It is recommended to provide whole milk or its milk substitute for eight to 12 weeks at a temperature of 39ºC, divided into meals (AZEVEDO et al., 2016). According to Bittar et al. (2018), the greater the number of meals, the better, as the ingestive behavior will be closer to natural when the calf remains with its mother.

The liquid diet can be offered in two ways: natural or artificial breastfeeding. In natural breastfeeding, the calf feeds directly from the buffalo's udder through breastfeeding, and can feed from its own mother or from wet nurses (buffaloes that have mastitis or that for some other reason cannot be milked). In artificial breastfeeding, animals receive a liquid diet in buckets (with or without nipples), bottles or automatic breast feeders (SILVA, 2018).

The globally adopted recommendation establishes that liquid diet provision should be restricted to approximately 10% of the calf's live weight, aiming to induce the consumption of a solid diet (concentrate, forage) which will allow early weaning and reduce the cost of food (AZEVEDO et al., 2016).

Solid diet

Providing a solid diet during breastfeeding is important for rumen development. Forage in particular favors an increase in size and concentrates favor the growth of rumen

papillae, where nutrients are absorbed (OLIVEIRA et al., 2015).

Concentrated foods can be provided from the first week of life using crumbled, textured and pelletized concentrates, as their physical form can affect preference and palatability (SUÁREZ, 2018).

The following can be highlighted regarding the composition of energy concentrates: corn, rice, wheat, barley, sorghum and oats as the main sources. Soybean meal is the most used source when it comes to protein concentrated foods, however other foods such as cottonseed meal and linseed are also consumed. The use of non-protein nitrogen sources such as urea is not recommended for calves up to three months of age (FERREIRA et al., 2020).

Bulky food that is rich in fiber must be provided for the animals' free consumption, as they regulate the amount to be ingested. The forage offered to calves is generally legumes or grasses, with legumes being better degraded than grasses and having a higher starch content and a higher fermentable organic matter content (ROCHA et al., 2020).

Health management

Although the buffalo is a species that easily adapts to adverse environments, there are essential precautions to be taken. These animals are susceptible to a wide variety of diseases, so good health management is essential to obtain good results (HIMMAT et al., 2013).

For their bodies to grow effectively, it is necessary to adopt measures to control the various diseases arising from bacteria, viruses and parasites which affect calves and their health, resulting in productive and economic losses (KHAN et al., 2007).

Calves can be hosts to lice (*Haematopinus tuberculatus*), a parasite whose complete cycle occurs in the animal's body. This causes skin irritation, itching, and local scarring. Animals with severe infestations become restless, followed by weight loss and anemia characterized by pale mucous membranes. One way to identify whether the animal is infested or not would be to examine its tail, where it is possible to find adult lice or nits (SHRIVASTAVA et al., 2013).

Two sprays using organophosphate insecticides and pyrethroids with an interval of 15 to 18 days can be used as a form of treatment, which provide satisfactory control, or injectable medications can be applied, such as avermectin, which has good results (MARAFON & LOURENÇO, 2022).

Scabies is a skin disease caused by mites of the *Sarcoptes* and *Psoroptes* genera, which can affect calves. Affected animals present spots on their coats, itching and hair loss (MARQUES, 2000). Topical products based on pyrethroids and formamidine can be used for treatment, or medications based on avermectin are also recommended (LÓPEZ et al., 2022).

Gastrointestinal worms are one of the main problems which affect calves, and

are similar to bovine worms, namely: *Haemonchus spp, Ostertagia spp, Trichostrongylus spp, Cooperia spp, Bunostomum spp, Strongyloides spp, Nematodirus spp, Toxocara spp, Oesophagostomum spp* and *Trichuris spp*. Affected animals present anorexia, bristly and dull hair, weight loss, diarrhea, runny nose and watery eyes (CHO & YOON, 2014).

It is recommended to deworm calves 15 days after birth to prevent and treat gastrointestinal worms, repeating at 30, 60, 180 and 360 days after birth. The medications used must be based on albendazole and ivermectin (BASTIANETTO et al., 2008).

Pneumoenteritis is a bacterial disease found in newborns caused by the etiological agent *Salmonella* ssp., causing fever, weakness, diarrhea and weight loss. The condition can progress to pneumonia or a more serious illness when not treated correctly. Animals are infected via the digestive route and rarely via the umbilical route, making it important to maintain sanitary management and hygiene of the facilities, and to carry out navel healing properly (DAMÉ, 2019).

Calves can be born sick, and so as previously mentioned, buffaloes must be vaccinated in the last month of pregnancy and newborns at 15 days of birth for prevention, repeating the application after 30 days (FERREIRA et al., 2021).

Table 3. Annual calendar for controlling and preventing diseases that affect buffalo calves.

Diseases	Recommendations	Period
Ectoparasites (lice and scabies)	Use of insecticides	Period of greatest occurrence and rainy season
Endoparasites (gastrointestinal worms)	Deworming at 15, 30, 60, 90 and 180 days of age	After 180 days, carry out strategic control
Pneumoenteritis	Calves vaccinate at 15 days of age and revaccination after 30 days	Whole year
Foot and mouth disease	Vaccinate the entire herd	According to the Agricultural Defense calendar
Clostridiosis	Vaccinate at 90 days of age and revaccinate after 30 days	Whole year
Rabies	From the 4th month of age. Repeat annually	Annually
Brucellosis	Vaccination for buffaloes aged 3 to 8 months	May and November

Source: Adapted from (FIGUEIRÓ & SARAIVA, 2018).

In addition to these main diseases already mentioned, there are others that can affect calves, so implementing preventive measures within the property becomes essential. Therefore, the annual disease control and prevention calendar, shown in table 3, must be followed to reduce economic losses (BITTAR et al., 2018).

Weaning

The transition from monogastric to polygastric in ruminants occurs in three phases; the first lasts until the third week of life, when the diet is predominantly liquid. As soon as the calf begins to receive a significant amount of concentrate, it enters the second phase, which lasts until weaning. Then, the third phase begins from the moment weaning is carried out, which will last the entire life of the animal; this phase involves the fermentation of carbohydrates, their main energy source, and microbial biomass, the main source of amino acids (TEIXEIRA et al., 2017).

Defining the ideal time to wean and carrying it out correctly is essential to ensure that the gains obtained during the breastfeeding phase are maintained. The calf may lose weight and present immunological compromise due to the stress caused at this stage, compromising the gains initially obtained (WINDEYER, 2014).

According to Ferreira et al. (2020), there are basically three criteria used for weaning calves: the age, where the animal must be at least two months old; weight, where birth weight should be doubled during breastfeeding; and the consumption of concentrate. It is essential that the animal consumes a minimum amount of concentrate, which is related to their rumen development. If the animal is weaned before the ideal amount, it is likely that its rumen is not developing properly, which will reduce its potential for post-weaning weight gain.

It is recommended that the minimum consumption for weaning is around 1.5% of birth weight. This minimum consumption should not be evaluated just once, as the consumption of concentrated feed for calves is highly variable, so it is necessary to evaluate it three days in a row (SILVA, 2018).

Another determining factor in preventing weight loss and a reduction in the animal's growth and development rates when weaning is carried out is the consumption of forage. This consumption physically stimulates the rumen wall, increasing its volume and muscle development (ZITNAN et al., 1998).

FINAL CONSIDERATIONS

The first phase of a calf's life is extremely important for it to grow healthily. With the introduction of

correct management practices in raising calves, it is expected that the health status will be improved and the mortality rate reduced, resulting in greater profit for the rural producer, as these animals will be the next generation of the herd, the future in milk production. The development of calves is influenced by several factors, and the first care for the newborn, including pre-partum, makes all the difference in the health and quality of life of these animals, the adoption of care practices, adequate management, trained staff, good facilities, combined with animal welfare, will make a difference in the long term. The balance of these factors contributes to reducing costs and improving productivity.

REFERENCES

ASSOCIAÇÃO BRASILEIRA DOS CRIADORES DE BÚFALOS (ABCB). **O Búfalo**. Disponível em: https://bufalo.com.br/o-bufalo/. Acesso em: 16 mar. 2023;

AZEVEDO, S. R. B.; SILVA, J. C. S.; AZEVEDO, C. C. F. B.; CAVALCANTE, M. F. M. Manejo alimentar de bezerras leiteiras. **Diversitas Journal**, v. 1, n. 1, p. 100-112, 2016;

AZEVEDO, R. A. A.; COELHO, S. G.; LAGE, C. F. A. Dieta líquida para bezerros leiteiros. **Cadernos Técnicos de Veterinária e Zootecnia.** Edição da

FEPMVZ, nº 81, 45 p, junho de 2016;

BASTIANETTO, E.; FREITAS, C. M. V.; BELLO, A. C. P. P.; CUNHA, A. P.; DALLA ROSA, R. C.; LEITE, R. C. Primeiro diagnóstico de Eimeria bareillyi (Apicomplexa: Eimeridae) nas fezes de bezerros bubalinos (Bubalus bubalis) naturalmente infectados no estado de Minas Gerais, Brasil. **Revista Brasileira de Parasitologia Veterinária**, v. 17, Supl. 1, p. 234-238, 2008;

BERNADES, O. **O búfalo no Brasil**. Encontro de Búfalos das Américas, Medellín, Colombia, p. 14-19, 2006;

BERNARDES, O. Bubalinocultura no Brasil: situação e importância econômica. **Revista Brasileira de Reprodução Animal**, Belo Horizonte, v.31, n.3, p.293-298, 2007;

BITTAR, C. M.; PORTAL, R. N.; PEREIRA, A. C. **Criação de Bezerras Leiteiras**. Piracicaba - SP: ESALQ/USP, 2018;

BORGHESE, A. Buffalo Production and Research: Reu technical series. **Roma: FAO**, v.67, p.1-315. 2005;
BORGHESE, A. Buffalo livestock and products in Europe. **Buffalo Bulletin**, v. 32, n. 1, p. 50-74, 2013;

CAIXETA, D. G.; CARMO, J. P. CRIAÇÃO DE BEZERROS NEONATOS: manejo e bem estar. **Scientia Generalis**, v. 1, n. 3, p. 92–103, out. 2020;

CALDATO, E. M. R. **Manual técnico de construção e manejo de Compost Barn para búfalas leiteiras.** Dissertação (Mestrado em Zootecnia)- Viçosa: Universidade Federal de Viçosa, 2019;

CAMPANILE, G.; BARUSELLI, P. S.; NEGLIA, G.; VECCHIO, D.; GASPARRINI, B.; GIMENES, L. U.; ZICARELLI, L.; D'OCCHIO, M. J. Ovarian function in the buffalo and implication for embryo development and assisted reproduction. **Animal Reproduction Science**, v. 121, p.1-11, 2010;

CARVALHO, L. T.; CUNHA, A. F.; COELHO, K. S.; FONTES, T. O. M.; VIVENZA, P. A. D. l. **Influência do período seco no volume de colostro produzido por búfalas leiteiras**. ANAIS IX SIMPAC 411. Revista Científica Univiçosa - Volume 9- n. 1. **Anais...**Viçosa-MG: dez. 2017;

CHO, Y. I.; YOON, K. J. An overview of calf diarrheainfectious etiology, diagnosis, and intervention. **Journal of veterinary science**, v. 15, p. 1-17, 2014;

CHURCH, D. C. **Fisiologia digestiva y nutricion de los rumiantes**. Zaragoza: Editorial Acríbia, 1974;

COELHO, S. G. **Desafio na criação e saúde de bezerras.** CONGRESSO BRASILEIRO DE BUIATRIA, 2009, Belo Horizonte, **Anais...**, Belo Horizonte: [s.n] 2009.p.1-16, 2009;

COROIAN, A.; ERLER, S.; MATEA, C. T.; MIREȘAN, V.; RĂDUCU, C.; BELE, C.; COROIAN, C. O. Seasonal changes of buffalo colostrum: Physicochemical parameters, fatty acids and cholesterol variation. **Chem. Central J**. v, 7, 2013;

COSTA, M. J. R. P. **Boas práticas de manejo Bezerros ao nascimento**, Funep, Jaboticabal, São Paulo, 2006;

DADARIO, N.; SANTINI PIGATTO, G. A.; BAPTISTA, R. D. O processo de inovação na produção de leite de bubalinos: um destaque de caso no município de Queiroz/SP. **Revista Brazilian Journal of Biosystems Engineering**, São Paulo, n. 1, v. 12, p. 77 - 90, 2018;

DAMÉ, M. C. F. **Sanidade de bubalinos no extremo sul do Brasil**. Pelotas: Embrapa Clima Temperado, 2019;

DAS, G.; KUMAR, A.; DANGI, S.; KHAN, F. Parturition and puerperium in the buffalo. **Bubaline Theriogenology**. International Veterinary Information Service, Ithaca, 2013;

DAS, L.K.; BEHERA, S. Colostrum: A wonder nutrition for newborn calves of cattle and buffaloes**. Indian Farmer**. v. 2, n. 3, p. 165-170, 2015;

FERREIRA, F. C.; SALMAN, A. K. D.; CRUZ, P. G. Criação de bezerras

leiteiras. **Embrapa**, Rondônia, p. 235-255, 2020;

FERREIRA, J. D. N. P.; MATOS, L. B.; RIBEIRO, L. F. CONDENAÇÃO DE CARCAÇAS DE BÚFALOS (Bubalus bubalis) POR TUBERCULOSE BOVINA: REVISÃO DE LITERATURA. **Revista GeTeC**, v. 10, n. 28, 2021;

FIGUEIRÓ, M. R.; SARAIVA, N. Z. Principais estratégias de manejo sanitário na bubalinocultura. 2018. **Embrapa**, Belém. Disponível em: https://ainfo.cnptia.embrapa.br/digital/bitstream/item/185685/1/DOCUMENTOS-439-AINFO.pdf. Acesso em: 16 maio 2023;

FISCHER, G.; RODRIGUES, R.; PAPPEN, F. G.; ZANELA, M. N.; RIBEIRO, M.; ALMEIDA, L. L.; PRADIEÉ, J. Principais doenças da bovinocultura leiteira. In: **BIOSSEGURIDADE NA BOVINOCULTURA LEITEIRA**. 1. ed. Pelotas - RS: Embrapa, 2018. p. 13–27;

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS (FAO). Disponível em: http://fenix.fao.org/faostat/internal/en/#data/QA. Acesso em: 15 abr. 2023;

FONSECA, W. O búfalo, sinônimo de carne, leite, manteiga e trabalho. **Ícone, coleção Brasil Agrícola**, São Paulo, p. 47-48, 4. Ed, 1986;

HIMMAT K.; KHADDA B.S.; KALASH, P. Analysis of factors affecting calf mortality in a herd of Surti buffaloes up to AFC. J. Progress. **Agri**, v. 4, p. 78-81, 2013;

INSTITUTO BRASILEIRO DE GEOGRAFIA E ESTATÍSTICA (IBGE). **Censo Pecuária de 2021**. Rio de Janeiro: IBGE, 2022;

JIANQIN, S.; LEIMING, X.; LU, X.; YELLAND, G. W.; NI, J.; CLARKE, A. J. Effects of milk containing only A2 beta casein versus milk containing both A1 and A2 beta casein proteins on gastrointestinal physiology, symptoms of discomfort, and cognitive behavior of people with self-reported intolerance to traditional cows' milk**.** **Nutrition journal**, 15, 1-16, 2016;

KHAN, Z. U.; KHAN, S.; AHMAD, N; RAZIQ, A. Investigation of mortality incidence and managemental practices in buffalo calves at commercial dairy farms in Peshawar city. **Biolog. Sci**, v. 2, p. 6-21, 2007;

KHARKAR, K. P.; RAGHUWANSHI, D. S.; THAKRE, P. D.; LENDE, S. R.; KHATI, B. M. Effect of non-genetic parameters on mortality pattern in nagpuri buffalo calves. **J. Anim. Health Prod,** v. 7, n. 1, p. 1-4, 2019;

LÓPEZ, B. C. T.; GARCÍA, F. U.; MONTOYA, M. X. M.; VALENCIA, N. M. D. P. C.; VÁSQUEZ, N. R.; SILVA, J. A. F. Mycobacterium avium subsp. paratuberculosis (MAP) en un

hato lechero de búfalos en Colombia. **Revista MVZ Córdoba**, v. 27, n. 1, p. 9, 2022;

MARAFON, A.; LOURENÇO, W. CRIAÇÃO DE BÚFALOS: CARACTERÍSTICAS, PRODUÇÃO, VANTAGENS E DESAFIOS DO MERCADO. **Revista Alomorfia**, v. 6, n. 4, p. 548-561, 19 dez. 2022;

MORAES, C. N.; MAIA, L.; LANDIM-ALVARENGA, F. C; OBA, E. Considerações a respeito do pós parto em bovinos. **Veterinaria e Zootecnia**, v. 21, p. 53-63, 2014;

MOREIRA, P.; COSTA, A. L.; VALENTIM, J. F. Comportamento produtivo e reprodutivo de bubalinos mestiços Murrah-mediterrânio em pastagem cultivada de terra firme, no estado do Acre. **Folheto Embrapa**, Acre, v. 13, p. 19, 1994;

NAPOLITANO, F.; MOTA-ROJAS, D.; MARTÍNEZ-BURNES, J.; ROSA, G.; HUFANA-DURAN, D.; BRAGHIERI, A.; ORIHUELA, A. Perinatología y ginecobstetricia de la búfala de agua. **El búfalo de agua en Latinoamérica, hallazgos recientes**. 3.ed. México: BM Editores, 2020;

NASCIMENTO, G V. Avaliação da eficiência do uso da fita métrica para estimativa do peso corporal em bovinos Curraleiro Pé-Duro. **Brazilian Journal of Development.**, Curitiba, v. 5, n. 9, p. 16470-16478, sep. 2019;

OLIVEIRA, M. D. S.; SILVA, T. M; ARTONI, S. M. B.; CRUZ, C. Desempenho alométrico do trato gastrintestinal de bezerros de raça holandesa alimentados com diferentes dietas líquidas durante o aleitamento. **Acta Scientiarum Animal Sciences**. V.26, n.4, p. 493-499, 2015;

OLIVEIRA, S. M. F. N.; SILVA, B. T.; LEITE, S. B. P.; MORI, C. S.; GOMES, V. Avaliação de diferentes métodos para estimar qualidade do colostro e transferência de imunidade passiva (TIP) em bezerras Holandesas. **Revista Acadêmica Ciência Animal**, p. 17, 2019;

OLIVEIRA, A. A.; AZEVEDO, H. C.; MELO, C. B. Criação de Bezerras em Sistemas de Produção de Leite. **Embrapa**, Aracajú, p. 1-8, 2005. Disponível em: http://www.infoteca.cnptia.embrapa.br/infoteca/handle/doc/888547. Acesso em: 21 abr. 2023;

PAULA, M.R.D.; RODRIGUES, D.D.C. **Guia de criação de bezerras leiteiras**. [Ebook: Criação de Bezerras leiteiras], p.52. 2020;

PENCHEV, G. I. Differences in chemical composition between cow colostrum and milk. **Bulg. J. Vet. Med**. n. 1, p. 3−12, 2008;

PEREIRA, R. G. A.; TOWNSED, C. R.; COSTA, N. L.; MAGALHÃES, J. A. Eficiência reprodutiva de búfalos. **Embrapa**, Rondônia, 2007. Disponível

em: http://ainfo.cnptia.embrapa.br/digital/bitstream/CPAF-RO-2010/12418/1/doc123-bufalos.pdf. Acesso em 10 abr. 2023;

PUPPEL, K.; GOŁĘBIEWSKI, M.; GRODKOWSKI, G.; SLÓSARZ, J.; KUNOWSKA-SLÓSARZ, M.; SOLARCZYK, P.; ŁUKASIEWICZ, M.; BALCERAK, M.; PRZYSUCHA, T. Composition and factors affecting quality of Bovine Colostrum: A Review. **Animals**. v. 9, n. 12, p. 1070, 2019;

ROCHA, D. T.; CARVALHO, G. R.; RESENDE, J. C. Cadeia produtiva do leite no Brasil: produção primária. **Embrapa**, Juiz de Fora, p. 3-3, 2020;
SCHMIDEK, A.; DURÁN. H.; COSTA, M.J.R.P. Boas Práticas de Manejo. Jaboticabal: **Funep**, 2009. 39 p;

SHRIVASTAVA, M.; NANAVATI, S.; YADAV, D. S.; MISHRA, A. K. Studies on incidences and causes of buffalo calf mortality in Malwa region of Madhya Pradesh. **Sci. Vet. Med**, v. 1, p. 69-72, 2013;

SIDDHAPARA, B. S.; SINGH, V. K.; CHAUDHARY, S. S.; MODI, L. C.; JOSHI, A. B.; PATEL, S. B.; MANAT, T. D. Early changes in vital signs and leukogram profile of diarrheic Surti buffalo calves. **The Pharma Innovation Journal**, Índia, p. 2359-2362, 2022;

SIGNORETTI, R.D. Gestão da criação de bezerras leiteiras: práticas de manejo para alcançar sucesso na atividade. **Pesquisa & Tecnologia**, São Paulo, v. 15, n.2, p. 1-7, 2018;

SILVA, C. P. M.; VELOSO, C. M.; CAMPOS, J M. S.; LANA, R. P. **Manejo e administração na bovinocultura de leiteira**. 2a ed. Viçosa, Minas Gerais, 2014;

SILVA, D. F. **Comportamento como indicador de bem-estar de bezerros leiteiros mantidos em sistema tropical de criação**. 2017. 40 f. TCC (Graduação) - Curso de Zootecnia, Universidade Federal da Paraíba, Areia, 2017;

SILVA, M. D. **Avaliação de diferentes dietas líquidas associadas ao enriquecimento ambiental no desempenho e comportamento de bezerros leiteiros.** 2018. 85 p. Dissertação de Mestrado, Programa de Pós-graduação em Ciência Animal e Pastagens, Universidade de São Paulo, Piracicaba, 2018;

SILVA, G. C.; RIBEIRO, L. F. Os bubalinos no Brasil e a produção de leite**. Revista GeTeC**, v. 10, n. 27, 2021;

SILVA, F. L.; MIQUEO, E.; SILVA, M. D.; TORREZAN, T. M.; ROCHA, N. B.; SALLES, M. S.; BITTAR, C. M. Thermoregulatory responses and performance of dairy calves fed

different amounts of Colostrum. **Animals**. v. 11, n.3, p. 703, 2021;

SOARES, A. C. L. **CUIDADOS FUNDAMENTAIS COM NEONATOS BOVINOS: Revisão bibliográfica.** Trabalho de Conclusão de Curso-Gama: Centro Universitário do Planalto Central Aparecido dos Santos - UNICEPLAC, 2020;

SOUZA, D. C.; SILVA, D. G.; ROCHA, T. G.; MONTEIRO, B. M.; PEREIRA, G. T.; FIORI, L. C.; VIANA, R. B.; FAGLIARI, J. J. Serum biochemical profile of neonatal buffalo calves. **Arq. Bras. Med. Vet. e Zootec**. v. 1, n. 71, p. 187–196, 2019;

SUÁREZ, B. J. Effect of Roughage Source and Roughage to Concentrate Ratio on Animal Performance and Rumen Development in Veal Calves. **Journal of Dairy Science**, v. 90, n. 5, p. 2390–2403, 2018;

TAO, S.; MONTEIRO, A. P. A. Efeitos do manejo no período pré-parto sobre o crescimento e saúde dos bezerros. **Cadernos Técnicos de Veterinária e Zootecnia - UFMG**, Criação de Bezerras Leiteiras. n. 81, p. 9, 2016;

TEIXEIRA, V. A.; DINIZ NETO, H. C.; COELHO, S. G. Efeitos do colostro na transferência de imunidade passiva, saúde e vida futura de bezerras leiteiras. **Nutritime Revista Eletrônica**, v.14, n.5, p. 7046-7052, 2017;

TEIXEIRA, W.D.S.S. **Manejo de neonatos e relato de surto de doença respiratória.** 2018. f. 55. Trabalho de conclusão de curso (Graduação em Medicina Veterinária) – Universidade Federal da Paraíba. Areia, 2018;

TEIXEIRA, A. DA S. M. et al. Onfalite e onfaloplastia em bezerro - Relato de Caso. **Revista Caparaó**, v. 3, n. 38, 2021;

VERRUMA, M. R.; SALGADO, J. M. Análise química do leite de búfala em comparação ao leite de búfala. **Scientia Agricola**, v. 51, p. 131-137, 1994;

VIEIRA, J. N.; TEIXEIRA, C. S.; KUABARA, M. Y.; OLIVEIRA, D. A. A. Bubalinocultura no Brasil: Short communication. **PUBVET**, Londrina, v. 5, n.2, ed.149, 2011;

WATTIAUX, M. A. **Essenciais em Gado de Leite**: Criação de novilhas do nascimento à desmama - importância do fornecimento de colostro. University of Wisconsin-Madison, Instituto Babcock para Pesquisa e Desenvolvimento da Pecuária Leiteira Internacional, 2011;

WERNER, A. **Experimentelle Untersuchungen zur Eignung der[gamma]-Glutamyltransferase-Aktivität im Blut von Kälbern zur Überprüfung der Kolostrumversorgung**. Hannover, Tierärztl. Hochsch. 2003;

WINDEYER, M. C. Factors associated with morbidity, mortality, and growth

of dairy heifer calves up to 3 months of age. **Preventive veterinary medicine**, v. 113, n. 2, p. 231–240, fev. 2014;

WOODFORD, K. DEVIL IN THE MILK: Illness, health, and the politics of A1 and A2 milk. **Chelsea Green Publishing Company** , New Zealand: 2. ed. 257 p, 2007;

WOODING, F. B. P.; MORGAN, G.; ADAM, C. L. Structure and function in the ruminant synepitheliochorial placenta: Central role of the trophoblast binucleate cell in deer. **Microsc. Res. and Tech**. v. 38, p. 88–99, 1997;

ZARCULA S.; CERNESCU H.; MIRCU C.; TULCAN C.; MORVAY A.; BAUL S.; POPOVICI D. Influence of Breed, Parity and Food Intake on Chemical Composition of First Colostrum in Cow. **Anim. Sci. and Biotech**. v. 43, 2010;

ZITNAN, R.; VOIGT, J.; SCHONHUSEN, U.; WEGNER, J.; KOKARDOVA, M.; HAGEMEISTER, H.; LEVKUT, M.; KUHLA, S.; SOMMER, A. Influence of dietary concentrate to forage ratio on the development of rumen mucosa in calves. **Archives of Animal Nutrition,** 1998.