

## CARE OF CALVES AND DAIRY COWS IN CLOSE-UP DRY, MATERNITY AND FRESH COW PERIODS

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SÜT İNEKLERİNİN VE BUZAĞILARIN BAKIMI*

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### INTRODUCTION

In cattle farming sector of the present day, enterprises seek to maximize the yield of their herds while minimizing their costs. To achieve this goal, proper care and feeding of the breeding stock candidates are important factors, in addition to the genetic capacities of the selected stock breeders. Income analyses performed in dairy cow enterprises show that the milk and calf sales make up for the majority of the enterprise's income. The datas obtained from all these analyses indicate that the income increases of an enterprise

is proportional to the increase of its milk yield. Considering the fact that cows need their calves for their individual milk yields, having the breed stock cows calf once every year and to ensure the survival of the calf should be amongst the priorities of an establishment. In cattle farming, calving periods can extend due to insemination problems, which in turn may lead to losses in milk yield. The high-yield cow breeds particularly have insemination issues, and often only get inseminated after a few mating sessions.

### ÖZET

Geçmiş yıllardan günümüze kadar uzanan süreçte; geleneksel süt sığırı işletmelerinde yapılan hataların önüne geçmek, buzağların daha ekonomik ve verimli bir şekilde bakım ve beslemelerinin yapılması amacıyla çalışmalar gerçekleştirilmiştir. Çalışmalarla elde edilen sonuçlar kısa vadede işletme ekonomisine katkı sağladığı düşünülse de zamanla birtakım olumsuzluklar ortaya çıkarmıştır. Bu olumsuzlukların etkileri farklı şekillerde görülmüştür. İnekler yapılan uygulamalardan kaynaklı stres faktörlerine maruz kalarak çeşitli fertilité sorunları yaşamaktadır. Tüm bu olumsuzluklar sonucunda işletmelerin buzağı ve süt gelirleri azalmakta, hastalık ve stres kaynaklı verim kayıpları ve tedavi giderleri artmaktadır. Hayvan refahı da dikkate alınarak, üst düzeyde verim elde edilebilecek sağlıklı sürüler ile sağlıklı hayvansal gıdalar üretebilmek için uygulanan olumsuzlukların ortadan kaldırılmasına yönelik çalışmalar yapılmalıdır.

**Anahtar Kelimeler:** Fertilité, buzağılama aralığı, hayvan refahı

### ABSTRACT

From the past years to the present day, numerous studies were performed to achieve more economically viable and efficient care-feeding of calves and to avoid the mistakes made in the traditional practices of classical enterprises. Although the results obtained in these studies were thought to have contributed to the enterprises' economies in the short term, it has later been determined that a number of adverse effects have taken hold over time. These adverse effects show themselves in different ways. Cows are exposed to additional stress factors caused by these practices and often suffer from various fertility problems. As a result of all these unfavorable developments, calf and milk related incomes of the enterprises have decreased, and they have suffered from yield loss due to various diseases and stress factors, in addition to the treatment costs. Taking animal welfare into consideration as well, new studies should be carried out to eliminate these negative effects and to obtain healthy animal products in high yield herds.

**KEY WORDS:** Fertility, calving interval, animal welfare.

Breeders who want to remedy this problem pay for additional artificial insemination processes for each maternity, increasing their operational costs. One of the most important factors that reduce calf-related income is calf deaths. Calf deaths are seen as one of the most. Considering there are calves that die in family establishments and most of these are not reported, it is likely that this rate is higher in reality. In a study performed in the Yenişehir district of Bursa province, the calf death rate was reported as 16.3%.<sup>2</sup> In another study performed in the Hacıali Establishment of the Eastern Mediterranean Agricultural Research Institute, the rate was determined as 16.6%.<sup>3</sup> The calf death rates in the countries which are considered to have advanced animal breeding sectors are reported to be lower compared to Turkey. In the USA, for instance, a study was performed involving 1685 dairy establishments which reported the calf death rate as 9.4%.<sup>4</sup> The booklet of the ministry of agriculture and forestry informs that calf death rate until ab lactation should be  $\leq 3\%$ , while it should be  $\leq 5\%$  until the end of the sixth month.<sup>1</sup> The studies performed indicate that the calf death rate in our country is quite higher than the acceptable levels and are causing significant economic losses. These losses come in the form of treatment costs for the diseased calves, loss of live materials, and loss of yield based on these deaths. Since both the calf deaths and cow insemination problems in the country are high, it is evident that the methods employed in that regard are problematic for animal welfare and health. To solve these problems, it is necessary to manage the gestational cows properly and to take good care of the calves during their raising periods.

### Managing Cows

If the farm conditions are sufficient, in the prenatal period the cows in their first 40 days of gestation (far-off dry cows), and those within 15-20 days of the birth (close-up dry cows) should be held in different paddocks to ease up their management. Furthermore, those with 1-2 days before birth (maternity cows) and those which are in the first 7 days of post-partum period (fresh cows) should be held in different paddocks.<sup>5</sup>

#### 1. Prenatal Period:

The actions that should be performed in the prenatal period can be classified as the following: animal grouping, practices to increase animal welfare, feeding, practices to reduce difficult births or to ease them, observation for abortions, preterm births, and normal birth

significant problems and cause of loss for cattle breeding in Turkey and in the rest of the world alike. While there is no official statistical information regarding the calf death rate in Turkey, the booklet of the ministry of agriculture and forestry specifies this rate as 10%.<sup>1</sup> indicators, and supporting the immune systems of the animals after birth. Establishments (digger yerlerde değiştir enterprises ile) should create control lists for these subjects and take necessary actions based on these lists.<sup>6</sup> Since the cows in this period need exercise, and their size increases due to gestation, the paddock size per cow should be around 12-14 m<sup>2</sup>.<sup>7</sup> In the prenatal period, clean water, fresh air, large feedboxes, and walking areas should be provided to the animals, while stress factors related to congestions, heat, cold, and feeding should be minimized. Furthermore, the litter material should be clean, dry, easy to wash, and should have anti-slippery, anti-bacterial and anti-allergic properties.<sup>8</sup> It helps with the manpower and time efficiency to separate the cows within 15-20 days of their normal birth periods into the birthing pens, while it makes rationing easier as well.<sup>9</sup> In order to reduce the birth stress, it is more appropriate to group the cows with other cows that they are used to the presence of (in average populations of 10). In the prenatal period, it is important for the future yields of the establishment to monitor the breast health of both the cows and the heifers. This is due to the fact that a significant portion of the mastitis cases encountered in the lactation period is based on the management methods employed in the dry period. There is no milking in this period, yet the milk-like secretion through colostrogenesis beginning as the birth closes by creates a predisposition for mastitis. Separating the animals is therefore also important in terms of being able to monitor their breast health with more ease.<sup>10,11</sup>

#### 2. Birth:

Proper management of natal period in cow breeding is important for animal welfare as much as it is important for cow and calf health. Animals should be taken into birth paddocks 1-2 days prior to birth to help them with healthy and problem-free deliveries. These paddocks should be easy to see and to control regularly, and they should allow for intervention in case the birth takes place in them. When this is not possible, camera systems that continuously monitor the paddocks should be made available. Birth paddocks should have an average size of 15 m<sup>2</sup>, and the establishments should plan for 1 paddock for 25 cows in case the establishment has no birth-synchronization practice and instead the births are distributed along the year.

Paddocks should be protected from heat, cold, and wind, and should be clean, breathable, and well-lit. They should also be well-littered with clean litter, free from air currents, and have minimal contact with other animals if possible. It also helps if they are easy to disinfect and have easy access to hot or cold water, and if they lack any materials that the animals could hurt themselves with.<sup>12,13</sup> The breeders in the birth-paddocks should know very well how cows give birth and which stage every cow is in their respective gestations. It is essential to have people with the capability of distinguishing a difficult birth from normal one to work in the paddocks, and they should preferably be able to decide when to intervene with a birth. Early or late interventions with birth represent a problem for animal welfare and may cause the loss of the cow, the calf, or both. The passage of the calf takes 1 to 4 hours in a cow, and 2 to 6 hours in a heifer<sup>14</sup>. Once the fetal sacs burst open, it takes 4 to 6 hours for the fetus to leave the uterus in heifers, while it takes 2 hours in cows. Any vaginal control should only be performed if the expected time is past, the delivery or position anomalies can be observed from the outside, or the abdominal contractions are not observed. There is no need to intervene in birth where everything goes normal. It is enough to monitor the birth and to take hygiene and protection cautions rapidly. That being said, the birth is a process that should be monitored, no matter it is day or night time.<sup>15,16</sup> Insufficient monitoring during birth extends the birth process and increases stillbirth risk.<sup>14,17,18</sup> The records for calving difficulties should be kept accurately.<sup>19,20</sup> After each calving, the calving paddocks should be thoroughly cleaned and fresh litters should be placed.

### 3. Postnatal Period:

Puerperal period (fresh cow period) is one of the most important components of the periparturient period in dairy cow breeding. It is essential to have knowledge of the physiological processes during that period, potential abnormalities in these processes, and factors that may lead to such anomalies so that the period can be managed properly and effective measures can be taken for the animal welfare. For the fresh cows, suitable paddocks should be prepared, proper animal grouping should be performed, animals should be fed appropriate rations, and any problems that may arise during puerperal period should be identified and treated as soon as possible, preferably by means of monitoring programs and treatment protocols created specifically for the period.<sup>9</sup> The stress must be kept at the minimum level when grouping the animals and when making changes in these groups. Particular care should be given

to ensure that the paddocks are clean and dry. A muddy surface and heat stress increase the mastitis risk and the metabolic needs of the animal while reducing dry matter consumption.<sup>21,22</sup> The calved cows should be taken into the colostrum section right after the birth and should be kept there for approximately 48 hours. In order to reduce the distance they have to walk for milking, the paddocks of the fresh cows should be close to the milking unit.

Treating fresh cows with a mixture of calcium propionate, potassium chlorite, magnesium sulfate, sodium chlorite, and propylene glycol in 20 liters of warm water is helpful to remedy the gap left behind in the abdomen after the birth by the calf and fetal membranes and liquids.<sup>23,24</sup> A ration between the ration given to the cows within their last 15 to 20 days to birth and the ration given to cows that deliver the highest milk yields is suggested for the fresh cows. Any alteration in the ration should never exceed 10%.<sup>25</sup> Furthermore, the body temperature of the cows in this period should be recorded, along with their milk yields, body condition scores (BCS), diseases, and exclusions from the herd.<sup>26</sup> In large scale establishments, instead of depending on the inspections of the personnel or monitoring their milk yields, mastitis cases with pre-milking and milk inspections, and ? manually, utilization of systems working on sensor technology provides advantages in manpower and costs, while also providing more accurate information.<sup>27</sup> The sensitivity of the animals towards environmental conditions tend to increase, which is particularly true for the high-yield animals. While it is believed that high milk yield animals suffer from reduced fertility yields due to difficulty in obtaining negative energy balance, the influence of the environmental stress factors in fertility yields are still considerable. The high-yield cow breeds particularly have insemination issues, and often only get inseminated after a few mating sessions. Based on the 2016 statistics in the breeding cattle breeders union (2018) registries, in the high-yield Holstein cows, the average number of artificial inseminations per gestation was determined as 1.89. The increased amount of artificial inseminations required for fertility both increase the cost per gestation and extend the calving gaps, causing in reduced milk and calf income. Having a longer-than-normal calving gap is also reflected in the statistics for fertility problems in Turkey. While the average calving gap in EU countries is 382 days, in Turkey this gap is 414.5 days for the Holstein breed cows according to the 2017 statistics of the Cattle Breeders Association of Turkey. It is accepted that the calving gap should be at an average of 365 days in order to increase the efficiency of breeding in establishments<sup>9</sup>.

Calving gap includes the involution period, service period, gestation period, and the dry period. It is important to shorten the involution period in order to actively employ the principles specified above that would increase profitability. The involution period represents the time required for the cow reproductive organs to recover anatomically, histologically, and functionally after birth, so that a new gestation can start and sustain.<sup>9,28</sup> The involution of the uterus is affected by the difficulty of birth, a number of previous births, feeding, breed, and milking, in addition to the normal hormonal mechanisms involved. It is important that uterus completes its physical involution and endometrium completes its regeneration so that the next rutting period can start. In the dairy cows, the involution period is reported as 26 to 52 days, while it's between 38.7 and 56 days in meat cows. In general, the physical involution of the uterus is completed in 25-30 days, and the complete process of involution that includes the endometrium regeneration takes 40 days.<sup>29</sup> Studies conducted on horses report that dopamine receptor blockers like sulpiride, domperidone and perphenazine shorten the transition period and cause the first ovulation of the year to occur earlier.<sup>30,31</sup> Dopaminergic antagonists show this effect by stimulating endogenous prolactin secretion.<sup>32</sup> The increased prolactin levels observed within 24 hours in mares treated with sulpiride with 12 hour periods is the clearest indication of this phenomena<sup>33</sup>. The fact that ovulation in mares administered exogenous prolactin (recombinant pig prolactin) occurs earlier (in 4 weeks on average) also indicate that prolactin has a role in mare reproductive processes.<sup>34</sup> The role of prostaglandin in involution is important as it has uterotonic effects.<sup>28</sup> The effect of nursing on the uterus involution also takes part at this point. Involution in nursing cows is faster. The oxytocin secreted as a result of the nursing is known to cause a partially increased prostaglandin secretion.<sup>35</sup> Furthermore, the sucking reflex also has a strong impact on the prolactin secretion.<sup>36</sup> In this period the insemination yield is important in determining the insemination rate and the sustaining of the gestation. In the final stages of the gestation, during birth, and in the periods following the birth, the physiological conditions change rapidly and these have a strong impact on the cow combined with the stress of birth.<sup>29</sup> The involution of the uterus is faster in nursing cows compared to milked cows.<sup>37</sup> While the involution is completed in nursing cows in 15-25 days, it takes 25-30 days in milked cows. It is also believed that the stimulus of sucking causes an increased the rate of oxytocin secretion from the hypophysis, which in turn causes the uterus to shrink in size due to myometrial contractions<sup>38</sup>. In studies performed on water

buffalo, the average involution period of the nursing marsh buffalo was determined as 30 days, while the average involution period of the milked river buffalo was found to be 45 days.<sup>39</sup> The involution period of the uterus has an important function in the first rutting period following birth. The cost of late involution per day varies between (profit/average open days) 3.19 and 5.41 dollars.<sup>40</sup> In light of the above information, the current practice of colostrum program performed to reduce the calving gap should be re-evaluated, particularly for the high milk yield cows, and the cow should be allowed to allow her calf for 1 day to let it receive the colostrum.

### Management of Calves

The proper management of the calves in the first three weeks is particularly important for obtaining high yields in future.<sup>41</sup> The personnel working in the calf pens should be educated and experienced, and should only have duties in this section. A calf monitoring program should consist of monitoring of respiration of the newborn calf, ensuring thermo-regulation, care of navel cord, monitoring of the attempts of the animal at standing up, and septicemia monitoring. Furthermore, colostrum management, design, and placement of the calving pens, hygiene practices, monitoring of the calf health, vaccinations and infirmity conditions for the calves should also be managed systematically.<sup>42</sup> The first hour after the birth of the calf is the most critical period. In this period, initiation of respiration and resuscitation of non-normal birth calves should be performed when necessary, heat loss of the calf should be minimized (thermo-regulation), and the calf should be given colostrum within two hours of birth. Cold water should be applied to the heads of the calves with mild asphyxia, and the calves should be shaken upside down for about a minute. The respiration of the calf should be stimulated by touching the nasal cavity of the calf with an object like a straw or a branch, and artificial respiration should be applied at once in case natural respiration not to start.<sup>12</sup> If the navel cord is not torn from the bottom end, the cord should be massaged from the part closes to the abdomen and downwards, emptying any fluids inside. Tincture of iodine then should be poured into the cord and the cord should be cut at a 4 to 5 cm distance to the abdomen. The disinfection process should be conducted for three days.<sup>43</sup> After the birth, the cow stimulates the calf's respiration by licking the cow, and helps the calf dry and speed up its circulation. If the cow can't do this herself then the calf must be dried. The calf normally stands up within half an hour of the birth and tries to suck milk within the first hour.

Before the calf sucks milk, the nipples of the mother and their surrounding areas should be washed with warm, soapy water, and should be dried with a clean towel. If the calf can't suck, the colostrum should be given to it with a feeding bottle.<sup>43</sup> After birth, the immunoglobulin absorbance capability of the intestines drops rapidly. The immunoglobulin absorption capability of the calf drops to under 70% within the first 3 hours, which later drops below 50% in 12 hours and to a minimum after the first 24 hours.<sup>44</sup> Due to this phenomenon, it is suggested to give the calf as much colostrum as possible within the first hours of its birth. Studies suggest 3-liter colostrum for the calf between the first 30 minutes and 2 hours of its birth, and 4-4.5 liters within the first 12 hours.<sup>45</sup> In modern animal breeding practices, the calves are taken to their private pens after their birth. The calves then receive their colostrum taken from the colostrum pool of the establishments (usually as a result of their colostrum management procedures) in their private pens either via feeding bottle or from a bucket. While this method helps alleviate some problems that may occur with a natural sucking, the removal of the calf from its mother into a private pen causes significant stress both in the calf and in the mother, causing unfavorable animal welfare situations. The impact of this stress and the economic causes coming from it should also be considered. The calves should be provided the housing conditions in which they can live healthily. Calf pens should be protected against wind and should be clean, dry, and well lit, and the calves should be protected from air drafts. The calf pens should be conditioned with mobile canopies/portable tents and roof systems considering the summer and winter conditions. The ideal environmental temperature for calves is 18 °C, while the ideal relative humidity is 65%. The comfort zone of the calves is between 10 and 26 °C, but they can live without problems even in freezing temperatures as long as they are not wet. The calf pens should be placed with a minimum of 60 cm space between them. After each raising period, the pens should be cleaned and disinfected and carried over a new spot. At least 10 kg of litter should be used per calf, and 1 to 1.5 kg of fresh litter should be refreshed each day. The pens should face south in winter, and to east in summer. Furthermore, the calves should be dehorned and excess nipples should be removed once they are of 20 to 30 days of age.<sup>45</sup> After the colostrum and transition milk feeding in the first 3 days, the calf should be fed milk from the 4<sup>th</sup> day onwards until the dry period and concentrated feed should be provided to it alongside.<sup>46</sup> If the above conditions are not met, the calves become affected by the suppressive effects of stress factors. If these factors

persist, the consistent stimulation of adrenal cortex (suprarenal glands) causes the corticosterone and cortisol levels in the circulation to stay high all the time. At high doses, these hormones may cause cardiovascular and gastrointestinal diseases, hypercholesterolemia, metabolic defects, and suppression of inflammatory events due to alterations in immunological functions.<sup>47</sup>

## CONCLUSIONS

The fresh cows are under stress due to their incapability to sustain their normal physiologic and psychological needs. When their calves are removed from their presence they can't nurse them, which affects their hormonal regulations. As a result of this their post-natal rutting period comes late, and they suffer from various fertility problems. The establishment owners that seek a solution to this problem are often forced to employ veterinary services involving hormonal treatments. Amongst the causes of the fertility problems of today are the motherless raising programs. These programs are usually employed in calf care and feed systems, and the hormone and antibiotics treatments targeted to remedy the adverse effects of them are under careful monitoring in latest years due to their potential threats to human health. It is possible to reduce the zoonotic diseases and the negative effects of antibiotics and other residues in animal products on human health by improving animal welfare. By improving the animal welfare the stress factors for the animals will be reduced, which in turn will remove the suppression over their immune system and reduce the disease events. Some restaurants and store chains are aware of this fact and see the animal welfare as part of their product quality, and visit the farms in person to detect the farms with utmost animal welfare conditions before making their own purchases<sup>48</sup>. More studies are needed on the animal welfare and animal stress factors in order to be able to obtain high-yield, high-quality and safe animal productions in the future.

## REFERENCES

1. Anonymous. [www.tarimgov.tr/HAYGEM/Belgeler/Hayvancılık/Büyükbakım%20Hayvancılık/2018%20yılı/Buzagi\\_Bakim\\_Beslenmesi.pdf](http://www.tarimgov.tr/HAYGEM/Belgeler/Hayvancılık/Büyükbakım%20Hayvancılık/2018%20yılı/Buzagi_Bakim_Beslenmesi.pdf) (Accession date: 15.05.2019)
2. Karakaş, E. Bursa-Yenişehir İlçesinde yetiştirilen holştayn buzağularının doğum ağırlığı, süttten kesim yaşı, süt tüketimleri ve yaşama güçleri. *Uludağ University J Fac Vet Med*, 2002;77-81.
3. Ayaşan T, Hızlı H, Asarkaya A, Coşkun MA. Siyah Alaca buzağularda büyüme performansı ve yaşama gücü. *Türk Tarım ve Doğa Bil Der.* 2016;3(3): 223-228.
4. Losinger WC, Heinrichs AC. Management practices associated with high mortality among preweaned dairy heifers. *J Dairy Res.* 1997;64(1):1-11.

5. Dann, HM, Litherland NB, Underwood JP, Bionaz M, D'Angelo A, McFadden JW, Drackley JK. Diets during far-off and close-up dry periods affect periparturient metabolism and lactation in multiparous cows. *J Dairy Sci.* 2006;89(9):3563-77.
6. Cathan AK. <https://store.extension.iastate.edu/Product/Da3083-pdf>. (Accession date: 17.05.2019)
7. Göncü S. Süt Sığırcılığında Barınak Çeşitleri. <http://www.muratgorgulu.com.tr/altelkan.asp?id=15>, (Accession date: 19.05.2019)
8. Hayırlı A, Çolak A. İneklerin kuru ve geçiş dönemlerinde sevk-idare ve besleme stratejileri: Postpartum süreçte metabolik profil, sağlık durumu ve fertiliteye etkisi. *Türkiye Klinikleri J Vet Sci.* 2011; 2(1):1-35.
9. Öcal H, Rışvanlı A, Kalkan C, Doğan H. The Care of Dam and Calf in Dairy Cows in Peripartum Period. *Türkiye Klinikleri J Vet Sci Obstet Gynecol-Special Topics.* 2015;1(1):42-60.
10. Moore DA: Herd health incentives. *Dairy Incentive Pay.* 4th ed. USA: Billikopfp. pp. 69-76, (2005).
11. Kadokawa H, Martin GB. A new perspective on management of reproduction in dairy cows: the need for detailed metabolic information, an improved selection index and extended lactation, *J Rep Dev,* 2006;52(1):161-8.
12. Semaçan A, Kaymaz M, Fındık M, Rışvanlı A, Köker A: Perinatal Dönemde Anne ve Yavruya Gösterilecek Özen. *Çiftlik Hayvanlarında Doğum ve Jinekoloji*, Ed., Medipres Yayıncılık Ltd. Şti. Malatya, pp. 259-274, (2015).
13. Drew B: Heifer. Rearing –12 weeks to calving. In: Andrews AH, Blowey RW, BoydH, Eddy RG, eds. *Bovine Medicine: Diseases and Husbandry of Cattle.* 2nd ed. Oxford: Blackwell Science; p.54-67, (2008).
14. Gundelach Y, Essmeyer K, Teltscher M. K, Hoedemaker M. Risk factors for perinatal mortality in dairy cattle: Cow and foetal factors, calving process. *Theriogenology,* 2009;71(6):901-9.
15. Semaçan A, Gümen A, Kaymaz M, Fındık M, Rışvanlı A, Köker A: *Çiftlik Hayvanlarında Doğum ve Jinekoloji*, Medipress, Malatya-Türkiye, pp. 469-506, (2012).
16. Lorenz I, Mie JF, Earley B, More SJ. Calf health from birth to weaning. I. General aspects of disease prevention. *Irish Vet J.* 2011; 64 (1):10.
17. Kunkle B, Gamble SF, Kistler M: Florida cow calf management, getting started. AN115, The Animal Sciences Department, Florida Cooperative Extension Service, Gainesville-USA, (2007)
18. Bayrı T, Yılmaz O, Çak B. Effect of timing of artificial insemination relative to spontaneous estrus on reproductive performance and calf gender ratio in repeat breeder holstein cows. *The Journal of Animal and Plant Sciences,* 2016;26(4):924–930.
19. Drost M: Management of calving on large dairy farms. *Proceedings 2nd Florida Dairy Road Show.* Gainesville-USA 2005
20. Schuenemann GM: Calving management in dairy herds: Timing of intervention and stillbirth. *Veterinary Preventive Medicine,* Ohio State University. 2012.
21. Overton MW, Boomer WG, Gorden PJ..Transition management checklist. *Western Dairy Management Conference,* 2009; 11-13 March, Reno.
22. Cook NB. Pen moves and facility designs to maximize transition cow health and productivity. *Western Dairy Management Conference,* 2007; 7-9 March, Reno.
23. Hutjens MF, Aalseth EP. *Management Tool, Caring for Transition Cows.* 1st ed. Fort Atkinson: WD Hoards & Sons Company, New Jersey-USA. 2005; p.58-60,
24. Goff JP. Managing the transition/fresh cow. *5th Western Dairy Management Conference.* 4-6 April, 2001, Nevada.
25. Hutjens MF. Transition cow feeding strategies. University of Illinois. <http://livestocktrail.illinois.edu/dairynet/paperDisplay.cfm?ContentID=167> (Accession date: 06.06.2019).
26. LeBlanc S. Health in the transition period and reproductive performance. *J Rep Dev.* 2010;56 Suppl:S29-35.
27. LeBlanc S. Challenges and opportunities for technology to improve dairy health management. *The First North American Conference on Precision Dairy Management,* 2010; 2-5 March, Toronto.
28. Cannazik O. ve Polat B. İneklerde postpartum dönemde endometritisin sınıflandırılması ve tanımlanmasında kullanılan muayene yöntemleri. *Atatürk Üniversitesi Vet. Bil. Derg.* 2015; 10(3):198-204.
29. Görgülü M, Göncü S. Pratik süt sığırcılığında sürü değerlendirmede kullanılacak döl verim kriterleri-üreme etkenlik. <http://traglor.cu.edu.tr/objects/objectFile/PbHdpTZL-3032013-7.pdf> (Accession date : 27.01.2018.)
30. Mitcham PB, Thompson DL, Burns PJ, Gilley RM. Recent advances in the use of an estradiol-dopamine antagonist protocol to induce ovulation in seasonally anovulatory mares. *J Equine Vet Sci* 2014; 34: 105-106.
31. Panzani D, Zicchino I, Taras A. Clinical use of dopamine antagonist sulpiride to advance first ovulation in transitional mares. *Theriogenology* 2011;75:138-143.
32. Thompson DL, Anestrus IN, McKinnon AO, Squires EL, Vaala WE, Varner DD. 2015. *Equine Reproduction.* 2nd Edition, Oxford: Wiley-Blackwell; 2011: 1696-1703.
33. Martinez-Bovi R, Zagrajczuk A, Domingo-Ortiz R, CuervoArango J. The Effect of sulpiride treatment during the periovulatory period on prolactin concentration and ovulation in the mare. *J Equine Vet Sci* 2015; 2014; 34: 1170- 1174.
34. Tibary A.. Dopamine Antagonists. In: McKinnon AO, Squires EL, Vaala WE, Varner DD. (Editors). *Equine Reproduction.* 2nd Edition, Oxford: Wiley-Blackwell; 2011: 1788-1793.
35. Uzun M, Sulu N. Oksitosin ve fizyolojik etkileri. *Kafkas Üniversitesi Vet Fak Der.* 2002;8(1): 91-97
36. Aksoy M, Söylemez F, Tek İ. Laktasyonun Endokrinolojisi. *Dirim Tıp Dergisi.* 2002; Temmuz-Ağustos, 22-27.
37. Saiduddin S, Riesen JW, Tyler WJ, Casida E. 1983.Relation of postpartum interval to pituitary gonadotrophins, ovarian follicular development, and fertility in dairy cows. *Studies on the postpartum cow. Res. Bulletin* 270. 1968; pp. 15-22. University of Wisconsin.
38. Leslie, K.E. The events of normal and abnormal postpartum reproductive endocrinology and uterine involution in dairy cows: a review. *Canadian Vet J,* 1983;24:67-71.

39. Jainudeen MR, Bongso TA. 1982/1983. Tan HS. Postpartum ovarian activity and uterine involution in the suckled wamp buffalo (*Bubalus bubalis*). *Animal Reproduction Science*. 5 181-190. ElsevierScientific Publishing CompanyAmsderdam. Printed in The Netherlands.
40. Tekin K. ve Daşkın A. The Reproductive Parameters Affecting Fertility in Cattle Livestock Enterprises. *Kocatepe Vet J*. 2016;9(1): 43-50
41. Mellor D, Stafford K. Animal welfare implications of neonatal mortality and morbidity in farm animals. *The Vet J*, 2004;168(2):118-33
42. Murray CF. Characteristics, risk factors and management programs for vitality of newborn dairy calves. Doctoral thesis, The University of Guelph, . Ontario, Canada, 2014.
43. Alpan O, Aksoy AR: Sığır yetiştiriciliği ve besiciliği. 6.baskı, Kars-Türkiye, (2012).
44. Erdem H, Atasever S. Yeni doğan buzağılarda kolostrumun önemi. *Ondokuz Mayıs Üniversitesi Zir Fak Der*. 2005;20: 79-84.
45. Anonymous.<https://www.tarim.gov.tr/HAYGEM/Belgeler/Hayvancılık/Büyükbaş%20Hayvancılık/2016%20yılı/Buzağı%20Bakım%20ve%20Beslenmesi.pdf> (Accession date: 02.12.2017).
46. Başer E., Buzağların sütten kesim öncesi besleme prensipleri. *Atatürk Üniversitesi Vet Bil Der*, 2016;11(3):348-354
47. Altınçekiç Ö Ş, Koyuncu M: İklim Değişikliğinin Çiftlik Hayvanları Üzerindeki Etkileri. 8. Ulusal Zootekni Bilim Kongresi, Çanakkale, Bildiri Kitabı, s:294-299, (2013)
48. Sağmanlıgil V. Cengiz F. Salgırlı Y. Atasoy F. Ünal N. Petek M: Hayvan Davranışları ve Refahı, T.C. Anadolu Üniversitesi Yayını, Eskişehir-Türkiye, (2011).

