

WEANING STRESS IN LAMBS

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Abstract

Sheep are subjected to a multitude of psychological and environmental stressors that cause decreased productivity, increased disease and hence to poorer welfare. The weaning is one of the most stressful procedures for all lambs not only in terms of the dam-lamb relationship, but also because of its potential effect on the health of lamb. In numerous studies have been discussed the effects of different weaning strategies, along with physiological and behavioural responses to weaning stress of lambs. However, there does not seem to be a consensus on the strategy that completely eliminates weaning stress. Sheep producers should know weaning strategies which minimize negative stress caused by nutritional, environmental, physical and social changes experienced by lambs at weaning time. The purpose of this paper is to provide an overview of the literature examining what is known about the importance and impact of weaning stress in lambs.

Key words: Weaning, stress, welfare, lamb

1. INTRODUCTION

Animal stress is identified as a unique event that elicits a specific behavioral, physiological, neuroendocrine, endocrine, and/or immune response that may be as unique as the stressful event itself (Carroll & Burdick Sanchez 2013). The detrimental effects caused by stress can reduce the fitness of an animal, affect reproductive and immune systems as well as the quality of animal products and can even cause death (Etim et al. 2013).

All living organisms maintain a complex dynamic equilibrium or homeostasis, which is constantly challenged by internal or external adverse effects, termed stressors. Stress occurs when homeostasis is threatened or perceived to be so (Chrousos 2009). Stressor is defined as the environmental stimulus that provokes the stress response (Kelley 1980). Sheep are subjected to a multitude of psychological and environmental stressors that cause decreased productivity, increased disease and hence to poorer welfare. Routine management procedures such as isolation (Altın et al. 2012), restraint (Rivalland et al. 2007), milking (Negrao & Marnet 2003), shearing (Fidan et al. 2009), castration and tail docking (Mears & Brown 1997), and transportation (Ekiz et al. 2012a) have been reported to be stressful to sheep.

The weaning is one of the most stressful procedures for all lambs not only in terms of the dam-lamb relationship, but also because of its potential effect on the health of lamb. The lambs may have difficulty in adapting to the weaning, because the weaning produces weaning shock in the lambs. The level of shock manifested by reduction in post-weaning growth rate may vary depending on weaning age and weight, the intake of solid feed before weaning as well as health status of the lamb. The purpose of this paper is to provide an overview of the literature examining what is known about the importance and impact of weaning stress in lambs.

2. WEANING IN LAMBS

Under natural conditions, the survival of the newborn depends on the establishment of a strong and lasting social bond with the dam. The mother-young bond has been defined as a preferential mutual, emotional attachment, of relatively long duration (Enriquez et al. 2011). Suckling is a major factor in the strength of the mother-young bond that usually begins at birth (Schichowski, Moors & Gauly 2008). Lambs are allowed to suck their dams until four weeks old. At the same time good quality roughage and a concentrate mixture in pelleted form with clean drinking water should be available in front of lambs from the second week. After the fourth week restricted suckling should be applied to encourage the consumption of solid feed. Increasing solid feed consumption stimulates rumen morphological development.

The sheep is a follower species and in the first day of life the ewe remains within one meter of the lamb. When both are grazing the distance between ewe and lamb increases rapidly over the next 10 days of life, reaching a plateau with an average distance of 20 meters (Blackshaw 2003). Schichowski, Moors & Gauly (2008) reported that the intervals between suckling increase with age, indicating that 16 wk old lambs are more accustomed to a

separation from the mother than younger lambs. With age the distance between mother and young becomes longer. Older lambs also move more frequently and further from the ewe than younger lambs and they do not vocalize as much as younger ones. The fact that younger lambs were more stressed by weaning procedures when compared with older lambs may be due to the stronger mother-young bond (Schichowski, Moors & Gauly 2008). Accidental separation in the first few days causes great agitation of both lamb and ewe, and reunion is immediately followed by suckling (Blackshaw 2003).

The frequency and duration of suckling decrease with reduced milk production. Therefore, progressive natural weaning has very little apparent negative consequences on social groups of ewes and lambs (Schichowski, Moors & Gauly 2008). A decrease in milk production leads to the distancing of both partners. The changes in the lamb's nutritional requirement also seem to play a part in the inception of the weaning process (Orgeur et al. 1998). Lambs reared with their mothers become accustomed to solid feed more rapidly than artificially reared lambs (Napolitano et al. 2003). The lambs subjected to a gradual separation from their mothers exhibited a more rapid approach to and a higher intake of solid feed than did the lambs that were abruptly removed from their dam's 24-30 h post-partum (Sevi et al. 2003).

The weaning is defined as the complete physical separation of mother and young, and also the transition from feeding of milk to solid feeds. In sheep production the traditional method of weaning referred to as abrupt separation is performed by separating lambs from their dams without applying any treatment before weaning. The weaning age of lambs may vary between 4-16 weeks. It is recommended that lambs should not be weaned until they reach 3-4 times of their birth weights or 12-13 kg live weight.

Ewe condition, feed quality and quantity, and target market as well as the age and weight of lamb are important factors in determining the weaning time. Rauw et al. (2007) reported that the phenotypic correlation between weaning weight and weaning age in lambs was positive (0.20) and highly significant ($P < 0.001$). On the other hand Mousa et al. (2013) estimated phenotypic and genetic correlation between birth weight and weaning weight (eight weeks age) as 0.52 and 0.37, respectively.

Weaning weight is an important factor of influence on later growing rate and should be considered as important criteria for lamb weaning determination. After weaning, it was expected that lambs weaning with lower weights would have less growth rate by the effect of weaning stress and poor quality of the native pasture. Body weight is more important than weaning age on lamb growth and it should be considered on weaning decision (Selaive-Villaruel, Maciel & de Oliveira 2008).

Early weaning may be defined as the withdrawal of the milk supply before the time when weaning would normally occur. The success of early weaning must depend partly upon the speed with which the rumen develop in lambs and partly upon the level of milk production of the dams (Abou Ward et al. 2008). In many milk production systems, lambs are separated from the ewe at an early age in order to increase the amount of milk available for cheese making. However, this rearing system is often associated with poor performance of lambs (Napolitano et al. 1995). Therefore, feeds given to lambs must be carefully formulated to ensure animal health.

3. PHYSIOLOGICAL AND BEHAVIOURAL RESPONSES TO WEANING STRESS

The reaction of the animal to stressors depends on the duration and intensity of the stressors, the animal's previous experience to the stressors, the physiological status and immediate environmental restraints. An animal may react either by physiological or a behavioural responses, but most often a combination of both (Etim et al. 2013).

During the weaning process, the lambs like piglets (Campbell, Crenshaw & Polo 2013) and calves (Enriquez et al. 2011) experience changes in their physical and social environments. Therefore, weaning can be a multi-factorial stressor, in which, nutritional, social, physical, and psychological stress are combined. Physical and nutritional stressors are often present through the introduction and adaptation to a new diet and new environment, whereas, psychological stress is present in the form of maternal separation and social disruption (Earley & McGee 2011).

A potential indicator of animal welfare is the absence of stress. A multitude of hormones (e.g., ACTH, glucocorticoids, catecholamines, prolactin, etc.) is involved in the stress response (Möstl & Palme 2002). These hormones serve to adapt animals to stress by altering their cardiovascular, energy-producing and immune systems (Mears & Brown 1997). There is no single biochemical assay system to measure stress. Thus, there is a need for additional biochemical or endocrine parameters for detection of disturbances (Möstl & Palme 2002).

The evaluation parameters are not always the same for short or long periods of stress and require the use of different measures. In case of short-term stimuli, the behavioral, physiological and endocrine evaluation parameters consist of vocalizations, escape attempts, heart rate, respiration rate, cortisol blood level, etc. Differently, in the event of long-term stress, important behavioral, physiological and endocrine parameters can be the reproductive efficiency, growth rate, stereotype manifestation, blood hormones and metabolites concentrations, and immune responses (Carzedda 2011-2012).

In domestic livestock, excessive concentrations of cortisol have been linked to reduced rates of reproduction, suboptimal growth, suppressed milk production, and suppression of immune function that could increase susceptibility to disease (Carroll & Burdick Sanchez 2013). Plasma cortisol levels are elevated after either physical or psychological stress. Likewise, sheep respond with elevated plasma β -endorphin following stressful procedures. In Suffolk lambs weaned at 7-wk old, plasma cortisol was elevated for only the first 60 min and at 24 h after weaning compared to basal levels at 0 min, while weaning did not affect plasma β -endorphin. Weaning had no influence on cortisol level at 48 and 72 h after weaning (Mears & Brown 1997).

Orgeur et al. (1998), who studied the consequences on animal welfare of two weaning procedures, progressive weaning and sudden weaning, found out that the cortisol levels in ewes were not affected by separation from their young whatever weaning method was used. In a subsequent study, Orgeur et al. (1999) evaluated the psychobiological consequences of two types of sudden weaning at 3 months of age in sheep. Ewes and their lambs were either completely denied the opportunity to communicate (total separation) or allowed to visually and vocally communicate (partial separation). Plasma cortisol levels of lambs showed a greater increase when the partners were totally separated than when maintained visual and auditory contact. Napolitano et al. (2003) observed a lower cortisol response in ewe-reared animals than in artificially reared lambs. Ekiz et al. (2012b) also reported that suckling management at 45-d and 75-d resulted in stress responses in lambs with increasing plasma cortisol concentration.

The process of separation at weaning can induce some stress for lambs (Gauly et al. 2004). Early separation from the ewe affects humoral immune response and post-separation performance of lambs as a possible consequence of a reduced ability of young animals to cope with emotional and nutritional stresses (Napolitano et al. 1995). Weaning performed by breeders is sometimes associated with a complete separation of the two partners. Therefore, such practices may cause more profound behavioural and/or physiological disturbances (Orgeur et al. 1999). Lambs were generally found to be disturbed when they were separated from their mothers than when they were reunited (Abdul-Rahman, Chikpah & Yaro 2012).

In a review on minimizing the stress of weaning of beef calves, Enriquez et al. (2011) noted that among the many behavioural changes taken as indicators of weaning stress, the most characteristic was the high frequency of vocalizations emitted by the calf. Vocalizations by the young are thought to evoke maternal care and the need to reunite with the dam. Both ewes and lambs temporarily separated from each other express their distress by an increase in bleating and locomotor activity. These behavioural modifications help the animals to cope with the stress-inducing situation and to keep contact (Orgeur et al. 1998). Mears and Brown (1997) also concluded that lambs separated from their mothers vocalize to show their displeasure. Orgeur et al. (1999) revealed that regardless of the separation procedure, lambs vocalized significantly more than mothers on the day of weaning. However, on the days after weaning, mothers were more vocal than their young. According to the researches, this suggests either a better adaptation by the lambs to weaning or that ewes called their lambs to be suckled.

Lambs prevented from suckling their mothers and receiving milk from a bucket show more distress bleats and less time near their companions compared with dam-suckled lambs (Napolitano et al. 2003). Schichowski, Moors & Gauly (2008) compared lambs weaned at 8 or 16 weeks of age in two stages to those weaned by abrupt separation. Weaning was done by one of two procedures. The traditional weaning method was by abrupt visual and acoustical separation of the ewe and lamb. In the 2-stage method, lambs were first prevented from nursing their dam for 1 week before their physical separation. Researchers concluded that lambs weaned with the 2-stage method vocalized less and showed less behaviors indicative of agitation after separation than animals weaned by the traditional method of abrupt separation. However, Sevi et al. (2003) concluded that gradual separation from their mothers induced behavioral, endocrine and immune disturbances in lambs. The lambs subjected to a sudden separation from their mothers displayed responses comparable to those of the dam-suckled lambs. In another study, Camarillo (2011) compared the effect of gradual versus abrupt weaning strategies on lamb performance. It was found that total vocalizations on Day 0, the day of initial weaning, were significantly higher for ewe and lambs in gradual-weaned group than those from abrupt-weaned group. On day 1, mean vocalization scores were significantly higher for abrupt-weaned ewes and lambs, as they approached 48 hours of complete separation from each other. By day 2, abrupt-weaned ewes had dramatically decreased their frequency of vocalization.

However, gradual-weaned ewes and lambs were vocalizing more. Vocalization and agitation levels quickly declined for both groups after day 2 and no significant differences between groups were noted after day 2 (Camarillo 2011).

The health of lamb can be adversely affected by the new pathogens associated with exposure to changing conditions due to weaning. Especially, abrupt weaning can increase lambs' susceptibility to disease. Milk may play little role in the enhancement of host resilience to infection. It was found that suckled lambs had a greater ability to resist worm establishment (Iposu 2007). Continued suckling may have benefits in the control of nematodes in young lambs, probably through reducing nematode larval establishment. The major benefit of continued suckling in young lambs appears to be in the provision of nutrients which enhance growth rate rather than resilience to nematode infection (Iposu et al. 2008).

4. EFFECT OF WEANING STRESS ON FEED INTAKE AND BODY GROWTH

One of the most important consequences of weaning stress in lambs is the reduction in feed intake. The reduction in feed intake results in reduced growth rate and therefore increased susceptibility to diseases.

Growth rate can be inhibited by early weaning (21-77 days) as the animals are slow in adapting to solid food consumption as a consequence of the physiological delay in ruminal development. Thus, in the weeks following weaning at 45 days, weight gain can drop due to a low consumption of grass and concentrate. The effect of weaning on growth is less marked in lambs separated from their dams at 65 days of age (Napolitano, De Rosa & Sevi 2008). Gauly et al. (2004) noted that the lower average daily gain in lambs weaned at age of 40 days compared with unweaned lambs might be due to weaning stress.

Numerous studies have been conducted concerning the effects of different weaning strategies on lamb performance. Sevi et al. (2003) suggested that the lambs subjected to a gradual separation from their dams exhibited a lower growth rate than dam-suckled lambs ($P<0.01$) and artificially reared lambs ($P<0.05$, $P<0.001$). However, the higher hay and concentrate consumption was not enough to bridge the gap in growth rate between the lambs gradually separated and the other lambs. According to the researchers, the provision ad libitum of a milk substitute having a nutritional value comparable to ewe milk may minimize the stress associated to artificial rearing.

Ekiz et al. (2012c) investigated the effects of suckling length and rearing type on average daily gains (ADG) of lambs at different periods of growth. A significant ($P<0.05$) decrease in ADG was observed in lambs of SC-45 group after weaning at 45 days and in lambs of SC-75 group after weaning at 75 days. These results indicate that weaning might cause a decrease in ADG of lambs. With respect to ADG from birth to slaughter, lambs suckled until slaughter age (SC-120) had higher ADG than those weaned at either 45 d (SC-45) or 75 d (SC-75) ($P<0.001$).

Lambs weaned at 8 weeks had greater ADG than lambs weaned at 16 weeks of age. The availability of high-quality concentrates may have allowed early weaned lambs to compensate for the loss of maternal milk by increased feed intake, resulting in a greater total intake of energy. However, traditional and 2-stage weaning did not differ regarding daily weight gains (Schichowski, Moors & Gauly 2008). Also, Abou Ward et al. (2008) indicated that age at weaning affected ($P<0.05$) ADG in favor of the early weaned lambs (8 weeks) compared with the late weaned lambs (12 weeks). Similar results were obtained by Abdel-Fattah et al. (2013).

5. CONCLUSION

All farmers should aim to keep all their animals within their comfort zone and also employ proper management practices in order to minimize stressful situations and allow for greater well-being, growth, reproductive efficiency of the animals (Etim et al. 2013). Weaning is a stressful time for lambs and their dams due to the sudden separation from their dams and changes in the social and physical environment. Therefore, weaning time is a crucial period in the management of ewes and lambs. In numerous studies have been discussed the effects of different weaning strategies, along with physiological and behavioural responses to weaning stress of lambs. However, there does not seem to be a consensus on the strategy that completely eliminates weaning stress. Sheep producers should know the main stressors associated with weaning and benefit from appropriate strategies to minimize the adverse effects of weaning stress in lambs. Lambs should be carefully observed in the process of weaning due to the effect of weaning stress on post-weaning lamb performance.

The risks of pneumonia, scours, coccidia and urinary calculi are increased at the time of weaning. To avoid additional stress, vaccinations, castration, worming and tagging should be performed at least two weeks before weaning. Lambs should be monitored closely for health problems (Redden 2013).

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