Welfare assessment of goat during transportation and unloading at the livestock cattle market

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Abstract

In Bangladesh, studies on the effect of long-distance transportation on goat health are not frequent. The study aimed to investigate the behavior of goats and goat handlers during unloading, health conditions, and the nature and types of injuries. Further attempts were made to assess the hematological profile after long-distance transportation as physiological indicator. A total of 8790 goats were studied in Sagorika Livestock Market, Chattogram, Bangladesh from February 2023 to September 2023. Goats were transported from the different markets of origin in Bangladesh where the duration of the journey ranged from 12 to 17 hours. During unloading, the behavior of goats and goat handlers was observed. Blood was collected from the jugular vein for hematological analysis. Among the goat's behavior, 'Jump' (35.29%) was most prevalent followed by 'Fall' (18.62%) and 'Refuse to move' (18.60%). However, 'Hanging by a rope' (38.89%) was the common unloading behavior of staff followed by 'Push' (15.55%) and 'Beating' (13.69%). Fresh Injury (14.72%) was more prevalent than old injury while Abrasion (9.30%). Laceration (6.24%), Lameness (5.13%), Dehydration (51.66%), and Nasal discharge (14.80%) was also observed at different proportionate rate. Several hematological values in goats were significantly impacted by long-distance transportation, including PCV, TEC, and TLC percentages of Eosinophils and Basophils, Lymphocytes, and Monocytes, as well as the N:L ratio where the p-value is $p<0.05$. Nevertheless, there were no statistically significant variations ($p>0.05$) in the Hb or Neutrophil counts. The overall finding reflects poor welfare during transportation and unloading of transported goats. Raising awareness among staff and proper care during transportation and unloading is necessary to overcome the stress.

Keywords: Goat, Welfare, Transportation, Behavior, Hematological value

Chapter I: Introduction

Goats provide an important source of income for farmers in small-scale farms in developing countries. Many small farmers, especially women, landless and marginal farmers living in remote places, depend mainly on goats for their livelihood and rarely have other sources of income (Choudhury *et al.*, 2012). Through the production of milk and meat or indirectly through the money they receive from the sale of their goods, they help to provide food security and reduce seasonal food variability and availability (Homann *et al.* 2007). According to Broom (1986), a person's welfare is determined by how well they can deal with their surroundings, including how much they have failed to do so and how easy or difficult they find it to do so.

Stress is an external effect on an individual which overtaxes their control systems and lowers their overall health, or appears likely to do so (Broom and Johnson 1993). Overcrowding, production/lactation, weaning, transportation, environmental changes, and other factors can cause animal stress. Goats are more susceptible to these stresses than other animals (Kannan *et al.,* 2000). Transporting animals has developed into an essential step in animal management and is frequently seen as one of the main sources of stress, which has brought about a significant amount of attention from both an economic and animal welfare perspective (Mormede *et al.,* 1982).

Transportation stress is caused by a variety of factors, such as pre-transport management, noise, vibration, novelty, social regrouping, separation from familiar groups and eventual relocation to new areas, crowding, handling methods and facilities, restraint, loading and unloading, time of transit, mixing with unfamiliar animals, and lack of feed and water (Swanson and Morrow-Tesch, 2001). Stocking density is a significant element in determining the welfare of animals in transportation (Fazio and Ferlazzo, 2003). When compared to medium and low stocking densities, high stocking densities on transport vehicles have been directly linked to increased physiological stress reactions and worse meat quality (Broom, 2000). Animals owned by private dealers are moved around Bangladesh from market to market and from one district to another by truck, on foot, by boat, and occasionally by train (Alam *et al.*, 2010b). The two most stressful phases of animal transportation are loading and unloading (Kober, 2011). In Bangladesh, road vehicles are primarily used for livestock transport. Bangladesh is a tropical country, with average temperatures during the summer of 30°C to 40°C and humidity levels of 60–85%. The UV exposure is

high and most days are extremely hot. Animals may suffer as a result of animal transporters attempts to relocate them in poor weather (Alam *et al.,* 2018). The danger of muscle strain and damage is increased by a number of cruel practices, including physical handling, excessive stocking density, transportation in high temperatures, and humidity (Kober *et al.,* 2014). Damage to the tissues is evident in inadequate transport, and stress is likely a factor in poor welfare.

Poor animal welfare makes each animal more vulnerable to disease and increases the likelihood that the disease will spread quickly (Broom, 2003). According to Sporer *et al.* (2007), animals reflect changes in the body's physical, biochemical, and immunological characteristics. Increased body temperature, and heart and respiration rates, among other bodily changes, are among the modifications (Swanson and Morrow-Tesch, 2001). Non-esterified free fatty acids, glucose concentrations, and muscle enzymes like CK are among the biochemical alterations brought on by transportation stress (Ishiwata *et al.,* 2008; Uetake *et al.,* 2009; Uetake *et al.,* 2011). Increased packed cell volume and serum protein measurements have also been linked to dehydration (Sporer *et al.,* 2007; Ishiwata *et al.,* 2008; Sporer *et al.,* 2008). Researchers concluded that cortisol and catecholamine levels in various phases of transportation underwent significant alterations as a result of stimulation of the hypothalamic-pituitary-adrenal axis (HPA) (Ishizaki *et al.,* 2005; Sporer *et al.,* 2007). In Bangladesh, a few research on the welfare of goats over transport was carried out. The main objective of the current study was

1) To investigate the health and welfare condition of transported goats during unloading

2) To find out the behavior of goats and the transport staff during unloading

3) To examine the hematological profile of transported goat

Chapter II: Materials and Methods

2.1 Study design:

The current study was carried out between February 2023 and September 2023 at the Sagorika livestock market. It is the second largest livestock market in Bangladesh located in Chattogram metropolitan city corporation, popular for trading goats and cattle over the years. Though there is a great distance between Pabna, Jessore, and Meherpur to the Sagorika live cattle market, traders chose this place because they got good prices through selling goats.

2.2 Study description:

The journey started in three different districts during the study time and they were Jessore, Pabna, and Meherpur. The animals were loaded from the Jhikargacha cattle market of Jessore (≈416.6km); the Autapara cattle market of Ishwardi, Pabna (≈400km), and the Meherpur cattle market of Meherpur Sadar (≈480 km). The transportation started at 4.00-7.00 p.m. and they reached their destination at 6.30-9.00 a.m. The journey duration varied from 12 to 17 hours according to the traffic condition of the road. At the unloading time, the temperature range was (23.5-32°C) and the relative humidity range was (43-77%). The temperature and humidity were measured by using a digital Thermo-hygrometer.

2.3 Transporting vehicle:

A total of 51 open trucks with a maximum loading weight of up to 5000 kg were included in the study. From the floor of the vehicle, they were measuring 19.38 ft. (l) × 7.95 ft (w) × 4.1 ft (h). The floor space in the truck was divided into two compartments using wooden partitions horizontally in those trucks which came from Jessore, and Meherpur, and without partitions in trucks which came from Pabna. During our study time, 35 trucks came from Jessore,5 trucks from Meherpur, and 11 came from Pabna. The vehicle's space allocation and higher stocking density were prevented from sitting or lying down as the average stocking density in the truck was 1.54 sq ft/animal from Jessore and Meherpur, and 1.65 sq ft/animal came from Pabna. So, they remained in a standing position throughout the journey. During the journey, they were not given any kind of

food or water. Only paddy straw was given which was unable for them to eat because of higher stocking density.

2.4 Study animal:

Overall, 8790 goats irrespective of age and body weight were carried in the 51 targeted vehicles. Among them, 7568 were male and 1222 were female.

2.5 Data collection:

An organized questionnaire was designed related to the objective of the study. The data included in the questionnaire were market information, vehicle information, animal data, unloading data, transportation data, animal and staff behavior during unloading, mortality, and observable clinical signs. All the information was recorded in the questionnaire.

2.6 Physical examination:

All the signs including injury, wound, lacrimation, and lameness were observed by close inspection of the animal by the author of the manuscript. The below signs were observed during the unloading.

Table 1: Definition of different observable clinical sign

Clinical Sign	Definition
Fresh injury	Newly formed injury on the epidermal layer of skin.
Old injury	Old injury is the type of injury where a scar is already formed.
Abrasion	An abrasion is an area damaged by scraping or wearing something away.
Laceration	A laceration is a deep cut or tear in skin or flesh.

Lameness	Lameness is the condition of being unable to walk well because of an injury to the leg or foot.
Nasal Discharge	When mucus comes out of a goat's nose, it's called nasal discharge.

2.7 Cleanliness score in skin :

Depending on the presence of dirt on the different body areas they were categorized into three sections Good, Fair, and Poor.

Table 2: Definition of different categories of cleanliness of the skin

Category	Definition
Good	Presence of dirt in a minimal amount on the body (<20% of body area)
Fair	Presence of dirt in a minimal amount on the body (20-40% of body area)
Poor	A large or maximum amount of dirt is found in the skin (>40% of body area).

2.8 Attitude and behavior of staff during unloading:

During unloading transport staff showed different behavior. Friendly behavior is a sign of good welfare whereas Rude behavior is an indicator of bad welfare.

Table 3: Definition of different behavior by staff

Behavior	Definition
Friendly	The handler shows kindness during unloading.
Rude	When staff or handlers show aggressiveness during unloading.

Beating	A punishment or assault by a handler in which the animal is hit repeatedly during unloading.
Slapping	Hit or strike with the palm or a flat object during unloading.
Hanging by Rope	Tight the head into the rope then place the animal in the ground by hanging.
Push	Exert force on animals to move them away from a place.
Dragging by ear	Pull the ear of the goat along forcefully, roughly, or with difficulty.

2.9 Behavior of goat during unloading:

Different behaviors of goats were observed during unloading. The kinds of behavior depend on goats and how they were handled by staff. The different kinds of behaviors are :

Table 4: Definition of different behavior by goat during unloading

Behavior	Definition
Refuse to move	The state where the animal will show reluctance during unloading.
Jump	The way of moving quickly or suddenly from the surface of the truck to the ground during unloading.
Fall	State of moving from a higher to a lower level, typically rapidly and without control.

Slip	Go or move quietly or quickly, unintentionally without attracting notice.
Runaway	An animal that is running out of control.

2.10 Blood sampling:

Blood was collected randomly from 40 goats immediately after unloading from the truck at the market of destination. On the other hand, 20 healthy control goats were selected for comparison in a hematological study. The control animals were from a farm where they were in good management condition. 4 ml of blood was collected from the jugular vein of the animals that were selected. After collection they were put in one vacutainer containing EDTA (anticoagulant) and the other vial did not contain EDTA. The vacutainer that contains EDTA was used for hematological analysis. Each vial contains 2 ml of blood. Then they immediately put it in an icebox and transferred it to the physiology lab of Chattogram Veterinary and Animal Sciences University within 1 hour after collection. Blood samples with EDTA were stored at 4°C. All the laboratory examinations were done within 20 hours.

2.11 Hematological analysis:

The blood sample in a vacutainer that contains EDTA was analyzed for Differentiate Leucocyte Count (DLC), Packed Cell Volume (PCV), Hemoglobin (Hb), Total Erythrocyte Count (TEC), and Total Leucocyte Count (TLC). Among them, Differentiate leucocyte count (DLC) was done manually and the rest of them were done by Automatic Blood Analyzer (Celltac alpha by Nihon Kohden, Japan)

2.12 Statistical analysis:

All collected information and results of hematological and biochemical analysis were imported into Microsoft excel-2019. For analysis, data were transferred to STATA-13 software. Comparison of quantitative data of blood and serum analysis between the reference animal and control healthy animal were done by t-test. Prevalence and confidence interval of different qualitative data during the unloading of the animal was done by GraphPad Quickcalcs software. The probability level of significance was considered as $p<0.05$.

Figures

Fig 1: Push by handler

Fig 2: Injured during unloading

Fig 3: Higher stocking density

Fig 4: Beating by staff

Fig 5: Lameness after unloading

Fig 6: Dead animal

Fig 7:Hanging by rope

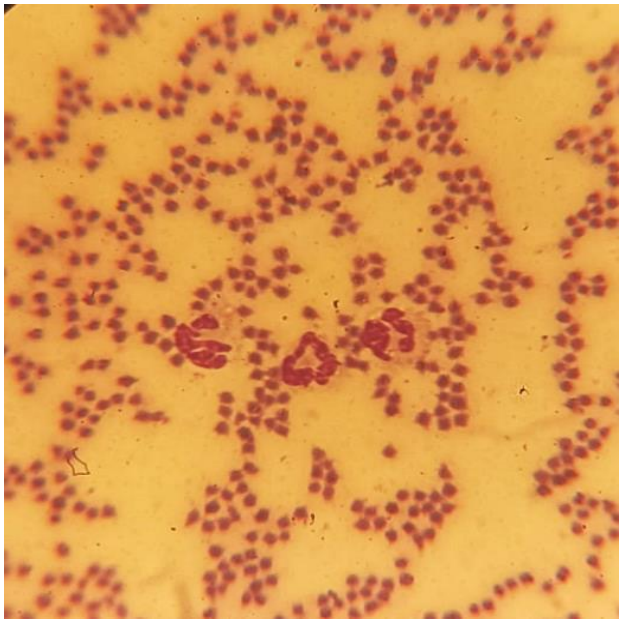

Fig 8: Microscopic examination blood film

Chapter III: Results

A total of 8790 goats were examined during the study period. In the study animal, the percentage of males and females is 86.10% and 13.90%, respectively. The aim was to find the potential stress and impact of transportation on goats by observing evident clinical signs, and behaviors of goats and handlers during unloading. Furthermore, hematological differences between transported and non-transported goats were examined.

Table 5: General information on Transported vehicle (N=51)

Trait		Frequency	Percentage	95% CI
Loading place	Jessore	35	68.63	54.91-79.84
	Meherpur	5	9.80	3.83-21.41
	Pabna	11	21.57	12.33-34.79
Duration of Journey	<13hr	15	29.41	18.63-43.08
	≥ 13 hr	36	70.59	56.92-81.37
Unloading Temperature	(<25°C)	1	1.96	0.01-11.27
	(>25°C)	50	98.04	88.73-99.99

CI= Confidence Interval

Table 5 shows the general information about the truck that transported the studied animal. Out of 51 trucks observed, the majority of goats came from Jessore(68.63%), followed by Pabna (21.57%), and Meherpur (9.80%). Only 29.41% of the total number of trucks made the journey in less than 13 hours, whereas 70.59% required 13 hours or more. In 98.04% of the cases, the temperature during unloading was >25 °C, and only 1.96% of the trucks had a temperature <25 °C.

Table 6: Clinical Signs observed during unloading (N=8790)

Trait		Frequency	Percentage	95% CI
Nature of Injury	Fresh	1294	14.72	14.00-15.48
	Old	473	5.38	4.93-5.87
Types of injury	Abrasion	821	9.30	8.75-9.97
	Laceration	549	6.24	5.76-6.77
Dehydration	Present	4541	51.66	49.86-53.48
	Absent	4249	48.34	46.52-50.14
Lameness	Present	451	5.13	4.69-5.61
	Absent	8339	94.87	93.74-95.82
Nasal Discharge	Present	1301	14.80	14.07-15.56
	Absent	7489	85.20	83.62-86.59
Cleanliness of Skin	Good (<20 %)	3967	45.13	43.68-46.62
	Fair (20-40%)	2549	30.00	27.69-30.37
	Poor (>40 %)	2274	25.87	24.60-27.19

CI= Confidence Interval

The clinical signs that were observed are presented in Table 6. Out of the total injuries examined, 14.72% were considered to be fresh injuries, while 5.38% were found to be old injuries. The majority of injuries observed consisted of abrasions (9.30%) and lacerations (6.24%). Lameness was observed in 5.13% of the cases. Nasal discharge was noted in 14.80% of the cases that were observed. On the other hand, most of the animals had clean bodies.

Table 7: Frequency of the behavior of goats during unloading (N=8790)

Trait	Frequency	Percentage	95% CI
Refuse to Move	1635	18.60	17.80-19.43
Jump	3102	35.29	33.89-36.72
Fall	1637	18.62	17.82-19.45
Slip	1257	14.30	13.58-15.05
Run away	664	7.55	7.02-8.13
Confusion	480	5.46	5.00-5.96

CI= Confidence Interval

Table 7 shows the different behaviors of goats when were unloaded from the truck. A variety of behaviors were observed during unloading. The most common behavior among them, exhibited by goats in about 35.29% of occurrences, was the Jump. About 18.62% of cases reported Fall and another reasonably prevalent behavior was Refusing to move which occurred about 18.60% of the time. Slip and Run away, on the other hand, had a prevalence of 7.55% and 5.46%, respectively**.**

Table 8:Frequency of behavior of staff during unloading (N=8790)

Trait		Frequency	Percentage	95% CI
Friendly		1349	15.35	14.61-16.12
Rude	**Beating**	1203	13.69	12.98-14.42
	Slapping	976	11.10	10.46-11.78
	Push	1367	15.55	14.81-16.32
	Hanging by rope	3418	38.89	37.45-40.34
	Dragging by ear	1009	11.48	10.83-12.16

CI= Confidence Interval

The behavior of staff during unloading was observed in Table 8. The staff displayed a variety of behaviors when unloading the goats from the truck. Remarkably, they employed a technique that involved hanging the goats by a rope 38.89% of the time. This approach appears to be used the most commonly while unloading. Furthermore, 15.55% of the time, pushing was observed, and 15.35% of the time, friendliness was reported. Behavior such as beating was noted 13.69% of the time and slapping at 11.10% during unloading. In addition, 11.48% of the cases involved dragging goats by their ears, suggesting that a range of behaviors were employed in this approach.

Table 9: Hematological result of transported and non-transported goat

Variable	Transported goat (Mean±SD)	Non-transported goat (Mean±SD)	P-value
TEC(10^6/µl)	1.6±2.3	8.6±0.3	0.0000
TLC (10^3/µl)	18.8±7.5	10.5±1.5	0.0000
Hb (mg/dl)	8.3±1.4	8.1±0.4	0.4343
PCV (%)	6.3±7.1	23.7±2.0	0.0000
L (%)	51.6±12.2	60.7±3.5	0.0001
M (%)	5.2±2.2	3.1±0.8	0.0000
N (%)	35.5±10.4	32.2±3.5	0.0710
E (%)	7.5±3.1	4.2±1.0	0.0000
B (%)	0.2±0.4	0±0	0.0065
N:L (ratio)	0.9±1.0	0.5±0.1	0.0363

N=40 (Transported goat) ; N= 20 (Non-Transported goat)

Several hematological parameters were observed in a comparison study between transported and non-transported goats are shown in Table 9. Long-distance transportation significantly affected a number of hematological parameters in goats, such as PCV ($p< 0.0001$), percentages of eosinophils ($p< 0.0001$) and basophils ($p=0.0065$), counts of erythrocytes and leukocytes ($p< 0.0001$), lymphocytes ($p=0.001$), and monocytes ($p< 0.0001$), as well as the n:l ratio ($p=0.0363$). However, no statistically significant differences were noted in the count of neutrophils or Hb. Compared to non-transported goats (8.6 ± 0.3), goats that were transported had a significantly lower TEC (1.6 ± 2.3). However, there was no significant difference in the Hb levels between the two groups. Furthermore, the TLC of the transported goats was significantly higher (18.8 ± 7.5) than that of the control goats (10.5 ± 1.5).in addition, the PCV of the moved goats was significantly lower (6.3 ± 7.1) than that of the non-transported goats (23.7 ± 2.0). Moreover, compared to control goats (60.7 ± 3.5), the percentage of lymphocytes in the traveled goats was much lower (51.6 ± 12.2). Moreover, compared to non-transported goats (monocytes: 3.1 ± 0.8, eosinophils: 4.2 ± 1.0), the reference goats showed a significantly higher percentage of monocytes (5.2 ± 2.2) and eosinophils (7.5 ± 3.1). Goats that were traveled had a significantly greater percentage of basophils (0.2 ± 0.4) than goats that were not traveled. Remarkably, the ratio of neutrophils to lymphocytes (N:L) in goats that were carried by vehicle (0.9 ± 1.0) was significantly greater than that of goats who were not carried (0.5 ± 0.1).

Chapter IV: Discussion

The current study investigated the effects of transportation stress on goats in terms of observing the clinical signs, and behavior of goats and handlers during unloading and by examining hematological differences between transported and non-transported goats. The changes in the parameters of hematology are due to transportation stress as they have traveled a long distance about 12 to 17 hours. As they were not given any feed except paddy straw during the journey it was also a major problem for them.

Animal welfare is severely impacted by mismanagement during transportation since it causes animals to experience prolonged stress (Gregory, 2008). The present study recorded animal deprivation from feed and water and insufficient space allocation. For the animals, in the vehicles, and forcefully keeping the animals in standing position for the entirety of transportation. One of the five requirements taken into consideration when evaluating an animal's welfare is freedom from hunger, and it is deemed violated when food and water are withheld (Broom, 2015). In our study, it was found that due to low stocking density, the animals were unable to move or sit in the truck. So they have to remain in a standing position during the whole journey. According to studies on sheep, an animal's capacity to lie down throughout a lengthy journey is important to their health (Cockram et al., 1996). Goats weighing an average of 20 kg should have a stocking density of 0.17 m2 (1.83 sq ft) per animal, according to the animal welfare guideline of Tasmania(2008). However in the present study, the space allocation per animal was less than this.

Stress-induced hyperthermia may potentially be the cause of the rise in body temperature after transportation (Bouwknecht et al., 2007). In our study, among 51 trucks, the unloading temperature was abnormal (>25°c) in 50 trucks. Higher environmental temperature may cause hyperthermia. In the present study there is found injury like abrasions (9.30%) and lacerations (6.24%) might have happened as a result of the overcrowded trucks carrying an excessive number of goats and unfair management practices, like positioning the goats incorrectly on the vehicles, providing insufficient padding support, and placing pointed objects on the truck. It might also have happened because of handling practices like rapid loading and unloading and failing to raise the floor of the vehicle while doing so

Transportation stress has been shown to affect the leukocyte count in a variety of animals, such as cattle (Schaefer *et al.,* 1992), poultry (Zulkifli *et al.,* 2000), and goats (Kannan *et al.,* 2000; Rajion *et al.,* 2001).in our study, we found that the goats that were transferred had a higher neutrophil count (35.5+10.4) than the goats that were under control (32.2±3.5). Moreover, the transferred goats' lymphocyte percentage was significantly lower (51.6±12.2) than that of the control group (60.7±3.5). These results are in opposition to those of Kannan *et al.* (2000), who reported that the stress of transportation caused a rise in the percentage of neutrophils and a fall in lymphocytes. The increment of neutrophil count in this study may be a proportionate increase that may be a result of lymphopenia, which is quite common in stressed animals (Tarrant *et al.,* 1992, Alam *et al.,* 2018)

Chapter V: Conclusion

In conclusion, a number of problems were observed during this study on the welfare of goats during long-distance transportation and unloading in a livestock market in Bangladesh. The study found that when goats were transported, there were notable physiological alterations, aggressive staff behaviors, and poor animal behavior. Enhancing handling procedures, controlling stocking densities, guaranteeing access to food and water, keeping an eye on and enforcing standards, looking into alternate modes of transportation, and raising awareness and education. Moreover, funding for continued research and development are some suggestions made to address these issues. These actions are essential to improving the livestock business and goat welfare.

Chapter VI: Reference

Alam, M. R., Gregory, N. G., Uddin, M. S., Jabbar, M. A., Chowdhury, S., & Debnath, N. C. (2010). Frequency of nose and tail injuries in cattle and water buffalo at livestock markets in Bangladesh. Animal Welfare, 19(3), 295-300.

Alam, M., Hasanuzzaman, M., Hassan, M. M., Rakib, T. M., Hossain, M. E., Rashid, M. H., ... & Hoque, M. A. (2018). Assessment of transport stress on cattle traveling a long distance (≈ 648 km), from Jessore (Indian border) to Chittagong, Bangladesh. Veterinary Record Open, 5(1), e000248.

Alam, M. R., Islam, M. J., Amin, A., Shaikat, A. H., Pasha, M. R., & Doyle, R. E. (2020). Animal-based welfare assessment of cattle and water buffalo in Bangladeshi slaughterhouses. Journal of Applied Animal Welfare Science, 23(2), 219-230.

Broom, D. M. (1986). Indicators of poor welfare. British Veterinary Journal, 142(6), 524-526.

Broom, D. M., Johnson, K. G., & Broom, D. M. (1993). Stress and Animal Welfare (Vol. 993). London: Chapman & Hall.

Broom, D. M. (2003). Causes of poor welfare in large animals during transport. Veterinary Research Communications, 27(Suppl 1), 515-518.

Cockram, M. S., Kent, J. E., Goddard, P. J., Waran, N. K., McGilp, I. M., Jackson R. E& Prytherch, S. (1996). Effect of space allowance during transport on the behavioral and physiological responses of lambs during and after transport. Animal Science, 62(3), 461-4

Fazio, E., & Ferlazzo, A. (2003). Evaluation of stress during transport. Veterinary Research Communications, 27, 519-524.

Gebresenbet, G., Aradom, S., Bulitta, F. S., & Hjerpe, E. (2011). Vibration levels and frequencies on vehicle and animals during transport. Biosystems Engineering, 110(1), 10-19.

Homann, S., Van Rooyen, A. F., Moyo, T., & Nengomasha, Z. (2007). Goat production and marketing: Baseline information for semi-arid Zimbabwe.

Ishizaki, H., & Kariya, Y. (2010). Road transportation stress promptly increases bovine peripheral blood absolute NK cell counts and cortisol levels. Journal of Veterinary Medical Science, 72(6), 747-753.

Ishiwata, T., Uetake, K., Eguchi, Y., & Tanaka, T. (2008). Function of tongue-playing of cattle in association with other behavioral and physiological characteristics. Journal of Applied Animal Welfare Science, 11(4), 358-367.

Kannan, G., Terrill, T. H., Kouakou, B., Gelaye, S., & Amoah, E. A. (2002). Simulated preslaughter holding and isolation effects on stress responses and live weight shrinkage in meat goats. Journal of Animal Science, 80(7), 1771-1780.

Kannan, G., Terrill, T. H., Kouakou, B., Gazal, O. S., Gelaye, S., Amoah, E. A., & Samake, S. (2000). Transportation of goats: effects on physiological stress responses and live weight loss. Journal of Animal Science, 78(6), 1450-1457.

Kober, A. K. M. H., Bari, M. S., Rakib, M. R., & Ali, M. S. (2014). Injuries of cattle and buffaloes during transportation and slaughter at Chittagong City Corporation of Bangladesh. Bangladesh Journal of Animal Science, 43(1), 74-77.

Rajion, M. A., Mohamed, I., Zulkifli, I., & Goh, Y. M. (2001). The effects of road transportation on some physiological stress measures in goats. Asian-Australasian Journal of Animal Sciences, 14(9), 1250-1252.

Schaefer, J. A., & Moos, R. H. (1992). Life crises and personal growth.

Sporer, K. B., Burton, J. L., Earley, B., & Crowe, M. A. (2007). Transportation stress in young bulls alters expression of neutrophil genes important for the regulation of apoptosis, tissue remodeling, margination, and anti-bacterial function. Veterinary Immunology and Immunopathology, 118(1-2), 19-29.

Swanson, J. C., & Morrow-Tesch, J. (2001). Cattle transport: Historical, research, and future perspectives. Journal of Animal Science, 79(suppl_E), E102-E109.

Uetake, K., Tanaka, T., & Sato, S. (2011). Effects of haul distance and stocking density on young suckling calves transported in Japan. Animal Science Journal, 82(4), 587-590.

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Biography of Author

Iftekhar Ibna Mustafa Tanjim is the son of Mohammed Mostafa Tayab and Monwara Begum. He completed both his SSC and HSC with a GPA of 5.00 from Nasirabad Govt. High School and Hazera Taju University College, respectively. He is an enthusiastic researcher who is currently focused on zoonotic diseases and antibiotic resistance. His academic career has been characterized by an everlasting passion for comprehending the complex dynamics of these important subjects as an intern student at the Faculty of Veterinary Medicine at Chittagong Veterinary & Animal Sciences University. Tanjim wants to have a significant impact on veterinary medicine and the health of the planet as a whole.