Chapter 1

Introduction

Beef cattle production is an integral part of livestock based livelihood. The United States was the largest producer of beef in the world in 2020 followed by Brazil & the European Union (Cook, 2022). The United States, Brazil and the European Union accounted for roughly 50% of the world's beef production. It is reported that 75% of the world's cattle population is in the developing countries (Asia, Africa and Latin America), but it contribute only 34% of the beef production (Rahman, 1992) globally. The annual meat production in Bangladesh is about 290000 metric ton, whereas beef contributes 161000 metric ton (FAO, 1998) of the total meat production. The development of the meat industry is an emerging sector for employment and income generation of the rural poor, especially landless, destitute and divorced women. Now a days, the higher educated people also involved with cattle farming both dairy and beef cattle production in Bangladesh. Demand for meat is rising because of the rapid increase in population, rising living standards, growing awareness of nutrition and change in food habits (Rahman et al., 2013).

The majority of the cattle in Bangladesh are natively produced. The most notable ones are Red Chittagong cattle, North Bengal Grey, Pabna, and Munshiganj (Hossain et al., 2006). As there is no beef type animal in the country, the farmers are frequently being involved in fattening of either local or upgraded dairy bull calves for beef production in Bangladesh. Recently, the government took some initiatives. The Department of Livestock Services (DLS) of the Government of the People's Republic of Bangladesh is now administering a program for the enhancement of beef breeds called "Beef breed improvement project" in a number of various selected areas of Bangladesh. In this project, semen of Brahman bulls was imported from the USA in 2008.This imported American Brahman bull semen was used to inseminate native cows to obtain graded calves in the selected regions (Haque et al., 2013). Apart from this, the private animal producer also interested to brought some breed for up-gradation (e.g., ACI, BRAC).The Brahman (American zebu) can tolerate parasite challenges and heat stress (Franke, 1980). In tropical and subtropical areas, the Brahman breed is said to be the most suited and compatible breed of beef (Hernandez et al., 2004).

During the transportation of Brahman cattle from America to Bangladesh, due to the stress on the cattle, many times they have to face different types of obstacles and they are not cope-up with our environment. A weakened immune system is a result of ongoing stress from

transportation, an unfavourable environment, physical discomfort, and poor feed quality. Stress alters the PH of the rumen, which might cause the animal to consume less feed. Sickness, slow growth, and even weight loss will result from this. Sometimes it can be seen that various nutritional and metabolic disorders are found a result of off-feed due to stress. The term "metabolic disease" refers to a range of ailments brought on by a deficiency in some vital nutrients, which disturbs the animal's regular metabolic functions (Gadberry & Powell, 2011). As a result, of going off-feed, the glucose level in their body decreases and hypoglycaemia develops. Hypoglycaemia is the medical term for an abnormal fall in blood glucose levels (Lundkvit et al., 2005). The range of blood glucose level is 45 to 75 mg/dl is considered typical for healthy cattle (Kaneko et al., 1997). When the body reserves of glucose are depleted by excessive glucose utilisation hypoglycaemia take place (Koeing, 2009). Possible mechanisms leading to hypoglycaemia include (i) impaired glycogenolysis and gluconeogenesis in the liver, (ii) the presence of endotoxin or cytokines that have insulin like activity, (iii) increased catabolism of glucose by the animal, and (iv) excessive utilization of glucose by bacteria and leukocytes (Nelson, 2014). If the blood glucose levels are too low, certain organ systems may not operate properly and develop hypoglycaemic shock.

As physiological and pathological changes occur in animals, their blood components change accordingly. Consequently, the blood parameters can be used clinically to assess the severity of the disease and apply various treatments. The use of haematological and biochemical parameters for animal breeding selection has been the subject of numerous studies recently (Pathak et al., 2018; Molina et al., 2018). As they have significant role on the production performance and adaptability of cattle, haematological and biochemical profiles are one of the most sensitive indicators that represent the physiology, health, and metabolic conditions of cattle. Considering the above background, the present study was undertaken with the following objectives:

1. To analysis the proximate and minerals component of concentrated feed;

2. To analysis the Haematological Parameters;

3. To analysis the Biochemical Parameters.

Chapter 2
Materials and Methods

2.1 Case Presentation

A 10-years-old, male, American Brahman cattle was weighing 938kg with signs of laminitis, weakness and off-feed, which was attended by a veterinarian in 'Heritage and Corporation farm', Khulshi, Chattogram.

2.2 Case History

The cattle were brought to Bangladesh by air from America and kept at the airport for 2 days. On 4 March 2022, the cattle were kept at a farm in Asulia, Dhaka. On 24 April, the cattle were brought from Dhaka to a farm "Heritage & Corporation" in Khulsi, Chattogram. On 22 July 2022, the caretaker observed laminitis, weakness & off-feed. Then the cattle treated with with Streptopen® (streptopenicillin) (Renata Ltd, Bangladesh) & NS 3000ml intravenously once daily for 2 days by the attending veterinarian. After 2 days the caretaker observed the cattle were in recumbent condition. Then the veterinarian administrated Ceftron-vet® (Ceftriaxone) (Square Pharmaceuticals Ltd, Bangladesh) 6gm & Ketovet® (ketoprofen) (Techno Ltd, Bangladesh) 30ml respectively intramuscularly 24 hours interval for three days. Three days afterward, while the condition was not improving, he consult with a veterinarian (Professor) from CVASU, who examined the animal and recorded clinical findings. The vet suggested him to test the feed materials and blood. The caretaker had sent some feed samples to the Department of Animal Science and Nutrition, and blood and serum samples were sent to the Department of Physiology Biochemistry and Pharmacology laboratory at Chattogram Veterinary and Animal Sciences University. Apart from this cattle, the farm had four other healthy American Brahman cattle.

2.3 Management & Feeding

Cattle were fed on the stall feeding condition. The daily ration for cattle was 15 kg of green grass, 3 kg of silage, 2 kg of rice straw and 10 kg of concentrate.

2.4 Clinical Examination

On clinical examination it was founded that temperature 102° F, laminitis, abnormal rapid breathing, increase heart rate and severe dehydration.

2.5 Laboratory Examination of Feed Sample

The concentrated feed samples were analyzed for proximate components (dry matter, moisture, crude protein, crude fiber, ash, ether extraction) at the department of Animal Science and Nutrition, CVASU according to AOAC method and mineral contents of feed analyzed at the biochemistry laboratory, department of Physiology, Biochemistry and Pharmacology, CVASU using spectrophotometer.

2.6 Laboratory Examination of Blood Sample

2.6.1 Blood collection:

At first, the skin at the blood collection site was sterilized with 70% alcohol. A 10 ml plastic syringe was used to take blood from the jugular vein. For a complete blood count, 3ml of blood was immediately allotted into an aseptic tube containing Ethylene Diamine Tetra Acetic Acid and 4ml of blood was taken in to a vacutainer without anticoagulant for serum preparation. Then the samples were brought at the post graduate laboratory, Department of Physiology Biochemistry and Pharmacology through a ice box immediately after collection.

2.6.2 Haematological parameters

Haemoglobin (Hb), erythrocyte sedimentation rate (ESR), total erythrocyte count (TEC), total leukocyte count (TLC), packed cell volume (PCV) and differential leukocyte count (lymphocyte, neutrophil, eosinophil, monocyte, basophil) were performed using haemato-analyzer (Celltacα, MEK-6550, Nihon-Kohden, Japan) ®.

2.6.3 Serum biochemical parameters

After the blood had stopped clotting, the serum was extracted, centrifuged at 3000 rpm for 10 minutes, and then put in the eppendrof tube and stored at 4°C for future examination. Serum Biochemical tests including Calcium, phosphorus, aspartate aminotransferase (AST), alanine aminotransferase (ALT), total protein (TP), albumin (ALB), globulin (GLO), ALB:GLO , glucose (GLU), creatinine (CREA), blood urea nitrogen (BUN), glutamyl transpeptidase (GGT) were performed using commercial kits through the biochemical analyzer (Humalyzer 3000®).

2.7 Data Analysis

All data were recorded, sorted out and imported in spreadsheets of Microsoft Excel 2010 and exported to Statistical Package for Social Sciences (SPSS version, 26.0). Then descriptive statistics were performed including percentage and mean ± SD.

Chapter 3

Results

3.1 Demographic information of cattle

The demographic parameters showed that the average age of the healthy animals was 4.50±2.92 years and the age of the diseased animal was 8 years. The mean body weight of the healthy animal was 660.50±183.87 kg and the body weight of the sick animal was 938 kg.

Table 1: Demographic information of cattle

Parameters	Health status	No. of animal	Mean ± SD
Age (year)	Healthy	4	4.50±2.92
	Diseased	1	8
Body Weight (kg)	Healthy	4	660.50±183.87
	Diseased	1	938

3.2 Feed Analysis

3.2.1 Proximate analysis of feed

Proximate analysis of cattle feed revealed following parameters, dry matter 87.48%, moisture 12.52%, crude protein 13.30% , Crude fiber 13.04%, Ash 7.94%, ether extract 4.11%.

Table 2: Proximate component of feed

Serial No	Proximate component	Results (%)
1	Dry matter	87.48
2	Moisture	12.52
3	Crude protein (CP)	13.30
4	Crude Fiber (CF)	13.04
5	Ash	7.94
6	Ether Extraction	4.11

3.2.2 Minerals of Cattle Feed:

Cattle feed revealed calcium 0.41% , magnesium 0.20% , phosphorus 0.45% , sodium 0.10%, potassium 0.70% , zinc 30.0 ppm, copper 9.0 ppm , iron 49.0 ppm , selenium 0.10 ppm, manganese 38.9 ppm

Table 3: Minerals Parameters of Cattle Feed

Parameters	Results	Reference value
Calcium (%)	0.41	0.58
Magnesium (%)	0.20	0.20
Phosphorus (%)	0.45	0.26
Sodium (%)	0.10	0.10
Potassium %)	0.70	0.70
Zinc(ppm)	30.0	30.0
Copper(ppm)	9.0	10.0
Iron(ppm)	49.0	50.0
Selenium(ppm)	0.10	0.10
Manganese(ppm)	38.9	40.0

(Source: NRC, 1996. Adapted from NRC.Nutrient Requirements of Beef Cattle, 6th Edition.)

3.3 Haemato-biochemical parameters

3.3.1 Haematological parameters

Haematological parameters of diseased cattle showed, Hb-60 g/L, ESR-0 mm 1st hour, TEC-(6.20×10⁶/cumm), TLC-(18.10×10³/cumm), PCV-24%, DLC (lymphocytes-60%, Neutrophils-20%, Eosinophils-5%, Monocytes-15%, Basophil-0%). Haematological parameters of healthy cattle were within the reference value.

Table 4: Haematological parameters

Parameters	**Category**		**Reference Value**
	Healthy (4)	**Diseased (1)**	
	Mean ±SD	**Mean ±SD**	
Hb (g/L)	130±14.31	70	80-150
ESR (mm)	0	0	0-1 (1st hour)
TEC (10^6/ cumm)	9.00±1.17	6.2	5-10
TLC (10^3/cumm)	10.70±1.68	18.10	4-12
PCV (%)	38.25±3.21	24	24-46
Differential Leukocyte Count (DLC)			
Lymphocytes (%)	63.50±11.90	60	50-75
Neutrophils (%)	39.75±12.65	20	15-40
Eosinophils (%)	5.25±0.50	5	0-5
Monocytes (%)	4.75±0.50	15	2-15
Basophils (%)	0	0	0-2

(Source: The Merck Veterinary Manual, 11th Edition)

3.3.2 Serum biochemical parameters

Serum Biochemical examination of diseased cattle showed that, calcium (7.3 mg/dl), phosphorus (8.4 mg/dl), albumin (22.6 g/L), globulin (66.50 g/L), albumin globulin ratio (0.59) AST (153.6 U/L) , ALT (109.7 U/L), GGT (44.6 U/L), BUN(45.6 mg/dl), creatinine (4.7 mg/dl), total protein (117.1 g/L) , glucose (27.6 mg/dl). Serum biochemical parameters of healthy cattle were within the reference value.

Table 5: Serum biochemical parameters

Parameters	**Category**		**Reference Value**
	Healthy (4)	**Diseased (1)**	
	Mean ±SD	**Mean ±SD**	
Calcium (mg/dl)	9.38±0.37	7.3	9.7-12.4
Phosphorus (mg/dl)	6.40±1.37	8.4	5.6-6.5
ALB (g/L)	42.43±1.9	22.6	30.3-35.5
GLO (g/L)	48.72±10.79	66.50	21.2-67.5
ALB:GLO	0.90±0.19	0.59	0.41-1.26
AST (U/L)	79±11.70	153.6	78-132
ALT (U/L)	28.25±14.36	109.7	11-40
GGT (U/L)	-	44.6	1-67
BUN (mg/dl)	16.80±1.15	45.6	20-30
Creatinine (mg/dl)	2.32±0.43	4.7	0-2
TP (g/L)	75.3±11.92	117.1	67.4-74.6
Glucose (mg/dl)	74.60±6.22	27.6	45-75

(Source: Clinical Biochemistry of Domestic Animals. 5th Edition)

3.4 Treatment

The treatment was given with RESFLOR GOLD® (Florfenicol + Flunixin Meglumine) (Merck Animal Health USA) 120 ml subcutaneously once daily for 3 days and Dextrose 5% 3000ml intravenously twice daily for 3 days. After treatment, the condition of Brahman cattle was not improving.

Chapter 4

Discussion

Routine examination of haemato-biochemical profiles are used for the diagnosis, progression and prognosis of different diseases, which may indicate the body's state of health (Mahima et al., 2013). According to haematological and biochemical results, significant differences were observed in specific parameters of healthy and diseased Brahman cattle. A haematological examination of the blood of diseased cattle revealed leukocytosis (18.10× 10^3 cumm) that might be due to infection. According to another author, infectious diseases, endogenous or exogenous poisoning, endocrine disorders, central nervous system disorders, anaphylactic shock, leukemia, and bovine leukocyte adhesion deficit (BLAD) are some of the causes of pathological leukocytosis (Kraft, 2005). Increased bone marrow release, decreased tissue emigration, and a movement of cells from the margin into the circulatory pool are some of the mechanisms driving leukocytosis (Web and Latimer, 2011). In the diseased cattle, hemoglobin was 70 g/L, which is significantly lower than the reference value and this lead to the decrease PCV which might be cause of death.

Biochemical analysis of diseased cattle revealed that the calcium level was 7.2 mg/dl, which is slightly lower and the phosphorus level was 8.4 mg/dl, which is higher than the reference value. High phosphorus in the blood is also called hyperphosphatemia. It occurs due to a high dietary supplement of phosphorus. Hyperphosphatemia in ruminants is frequently observed in dehydrated animals and is most likely caused by hemoconcentration and a decrease in saliva production (Braithwaite, 1976). Rhabdomyolysis causes cell membrane integrity to be compromised in large tissue injuries, which causes phosphorus to be released into the extracellular environment along with other primarily intracellular chemicals like potassium (Braithwaite, 1976).

For cattle, liver function is very crucial. When the cattle body is affected by other diseases, poor liver function aggravates the condition. ALB, GLO, AST, ALT, and GGT are liver function detection indicators that directly measure the liver's capacity for metabolism and storage. In the present study, albumin was found to be 22.6 g/L, which is lower than normal limit, indicating hypoalbuminemia. In addition to its well-known ability to expand plasma, the liver's production of albumin also serves to modulate the immune system, bind and transport a variety of endogenous and exogenous chemicals, and have anti-inflammatory

effects (Malkowski, 2013; caraceni et al., 2013). Low albumin induced hypoalbuminemia is associated with a wide range of illnesses, including sepsis, starvation, nephrotic syndrome and liver cirrhosis (Gatta et al., 2012). Respectively AST and ALT levels are 153.6 U/L and 109.7 U/L, which are higher than the reference value. ALT and AST levels may increase due to the higher body weight of cattle. Other author said that, high levels of circulating liver enzymes have been linked to obesity, which may raise the risk of metabolic disorders (Marchesini et al., 2008; Stranges et al., 2004). ALT and AST also increases due to hepatocellur damage and muscle damage (Sheth et al., 1998).

BUN and creatinine is very important for cattle. The BUN level was found to be greater (45.6 mg/dl) than expected, which might be occurs due to the retention of urine for three days. In a similar way, other authors (Morais, 2017) claimed that renal disease and obstruction of the normal flow of urine might cause elevated levels of BUN. Chikhou et al. (1993) showed that the amount of BUN in plasma might serve as a reflection of an animal's protein metabolism and as a measure of the body's protein breakdown status. Muscles produce creatinine as a waste product. Creatinine is removed from the body through the urine by the kidneys in a healthy body. Kidney problems may be indicated by high creatinine levels. In this study, we found that the creatinine level was 4 mg/dl, which is higher than the normal value. It might have occurred due to dehydration. Researchers have reported that repeated dehydration caused increased creatinine levels in animals (Johnson and Sanchez, 2013). Dehydration can result in a buildup of acids and waste products in the body as well as kidney clogging muscle proteins (myoglobin) and increase creatinine level. The kidneys may be harmed by all of these things. Due to extreme dehydration, there was also an elevated amount of total protein (117.1 g/L), which is consistent with an earlier report from de Morais in 2017.

It can be seen from the current study that the glucose level of the cattle is 27.6 mg/dl, which is much less than the normal value. Mainly due to off-feed, its glucose level decreased a lot. Numerous studies have suggested that glucose is connected to metabolism and diet (Engeroff et al., 2017; Wilms et al., 2020). Although a state of hypoglycaemia and subsequently hyperketonemia can result from inadequate amounts of glucose being provided in the diet (Mohammad, 2020).There are some strength of this study, for example, a veterinarian looks after the cattle of this farm, immediately after notice of the illness, he treated the diseased Brahman cattle, later on he investigated the disease using all tools including haemato-biochemical analysis and assessment of concentrated cattle feed used in this farm.

Conclusion

As a summary, a diagnosis of hypoglycaemic shock was based on the collective findings of the history, clinical signs, and findings of the haematological and biochemical parameters of the blood and the proximate and mineral components of the feed. The above discussion remains that cattle have multifunctional problems like leukocytosis, hyperphosphatemia, hypoalbuminemia, liver and kidney disfunction, and hypoglycaemia. Due to multifunctional disorder and severe hypoglycaemia, the cattle died of hypoglycaemic shock.

Limitations

This study has several limitations. The current study is based on only one case study and resembling ketone bodies, lipid profile, C- reactive protein and D-dimer test were not done. Another limitation is that a post-mortem should have been done to find out the proper cause of why the cattle died, but a post-mortem was not possible due to a lack of proper facilities. A weakness of this study is that the owner did not call the veterinarian in the first stage when the disease appeared. If the owner had called at the early stage of the disease, haematological and biochemical tests could have been done in first time, the diagnosis would have been easier and proper treatment would have been provided.

Reference

Braithwaite GD (1976).Calcium and phosphorus metabolism in ruminants with special on reference to parturient paresis. J Dairy Res. 43:501

Chikhou FH; Moloney AP; Allen P; Quirke JF; Austin FH; Roche JF (1993). Long-term effects of cimaterol in Friesian steers: I.Growth, feed efficiency, and selected carcass traits. J. Anim. Sci. 71:906-913.

Caraceni P; Domenicali M; Tovoli A; Napoli L; Ricci CS.; Tufoni M; Bernardi M (2013). Clinical indications for the albumin use: Still a controversial issue. Eur. J. Intern. Med. 24:721-728.

Cook R (2022).Top 50 world beef and cattle facts.

Dolka B; Wlodarczyk R; Zbikowski A; Dolka; L Szeleszczuk; P Klucinski (2014). Hematological parameters in relation to age, sex and biochemical values for mute swans (Cygnus olor), Vet Res Common. 38:93-100.

Engeroff T; Fleckenstein J; Banzer W (2017). Glucose metabolism from mouth to muscle: A student experiment to teach glucose metabolism during exercise and rest. Adv. Physiol Educ. 41:82-88.

FAO (Food and Agriculture Organization of the United Nations) (1998). Production Yearbook FAO Statistics Series. Vol. 52, Rome, Italy.

Franke DE (1980). Breed and Heterosis Effects of American Zebu Cattle. J. Anim.Sci. 50: 1206-1214.

Gadberry S & Powell J (2011). Nutritional disorders in beef cattle (Publication No. FSA3071). University of Arkansas Cooperative Extension.

Gatta A; Verardo A; Bolognesi M (2012). Hypoalbuminemia. Intern. Emerg. Med.7:193-199.

Hossain MM; Bhuiyan AKFH; Faruque MO; Deb GK (2006). Characterization and distribution pattern of Red Chittagong cattle of Bangladesh. Progressive Agriculture 17: 103-110.

Haque M; Hoque M; Saha N; Bhuiyan A; Hossain M (2013). Selection of Brahman Crossbred breeding bulls based on phenotypic performance. Bangladesh Journal of Animal Science. 41:60-66.

Hernandez AJ; Rae O; Olson T; Ferrer JM; Barboza M; Archbald LF(2004). Pre-Weaning traits of Brahman calves under a dual-purpose management system in the tropics. Revista Científica de Veterinaria. 4: 344-353.

Johnson RJ; Sanchez-Lozada LG (2013). Chronic kidney disease: Mesoamerican nephropathy new clues to the cause. Nat Rev Nephrol. 9(10):560-561.

Koenig A (2009). Hypoglycemia. In: Hopper KH, Silverstein DC.Small Animal Critical Care Medicine. 1st ed. St Louis, Missouri: Saunders Elsevier. 295–298.

Kaneko JJ; Harvey JW; Bruss ML (1997). Carbohydrate metabolism and its diseases. Clinical Biochemistry of Domestic Animals. 5th ed. 45-81.

Kraft W; Durr UM (2005). Klinische Labordiagnostik in der Tiermedizin [Clinical laboratory diagnostics in veterinary medicine], 6th ed. Schattauer, Stuttgart, Germany. In German.

Lundkvist J; Berne C; Bolinder B; Jonsson L (2005). The economic and quality of life impact of hypoglycemia. Eur J Health Econ. 6:197–202.

Lima PP A; Narciso LG; Alcindo JF; Deschk M; Carlini FC; Dos Santos; Almeida BFM (2022). Evaluation of hematological, biochemical and oxidative stress profile in calves under propofol anesthesia Vet. Res Commun. 46:27-35.

Morais DE; HA and Bartola DI (2017). Advances in Fluid. Electrolyte, and Acid-base Disorders. An Issue of Veterinary Clinics of North America: Small Animal Practice, E-Book47:2.

Molina E; Gonzalez RP; Moreno RR; Montero QK; Chirinos QN; Sanche UA(2018).Evaluation of haematological, serum biochemical and histopathological parameters of growing rabbits fed Amaranthus dubius. J. Anim. Physiol. Anim. Nutr. 102:e12791.

Mahima; Singh KV; Verma AK; Kumar V; Singh SK; Roy D (2013). Hematological and Serum Biochemical Profile of Apparently Healthy Hariana Cattle Hefers in Northern India. Pal J. Biol. Sc. 16: 1423-1425.

Mohammad Osamah dahl (2020).Laboratory evaluation of hypoglycemia in cattle .veterinary practitioner. 21(2):210-215

Małkowski P (2013). Human albumin: Old, new, and emerging applications. Ann. Transpl.18: 205-217.

Marchesini G; Moscatiello S; Di Domizio S; Forlani G (2008). Obesity-Associated Liver Disease. J Clin Endocrinol Metab. 93(11):74-80.

Nelson RW (2014).Small Animal Internal Medicine. 5th ed. St Louis, Missouri: Mosby Elsevier 777-823.

Pathak PK; Roychoudhury R; Saharia J; Borah MC; Dutta DJ; Bhuyan R; Kalita D (2018). Impact of seasonal thermal stress on physiological and blood biochemical parameters in pigs under different dietary energy levels. Trop. Anim. Health Prod.50:1025-1032.

Rahman MS (1992). Dairy Development in Bangladesh. Proceedings of Fourth National Conference. Bangladesh Animal Husbandry Association. 84-88.

Rahman MM; Hoque MA; Saha NG; Faruque MO (2013). Studies on management system and identification of the causes of genetic erosion of indigenous cattle in Mymensingh district. Bangladesh Journal of Animal Science. 42:23-28.

Susan E; Aiello; Moses MA (2010). The Merck Veterinary Manual, 11th Edition.

Stranges S; Dorn JM; Muti P; Freudenheim JL; Farinaro E; Russell M et al.(2004). Body fat distribution, relative weight, and liver enzyme levels: A population-based study. 39(3):754-63.

Sheth SC; Flamm SL; Gordon FD; Chopra S (1998). AST/ALT ratio predicts cirrhosis in patients with chronic hepatitis C virus infection. Am J Gastroenterol. 93:44-48

Webb JL; Latimer KS (2011). Leukocytes. In: Duncan and Prasse's veterinary laboratory medicine: clinical pathology, ed. Latimer KS, Chichester, UK.5th ed. 45-82.

Wilms JN; Berends H; Leal LN; Martínv Tereso J (2020). Determining the nutritional boundaries for replacing lactose with glucose in milk replacers for calves fed twice daily. J. Dairy Sci. 103:7018-7027.

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Biography

I am Sumyia Tanjid daughter of Ohidur Rahman and Bibi Morium. I passed my Secondary School Certificate examination from Basurhat A.H.C. Govt. High School in Noakhali in 2013 with a GPA 5, and a GPA 4.33 in the Higher Secondary Certificate examination in 2015 from Noakhali Govt. Women's College in Noakhali. Now I am an intern veterinarian under the faculty of veterinary medicine at Chattogram Veterinary and Animal Sciences University. In the future, as a human being, I have a long-cherished dream to serve my nation through my knowledge, creativity, and profession. As a veterinarian, I think I have a great opportunity to fulfil my dream by developing my career in the field as a veterinary practitioner. I have also a high interest in Medical Research and Public Health approach.