Thesis Ref. No._____

ADDIS ABABA UNIVERSITY

COLLEGE OF VETERINARY MEDICINE AND AGRICULTURE

CASE REPORTS ON SELECTED CLINICAL CASES OF ANIMALS PRESENTED TO ANIMAL HEALTH FACILITIES IN AND AROUND BISHOFTU, ETHIOPIA

MVSc RESEARCH THESIS

By:

FIRAOL SIMEWORK

JUNE, 2023

BISHOFTU, ETHIOPIA

CASE REPORTS ON SELECTED CLINICAL CASES OF ANIMALS PRESENTED TO ANIMAL HEALTH FACILITIES IN AND AROUND BISHOFTU, ETHIOPIA

A Thesis submitted to the College of Veterinary Medicine and Agriculture of Addis Ababa University in partial fulfillment of the requirements for the degree of Master of Science in Veterinary Clinical Medicine

By:

FIRAOL SIMEWORK

JUNE,2023

BISHOFTU, ETHIOPIA

SIGNATURE SHEET

Addis Ababa University

College of Veterinary Medicine and Agriculture

Department of clinical studies

"Case Reports on Selected Clinical Cases of Animals Presented to Animal Health Facilities in And Around Bishoftu, Ethiopia"

Submitted by: Firaol Simework _____ _____

Name of Student Signature Date

Approved for submission by:

1. Professor Teshale Sori _____ _____

Advisor Signature Date

2. Professor FikaduRegassa _____ _____

Co-Advisor Signature Date

3. Dr. Haileleul Negussie _____ _____

Department Head Signature Date

APPROVAL SHEET

Addis Ababa University

College of Veterinary Medicine and Agriculture

Department of Clinical Studies

As members of the Examining Board of the final MSc open defense, we certify that we have read and evaluated the thesis prepared by Firaol Simework
Entitled:

"Case Reports on Selected Clinical Cases of Animals Presented to Animal Health Facilities in and Around Bishoftu, Ethiopia"

And recommend that it be accepted as fulfilling the thesis requirement for the degree of: Master of Veterinary Science in Clinical Medicine

Dr._____	_____	_____
Chairman	Signature	Date
Dr. _____	_____	_____
Internal Examiner	Signature	Date
Dr. _____	_____	_____
External Examiner	Signature	Date

STATEMENT OF AUTHOR

First, I declare that this thesis is my work and that all sources of material used for this thesis have been duly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for an advanced MVSc degree at Addis Ababa University, College of Veterinary Medicine and is deposited at the College library to be made available to borrowers under rules of the library. I solemnly declare that this thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma, or certificate. Requests for permission for extended quotation from or reproduction of this manuscript in whole or in part may be granted by the head of the major department or the Dean of the College when in his or her judgment the proposed use of the material is in the interests of scholarship. In all other instances, however, permission must be obtained from the author.

Firaol Simework, Signature: _____.

Date of Submission: June 16/ 2023

College of Veterinary Medicine and Agriculture, Bishoftu, Ethiopia

TABLE OF CONTENT…….PAGES

ACKNOWLEDGMENTS

I am thankful to the almighty God for His eternal mercy, love, and protection in the ways and situations of my thesis work and my entire life.

Secondly, I would like to express my sincere gratitude and appreciation to my principal advisors, Professor Teshale Sori and Professor FikaduRegassa, for their guidance and constructive comments during the research work.

I am also thankful for my families especially my mother Gonfe Hangare Ebba, for her encourages and support.

My special thanks to the Addis Ababa University student council scholarship program for sponsoring me with academic fee-free support, and I want to express my heartfelt thanks to the College of Veterinary Medicine and Agriculture Academic and Management Offices for their great support and encouragement during my study period.

Finally, I want to thank all veterinary professionals at the Veterinary Teaching Hospital of the College of Veterinary Medicine and the SPANA Ethiopia project.

ABBREVIATIONS

AAU	Addis Ababa University
BR	Breath Rate
CCPP	Contagious Caprine Pleuropneumonia
CNS	Central Nervous System
CPV	Canine parvovirus infection
CSA	Central Statistics Agency
CVMA	College of Veterinary Medicine and Agriculture
DS	Donkey Sanctuary
EDTA	Ethylenediamine tetraacetic acid
ELISA	Enzyme-linked immunosorbent assay
EZL	Epizootic Lymphangitis
FAD	Flea allergy dermatitis
FMD	Foot and Mouth Disease
FMDV	Foot and Mouth Disease virus
GDP	Growth Domestic Population
HR	Heart Rate
LSD	Lumpy skin disease
MAbs	Monoclonal antibodies
NSAID	Nonsteroidal Anti-Inflammatory Drugs
NSAIDs	Nonsteroidal ant inflammatory drugs

NVI	National Veterinary Institute
OIE	World Organization for Animal Health
PCV	Packed cell volume
PCR	Polymerase chain reaction
PPR	Peste de Petitis
RNA	Pest pes petitis ruminants
SC	Subcutaneous
SPANA	Society for the Protection of Animals Abroad
UNDP	United Nations Development Program
vND	Newcastle Disease virus
VNT	Virus neutralization test
VTM	Virus transport media
WOAH	World Organization for Animal Health
XLD	Xylose Lysine Deoxycholate

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABSTRACT

Agriculture is a source of livelihood for an estimated 2.5 billion people and provides employment for 1.3 billion people globally. In developing countries, such as Ethiopia, livestock contributes around 30% of agriculturally related income. Despite the large number of livestock in Ethiopia, the sector is characterized by low productivity due to a wide range of animal diseases. This case report thesis describes the approach to handling clinical cases of various infectious and non-infectious diseases and their therapeutic management in different species of animals that were brought to veterinary facilities in and around Bishoftu, Ethiopia. Animals of different ages and species with different physiological statuses were examined from November 2022 to June 2023. The examination method involves owner complaints, anamnesis, and detailed clinical examinations of animals. Animals are treated and managed based on tentative and confirmatory diagnoses using broad-spectrum antimicrobials, anti-inflammatory drugs, and supportive drugs based on the manufacturer's guidelines. Parallel to treatment, samples from the diseased animals were collected and processed following laboratory procedures to reach a definitive diagnosis. The case follow-up was carried out to know the status of recovery through telephone and in-person communication. A total of 30 animals (bovine, equine, ovine, caprine, poultry, and canine) were examined and treated. Therefore, these case reports identified major diseases in and around Bishoftu and confirmed the underlying causes for each disease encountered during the practice period.

Keywords: *Animals, Bishoftu, Diagnosis, Treatment*

1. INTRODUCTION

Agriculture is a source of livelihood for an estimated 2.5 billion people and provides employment for 1.3 billion people globally (World Bank, 2007). In developing countries, such as Ethiopia, livestock contributes around 30% of agriculturally related income (World Bank, 2009). Ethiopia has the largest livestock population in Africa, with approximately 70 million cattle, 42.9 million sheep, 52.5 million goats, 2.15 million horses, 10.80 million donkeys, 0.38 million mules, 8.1 million camels, and 57 million poultry (CSA, 2021). Livestock is the pillar of the livelihood of most Ethiopians, providing draught power for crop production, a source of meat and milk, and a source of cash income for farmers. Furthermore, livestock provides foreign currency to the nation and considerably contributes to national GDP (Ayele *et al*., 2015). The economic contribution of livestock and their products accounts for around 20% of the total gross domestic product, 45% of the agricultural gross domestic product, and directly contributes to the livelihoods of about 65% of Ethiopian families (FAO, 2011).

Numerous factors affect livestock production and productivity, of which livestock disease is one of the most important (Ayele *et al*., 2015). The widespread prevalence of a wide range of diseases and parasites in all agro-ecological zones of the country causes direct economic losses through the high mortality of animals and contributes to the poor productive and reproductive performance of the animals. Various bacterial, viral, protozoal, endoparasites, and ectoparasites are frequently encountered in livestock diseases all over the country and account for the momentous economic losses. Consequences are also devastating at the national level since the presence of the diseases has triggered a strict trade embargo amounting to hundreds of millions of birr losses annually (UNDP, 1994; Abdeta *et al*., 2015).

A retrospective study conducted at the University of Gondar Veterinary Clinic determined that among the 1966 (during 2007–2009) farm animals admitted to the clinic, more than 75% were affected by bacterial, parasitic, and viral diseases, while metabolic diseases account for only 4.2% (Alemu and Zegeye, 2011). Among viral diseases affecting the

livestock sector of the country, foot-and-mouth disease (FMD), Capri pox virus diseases (sheep pox, goat pox, and lumpy skin disease), PPR (Peste de petits ruminants), contagious ecthyma, AHS (African Horse Sickness), and rabies are more frequent, while anthrax, blackleg, CBPP (contagious bovine pleuropneumonia), CCPP (contagious caprine pleuropneumonia), pastuerellosis, IBK (infectious Bovine Keratitis), Brucellosis, clinical mastitis, dermatophilosis, actinobacillosis, actinomycosis, foot rot, and abscess are among consistently reportable bacterial diseases (UNDP, 1994). Though erratic, tick-borne hemoparastic diseases such as Babesiosis and Theleriosis, although most of these diseases are curable and manageable, the subsequent interventions are not in line with the standard protocols.

Ethiopia is one of the countries where overall animal service has been compromised by inadequate and poorly maintained infrastructure and a scarcity of professionals (Jibat *et al*., 2015). The approach taken to this animal health service at different animal health centres is based on tentative diagnosis, which lacks accuracy in the diagnosis of the disease due to a lack of laboratory facilities and financial constraints (Beyene *et al*., 2018). The effect of the diseases is exacerbated by a lack of access to experienced veterinary services and advice and, consequently, by the misdiagnosis and incorrect treatment of endemic diseases, especially cattle diseases. Therefore, the objectives of this case report study will be:

General objective

- To handle and organise case reports on selected clinical cases of major diseases of animals presented to animal health facilities in and around Bishoftu, Ethiopia.

Specific Objectives

- To explore and compile major livestock and companion animal diseases in a veterinary clinic's service area.
- To describe the manifestations, clinical course, treatment outcome, and prognosis of clinical cases
- To confirm the underlying causes of each disease

2. MATERIALS AND METHODS

2.1. The Catchment Areas of the Clinics

The clinical service was provided at VTH, DS, and SPANA animal health facilities of Addis Ababa University College of Veterinary Medicine, Bishoftu, from November 2022 to June 2023. Bishoftu town is in the East Shewa zone of the Oromia region, 47.9 kilometres southeast of Addis Ababa. It is located at a latitude and longitude of 10° 35' 0" N and 35° 48' 0" E, respectively (Figure 1). The area lies at an altitude of 1850 metres above sea level and experiences the mean annual rainfall, maximum, and monthly temperatures ranging between 801.3mm, 25.5 ˚C, 23.7 °C in July, and 27.7 °C in May, respectively. These agro-climatic zones are inhabited by different plant (flora) and animal (fauna) species. Cattle, small ruminants, poultry, and equines are the major livestock species reared in Bishoftu. Most of the animals in the town are kept intensively, while those in the rural areas are kept semi-intensively. In this area, "Frushka, household remnants, and straw are the regular feed of the animals kept intensively, while semi-intensively kept animals graze on communal grazing land in addition.

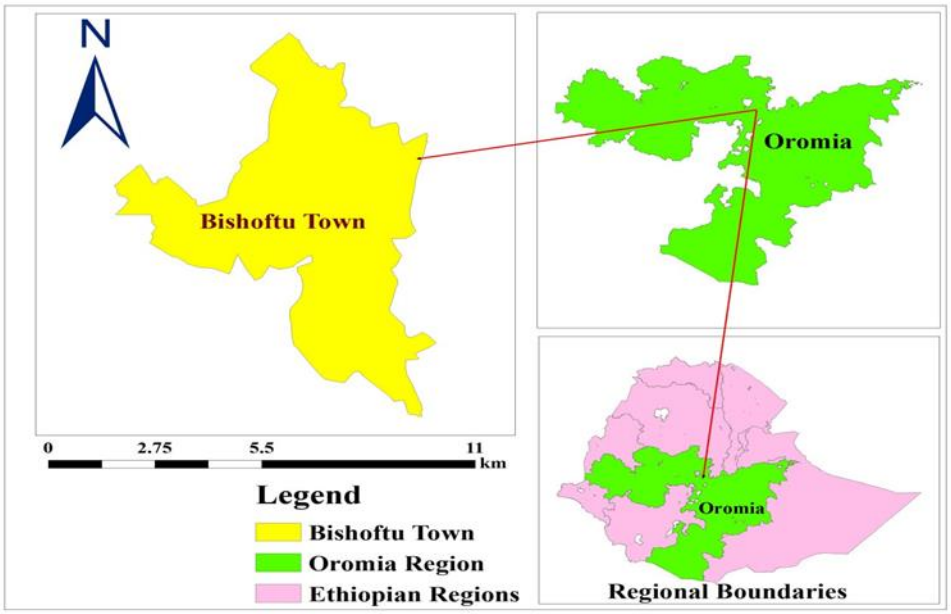


Figure 1: Map of Ethiopia Depicting the Location of the Clinic

2.2. Case Animal Report Design

This clinical case report was undertaken at animal health facilities in and around Bishoftu to report clinical diseases and disorders in animals during the clinical study period from November 2022 to June 2023. A detailed report of species, breed, age, and sex, as well as a detailed description of the symptoms, signs, diagnosis, treatment, and follow-up of individual patient animals, was done. Different species of animals (bovine, equine, ovine, caprine, canine, and poultry) of different ages and sexes were included in the report. Purposive sampling techniques are used on animals coming to the clinics from the case report areas. About 30 animals were included in the case report, and farmers were advised regarding livestock health management and follow-up.

2.3. Case Handling Protocols

Clinical case recording format (Addis Ababa University) (Annex 1) and the following clinical case handling protocol were used: owner's complaint, signalling of the patient, history of the patient(s), history of the farm, observation of the environment, observation of the animal at a distance, detailed examination of the animal, laboratory diagnosis, and postmortem examination (Jana and Ghosh, 2013).

2.3.1. History taking

Disease problems in veterinary medicine are invariably presented to the clinician through the medium of the owner's complaint, which is a request for professional assistance. Owner is the best link between clinician and patient animals, so appropriate anamnesis is very important in disease diagnosis. For completeness and accuracy of history taking, the following points are considered: patient data, immediate or present history, history, management, and environment history; and the history of each case is carefully taken, which gives a guideline for the examination of the animals (Duguma, 2016).

2.3.2. Physical and General Examination

Physical condition, behaviour, posture, gait, superficial skin wound, vagina, salivation, nasal discharge, distension of the abdomen, and locomotive disturbance are checked by visual examination of the patient. Examination of different parts and systems of the body of each of the sick animals examined by using procedures of palpation, percussion, auscultation, needle puncture, ultrasound, and walking of the animals. The temperature, pulse, and respiratory rate of each sick animal were recorded. Clinical examinations of all livestock of different ages were conducted based on disease history, owner complaints, and symptoms to diagnose diseases and disorders (Abdisa, 2017).

3. COMPILED CASE REPORTS

Accordingly, 19 major diseases of veterinary importance in the clinic's service area were studied during the study period. Each of the 19 definitively diagnosed clinical cases was compiled according to their species group. Abstract, introduction, case history, clinical examination and findings, tentative diagnosis, sample collection, laboratory diagnosis and result, treatment, outcome, discussion, acknowledgment, and were included for each individual case and each case references compailed collectively. The patient's case history, including relevant past, present, and environmental histories, was recorded, followed by documentation of any abnormal findings during the clinical examination. The body parameters were compared to the normal range of body parameter measurements listed below. Based on the history and clinical findings, the best tentative diagnosis was made, followed by selecting an appropriate sample with the correct sample taking procedure and sample transport system for the laboratory confirmation of the case. Based on the history, clinical signs, and laboratory findings, and sometimes based on the treatment outcome, the diseases were confirmed. Disease-causative agents such as bacteria, parasites, viruses, metabolic diseases, and others were diagnosed (Tables 1 and 2 below). The drug of choice, the duration of therapy, and the outcome of therapy were briefly discussed for each individual case. The findings of the case were then discussed in relation to the findings in the literature and scientific publications.

Table 1: Total number of animals examined and treatment outcome.

Animal	Total	Recovered	Died	Refractory
Ruminants	21	19	2	0
Equine	1	1	0	0
Canine	4	2	1	1
Poultry	4	1	3	0
Total	30	23 (76.7 %)	6 (20%)	1 (3.3%)

Table 2: Diseases encountered during the study in percentage.

Diseases	No of animal encountered	Percentages
Bacterial	7	36.8
Viral	4	21.3
Parasitic	4	21.3
Metabolic	2	10.5
Surgical case	1	5
other	1	5

3.1. Sheep Case reports

3.1.1. Peste Des Petits Ruminants

Abstract

Peste des petits ruminants (PPR) is an acute, contagious viral epidemic disease that results in large economic losses due to morbidity and mortality in small ruminants. These case reports discuss ovine herds presented to AAU, CVMA, Professor G/AB Memorial Veterinary Teaching Hospital with complaints of diarrhoea, coughing, ocular and nasal discharge, oral lesion, and inappetence. The diagnosis was conducted based on history, physical and clinical diagnosis, clinical observation, characteristic symptoms, epidemiology, postmortem findings, penside tests, and ELISA antigen detection examination. After three days of follow-up, one sheep was dead from the herd, and a postmortem was done. Postmortem illustrated intestinal haemorrhage, mesenteric lymph node swelling, congested lung, consolidated and foaming bronchioles, haemorrhaged trachea, and enlarged liver were appreciated, which reveals Peste des Petits Ruminants infection disease susceptibility. The susceptibility was reported to the district regional laboratory, and after arrival, the case was confirmed as positive by a penside screening test, and a nasal and ocular swab also revealed positivefor PPR infection by ELISA antigen capture test. The herd was treated with an antibiotic parenteral injection of oxytetracycline 10% (KELA N.V., St. Lenaartseweg, Hoogestraten, Belgium) at a dose of 100 mg/kg for five consecutive days, Ivermectin 0.2 mg/kg (Interchemiewerken "De Adelaar" B.V., Netherland), and Multivitamin 1 ml/cattle, IM (Aether Centre Biology Co., Ltd., China) for deworming and supportive treatment, respectively. Treatment and management of clinical cases of PPR in sheep are necessary to minimise the economic losses to farmers. Regular and mass vaccination should be carried out to control and prevent the disease, rather than a treatment approach.

Keywords: *Diarrhea, Coughing, Ruminants, PPR,*

Introduction

Peste des petits ruminants (PPR) is an acute, contagious viral epidemic disease that results in large economic losses due to morbidity and mortality in small ruminants (Alemnew, 2020). The PPR virus (PPRV) belongs to the genus *Morbillivirus* in the family Paramyxoviridae. It is regarded as one of the primary obstacles to increasing the production of small ruminants in underdeveloped countries (Vinayagamurthy, 2017). The disease is characterised by a high fever that causes anorexia, depression, ocular and nasal discharge, pneumonia, necrosis and ulceration of mucous membranes, and inflammation of the gastrointestinal tract that causes severe diarrhoea and death (Wohlsein and Saliki, 2006). Domestic animals such as sheep and goats, cattle, and pigs are susceptible to PPR to a variety of degrees (Adel *et al*., 2016). Cattle are susceptible to Peste des Petitis infection, but they are asymptomatic. It is now recognised as an emerging disease in camelids causing respiratory syndrome (Roger *et al*., 2001).

PPR is a widespread issue that is currently causing tropical and sub-tropical nations to suffer considerable economic losses. It is common in many African and Asian countries (Khan, 2018). It spreads through the aerosol route through sneezing and coughing, causing severe lesions in organ systems rich in lymphoid and epithelial tissues, sudden dullness, high fever, and decreased appetite, as well as mucosal congestion that results in serous to mucopurulent discharges, bronchopneumonia, dyspnea, diarrhoea, and, ultimately, death within 5 to 10 days (Jilo, 2016). The disease causes serious economic losses and remains a major deterrent to the successful development of small ruminant production in the countries where it occurs (Yener *et al*., 2004).

Peste des petits ruminants were clinically suspected for the first time in Ethiopia in 1977 in a goat herd from the Afar region, in the eastern part of the country (Pegram and Tereke, 1981). Clinical and serological evidence of its presence has been reported by Taylor (1984) and later confirmed in 1991 with a cDNA probe in lymph nodes and spleen specimens collected from an outbreak in a holding near Addis Ababa (Roeder, 1994).

PPR probably became one of the most economically significant livestock diseases in the nation based on the reported morbidity and mortality of the infection as well as the size and structure of the small ruminant sector (Abraham *et al*., 2005). PPR is endemic in Ethiopia and is one of the diseases causing significant financial losses to small ruminants by restricting the export of animals and animal products internationally. But the prevalence of the disease in different parts of the country is not yet investigated; inefficiency in early detection and lack of regular on-time vaccination, the dynamics of the disease are not adequately known, and uncontrolled animal movement across the borders are major challenges in the country (Jilo, 2016).

Screening disease occurrence in a study area allows for the accumulation of valuable information and allows animal attendants and veterinarians to confidently determine priorities for designing preventive measures, which consequently leads to the prevention of economic losses associated with diseases (Alemnew *et al*., 2020). Histories of animal origin are necessary for prediction of disease occurrence, to know the potential associated risk factors of clinical diseases in animals, to point out the epidemiology of diseases, and to gate useful information on disease patterns that can be used in preventing diseases as well as formulating policies for future management to prevent diseases (Bider *et al*., 2013).

A preliminary diagnosis of PPR is made using clinical observations, recognised symptoms, epidemiology, postmortem abnormalities, and laboratory confirmation using several serological and molecular techniques (Mahajan *et al*., 2012). The advent of cell culture and molecular biological techniques has allowed the development of specific, rapid, and sensitive diagnostics. Serum or virus neutralisation tests (VNT) and ELISA using PPR-specific monoclonal antibodies (MAbs) are used for the diagnosis of PPR (Balamurugan *et al*., 2014).

There are different stages of the disease: (a) incubation period; (b) prodromal phase (febrile); (c) mucosal phase; ocular and nasal discharges; hyperaemia of the conjunctiva and mucosa of the anterior nares; and erosions on the tongue, palate, and lips; (d) diarrheal stage; and (v) recovery stage, in which sheep and goats that recover from PPR

develop an active lifelong immunity (Kumar *et al*., 2012). PPR may manifest in different forms, like acute, acute, and mild, depending on the severity of the disease (OIE, 2013). Further, the severity of disease depends on various factors, namely the PPRV virulence or lineage (Couacy-Hymann *et al*., 2007), species, breed, immune status of animals, and age of the animals (Soundararajan *et al*., 2006). The diseases with similar signs for differential diagnosis are bluetongue, contagious ecthyma (Orf), foot and mouth disease (FMD), contagious caprine pleuropneumonia (CCPP), and pasteurellosis. Sometimes, mixed infections of PPR with goat pox, sheep pox, or Orf or blue tongue occur (Mondal *et al*., 2009).

Measures should focus on prevention of the disease rather than treatment of sick animals, given that there is no specific therapy and overall prevention could be cost-effective (Chenais *et al*., 2021). Timely vaccination of susceptible populations of sheep and goats and precise diagnostic methods are required for the effective management of PPR (Balamurugan *et al*., 2014). Consequently, identifying the incidence and prevalence of PPR in different parts of the country through country-wide surveillance is imperative. The control and prevention of the diseases should follow, along with educating and creating awareness among farmers and livestock owners regarding the disease risks. Implementation of control and prevention measures should be taken to eradicate. Therefore, the objective of these case report is to assess the diagnosis, treatment, economic importance, and control and prevention of Peste des petits ruminants disease.

Case Description

History

Ovine herds presented to AAU, CVMA, Professor Feseha G/AB Memorial Veterinary Teaching Hospital with the same clinical sign observations; the owner complained his herd became diarrheal, coughing, oral lesion, nasal, and ocular discharges, and inappetence, starting before a week of arrival. He took herds to a local veterinary clinic, and he didn't observe any change in posttreatments. In the herd, one sheep was severely sick and didn't have any appetite.

Clinical Diagnosis

The temperature, respiratory rate, and heartbeat show abnormalities according to the standard. The diagnosis was conducted based on history, physical diagnosis with a stethoscope, clinical observation, symptoms, epidemiology (Balamurugan *et al*., 2014), postmortem findings and ELISA antigen detection. Signs and symptoms observed were indicators of PPRV infection in the flock. The affected animals manifested abortion, dullness, mucopurulent discharge, oculo-nasal discharges, coughing, and crust on the lips, erosive and necrotic lesions on the gums, dyspnea, diarrhoea, and death (figure 2 below).

Table 3: Parameter of Body Temperature (T), Heart Rate (HR), Breathing Rate (BR)

	Day 1			Day 2			Day 3			Day 4		
	T	HR	BR	T	HR	BR	T	HR	BR	T	HR	BR
Case 1	41 C	144/ min	60/ min	40.4 ^{O}C	132/ min	38/ min	38 ^{O}C	88/ min	35.6 ^{O}C	dead	died	died
Case 2	39.7 C	160/ min	40/ min	38.8 ^{O}C	144/ min	60/ min	39 ^{O}C	144 /min	39.7 ^{O}C	40.1 ^{O}C	120 /min	46/ min
Case 3	38.9 C	104/ min	38/ min	38.6 ^{O}C	100/ min	28/ min	38 ^{O}C	100 /min	38.1 ^{O}C	38.5 ^{O}C	80/ min	32/ min

The table above shows body parameter measurements of three severely diseased sheep at consecutive day follow-up, showing severe clinical signs during diagnosis.

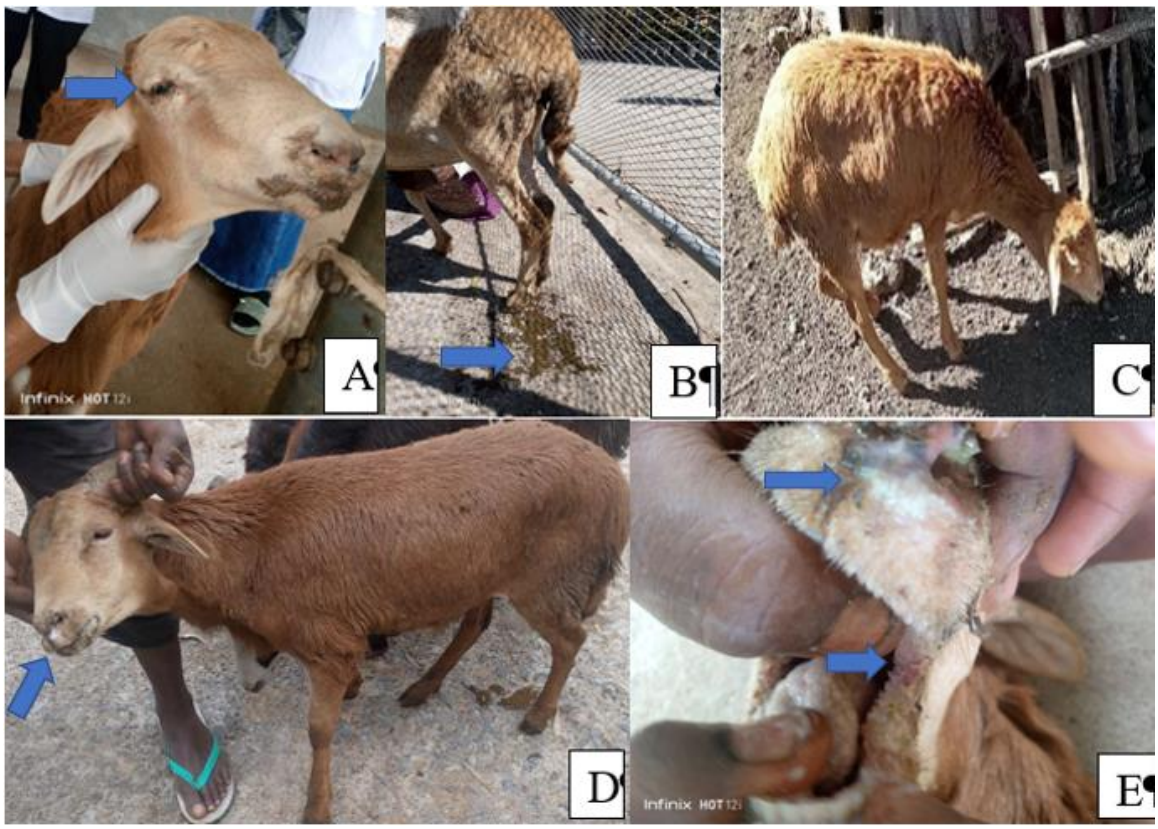


Figure 2: Clinical findings observed during diagnosis.

Postmortem Examination

After three days of follow-up, one sheep was dead from the herd, and a postmortem was done. During postmortem, the following are illustrated: (A) haemorrhage of the trachea, congestion, and consolidation of the lung (B), swelling of the liver (C), enlarged intestinal mesenteric lymph nodes (D), a colon showing discontinuous streaks of congestion and haemorrhages of the intestine (E), and a coded sample taken to Sebeta, Animal Health Institute (F).

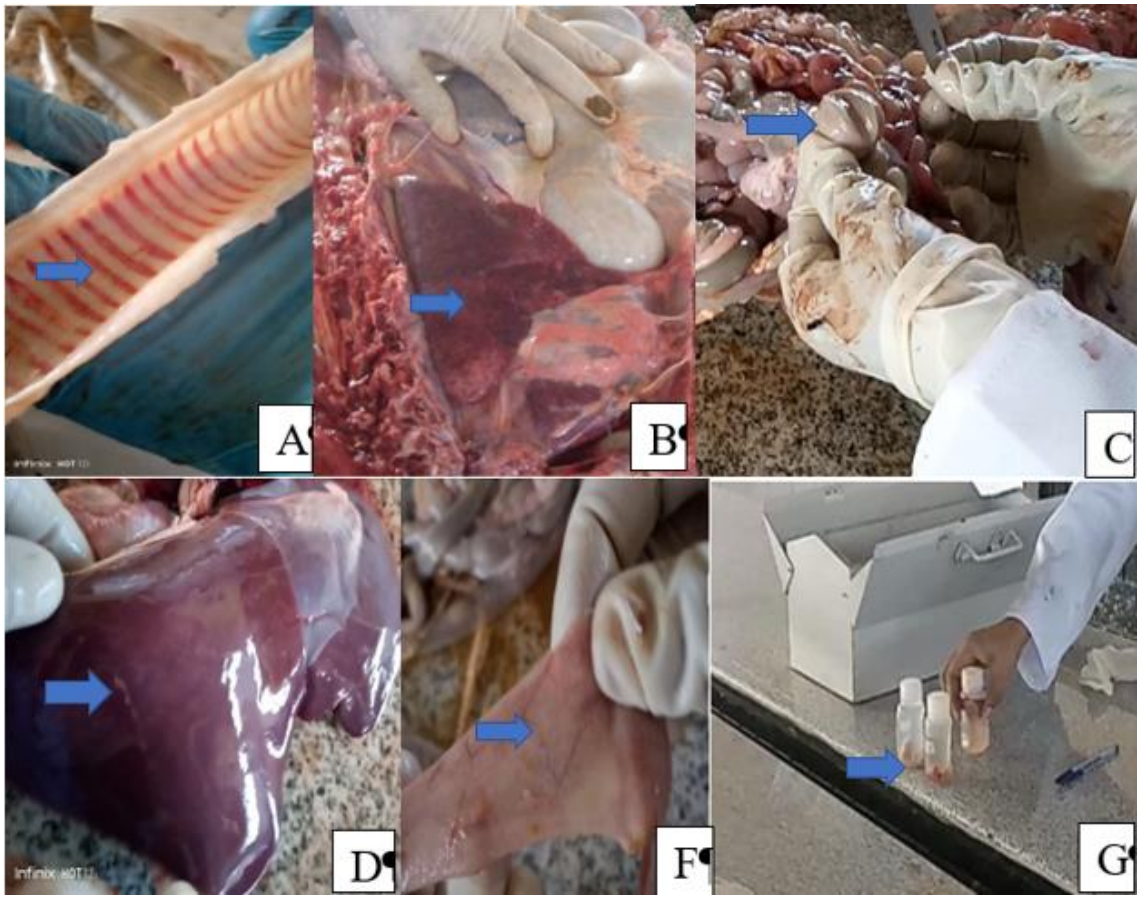


Figure 3: Lesions illustrated during the post-mortem of ppr diagnosis.

Laboratory Examination

Nasal and ocular swabs, blood serology, and tissue specimen samples from postmortem liver, lung, and intestine organs (Figure 3G) were taken with virus transport media and submitted to the Animal Health Institute, Sebata, Ethiopia, for PPR susceptibility to diagnosis by PCR examination. Also, a report to the district regional laboratory was done, and they arrived to confirm the case by Penside test, which was positive for PPR. They also took an ocular and nasal swab with VTM, which revealed a positive test for PPR antigen detection by capture capture ELISA (Annex 3).

Treatment and Case Management

The herd was treated with antibiotic parenteral injection with 10% oxytetracycline (KELA N.V., St. LenaartsewegHoogestraten, Belgium) at a dose of 100 mg/kg (2 ml/day) for five consecutive days to avoid secondary bacterial complications. They have a good prognosis, especially in terms of feeding, becoming active, and reducing coughing, but not much change in body parameter measurement (Table 1). For deworming, Ivermectin 0.2 mg/kg (Interchemiewerken "De Adelaar" B.V., Netherland), 1 ml stat, subcutaneously for deworming, and Multivitamin 1 ml (Aether Centre Biology Co., Ltd., China) were given by parenteral injection for supportive treatment. Asella district regional laboratory office recommended vaccination for Ada'a woreda, and implementation of PPR vaccination for small ruminants in and around Bishoftu town was done, as information from the district shows. The owner advised to give soft feed with enough water and to keep away from other healthy herds of neighbours. Lastly, the owner sold some healthy apparent herds and severely diseased animals with a prognosis after three weeks (Figures 3C and D).

Figure 4: Penside screening test and outcome of the cases.

The above figure discusses (A) swab sampling from the ocular for penside testing; (C) penside testing; (C) grazing sheep after three weeks of treatment; and (D) no nasal and mucosal discharges after two weeks.

Discussion

This case report shows that PPR has circulated across Bishoftu, Ethiopia, with risk factors of high small ruminant movement with respect to the social practise of live animal trade with other local areas of the country. During the past decades, PPR has been reported in different localities in Ethiopia: Gelagay, (1996) reported 14,6% in the High Land of North Shewa; Abraham *et al*. (2005) reported 13% in sheep in different parts of Ethiopia; and Getachew *et al*. (2017) reported 48.43% in sheep and goats in East Shewa and Arsi Zones, Oromia Region.

Diop *et al*. (2005); CouacyHymann*et al*. (2007a) and (2007b) studied outbreaks of the disease, which are characterised by fever, erosive stomatitis, nasal and ocular discharges, pneumonia, diarrhoea, and death, which agrees with the present case report. Chauhan *et al*. (2011) concluded that the clinical findings, gross lesions, histopathological changes, and detection of PPRV antigen and antibodies were useful for the diagnosis of PPR and subsequently to control the disease by vaccination, have similar agreement is made in this paper.

Waret-Szkuta*et al*. (2008) said a national survey was conducted in Africa using 13,651 samples collected from seven regions of Ethiopia, and results showed that PPRV infection was present throughout Ethiopia with variable seroprevalence in different regions. In some cases, PPR's seroprevalence was higher than 50%. Generally, this case report forecasts that effective approaches to controlling PPR, accurate diagnostic techniques, and timely vaccination of susceptible populations are necessary.

Acknowledgment

I am grateful to Dr. Elias, Asella regional laboratory staff, Dr. Abraham, and Ada'a district staff for their support during diagnosis, report of results, and vaccination history.

Limitation

Postmortem sample taken to Sebeta; Animal Health institute was unsuccessful due to unknown response after sample reception.

3.1.2. Lactic Acidosis

Abstract

Grain overload (lactic acidosis) is an acute metabolic disease of ruminants characterised by indigestion, rumen stasis, dehydration, acidosis, ataxia, collapse, and frequently death. Eight-year-old pregnant ewes were presented to AAU, CVMA, Professor Feseha G/AB Memorial Veterinary Teaching Hospital with a history of accidental feeding of chickpea locally called ‘’Shimbura" and becoming recumbent, not ruminating, depressed with diarrhoea, and distension of the abdomen. The diagnosis was made based on a history of exposure to sudden chickpea feeding and clinical signs and symptoms that show the typical presentation of grain overload (acidosis). The signs of rumen acidosis vary according to the type and amount of feed ingested, the amount of time since feed ingestion, and the severity of physiologic derangements. The sheep was depressed, ataxic, had foul-smelling diarrhoea, had abdominal distension, and had low rumen motility. The ewe was treated first with fluid therapy with a balanced electrolyte solution of 5% sodium bicarbonate in saline in 1000 ml, intravenous infusion for 2 hours, and antiacids (magnesium carbonate, 50g in 500 ml of drinking water) by orogastric tube. Lastly, the sheep was followed by interparental antibiotic injection for three days to protect secondary bacterial complications. The objective of the case report is to provide intensive management to save the life of the ewe and report the outcome.

Keywords*: Acidosis, Feed, Grain overload, Sheep*

Introduction

Grain Overload (Lactic Acidosis) is an acute metabolic disease of ruminants characterised by indigestion, rumen stasis, dehydration, acidosis, ataxia, collapse, and frequently death (Koondhar *et al*., 2020). It is common in ruminants that accidentally gain access to large quantities of readily digestible carbohydrates and the absorption of acid from the rumen, as in grain overload lactic acidosis. Acidosis is a serious acid-base disturbance commonly encountered in cattle and sheep. The occurrence of this condition can be attributed to various factors, such as diarrhoea-induced loss of base, excessive saliva loss, the intake of an unusually large amount of highly fermentable carbohydrates, and the body's accumulation of acid. Ruminal acidosis is typified by prevalent morbidity and mortality in both small and large ruminants (Snyder *et al*., 2017). Clinically, the condition is evident through rumen hypomotility, atony, dehydration, acidemia, and diarrhoea. Furthermore, there are notable alterations in haematological and biochemical profiles, such as depression, incoordination, collapse, and potential fatalities in severe cases (Snyder and Credille, 2017).

The rumen contains a diverse ecosystem encompassing a plethora of bacterial and protozoal species that work in concert to facilitate optimal carbohydrate fermentation, thereby enhancing its efficiency (Sadowsky *et al*., 2010). Among the major products of such fermentation are volatile fatty acids and lactic acid. The generation of a substantial volume of lactic acid in the rumen instigates significant transformations in the biochemical composition of the rumen fluid. As small ruminants, sheep are adapted to digest and metabolise predominantly forage diets (Lorenz, 2015). However, to enhance their growth rates and productivity, those animals may be subjected to the sudden consumption of diets that are deficient in fiber and high in grain. The implementation of dietary alterations may result in an excessive accumulation of volatile fatty acids within the rumen beyond its absorptive threshold, ultimately leading to the emergence of acidosis as a clinical manifestation (Al Jassim, 2003).

A decrease in the pH levels within the rumen has been associated with the development of rumenitis, along with the potential for erosion and ulceration of the ruminal epithelium. Upon inflammation of the ruminal epithelium, there is potential for bacterial colonization of the papillae and subsequent leakage into the portal circulation. The presence of bacteria has been linked to the development of liver abscesses, which in turn may prompt the onset of peritonitis in the surrounding region. Moreover, septic emboli can arise from liver abscesses, wherein the infected materials propagate along the caudal vena cava and penetrate the lungs. The proliferation of bacteria occurs within the lung tissue and may ultimately result in an invasion of the pulmonary vessels, leading to their rupture. This pathological process clinically manifests as hemoptysis and can result in per acute death because of massive pulmonary haemorrhage (Shant Kumar *et al*., 2022).

The degree of acidosis observed in animals is significantly influenced by the amount of grain consumed in relation to their ability to adapt to a diet high in grain content. The categorization of acidosis manifestations into subacute, acute, and peracute forms can prove advantageous (Hernandez, 2014). Animals exhibiting subacute symptoms maintain a state of brightness, alertness, and responsiveness, yet may display transient anorexia and demonstrate indications of mild to moderate dehydration. In such instances, there is a decrease in rumen motility; however, the presence of diarrhoea and indications of abdominal discomfort are not always consistently observed (Radostits, 2007).

In certain instances, indications of abortions, stillbirths, and premature births may exclusively manifest. In instances of acute occurrences, impacted animals may exhibit a pronounced state of depression and impairment in coordination, otherwise known as ataxia. The rumen typically presents as enlarged, and discernible auditory detection of fluid movement within the rumen is evident upon exam utilising abdominal ballottement (Van Metre *et al*., 2000). The clinical manifestation of anorexia, accompanied by exacerbating indicators of profuse excretion of fluid and malodorous diarrhoea, shall be observed. It is common for faecal matter to exhibit a grey hue and may be characterised by modicums of non-digested grains. In some cases, frank blood may be noted in the faeces. In the early stages of disease, rectal temperatures consistently increase. However, with clinical progression, hypothermia is often detected (Navarre *et al*., 2002).

There is a frequent coexistence of tachycardia and tachypnea, accompanied by superficial respiration. Dehydration and hypovolemia are apparent clinical manifestations characterized by the sinking of the eyes, prolonged skin tenting and capillary refill times, delayed jugular filling, weak peripheral pulses, and cold extremities. The presentation of neurologic symptoms such as obtundation, blindness, head pressing, opisthotonos, and disrupted gait. One particularly useful test is the evaluation of the palpebral reflex (Lorenz, 2014). In the sub-acute manifestation of this disease, animals may perish with minimal or absent premonitory indications. Animals may exhibit a state of recumbency and comatose with their heads positioned in the vicinity of them. In severe cases, the prognosis is generally poor, and death occurs within a matter of hours (Snyder and Credille, 2017).

Acute ruminal acidosis is characterized by a high mortality rate, thus necessitating that diseased animal be promptly and humanely slaughtered prior to succumbing to the disease. When treatment is deemed necessary, a confident approach ought to be taken, including the extraction of rumen contents via rumenotomy and the execution of a thorough fluid therapy programme to counter dehydration and acidosis. The key to preventing ruminal acidosis is allowing for ruminal adaptation to high-grain diets as well as limiting intake of readily fermentable carbohydrates. Ruminant diets should also be formulated to provide adequate buffering through appropriate feedstuff selection or the addition of dietary buffers such as sodium bicarbonate and potassium carbonate (National Research Council, 2001).

Rumen acidosis usually revolves around management practices that precipitate the development of disease in individual animals. In animals unaccustomed to high-concentrate rations, access to easily digestible feedstuffs should be restricted to ensure a proper balance of fiber and non-fiber carbohydrates. Feeding space must be adequate to allow all animals to access feed without excessive competition. Similarly, animals fed from a feed store should have been fed to them at consistent intervals. Therefore, the objective of the case report is to provide intensive management to save the life of the ewe and report the disease.

Case Description

History

An eight-year-old pregnant ewe was presented to AAU, CVMA, Professor Feseha G/Ab Memorial Veterinary Teaching Hospital with a history of accidental feeding of chickpea locally called Shimbura and becoming recumbent, not ruminating, depressed with diarrhoea, and distended of abdomen. The owner complained that he kept his herd in his compound, and suddenly she escaped from the herd and ate chickpea (Shimbura) from the agriculture field. Upon physical examination, the ewe was depressed with a temperature of 38.6 ℃ and 128 beats per minute and 48 breaths per minute heart and respiratory rates, respectively. There was diarrhoea with faeces on the tail of the sheep, as shown in the figure below.

Clinical Diagnosis

The diagnosis was made based on a history of exposure to sudden chickpea feeding and clinical signs and symptoms that show the typical presentation of grain overload (acidosis). So, an appropriate therapeutic plan was made. The signs of rumen acidosis vary according to the type and amount of feed ingested, the amount of time since feed ingestion, and the severity of physiologic derangements. The sheep was depressed, ataxic, had foul-smelling diarrhoea, had abdominal distension, and had low rumen motility.

Treatment and outcome

Fluid therapy with a balanced electrolyte solution, 5% sodium bicarbonate in saline in 1000 ml, and intravenous infusion for 2 hours to alter the osmotic pressure and dilute the acidic state, and antiacids (Pharma Swede-Egypt), magnesium carbonate, 50g in 500 ml of drinking water, given by stomach tubes, for one day. The ewe also followed with antibiotics, Procaine penicillin (24 mg/kg) and dihydrostreptomycin sulphate (30 mg/kg) (SG peno-strep ShangahiGongyi Pharmaceutical Co., Ltd., China), for three days for secondary bacterial complications.The case show response within a hour of treatment and she gave birth after three week as the owner communicate by phone.

Figure 5: Clinical diagnosis, treatment, and outcome of the ewe.

The above figure indicates (A) the first day at arrival of the ewe, unable to stand and showing ataxia symptoms; (B) the administration of IV catheter fluid therapy; (C) a solution of antacid drenching; and (D) the third day out of the flock with a good prognosis.

Discussion

To minimize the development of ruminal acidosis, it is imperative to implement a gradual adaptation process for animals consuming a high-grain diet. The outcome of the present case report discusses the occurrence of ruminal acidosis due to the sudden exposure of ewes to chickpea, which is a carbohydrate-rich grain. This report is similar to Navarre and Pugh, (2002) report that, in some cases, animals develop acute acidosis accidentally when they escape from their pen and get into a store of grain.

According to Nagaraja and Lechtenberg, (2007), a common cause of acidosis is the excessive consumption of rapidly fermentable carbohydrates by ruminants that have not adopted a high-concentrate diet, which has a similar description to this case report.

The present case report describes treatment with fluid therapy and indigestion powder. Schmidt, (2002) indicated that in acute lactic acidosis, systemic dehydration and blood pH must be corrected with supportive therapy. Therefore, fluids containing balanced electrolytes and magnesium hydroxide should be given at a dose of 1 g/kg of body weight and dissolved in enough water to ensure their dispersal throughout the rumen.

Jaramillo-Lopez, *et al*. (2017) studied acidosis, which causes anorexia and lethargy, as evidenced by the animal standing off by itself, showing little interest in food or water. There is decreased rumen motility, or in most cases, a stasis, which argues with the present clinical findings. This paper recommends not making sudden modifications to the content of animal feed. If modifications are necessary, a gradual transition should be implemented. Feeding additives such as ionophore antimicrobials, bicarbonate, and limestone might reduce disease severity and incidence when used appropriately.

Acknowledgment

I thank Dr. Taye Dinka (a vegetarian), the AAU, CVMA, and VTH staff for supporting me during case handling.

3.1.3. Listeriosis in Sheep

Abstract

Listeriosis is a bacterial disease caused by *Listeria species*, with *Listeria monocytogenes* being the most pathogenic species to small ruminants, causing encephalitis, blood infection, and abortion. This case report paper presents the clinical and laboratory diagnosis, treatment, and outcome of a listeriosis outbreak on a backyard sheep farm. A sheep herd was brought to AAU, CVMA, and Professor Feseha G/AB Memorial Veterinary Teaching Hospital with complaints of two sheep severely circling, nasal discharge starting four days before arrival, and all herd body condition loss. The owner says that two of his lambs were dead and two sheep were aborted. The herd fed poultry litter, manure, and locally prepared silage (frushka), and he also keeps his herd in the field locally called "Koticha". The disease remained localized in this group, and no disease has been reported among the other neighboring farmers. Clinically, there were nervous signs expressed by facial paralysis, incoordination in walking, ataxia, circling, lamb death, and abortions. Laboratory Bacterial identification and biochemical tests reveal *Listeria monocytogenes* bacteria. Depending on history, clinical findings, and laboratory examination, the diagnosis reveals listeriosis disease. The herd was managed with oxytetracycline, 10%, (KELA NV., St. Lenaarsteweg-Hoogestraten, Belgium) and show prognosis after three days follow up.The herd was treated and managed with antibiotics and supportive treatment and showed a good prognosis. From the herd, one severely diseased animal died, and others showed a good prognosis.

Keywords: *Listeriosis, Circling, Sheep*

Introduction

Listeriosis is an important infectious disease of sheep and goats, most commonly causing encephalitis but also capable of causing a blood infection and abortion. It is caused by the bacterium *Listeria monocytogenes* (Fentahun and Fresebehat, 2012). They are gram positive, facultative anaerobic intracellular bacteria that are ubiquitously distributed in the environment and grow over a wide range of pH and temperature. These bacteria can be found in the soil, food sources, and even the feces of healthy animals (Adzitey and Huda, 2010). It affects sheep and goats because they are fed mouldy or spoiled hay or silage. It's possible for sheep and goats to become infected without feeding mouldy or spoiled hay or silage, as it is found in the environment (Driehuis, 2018).

L. monocytogenes has been shown to have a worldwide prevalence and is associated with serious disease in a wide variety of animals, including humans. Although several forms of listeriosis are easily recognised, the epidemiological aspects and pathogenesis of infection in ruminants remain poorly understood (Abd El-Rahim *et al*., 2015). The organism resists freezing and thawing and can survive for several years in faeces, straw, silage, and soil (Fentahun and Fresebehat, 2012). The epidemiology and transmission of *L. monocytogenes* differ between small-ruminant and cattle farms (Nightingale *et al*., 2004).

The pathological condition of listeriosis can be classified as a significant neurologic disorder that is closely linked to a considerable risk of death. Encephalitis is the primary manifestation of listeriosis in sheep; abortion, septicemia, and, less frequently, mastitis and keratitis are also known to occur (Brugere-Picoux, 2008). Infection spreads from the mouth to the brain through small wounds in the mucosa (Delano *et al*., 2002). It has been postulated that the entry of the organism into the brain occurs via the transmission of blood circulation or through the branches of the trigeminal nerve that terminate in the oral cavity, nasal cavity, or conjunctiva (Vazquez-Boland *et al*., 2001). The localization of inflammation in the brainstem, medulla oblongata, and pons leads to recognizable clinical manifestations of cranial nerve impairment in sheep that are affected (Haligur *et al*., 2019).

The phenomenon of animal circling, characterised by unidirectional movement and the manifestation of unilateral facial paralysis, dysphagia, pyrexia, visual impairment, and head pressing, has been observed. It is common for individuals to encounter barriers such as gates, corners, and fences. Gradual progression towards recumbency may occur, ultimately resulting in paralysis and death within 2 to 3 days (Scott, 2015).

Typical signs of listeriosis are initially inappetence and depression, followed by circling to one side with unilateral facial paralysis and excessive salivation on the side affected and death (Kersting, 2008). Subtle differences in the expression of the symptoms can make the diagnosis of listeriosis difficult. Central nervous system (CNS) fluid analysis may be used as an aid to diagnosis (Scott, 1992), in conjunction with haematology and biochemistry, to check for other causes of CNS signs.

Listeriosis is considered a significant foodborne disease in humans (Abd El-Rahim, 2015). *Listeria monocytogenes* is an important pathogen in the food industry and is extensively subjected to screening in food, environmental, and clinical samples (Gasanov, 2005). It is a non-notifiable zoonosis that may manifest following exposure to animals. Pregnant women are highly vulnerable and are advised to avoid interacting with sheep while they are lambing (Ramaswamy *et al*., 2007).

According to Nicholson and colleagues, (2005), Listeria could persist for duration of three months within livestock manure. According to Garcia *et al*. (2016) soil containing pathogenic organisms in silage can render it a potential source of infection. Additionally, grazing practises that involve soil ingestion are also possible contributors to the spread of the disease. Silage that has not been properly prepared and has a pH level exceeding 5. 4, as well as silage that has undergone prolonged exposure to air, may facilitate the proliferation of microorganisms (Brugere-Picoux, 2008). Recovery from listeriosis depends on early, aggressive antimicrobial treatment and supportive care for the affected animals. One effective measure towards the prevention of listeriosis in ruminants entails the implementation of good hygiene and sanitation practises within the farm. Regular maintenance of soiled feed bunks and water troughs is paramount to mitigating the proliferation of mould (Dhama *et al*., 2016). Therefore, the objective of this case report is to provide diagnose, treatment and compile report of listeriosis sheep.

Case description

History

On April 11th, a 23-sheep herd was brought to AAU, CVMA, Professor Feseha G/AB Memorial Veterinary Teaching Hospital with complaints of two sheep severely circling, body condition loss, and nasal discharge starting four days before arrival. The owner also complains that two of his lambs were dead and two sheep were aborted. He feeds his sheep poultry litter manure and locally prepared silage (frushka), and he keeps his herd in the field area, locally called "Koticha". The disease remained localised in his herd, and no disease has been reported in the other animals on the farm.

Clinical Diagnosis

The case was tentatively diagnosed based on clinical signs, and its confirmation was achieved by isolating the causative organism from a nasal swab. On physical examination, there was submandibular swelling, loss of body condition, and a rough hair coat. Clinically, the animals exhibit symptoms of circling, nasal discharge, head tilt, drop ear, depression, and ataxia, as shown in (Figure 6). Depending on history, characteristics with neurological signs, lamb death, abortion, and association with poultry litter feeding suggest a tentative diagnosis of listeriosis was made.

Laboratory Examination

After a tentative clinical diagnosis examination, a nasal swab sample was taken and immersed in tryptone water bacterial transport media to confirm the tentative diagnosis of listeriosis. Immersed swab samples in tryptone water were taken to the microbiology laboratory for culture and biochemical testing and incubated for 24 hours at 37 °C. By preparing nutrient agar and MacConkey agar media, the sample was streaked on the media and incubated at 37 °C. After 24 hours, the bacteria grown on the nutrient media but not on MacConkey agar media, after a free colony of nutrient agar-stained gram-positive cocci bacteria, were sub-cultured on Listeria identification agar base (PALCAM), and the CAMP test was done on sheep blood agar by perpendicular streaking of *Staphylococcus agalactia* and *L. monocytogenes* (Annex 4).

Clear, free colonies grow on listeria agar base, and gram staining reveals crystal violet-stained coccobacilli road-shaped bacteria (Annex 4). The CAMP test shows clearly hemolyzed and positive for listeria monocytogenes character (Annex 4). The catalase reaction test shows positive, which is characteristic of *Listeria monocytogenes*.

Case Treatment and Management

A severely diseased ewe was managed with oxytetracycline, 10%, 100 mg/kg, 3 ml (KELA NV., St. Lenaarsteweg-Hoogestraten, Belgium) and glucose, 40% (40 ml) intravenously dripped. The case stands after treatment, and she arrives home but doesn't submit for admission the next day because of a transport problem, then she dies on the third day of follow-up. The other case was injected parenterally with oxytetracycline, 10%, 100 mg/kg, 3 ml, for three days (KELA NV., St. Lenaarsteweg-Hoogestraten, Belgium) and multivitamin, 1 ml IM, stat (Aether Centre Biology Co., Ltd., China). The owner recommended ceasing long-term storage of silage and feeding poultry manure. After two weeks, the patient shows a good prognosis and becomes healthy (Figure 6B).

Figure 6: Clinical presentation and outcome of the ewe

The above figure indicates the sheep before treatment with a head tilt to the ground, the drop-ear andposttreatment with a bright and alert appearance.

Discussion

The current case report discusses a sheep herd brought to a veterinary hospital with a history of feeding poultry faeces, abortion, and losing condition and the laboratory culture and tests confirm the occurrence of a listeriosis outbreak within a small backyard. Spindola, (2017) found that the aggregation of sheep in feedlot systems has a conducive factor for the proliferation of bacterial populations, thereby contributing to the incidence of listeriosis outbreaks. Brugere-Picoux, (2008) and OIE, (2012) have reported the common clinical manifestations of listeriosis in animals, showing encephalitis, septicemia, and abortion, especially in sheep and goats, which occurred with the present case report as well.

Scot *et al*. (2015) discussed the animal circling in one direction only and displaying unilateral facial paralysis, difficulty swallowing, fever, blindness, and head pressings. Individuals will often run into gates or corners and lean up against fences, progressing to recumbency paralysis and death in 2 to 3 days, argues the occurrence of clinical manifestations of the present outbreak. This case report has a history of feeding chicken litter and the occurrence of sheep disease. These argue with Ribeiro *et al*, (2022) report that listeriosis is caused by environmental contamination or through contact with the fluids and faeces of ducks, chickens, cattle, and pigs, which has already been described in outbreaks that occurred in Brazil.

In Younis, (2010), it was observed that nervous manifestations of listeriosis are more pronounced in sheep up to 6-month-old than in adult animals, and the lethality rate was significantly higher when compared to that in sheep older than 6 months; this is sharing the idea of this paper's report of lambs' deaths more than adult ones. Rissi *et al*. (2010) report that treatment for listeriosis is inefficient because neurological lesions are irreversible. Nonetheless, Camara *et al*. (2014) and Bell, (2007) reported the recovery of some animals when they were treated with oxytetracycline or a combination of oxytetracycline and dexamethasone or ampicillin and gentamicin.

Acknowledgement

I thank Mrs. Marta Jara, CVMA, electronic card office for her support during treatment.

3.1.4. Pneumonic Pasteurellosis in Sheep

Abstract

Pneumonia refers to the inflammation of the pulmonary parenchyma associated with inflammation of the bronchioles and pleurisy. Pneumonic pasteurellosis (Mannheimiosis) is caused by either *Pasteurella multocida* or *Pasteurella hemolytica* and affects small ruminants severely. Pasteurella is a gram-negative, facultative anaerobe, non-motile, non-spore forming, and coccobacilli bacteria. A local breed of sheep was brought to AAU, CVMA, Professor G/AB Memorial Veterinary Teaching Hospital on December 15th, 2022, with a history of coughing, sneezing, inappetence, depression, and nasal mucus discharge. The ewe shows clinical findings of occasional coughing, nasal discharge, and a high temperature of 40.5 and arrives with a history of strange sheep mixed into the herd from market before three weeks. The diagnosis was made based on the history of the ewe and physical examination, and the identification of the etiological agent, *Pasteurella* species, was forecast. A sample for laboratory examination was taken from nasal swabs in peptone water and cultured on blood agar and MacConkey agar. It shows hemolytic and red, odourless colonies of *M. haemolytica*on MacConkey agar. Then, free colonies subjected to gram's staining and cellular morphology under a light microscope (100X) and gram-negative coccobacilli bacteria and biochemical tests confirmed Pasteurella infection. The case was treated with an antibiotic of Oxytetracycline 10 mg/10 kg (Chongqing Bull Animal Pharmaceutical Co., Ltd., China), intramuscular injection for 5 consecutive days, and Ivermectin 0.2 mg/kg, SC, stat. On the fifth day of follow-up, the ewe had a good prognosis, and the owner was advised for proper management with enough feed and water and good hygiene. However, farmers are not fully aware of the need to take animals to veterinary treatment and vaccination centers for the affected ones, as disease resistance and economic impact are observed.

Keywords: *Sheep, Manhaemia haemolytica, Pasteurullosis, Pneumonia*

Introduction

Pneumonia is an inflammation of the pulmonary parenchyma associated with inflammation of the bronchioles and pleurisy (Nejiban and Al-Amery, 2018). Pneumonic pasteurellosis is caused by *Pasteurella (Mannheimia) haemolytica* and affects small ruminants severely (Jesse *et al*., 2019). It is a gram-negative, facultative anaerobe, non-motile, non-spore-forming, and coccobacilli bacteria. It is considered a priority concern on a national level among respiratory diseases affecting small ruminants. This is due to the considerable economic losses it can incur, primarily arising from mortality, morbidity, and the expensive nature of treatment (Megra *et al*., 2016; Sadia *et al*., 2016).

Pneumonic pasteurellosis is a frequently occurring disease among sheep and goats worldwide, which typically results in significant economic loss and high mortality rates within the ruminant industry. Its prevalence is observed more commonly in tropical and subtropical regions than in temperate regions and occurs sporadically (Odugbo *et al*., 2006). It represents a prevalent respiratory infection in Ethiopia, which leads to the occurrence of acute pneumonia outbreaks in sheep and goats across all age groups (Disassa *et al*., 2013).

Mannheimia haemolytica plays a significant role in the sheep industry, as it is responsible for septicemia in young lambs and pneumonia in older sheep (Scott, 2011). The commonly recognised diseases associated with *M. hemolytica* are pneumonia or pleuropneumonia in ruminants (Quinn *et al*., 2002). Animals with infection may experience mortality within a short period of time from the onset of clinical manifestations. Individuals who can survive an acute illness are at risk of developing a chronic infection. Sheep and goats that are infected display elevated body temperatures accompanied by clinical manifestations characterised by severe respiratory distress, including dyspnea, foam accumulation in the oral cavity, coughing, and nasal discharge (Quinn *et al*., 2002).

According to Afata, (2018), the microorganisms *Multocida* and *Bibersteiniatrehalosi* were found to be more commonly present in animals suffering from pneumonia as opposed to those not affected by pneumonia. The broad complexities of the species involve antigenic variation, host predilection, and the pathogenesis of Pasteurella (Wilkie *et al*., 2004). Infections by *P. multocida* alone and mixed infections involving both *P. multocida* and *M. hemolytica* have been observed to occur naturally (Sadeghian, 2011).

There are exposing factors such as viral and mycoplasma diseases, poor nutrition, overcrowding, and transportation that are related to decreased physical and immunologic resistances. These conditions compromise the respiratory tract (Yener *et al*., 2009), cause immunosuppression in the host, favour an abnormal multiplication of the bacteria in the upper respiratory tract, particularly in the tonsils, that subsequently colonises the lungs (Mary, 2009), and are a potential cause of pneumonia in sheep (Garde *et al*., 2005) and can be transmitted with aerosol and close contact.

Effective implementation of management protocols aimed at avoiding stress, along with timely identification and administration of antibiotics, are pivotal methodologies for controlling disease (Afata, 2018). When etiological agents spread rapidly in animal populations, immediate therapeutic intervention may be required, although prudent utilisation protocols recommend identifying the cause before handling (Michael *et al*., 2017). Oxytetracycline is a well-known therapeutic agent that is used to treat sheep and goats and can also act as a precautionary measure for animals in contact with affected animals (Quin *et al*., 2002). Extensive use of antimicrobials caused an increase in the incidence of drug resistance, which reduced the efficacy of the antimicrobial agents used to control *Pasteurella* and *Mannheimia* infections (Legesse *et al*., 2018).

The control of diseases with Pasteurella and Mannheimia species is troublesome for two reasons: in most cases, the *Pasteurella* and *Mannheimia* isolates are not the only causative agents involved, and nowadays they are becoming resistant to the antimicrobial agents available. Also, these bacteria are part of the normal microbiota in the upper respiratory tract, making the disease difficult to prevent (Kehrenberg *et al*., 2001; Catry, 2005).

Prevention of pneumonic pasteurellosis can be done through immunisation and the use of a biosecurity plan (Afata, 2018). Immunisation is the best control strategy for the disease, and it is an elective, non-antibiotic prophylaxis strategy (Abdullah *et al*., 2015). Utilisingimmunisation is the foremost financial and attainable control strategy for developing nations (Disassa *et al*., 2013; Mitku *et al*., 2017). The presence of different serotypes of *M. hemolytica* as well as *B. trehalosi* without cross-protection poses a challenge for the development of immunisation that's effective worldwide (Belege *et al*., 2017). Antimicrobials are still the tool of choice for the prevention and control of infections due to *Pasteurella* and *Mannheimia* (Kehrenberg *et al*., 2001). This case report provides the diagnosis, treatment, and follow-up of pasteurullosis.

Case Descriptions

History

A local breed of sheep was brought to AAU, CVMA, Professor FesehaG/AB Memorial Veterinary Teaching Hospital on December 15th, 2022, with a history of coughing, sneezing, inappetence, depression, and nasal mucus discharge. The farmers keep their sheep on communal grazing in a field locally named "koticha" with other herds. There is a similar case in the herds, but it is more severe with aged ewes. There is a history of newcomer ewes bought from the local market three weeks before arrival.

Diagnosis

The ewe shows clinical signs of occasional coughing, nasal discharge, inappetence, weight loss, and a high temperature of 40.5 °C. Examinations of the sheep showed fever, anorexia, dyspnea with head and neck strain and unilateral serous nasal discharge (Figure 8C), abdominal breathing, and crackling lung sounds upon auscultation. The diagnosis was also made based on the history of the ewe, physical examination, and identification of the etiological agent, *Pasteurella* species. A sample for laboratory examination was taken from nasal swabs. The sample was forecast to be cultured on blood agar and MacConkey agar.

Clinical findings

Clinical examinations of sheep reveal severe signs of respiratory infection; stethoscope hearing shows frequent and disturbing sounds. The prominent clinical signs are pyrexia, dyspnea, abnormal and laboured breathing, nasal discharge, coughing, tachycardia, and dullness.

Laboratory Examination

A nasal swab was taken, pre-enriched in peptone water transport media, and incubated for 24 hours at 37°C. The peptone water is streaked on to a blood agar base containing 6% sheep blood and MacConkey and incubated aerobically at 37°C for 24 hours. There

are hemolytic and red-odorless colonies of *M. haemolytica*on MacConkey agar and hemolysis blood agar (Annex 4).

Then, free colonies subjected to gram's staining and cellular morphology under a light microscope (X100) show gram-negative coccobacilli or short road-like in shape, which confirms Pasteurella bacteria. Biochemical tests (Annex 4) of citrate, indole, and VP show negative results, while methyl red and catalase show positive results; this characterizes Pasteurella infection.

Treatment and Case Management

The sheep was followed with antibiotic treatment of Oxytetracycline 10% (Chongqing Bull Animal Pharmaceutical Co., Ltd., China), 10 mg/kg, 5 ml intramuscular injection for 5 consecutive days, and Ivermectin 0.2 mg/kg, 1.5 ml stat. The owner was also advised to manage the sheep in a hygiene litter and to feed them properly. During injection follow-up, the sheep show a good prognosis and become alert with a bright coat (Figure 7D).

Figure 7: Clinical presentation, diagnosis, and outcome of the sheep

The above picture (A) shows day one of arrival to the hospital with a depressed and rough coat; (B) an auscultation examination of the respiratory system; (C) a nasal running mucopurulent discharge; and (D) the fifth day of the follow-up showing a good prognosis.

Discussion

In Ethiopia, respiratory diseases of small ruminants caused by concurrent infections have been identified as the leading health problem, accounting for more than half of the overall mortality of sheep in the central highlands Mukasa-Mugerwa *et al.* (2000). Chakraborty *et al.* (2014) indicated respiratory diseases in small ruminants are multifactorial). In the present case report, *Pasteurella* species of *Pasteurella haemolytica* were isolated from sheep submitted to a veterinary clinic, which have a similar fate to Mekibib *et al.* (2019), who say bacterial pneumonia is the most common respiratory problem in small ruminants and frequently diagnosed in veterinary clinics in Ethiopia. In the present case report study, *M. hemolytica* was isolated from a nasal swab taken from a veterinary clinic, which is like Marru, (2013). There is similar agreement idea with Tadesse *et al.* (2017) that most ruminant pasteurellosis cases are caused by *M. haemolytica.* The case report also discusses the economic importance of pneumonic pasteurellosis, which has a similar discussion with Legas (2022), stated pneumonicpasteurellosis is the most common economically significant infectious disease of ruminants and is predominantly caused by *Mannheimia haemolytica*. Rad *et al.* (2009) also forward a wide variety of clinical signs, ranging from coughing to sudden death, that may occur in sheep and goats affected by pneumonic pasteurellosis, which agree with current case report findings.Legesse *et al*. (2018) indicated infected animals appear extremely dull with reduced appetite and remarkable depression, high fever, coughing, dyspnoea, muco-purulent nasal discharge, and anorexia that commonly develop when the immune system of the animal is compromised by stress factors such as crowding, transportation, draught, and unfavourable weather, which agree with the discussion of the case report. Generally, this paper recommended farmers should be aware to take their animals to a veterinary treatment and vaccination center.

Acknowledgement

I am glad and thank Mrs. Bilisuma Abebe for her support during the laboratory examination.

3.1.5. Coenurosis in Sheep

Abstract

Coenurosis is a disease that affects the central nervous system of sheep and is caused by *Coenurus cerebralis*, which is the larval form of *Taenia multiceps*, a tapeworm that infects the small intestine of carnivorous animals. This paper discusses a case report of sheep arriving at AAU, CVMA, Professor Feseha G/Ab Memorial Veterinary Teaching Hospital with clinical manifestations of coenurosis in sheep with a history of one-directional circling. The sheep had a normal rectal temperature of 38.40 °C, respiratory breaths of 28/min, and a heart rate of 80 beats per minute. The case shows clinical signs of disorientation, circular movements, head tilt, and left-to-right incoordination. Based on a physical and neurological examination, a tentative diagnosis of coenurosis was made. The case was treated with oxytetracycline 20% (Hebei Hope Harmony Pharmaceutical Co., Ltd., China), IM, for three days with a one-day gap, intramuscularly, Ivermectin 0.2 mg/kg (InterchemieWerken "De Adelaar" B.V., Belgium), stat, subcutaneously, stat, and Albendazole 300mg bolus (Ashish Life Science Pvt. Ltd., India). The owner admitted submitting the ewe after two weeks for cheek up. Later, the sheep didn’t have a prognosis, and the owner advised slaughter and admitted submitting the head of the sheep to the hospital. At the necropsy, a *Coenurus cerebralis* cyst (young bladder worm) was found in the left-to-dorsal longitudinal fissure in the site of the tectum mesencephaly. Generally, communities should have to properly dispose of the brains of sheep and goats after slaughter.

Keywords: *Circling, Coenurosis, Cyst, Sheep*

Introduction

Coenurosis is a disease that affects the central nervous system of sheep and is caused by *Coenurus cerebralis*, which is the larval form of *Taenia multiceps*, a tapeworm that infects the small intestine of carnivorous animals (Farjani *et al*., 2015). It is characterised by the development of cysts in the brain. *Coenurus cerebralis* is the intermediatory larval stage of *Taenia multiceps*, a tapeworm that is found in the small intestine of dogs and wild canids (Evangelisti *et al*., 2016). The contamination of pastures with canine faecal matter that contains oncospheres and the consequent ingestion of oncospheres by ovine result in larval invasion of the central nervous system and ultimately fatal clinical manifestations; clinically, coenurosis occurs (Varcasia *et al*., 2022).

For the life cycle to be completed, an intermediate host must be involved. A mature tapeworm releases developed proglottid sections into the fecal matter, which is then excreted by the final host, including wild carnivores and domestic dogs, spreading the eggs into the surrounding area. The *Taenia-multiceps* eggs encompass oncosphere embryos that are fitted with six protective hooks. The ingestion of these eggs through contaminated feed or water by a host that is vulnerable leads to their release due to the dissolution of the eggshell by digestive enzymes in the small intestine. Through the aid of embryonic hooks, the oncosphere can invade the intestinal wall and move throughout the circulatory and lymphatic systems towards its preferred locations. Coenurus cysts tend to develop mostly in the neural system and spinal cord, though they can develop in the internal tissues and organs of patients as well. Coenurus cysts develop in internal tissues and organs, with the nervous system and the spinal cord being the most frequent locations for *T. multiceps* (*Coenurus cerebralis*) in sheep (El-Din, 2010). The cyst is implicated in inducing atrophy, necrosis in surrounding tissues, haemorrhage, ataxia, neurological degeneration, and meningoencephalitis, as posited in the recent study by Mohammadi *et al.* (2021). The disease is frequently observed among growing ovines within the age range of 6 to 18 months and manifests itself as a slowly progressing focal brain lesion. This pathological condition is generally confined to one cerebral hemisphere (Farjani *et al*., 2015).

Both acute and chronic manifestations of coenurusis are observed in animals, with chronic forms more easily diagnosed and more commonly documented (Scala and Varcasia, 2006). The clinical manifestations in the acute form of the disease are associated with several factors, including the quantity of eggs ingested, the immune status of the host, the specific migratory route of the parasites in the brain, and the degree of inflammatory response (Alemu *et al*., 2015). The global prevalence of small ruminant infections caused by the larval stage of multiceps tapeworms is widespread (Oryan *et al*., 2014).

Coenurosis is considered a significant parasitic disease in sheep production, leading to economic losses (Deressa, 2012). Several factors were identified as significant contributors to the prevalence of coenurosis, such as the approach between dogs and small ruminants, the poor awareness of the local population regarding the disease, the unregulated access of dogs to the viscera of ruminants, and the insufficient and inconsistent deworming of dogs. These factors collectively play a pivotal role in the transmission and existence of *T. coenurus*, which implicates the need for proactive measures to be taken towards disease control and prevention (Miran, 2015). Therefore, this paper discusses the significance of Coenurosis in sheep and it outcome.

Case Description

History

A one-year-and-a-half-year-old ram was brought to AAU, CVMA, Professor Feseha G/AB Memorial Veterinary Teaching Hospital with complaints of one-sided seizure (circling) disorder and the sheep's inability to walk with the herd. The owner complains that he grazes his herd at communal field grazing locally called ‘koticha’’. According to the owner, the circling started approximately 1 month earlier and became progressive and more frequent soon, occurring every day.

Clinical Diagnosis

The sheep had a normal rectal temperature of 38.4 C, respiratory breaths of 28/min, and a heart rate of 80 beats per minute. The case shows clinical signs of disorientation, circular movements, head tilt, and left-to-right incoordination (Figure 8). Based on a physical and neurological examination, a tentative diagnosis of coenurosis and listeriosis was made. During seizure episodes, the animal lay down in lateral recumbency, initially displaying an ataxic condition, and subsequently began to revolve its head. The ewe displayed lateral recumbency with seizure activity.

Figure 8: Left -side circling and ataxic clinical appearance of the ewe.

Case treatment and Management

The case was treated with oxytetracycline 20%, 20mg (Hebei Hope Harmony Pharmaceutical Co., Ltd., China), 3 ml intramuscularly for three days with a one-day gap, Ivermectin, 0.2 mg kg, 1.5 ml/stat (InterchemieWerken "De Adelaar" B.V., Belgium), subcutaneously, and Albendazole 300mg, one bolus (Ashish Life Science Pvt Limited, India). The owner admitted submitting the ewe after two weeks for cheek up. Later, the sheep didn't have a prognosis, and the owner advised slaughter and admitted submitting a head of the sheep to the hospital for confirmation.

Postmortem Examination

A postmortem was done on the submitted head of slaughtered sheep, followed by skin removal and careful opening of the skull using a machete and scalpel blade without damaging the brain. Meninges are incised using a scalpel blade to expose brain tissue. The whole brain of the animal was collected and examined for visible evidence of cysts. The location of cysts seen in the left hemisphere to mid-cerebellum was observed. The postmortem cyst compresses surrounding brain tissue where the *Coenurus cerebralis cyst* (young bladder worm) with multiple scolex was found dorsally inside the brainstem (Figure 9C), leaving a dorsal longitudinal fissure in the site of the tectum mesencephaly.

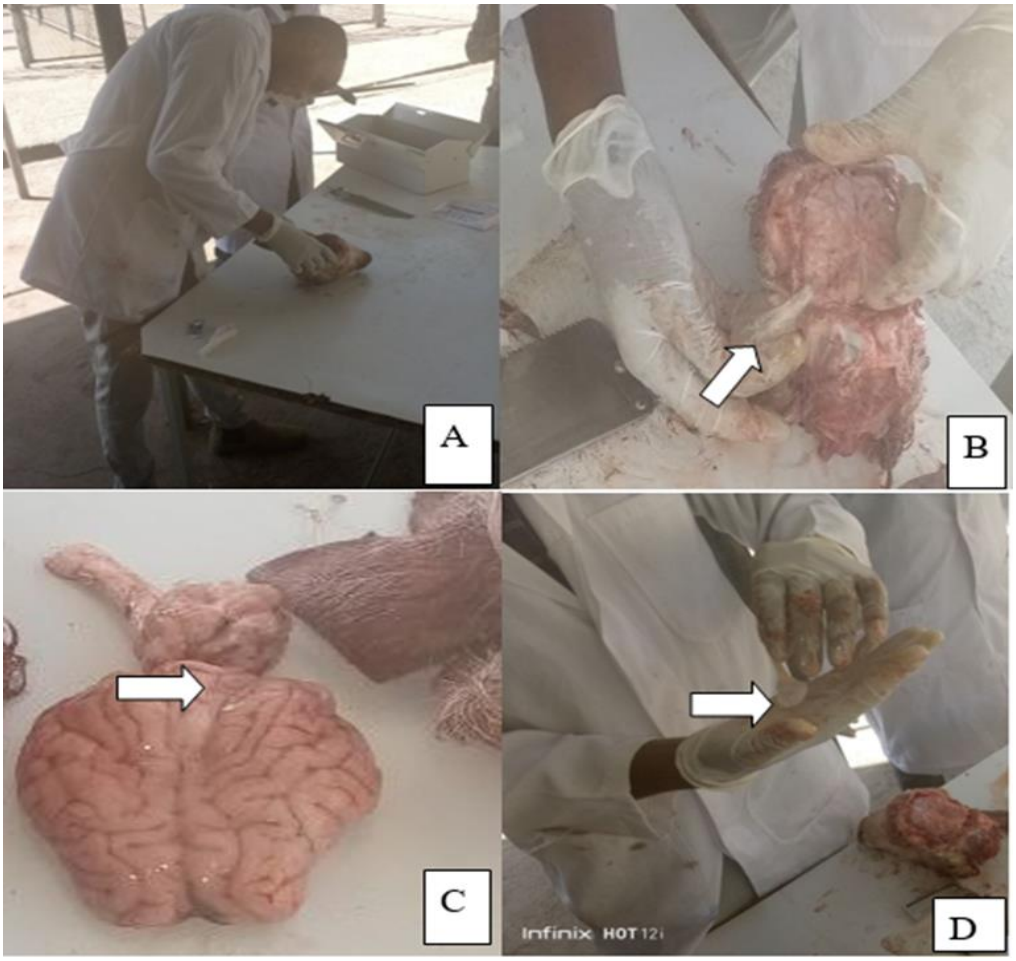


Figure 9: Head postmortem of cyst infected sheep**.**

The above figure shows (A) a suspected coenurosis ewe brain submitted after slaughter; (B) removing a coenurosis cyst located dorsally inside the brainstem at the site of the tectum mesencephaly (arrow); (C) indicating a cyst removed, pressed area; and (D) a gently removed cyst on hand.

Discussion

The case report forwards left circling (anticlockwise) and confirmed that presence of *coenurosiscerebralis* cyst which is similar result with Deressa, 2012; cases with clockwise circling had at least one cyst in the right cerebrum. Similarly, cases of anticlockwise circling had at least one cyst in the left cerebrum. Oryan *et al*. (2014) indicated global prevalence of small ruminant infections caused by the larval stage of *T. multiceps* tapeworms is widespread. There are no reports of veterinary interventions aiming at the treatment and control of parasitic infections in this region. Roy *et al.* (2007) forwards postmortem finding of cyst, clinical signs, ultrasound, and X-ray are the diagnostic method of coenurosis.

Abera, (2016) forwarded animal with cerebral coenurosis is usually diagnosed based on a clinical examination protocol Coenurosis was shown to depress liveweight gains or to lead to weight loss in infected lambs in both acute and chronic phase Biffa, (2006). Christodoulopoulos, (2007 forwarded presentation of *C. cerebralis* cysts in sheep exhibits considerable variability regarding both their location and depth. Clinical manifestations of affected sheep may include ataxia, incoordination, paresis, head pressing, circling, blindness, and potential complications. According to the present case report, the disease has a long-lasting impact for several months and is ultimately linked to a fatal result.

Present case neurological sign in the ewe shows anticlockwise circling which indicate there is cyst in the left cerebrum of brain arguing with Avcioglu *et al.* (2012) says clinical sign is based on location and size of the Coenurus cyst in the brain and spinal cord. Generally, communities should have to properly dispose of the brains of sheep and goats after slaughter.

Acknowledgement

I thank Dr. Getachew Mokonen (Veterinarian) for his support during Necropsy diagnosis.

3.1.6. Ovine Infectious Keratoconjunctivitis

Abstract

Ovine infectious keratoconjunctivitis (OIKC) is an eye disease in sheep. It can cause mild to severe inflammation and ulceration of the conjunctiva and cornea, which can lead to temporary or permanent blindness. This case report identifies the causative agent bacteriologically as an important pathogen causing ovine keratoconjunctivitis. A local breed ram was brought to AAU, CVMA, Professor Feseha G/AB Memorial Veterinary Teaching Hospital with a major history of being unable to see. The sheep has a history of isolating himself from the herd suddenly and colliding with objects around him. The diagnosis of the case was made based on the case history, clinical signs, physical examination, and bacteriological culture. On physical examination of both the right and left eye of the sheep, it was noticed to be blinded, congested, swollen, crusting over the eyelid, and having an initial watery discharge. Bacterial culture and biochemical tests reveal Moraxella bacteria. Early identification and treatment of the case depended on a physical examination of the eye. Then, the case was treated with parenteral injection of antibiotics, Oxytetracycline, 10%, 10 mg/kg, 3 ml, IM, for three days, and the owner recommended applying Dexamethasone sodium phosphate ophthalmic solution USP 0.1% w/v twice per day, morning, and night, for five days. He also advised separating infected animals from healthy herds, keeping the diseased at bay, and providing proper feeding and drinking water. After a two-week checkup, the ram became healthy and recovered from blindness. The best strategies to prevent and control an outbreak are maximizing the herd's immune status, minimizing the concentration of the Moraxella bacteria, and maintaining as irritant-free environment as possible. Further studies need to be carried out to determine the virulent factors of Moraxella sp. causing keratoconjunctivitis.

Key words: *Moraxella, Eye, Treatment*

Introduction

Ovine infectious keratoconjunctivitis (OIKC) is an eye disease in sheep. It causes mild to severe inflammation and ulceration of the conjunctiva and cornea, which can lead to temporary or permanent blindness (Williams *et al*., 2019). The clinical manifestation of the disease is the presence of cloudiness in the eye, severe congestion of the ocular mucous membrane, inflammation of the cornea, ocular discharges ranging from serous to purulent, and the potential occurrence of temporary or permanent blindness (Baker *et al*., 2001; Abdullah *et al*., 2014). The incidence rate and associated risk factors of OIKC infection have not been thoroughly studied in formal epidemiological investigations. It is thought to spread both within and between flocks due to the introduction of infected animals (Naglic *et al*., 2000).

There are several pathogens implicated as etiologic agents responsible for IKC: *Mycoplasma conjunctivae* is considered the major primary pathogen (Motha *et al*., 2003)*; Moraxella ovis* (Akerstedt and Hofshagen, 2004); *Listeria monocytogenes* (Dagnall, 1994); Chlamydial species (Polkinghorne *et al*., 2009); and *Mycoplasma agalactiae* (Scott *et al*., 2015). However, Moraxella has been identified as a significant etiological agent responsible for causing infectious keratoconjunctivitis (IKC) in small and large animals (Abdullah *et al*., 2015; Gelormini *et al*., 2017; and Zheng *et al*., 2019). It is considered a common eye disease in sheep and often occurs as a herd-level outbreak. Moraxella is a Gram-negative diplococcus that is nonmotile, catalase- and oxidase-positive, and easily transmitted by contact with nasal and ocular discharges and by flies as a mechanical transmitter (Ojo *et al*., 2009; Athira *et al*., 2018). Vectors, such as the house fly and face fly, play a significant role in the transmission of pathogens. Therefore, controlling these vectors is crucial to effectively controlling and preventing the spread of infections (Angelos, 2010b).

Moraxella ovis was found to produce one or more heat-labile exotoxins, causing both hemolysis in bovine RBCs and cytotoxic activities against corneal tissues (Zaitoun*et al*., 2006). The onset of the disease is not seasonally restricted, and its incidence is frequently linked to periods of warmer climate, during which exposure to risk factors is intensified (Kneipp*et al*., 2021). Affected animals usually recover within weeks, but some remain infected for longer periods, and permanent blindness may occur (Angelos, 2010b).

During the initial phases, the disease presents with unilateral or bilateral conjunctivitis, along with hyperemia in the scleral veins (Akerstedt, 2004). The cornea initially appears transparent, then faintly hazy, which increases opacity. However, over the course of several hours, a slight cloudiness emerges and progressively intensifies. Partial or complete blindness can occur in the affected eye due to the development of opaqueness in the cornea, which can occur entirely within 48 to 72 hours, including the most severe cases. It is possible for blood vessels to infiltrate the cornea from the limbus and advance towards the ulcer at a rate of 1 millimetre per day. Corneal opacity can ensue due to a condition called edoema, leading to a cloudy, white, or blue appearance of the cornea, thus accompanying the inflammatory cascade. Alternatively, leukocyte infiltration can cause a severe infection and lead to a milky white or yellowish presentation of the cornea. Continued ulceration can result in rupture of the cornea. Relapse may occur at any stage of recovery (Townsend, 2013).

Understanding the incidence of keratoconjunctivitis, the microorganisms that are involved, and the predisposing and environmental factors are crucial for the adequate administration of treatment and prophylactic measures (Radostits *et al*., 2006). The route of administration of antibiotics is likely to be a critical factor in treating bacterial eye diseases and achieving the necessary inhibitory antibiotic concentrations against the target organisms in animals. The best strategies to prevent and control an outbreak are maximising the herd's immune status, minimising the concentration of the Moraxella bacteria, and maintaining an irritant-free environment as much as possible (Seid, 2019). Hence, further studies must be carried out in this area to know the exact status of Moraxella infection and to carve out a better prevention measure to minimise the economic loss to the farmers.

Case Description

History

A male local sheep breed was brought to AAU, CVMA, Professor Feseha G/AB Memorial Veterinary Teaching Hospital with the intention of being seen. The owner complains that the ram isolates himself from the herd suddenly and collides with objects around him. He bought the sheep two weeks ago at the local livestock market and has a normal feeding appetite.

Clinical Diagnosiss

The diagnosis of the case was made based on history, ocular signs, concurrent systemic disease diagnosis, physical examination, and bacteriology. On physical examination of both the right and left side eyes of the sheep, it was noticed that they were blinded, congested, and swollen (Figure 10A). The left side of his eye started to become cloudy and showed clinical signs of keratitis and ulceration, and bilateral blindness was observed. It is distinguished that the lesions are not due to foreign bodies such as plant awns or parasites. No other clinical signs of concurrent illness were noticed, and the sheep had normal physiologic parameters.

Laboratory Examination

After taking a conjunctival swab scraping sample from both eyes, the swab was immersed in 10 ml of peptone water as a transport medium and incubated for 24 hours at 37 °C (Annex 5A). The conjunctival swab was streaked on blood agar and MacConkey agar. Both media were incubated at 37°C for 24 h. The growth of the plates was observed visually, and representative colonies of bacteria were subcultured onto nutrient agar plates and identified through biochemical tests and Gram staining characterization. Cocci *Moraxella (Branhamella) Ovis* bacteria were observed. Stained slides prepared from conjunctival swab cultures of sheep reveal Moraxella organisms (Stuve *et al*. 1992). A biochemical test shows citrate as positive and indole as negative (Annex 5) which indicated morexella positive.

Treatment and Management of the Animals

Early identification and treatment of the case depended on a physical examination of the eye. Both eyes of the sheep were cleaned and washed gently with gauze and sterile water (Amanta Health Care Ltd., India) for three days. Then, the case was treated with parenteral injection of antibiotics Oxytetracycline, 10%, 10 mg/kg, 3 ml for three days (PHENOXYL 10% KELA NV., St. Lenaarsteweg, Hoogestraten, Belgium), subcutaneous injection of ivermectin, 0.2 mg/kg, SC stat (Interchemiewerken de AdelaarB.v., Holland), and the owner was recommended to apply Dexamethasone sodium phosphate ophthalmic solution USP 0.1% w/v (Lincoln Parenteral Ltd., India), twice per day at morning and night for five days, and advised to separate the infected animals from healthy herds, keeping the diseased at shadow, and proper feeding and drinking water. After a two-week checkup, the ram became healthy and recovered from blindness. Hygienic farm practices can minimize vector control and thereby prevent vector transmission of Moraxella species (Karthik *et al*., 2017).

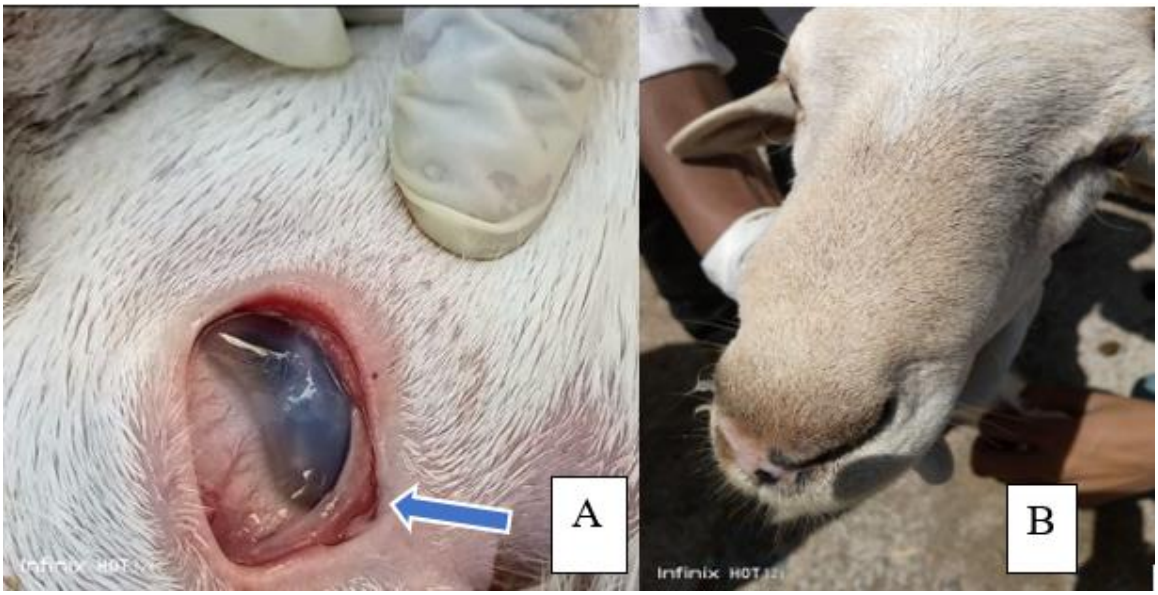


Figure 10: Ocular keratoconjunctivitis and post treatment of sheep

The figure shows (A) a temporary blinded ovine eye showing conjunctivitis before treatment and the outcome of the case after two months of seeing the camera (B).

Discussion

The infectious keratoconjunctivitis of small ruminants poses a significant economic challenge to sheep and goat production Zaitoun *et al*. (2021). This case report treats and tries to investigate the presence of *Moraxella ovis* in sheep with visual problems brought to a veterinary hospital. A similar study done by Akerstedt, (2004) investigated farms with infections of ovine keratoconjunctivitis, collecting conjunctival swabs from both healthy and affected sheep, as well as from healthy sheep free of any clinical indications of conjunctival disease. Moraxella (Branhamella) Ovis was isolated from sampled animals in both affected and healthy herds.

Similar reports by Karthik *et al.* (2017) and Athira *et al.* (2018) identified the Moraxella species pathogen as the causative agent responsible for the outbreaks of infectious keratoconjunctivitis (IKC) observed in flocks of sheep and goats. Parallel results were also forwarded by Dagnall, (1994); in experimental mixed infection, Moraxella ovis contributed to the severity of ovine keratoconjunctivitis attributable to infection with *Mycoplasma conjunctivae.*

Egwu, (1989) indicated that flies and sunlight have been recognised as potential predisposing factors, with multiple microorganisms being identified as potentially causative agents. Williams *et al.* (2019) and Zaitoun *et al.* (2019) discussed the administration of oxytetracycline via intramuscular injection, which has been demonstrated to effectively treat infectious keratoconjunctivitis owing to its broad-spectrum antibacterial activity against various bacterial species, including Mycoplasma, which strongly supports this case report treatment approach. Further studies need to be carried out to determine the virulent factors of Moraxella sp. causing keratoconjunctivitis.

Acknowledgement

I thanks to the owner of the case for his willingness of admission day follow-up.

3.2. Goats Case reports.

3.2.1. Goat Pregnancy Toxemia

Abstract

Pregnancy toxaemia, also known as ketosis, affects pregnant small ruminants during the last stage of gestation because of improper fat and carbohydrate metabolism. This case study was performed to report the possible cause and predisposing conditions of pregnancy toxaemia in goats and to indicate successful treatment approaches, control methods, and prevention methods of the disease in small ruminants. A pregnant doe was brought to AAU, CVMA, Professor Feseha G/AB Memorial Veterinary Teaching Hospital with complaints of diarrhoea, depression, and a rough hair coat that started before two days and had twin birth histories. The animal has a body temperature of 34.80 °C, a respiration rate of 60 breaths per minute, a heart rate of 120 beats per minute, and a congested, visible mucus membrane with good body condition. The diagnosis of the case was made based on clinical signs; a history of the goat was taken, and admission to fluid therapy was recommended. After fluid therapy with Ringer lactate and glucose via intravenous route, the doe developed clinical signs of listlessness; muscle twitching and grinding of the teeth occurred, and the doe died. A postmortem examination was done in the postmortem examination room, and it revealed twin foetuses were observed, along with a mass of plastic foreign bodies inside the rumen. The stomach, liver, heart, liver, and kidney were covered with fatty material. Depending on clinical findings, history, and postmortem examination, the case was diagnosed as pregnancy toxemia. With the prognosis of this disease being relatively poor despite treatment, it is essential that we consider how to prevent clinical cases from occurring for the healthy does within the flock in the current and future seasons.

Keywords: *Doe, Fat, Ketones, Pregnancy Toxemia*

Introduction

Pregnancy toxaemia, also known as ketosis, affects pregnant small ruminants during the last stage of gestation because of improper fat- and carbohydrate-metabolism (Kelay and Assefa, 2018). Several behavioural and neurologic clinical symptoms, as well as hypoglycemia encephalopathy, define the disease. The condition affects goats during late gestation and results in partial anorexia and depression, frequently accompanied by neurologic symptoms, recumbency, and death (Sagare, 2020). It has been seen more often in older ruminants and those carrying multiple foetuses (Brozos *et al*., 2011; Mongini and Van Saun, 2023).

Pregnancy toxaemia, which frequently develops in the final six weeks of gestation and results in considerable financial losses and a high mortality rate in pregnant goats, is a regular occurrence. Most frequently, it affects sheep and goats bearing two or more lambs or extremely overweight ewes (Uma Rani *et al*., 2015). Ketosis is caused by a disturbance in carbohydrate usage in animals (Amirul *et al*., 2016). As pregnancy progresses, the energy demands of her body increase. At the same time, the capacity of her rumen shrinks since her growing lambs in the uterus take up more and more space inside, leaving less space for the rumen (Rook, 2000). This combination can result in the goat not receiving sufficient energy through her diet. As a result, she will have to resort to breaking down her own body tissues, usually fat, to provide energy for her growing lambs, thus releasing ketones (a toxic byproduct of fat breakdown) into her bloodstream. When this occurs too rapidly, the animal body cannot detoxify the ketones fast enough, and ketosis or pregnancy toxemia results (Basavanagouda *et al*., 2021). Ketosis can also occur when the doe is too fat, since fat also takes up room inside the sheep, resulting in less space for the rumen to hold feed. Additionally, conditions that interrupt feed intake, such as storms, hauling, or other diseases, can also induce this metabolic disease (Celi, 2011).

In late gestation, the liver increases gluconeogenesis to facilitate glucose availability to the foetuses (Van Saun, 2000). Each foetus requires 30–40 g of glucose per day in late gestation, which represents a substantial percentage of the doe's glucose production and is preferentially directed to supporting the foetuses rather than the goat (Herrera and Ortega,

2018). The mobilization of fat stores is increased in late gestation to assure adequate energy for the increased demands of the developing foetuses and impending lactation. However, in the circumstance of a negative energy balance, this increased mobilisation may overwhelm the liver's capacity and result in hepatic lipidosis, with subsequent impairment of function. Additionally, twin-bearing ewes appear to have more difficulty producing glucose and clearing ketone bodies, thus increasing their susceptibility to pregnancy toxemia (Harmeyer and Schlumbohm, 2006).

Animals with a poor body condition score or that are overconditioned and carrying more than one foetus are most at risk of developing pregnancy toxaemia, although the condition can occur even in ideally conditioned animals on an adequate diet. Overconditioned animals may have decreased appetites, and adipose mobilisation quickly overwhelms the liver's capacity, resulting in hepatic lipidosis. In addition, there may be a population of animals less responsive to insulin production when nutritional intake is inadequate. Doe fitting these criteria may quickly shift from subclinical ketosis to clinical pregnancy toxaemia if feed intake is acutely curtailed by such events as adverse weather, transport, handling for shearing, preventive medication, and other concomitant diseases like foot root pneumonia (Silveira, 2015). Ketosis after kidding appears to be more common in herds fed a complete pelleted ration (Zobel, 2015). With increasingly insufficient energy to meet increasing foetal demands, the ewe or doe mobilises more body fat, with resultant ketone body production and hepatic lipidosis (Simoes, 2020).

Ewes or does in the early stages of pregnancy with toxaemia have a decreased appetite for grain, and a few CNS clinical signs can often be treated successfully with propylene glycol (60 mL PO every 12 hours for 3 days) (Cal-Pereyra *et al*., 2015). Adding oral supplementation with calcium (12.5 g calcium lactate) and potassium (7.5 g KCl) and administration of protamine zinc insulin (0.4 U/kg SC) every 24 hours increases survival rates. Commercial calf electrolyte solutions containing glucose may also be given by stomach tube at a dose of 3–4 L every 6 hours or drenched as a concentrated solution (Ji *et al*., 2023). Serum BHB concentration can be used as a flock screening test to detect flocks at risk of pregnancy toxaemia (Roubies *et al*., 2003).

Treatment of pregnancy toxaemia requires early detection and steps to quickly meet the energy (glucose) needs of the affected doe. The success of therapy relies on the ability to raise cerebrospinal fluid glucose concentrations before irreversible changes occur in the brain (Sargison, 2008). It requires the correction of fluid, electrolytes, and acid-base disturbances in addition to replacement therapy with glucose. Oral propylene glycol or corn syrup are quick sources of energy and should be given at a rate of 200 ml four times daily along with 3–4 litres of concentrated oral rehydration fluid (Bayne, 2023).

Doe treated very early in the course of the disease generally responds favourably, but response to therapy is poor once the animal has become recumbent (Lima, 2012). Parenteral therapy with glucose should be accompanied by the IV injection of lactated Ringer's solution and the administration of further fluids by a stomach tube. Success is reported with oral drenching every 4–8 hours of 160 ml of a solution containing 45 g glucose, 8.5 g sodium chloride, 6.17 g glycine, and electrolytes, which is available commercially as a concentrated oral rehydration solution. Reported recovery rates are 90% in early cases and 55% in advanced cases (Simpson, 2019). Treatment with insulin in addition to treatment with oral glucose precursors and electrolytes shows a significantly higher survival rate (87%) compared with treatment with oral glucose precursors and electrolytes alone (Herdt and Gerloff, 2008).

Prevention of pregnancy toxaemia involves adequate nutrition during the final weeks of pregnancy, enough space for exercise, and control of other conditions that might result in reduced feed intake (Gordan, 2012). Goats must be fed in relation to their changing energy needs throughout the reproductive cycle (Kenyon, 2014). Thus, ewes should not enter the last 6 weeks of gestation with a BCS less than 2.5. This can be prevented by good feeding management and ration formulation (Kahn, 2005). The total metabolic rate increases by at least 50 percent during late pregnancy. It has been shown that late-pregnant ewes require about 50% more feed if bearing a single lamb and about 75% more feed if carrying twins (Rook, 2000). During the last 6 weeks of gestation, grain is required as a source of carbohydrates in the ration to maintain the health of multiple-bearing ewes (Kahn, 2005). Effective anthelmintic treatment, especially on farms with high parasitic burdens, would further contribute to the prevention of the disease.

Case description

History

An aged pregnant doe was brought to AAU, CVMA, Professor Feseha G/AB Memorial Veterinary Teaching Hospital with complaints of diarrhoea, depression, and a rough hair coat starting within two days of arrival. The owner also said his goat cannot walk properly, and he submitted it by cart to the hospital. She also refuses to eat or drink. He reported that the goat gave birth during parturition.

Clinical Diagnosis

The diagnosis of the case was made based on clinical signs, history, and postmortem findings. The animal has a body temperature of 34.8 C at arrival, a respiration rate of 60 breaths per minute, a heart rate of 120 beats per minute, and a congested visible mucus membrane.

Clinical Findings

The doe manifests clinical signs of a rough coat, depression, viscous vaginal discharge, and frequent lying and standing. During fluid therapy, the goat developed clinical signs of listlessness, aimless walking, fine muscle tremors, grinding of the teeth, and a coma, and she died.

Treatment, Management, and Outcome

Administration of energy sources Intravenous fluid therapy was recommended. Fluid therapy of two vials (40 ml) of glucose 40%, IV infusion followed with balanced electrolyte solution, ringer lactate by intravenous as indicated by the blue arrow under figure (11C) for 30 min, then the doe developed clinical signs of listlessness, eye rolling, muscle twitching and fine muscle tremors, and grinding of the teeth, and lastly, she died.

Figure 11: Clinical presentation of goat suspected pregnancy toxemia.

The above photographs show (A) that the ewe shows a rough hair coat and is depressed as soon as she arrives (Figure 11A), and (B) vicouse discharge with tissue content (Figure 11C).

Postmortem findings

Postmortem demonstrates varying degrees of fatty heart and enlarged adrenal glands, twin foetuses (Annex 7), atrophy of the liver and swollen pancreas (Figure 12C), a highly fat-covered stomach (Figure 12A), a heart with a fat covering (C), approximately 1kg of foreign body content found inside the stomach (Annex 7), and hemorrhagic lung (D). The overall postmortem result indicates a pathognomonic sign for death due to pregnancy toxaemia.

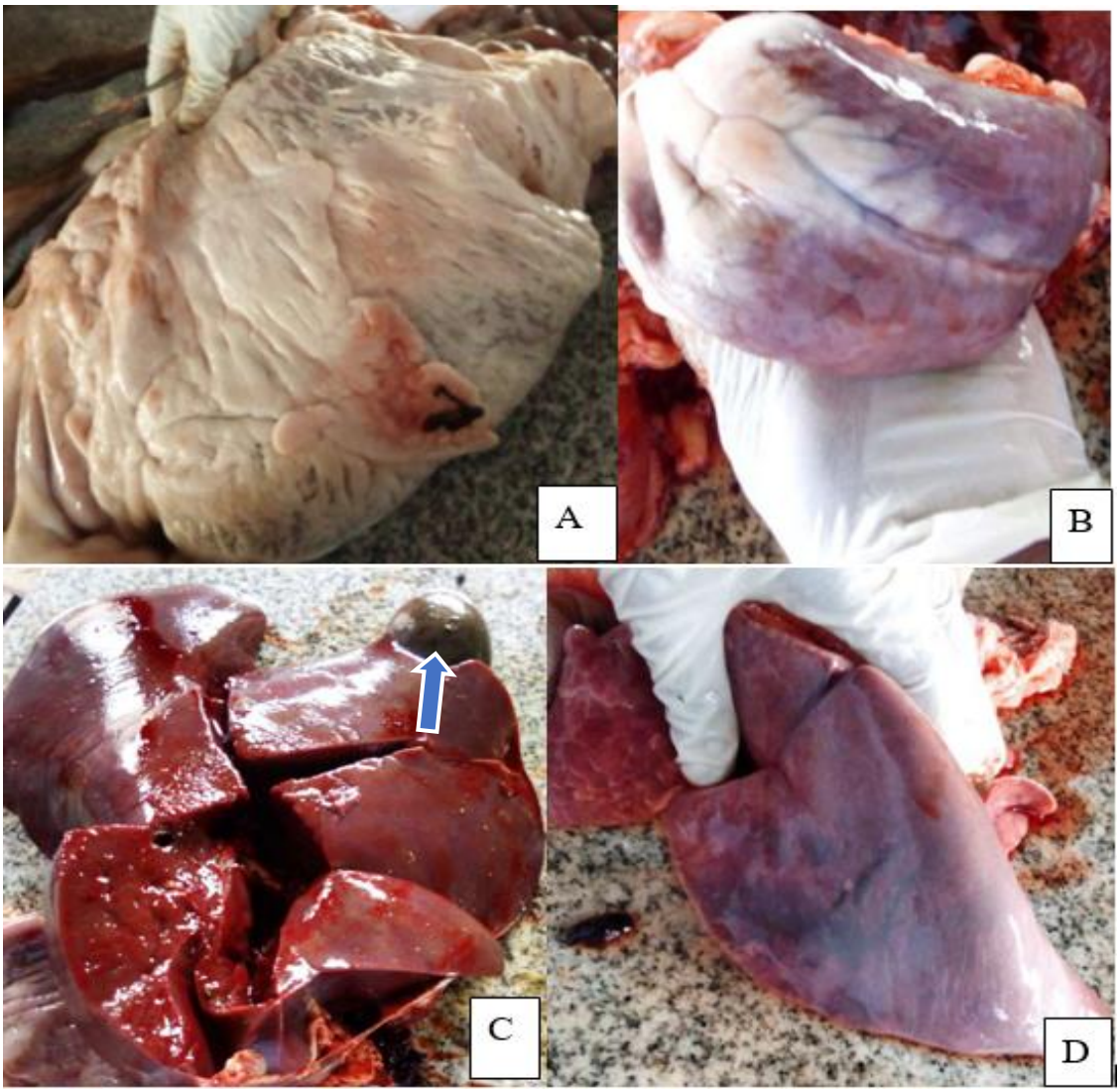


Figure 12; Postmortem of pregnancy toxemia diagnosed ewe.

Discussion

The increased requirement for energy during pregnancy, accompanied by inadequate nutrition to meet metabolic requirements, is the underlying cause of pregnancy toxaemia. This case report observed a twin pregnant dog with high fat organ coverage, which indicates ketosis occurrence within the doe. A similar study forwarded by Khan *et al*. (2021) indicated that high fat metabolism initiates the onset of excessive lipid metabolism and ketosis and eventually causes hepatic lipidosis and pregnancy toxaemia. An excess of ketone bodies can occur in both poor and well-conditioned sheep and goats, and in fact, excessively fat animals can be more prone to pregnancy toxaemia.

According to Lima, (2012), pregnant toxaemia-affected goats exhibit weakness and depression, usually within the last six weeks of pregnancy. Treatment of advanced cases of pregnancy toxaemia is frequently unrewarding. If she is already comatose, euthanasia is warranted. Pregnancy toxemic cases treated very early in the course of the disease generally respond favourably, but response to therapy is poor once the goat has become recumbent.

Sargison, (2009) reported that despite a full course of treatment, only one-third of affected animals are likely to survive. Ketosis can occur when the doe is too fat since fat also takes up room inside the sheep, resulting in less space for the rumen to hold feed. This is in strong agreement with the current case report. With the prognosis of this disease being relatively poor despite treatment, it is essential that we consider how to prevent clinical cases from occurring for the healthy does within the flock in the current and future seasons.

Acknowledgement

I would like to thanks Dr. Ufaysa Gensa (veterinarian) for his assisting during treatment and postmortem diagnosis of the case.

3.3. **Cattle Case reports**

3.3.1. Sub Clinical Mastitis in Dairy Cow

Abstract

Mastitis refers to an inflammatory condition of the parenchyma of the mammary glands, typically characterized by alterations in milk composition, including physical, chemical, and often bacteriological changes and pathological changes in glandular tissue. Knowledge of mastitis pathogens and their predominance, as well as an understanding of risk factors, are prerequisites to improving milk production in dairy farms. This case report discusses subclinical mastitis that occurred on an intensive dairy farm in Bishoftu, Ethiopia; the milker complained of milk reduction, and the cow became depressed and changed condition. The diagnosis was made based on the clinical signs, aided by the history and bacteriological culture of the sample to isolate the causative agent of the case. After subclinical mastitis infection screening by the California mastitis test, a milk sample was taken aseptically to the AAU, CVMA, Microbiology Laboratory, and culture of the sample was performed for bacteriological identification. For the isolation, about 5 ml of milk was collected from the teat after cleaning and milking the first drop in a screwed bottle from the quarter that was positive on the CMT positive screening. For bacterial identification, the grown culture on nutrient agar was also sub-cultured on mannitol salt agar and incubated overnight at 37 °C. After 24 hours, the media showed small colonies surrounded by a yellow zone, which confirms *staphylococcus aureus as* positive. The animal was treated with parenteral injections of procaine penicillin 24 mg/kg and dihydrostreptomycin sulphate 30 mg/kg (Shanghi Gongyi Pharmaceuticl Co., Ltd., China) and a multivitamin (Aether Centre Beijing Biology Co., Ltd.) for supportive treatment and shows a good prognosis after two weeks of follow-up. Post-treatment, the cow shows signs of health and starts producing good milk. The farm also recommended buying rubber cow mat sheets and placing them on the floor for cow bedding.

Keywords*: Bacteria, Diagnosis, Mastitis, Milk, Subclinical*

Introduction

Mastitis refers to an inflammatory condition of the parenchyma of the mammary glands, typically characterized by alterations in milk composition, including physical, chemical, and often bacteriological changes and pathological changes in glandular tissue (Sharma *et al*., 2011). The adverse impact on animal health, quality of milk, and economics of milk production due to this issue manifests as a significant global challenge affecting both developing and developed countries, with substantial financial losses incurred by all (Reshi *et al*., 2015). It manifests as an immunological reaction to the infiltration of the teat canal by a diverse set of bacterial sources that coexist on the premises and may also arise from physical harm caused by chemical, mechanical, or thermal factors to the udder of the cow.

Primarily, mammary gland mastitis occurs because of the release of leukocytes (white blood cells) into the gland, often in response to the invasion of the teat canal by bacteria. (Sordillo *et al*., 2018). The excretion of toxins by the bacteria leads to impairment of the milk-producing tissues and multiple ducts within the mammary gland. In certain cases, a lasting deformity of the udder may result. The microorganisms adhere to the skin, colonise the tip of the teat, and enter the teat duct, leading to infection (Tassew *et al*., 2016). Because of this, the implementation of post-milking teat disinfection and dry cow therapy plays a pivotal role in the management of contagious mastitis.

Mastitis is classified into clinical and subclinical forms based on its clinical presentation. Clinical mastitis is commonly diagnosed through visual evaluation of udder inflammation or by detecting alterations in the organoleptic characteristics of milk. Sub-clinical mastitis does not show visible signs; however, there is a noticeable reduction in milk yield and increasing levels of somatic cell count (Argaw, 2016). Subclinical mastitis is a highly prevalent and economically detrimental disease within the dairy industry. The prevalence of subclinical mastitis in dairy herds is 3 to 40 times greater than that of clinical mastitis, and it is responsible for significant economic losses in most dairy farms (Kumari *et al*., 2018).

The prevalence of subclinical mastitis in cows increases with increased milk production, unhygienic management practices, and an increasing number of lactations (Khasanah *et al*., 2021). Numerous factors may implicate susceptibility to mastitis, including the bacterial type, the physical condition, age, and physiological status of the cow, as well as the level of milk production and environmental conditions (Ganguly *et al.*, 2018).Mastitis occurs in all species of animals but assumes major economic importance in dairy cattle due to its effect on the quality and quantity of milk in high yielders.

It causes significant losses due to: milk thrown away due to contamination by medication or being unfit to drink; reduction in yields due to illness and permanent damage to udder tissue; extra labour required to treat mastitis-affected cows; costs of veterinary care and medicines; and reduced longevity due to premature culling. To avoid these, it is distinctly important to identify the disease at an early stage. Unlike the clinical form, in the subclinical form there is neither visual detection of abnormalities in milk nor in the mammary gland. Therefore, knowledge of routine diagnostic screening tests for early detection of mastitis is desirable to treat the condition and avoid the subsequent economic losses (Galdhar and Roy, 2003).

Currently in Ethiopia, a national drive is underway to mitigate the prevalent food insufficiency by formulating diverse agricultural tactics, including enhancing the efficiency of the livestock industry via the implementation of regular disease monitoring for major infectious diseases. Mastitis has been largely overlooked in Ethiopia, particularly its subclinical manifestation, which can be attributed to the causative agent Staphylococcus aureus. The bacterium produces a range of virulence factors, including toxins and enzymes that contribute to its pathogenicity (Lakew *et al*., 2019). The disease should be studied as it causes economic loss because of reduced milk yield, discarded milk following antibiotic therapy, veterinary expenses, and culling mastitic cows (Abera *et al*., 2010).

The predominant cause of mastitis is Staphylococcus aureus, followed by Streptococcus agalactiae (Keefe, 2012). The primary mode of transmission of these pathogens is via contagion, specifically from cow to cow, wherein infected cows in each herd function as a source of infection. This phenomenon proliferates through the act of milking, whereby it is transmitted through the milking apparatus as well as via contaminated hands and materials (Mekonnen *et al*., 2018). The organism is capable of living for a long period of time within the mammary gland of the cow (Rainard *et al*., 2018).

Somatic cell count (SCC) is an indicator of udder health problems. Milk from cows with a healthy udder should contain less than 200,000 SCC in 1 ml of milk (Bobbo *et al*., 2021). Most somatic cells are white blood cells (macrophages and neutrophils) that influx mammary gland tissue from the blood during inflammation (Rainard *et al*., 2018). Abnormal quarters are characterised by having a somatic cell count exceeding 300,000 somatic cells/ml of milk, whereas uninfected quarters have a somatic cell count below 200,000 somatic cells/ml of milk (Jones, 2009).

The possible elimination of microorganisms in a herd can be achieved by implementing suitable treatment methods in combination with good milking practises. To effectively control mastitis levels within a dairy herd, good milking hygiene practises, systematic culling of chronically infected cows, optimal housing management, and strategic implementation of dairy cattle nutrition programmes aimed at enhancing cow health are all vital requirements (Galdhar and Roy, 2003). Therefore, knowledge of routine diagnostic screening tests for early detection of mastitis is desirable to treat the condition and avoid the subsequent economic losses.

Case Descriptions

History

In a phone call received from one of the dairy farms found in Bishoftu, Oromia, Ethiopia, herd followers complained that the Holstein crossbred cow reduced milk production and caused condition changes and depression starting three days before arrival. He also said that, to some extent, the cow reduces feeding and drinking. The farm had an intensive farming system and held around 40 herd cows.

Clinical Diagnosis

The rectal body temperature was 39.0 C^0, Respiratory rate 28breath/min and Heart rate 84beat/min. During visual examination of the udder and palpation, there was little appearance of swelling at the caudal part of the udder, and depression of the cow was observed. The California mastitis test (CMT) was used as a screening test for mastitis. It was done for each quarter of individual cows, where a four-well white plastic paddle was used; one well was used for each quarter of the cow to be tested. The foremilk was discarded, and then a little milk was drawn into each well. An equal volume of CMT test reagent was added, and then the sample was slowly agitated (procedure as described by Radostitis *et al*., 2006). The hind quarter of the udder showed a positive reaction, but two of the front udder teats of cows were negative on the test. The infected hind quarter did not have any gross abnormality; it was equal in size with other quarters, and no prominent swelling was felt on palpation.

Figure 13: Diagnosing mastitis infected cow and post treatment outcome

The above figure (A) shows the cow before treatment with depression; (B) shows taking one teaspoon (2 cc) of milk from each quarter on a paddle for CMT tests; (C) shows the udder of the cow after treatment; and (D) shows the outcome of the cow post-treatment.

Laboratory Examination

After California mastitis test screening, subclinical mastitis infection was suspected, and a milk sample was taken aseptically to AAU, CVMA, and the Microbiology Laboratory, where culture of the sample was performed for bacteriological identification. For isolation of the causative agent, about 5 ml of milk was collected from the teat after cleaning and milking the first drop in a screwed bottle from the quarter that was positive on CMT, and it was transported with a cold chain to a microbiology laboratory. A milk sample loop was inoculated on a prepared blood agar plate and incubated for 24 hours. Free colonies that were grown uniformly were observed on the blood agar (Annex 8). To identify the bacteria, gram staining was done, and gram-positive staphylococcus species were observed under the microscope (100X). For bacterial identification, the grown culture on nutrient was also sub-cultured on mannitol salt agar and incubated overnight at 37 °C. After 24 hours, the media showed small colonies surrounded by a yellow zone (Annex 8). Then, after the gram staining procedure was performed and the slide was diagnosed under a 100-X microscope, 10 spherically shaped, violated gram-positive bacteria were found, which confirmed a *staphylococcus aureus i*nfection of the milk.

Case treatment and outcome

Systemic antibiotics were given to the cow by intramuscular injection, and she shows a good prognosis after two weeks of follow-up. The animal was treated with parenteral injections of procaine penicillin 24 mg/kg and dihydrostreptomycin sulphate 30 mg/kg (ShanghiGongyiPharmaceuticl Co., Ltd., China), 25 ml per day for 5 days, and multivitamin (Aether Centre Beijing Biology Co., Ltd., China), 8 ml, IM stat, for supportive treatment. Post-treatment, the cow shows signs of health and starts producing normal milking. The handler was advised to clean the pen ground at least twice per day and to clean his hands and milking material before and after milking. The farm also recommended buying rubber cow mat sheets and placing them on the floor for cow bedding.

Discussion

Subclinical mastitis poses a significant challenge to dairy development in Ethiopia. It represents a multifactorial disease, wherein its prevalence may be influenced by a range of factors inclusive of management practices, animal age, milk productivity, body composition, parity, environmental conditions, and other relevant circumstances. The current case report examines the presence of subclinical mastitis by CMT screening test and bacteriological examination in Bishoftu, Ethiopia, which agrees with Birhanu*et al*. (2017), who forwarded both the CMT and bacteriological results, showing the prevalence of subclinical mastitis in the study area to be remarkably high.

Ibrahim, (2017) discussed subclinical mastitis, which has no visible signs but a decrease in milk production and increased somatic cell count are evident; it has a similar agreement with the current case report. Putz *et al*. (2010) and Zhao *et al*. (2008) studied one of the most common mastitis-causing pathogens, *Staphylococcus aureus*, which can appear in both chronic and acute varieties with markedly low cure rates. *S. aureus* is known to escape immune clearance by adhering to and infiltrating epithelial cells of the mammary gland, which has parallels with this report. McDougal *et al.* (2012) forwarded that systemic antibiotics should be used when more than one quarter is affected and in severe cases of the disease and have a similar treatment approach to the case report.

To prevent the possible occurrence of mastitis on the farm, recommendations were forwarded: to regularly do CMT tests and isolate positive cases, cows with contagious mastitis should be milked last, or a separate milking claw should be used for the infected cows; milking material should be flushed with hot water or germicide after milking infected cows; individual towels should be used to wash or dry teats; and milkers should have clean hands and wear clean farm gowns.

Acknowledgement

I want to thank Mrs. Tesfanesh for her help in all the laboratory work and Dr. Tewodros Nigusse supporting me in handling the case and following up on this case report.

3.3.2. Actinobacillosis of Heifer

Abstract

Actinobacillosis is an infectious, chronic, generally non-fatal disease caused by*Actinobacillusligniеresi*. The classical form of the disease in cattle results from swelling, tumorous abscesses and hardening of tongue, which is often referred to as wooden tongue. This paper discusses a case report of local breed Heifer presented to AAU, CVMA, Professor G/AB Memorial Veterinary Teaching Hospital on December 15th, 2022, with complaints of chronic ventral mandibular swelling, reduce feeding and emaciated. On palpation of the affected area of neck, a painful response was appreciated. The swelling shows hard consistency inflammation of mandibular muscle and soft tissue of the neck and needle aspiration of the inflammation reveals pus formation inside. Incision of the swelling and drainage was recommended. After aseptically preparation of the swelling, simple surgical opening was performed by dissecting and drainage of internal groove lavage of pus and debridement of content was made. The swab sample was taken from the grove after drainage of the pus for bacteriological identification. Microbiological examination by Gram staining of bacteriological cultures reveals positive for Actinobacillus. Then, the heifer was treated with intramuscular injection of broad spectrum Oxytetracycline 20%, 20mg/kg (Hebei Hope Harmony Pharmaceutical Co., Ltd. China). Feeding animals soft and palatable fed with enough water is recommendable and it advised owners should communicate veterinarians when abnormal condition occurred to their animal.

Keywords*: Actinobacillusligniеresii, Granulomatous lesions,*

Introduction

Actinobacillosis is a chronic, non-fatal infectious disease caused by *Actinobacillus lignieresii*, *a* gram-negative bacterium that is non-fatal in nature (Salvaggio *et al*., 2023). The condition of bovine actinobacillosis is typically recognized as an opportunistic pathogen, sporadic, gradually progressing granulomatous condition underlying soft tissue, and regional lymph nodes, particularly in the head and neck area of animals (Sharma *et al., 2010).* Infection probably occurs endogenously because of small wounds or oral mucosa, and the bacterium is mostly found in the oro-pharyngeal area and upper respiratory tract (Songer and Post, 2005). Animals utilised for natural grazing are susceptible to the infections. The infectious disease caused by *Actinobacillus lignieresii* primarily impacts bovine and ovine species; however, its presence has also been documented in other animals such as equines, porcines, and canines (Brown *et al*. 2007).

In bovines, the classical form is characterized by the presence of enlarged, tumorous abscesses and hardening of the tongue. Regional infection caused by the organism leads to an immediate inflammatory response and the subsequent formation of granulomatous lesions characterized by necrotic and suppurative features, frequently accompanied by the discharge of purulent exudate (Aziz *et al*., 2019). It is believed that the causative agent infiltrates the oral tissues through wounds caused by consuming rough feed. The organism enters deep tissues through traumatic erosions, ulcers, and penetrating lesions caused by hard, fibrous hay, straw, and plant awns (Radostits *et al*., 2007; Brown *et al*., 2007; and Smith, 2009), and regional lymph node infection occurs. The pathological condition is characterized by the development of pyogranulomas with pus-containing small, hard yellow to white granules within the oral cavity, tongue, or forestomach of cattle and subsequent dissemination to the adjacent lymph nodes (Rycroft and Garside, 2000). The relatively high frequency of lesions at slaughterhouses suggests that actinobacillosis is widespread, causing numerous subclinical cases and, occasionally, outbreaks with a variable incidence of clinically affected animals (Caffarena, 2013; Melendez *et al.*, 1999).

The initial location of the lesion associated with actinobacillosis is commonly found in the lymph nodes, with subsequent extension to the subcutaneous tissue and skin and leading to ulceration (Kish, 2014; Dhand, 2003). At the slaughterhouse, a corresponding lesion within the parotid, submandibular, and retropharyngeal lymph nodes is detected (Caffarena, 2018). The designation of cutaneous actinobacillosis should be used preferentially in cases in which the lesion is associated with infection of skin wounds by *Actinobacillosis lignieresii* and may occur in different anatomic locations (Margineda, 2013).

According to Milne *et al*. (2001), numerous therapeutic interventions have been employed for the management of actinobacillosis, encompassing surgical debulking accompanied by post-operative intramuscular administration of penicillin or streptomycin and intravenous administration of sodium iodide, which may include administration of tetracyclines and sulphonamides. Cattle of a young age demonstrate vulnerability after subcutaneous inoculation, leading to the possibility of lesion development within a few days (Rycroft and Garside, 2000). Generally, this paper reports an Actinobacillosis-diseased calf caused by *A. lignieresi*.

Case Description

History

Black local Heifer presented to AAU, CVMA, Professor Feseha G/AB Memorial Veterinary Teaching Hospital on December 15th, 2022, with complaints of chronic ventral mandibular swelling, reduced feeding, and loss of body condition. The heifer was earlier treated at village by local veterinarian but did not show any improvement. The owner kept his herd at field communal grazing in ranch.

Clinical Diagnosis

Physical observation showed unilateral mandibular swelling and the heifer had normal physiological body parameter measurements. Palpation of the affected area of neck revealed, that the skin was thickened, and a painful response was appreciated. The swelling showed hard consistency inflammation of mandibular gland and soft tissue of the neck and needle aspiration of the inflammation reveals pus formation inside. Incision of the swelling and drainage was recommended.

Laboratory Examination

Swab sample was taken from the grove after drainage of the pus. The sample was preserved in peptone water of bacteria transport media and incubated for 24 hr. at $37C^0$. After MacConkey and nutrient agar preparation the sample was streaked on the media. Microbiological examination by Gram staining of bacteriological cultures found positive for *Actinobacillu slignieresii* (Annex 9).

Therapeutic management

After aseptically preparation of the swelling, simple surgical opening was performed by dissecting then, drainage with mild pressure and internal wound lavage of pus and debridement of content was made (Figure 14) with arrow. Then, the heifer was treated with intramuscular injection of broad spectrum Oxytetracycline 20%, 20mg/kg (Hebei Hope Harmony Pharmaceutical Co., Ltd. China), 20ml, IM, for three days every 72hrs. Besides iodine tincture cleaning, gauze dipping and resisting inside and removal of the

gauze was made during admission follow up. Multivitamin 4-8ml/cattle, stat (Aether Center Beijing Biology Co., Ltd, China) for supportive treatment and ivermectin 0.2mg/kg (Sunvictor Pharmaceutical Co., Ltd. China) for deworming were injected for one day intramuscularly and subcutaneously respectively.

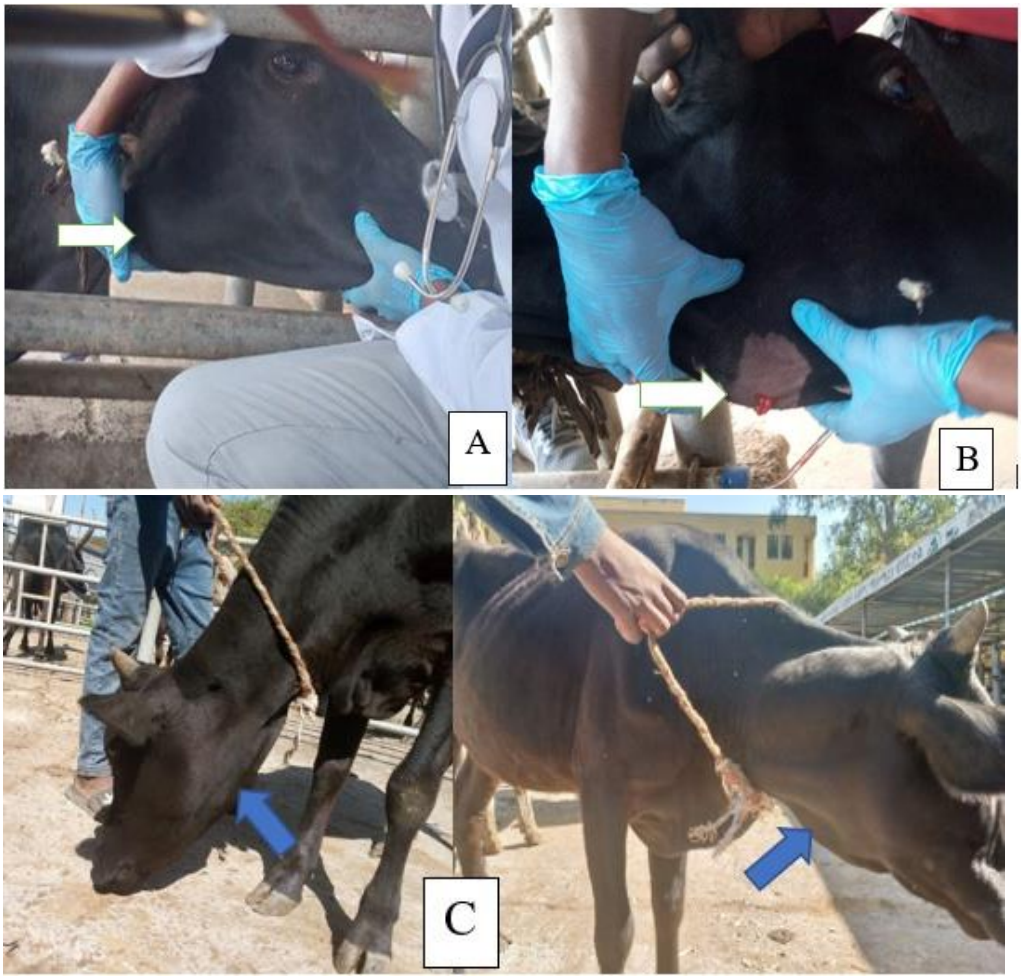


Figure 14. Clinical diagnosis, treatment, and outcome of heifer

The above figures (A) show mandibular swelling at day one; (B) opening, mild pressure pressing of the swelling and removal of pus with blood content; and (C) show the outcome of an Actinobacillus-treated heifer after 2 months of treatment.

Discussion

The present study revealed *A.lignieresii* as the causative agent of chronic mandible swelling in a heifer; a similar case was reported by Azizl, (2019), Actinobacillosis in a cross-bred heifer in India.Rycroft and Garside, (2000) forwarded that in cattle, ‘wooden tongue' is the classical presentation of infection with *A. lignieresii*, but soft tissue granulomas can develop around the head, pharyngeal, and stomach regions, with subsequent spread to regional lymph nodes.

The current case report focused on one animal with a lesion in the submandibular and arranged linearly along the lymphatic vessels of the neck, which, in agreement with Caffarena, (2013), further stated that the agent lodged in the lymph nodes of the head and neck disseminates through the lymphatic vessels, causing lymphangitis and reaching other lymph nodes.

Brown *et al*. (2007) studied animals used for natural grazing, which therefore run a greater risk of infection. *A.lignieresii*affects mostly cattle and sheep, but the disease is also known to occur in horses, pigs, and dogs. O'Neill *et al*. (2001) said the definitive diagnosis of wooden tongue should depend on the recovery of the organism from the lesion, which has a positive relationship with the current case report.

According to Caffarena*et al*. (2018), in outbreaks of actinobacillosis in beef cattle reported in Minnesota, the disease occurred in a herd that grazed in green, lush pastures, and the affected dairy herd ingested a typical diet for lactating cows. Albornoz and Sali, (2012) found that the disease was associated with the feeding of dry fibrous forage that may injure the mucous membranes of the oral cavity, favoring the colonization of deeper tissues by *A. lignieresii*, which is a commensal of the upper digestive tract. Regarding the prevention of infection with *A. lignieresii*, there are no vaccines available. Generally, this paper advises that control is achieved by early recognition and prompt treatment of cases, and isolation or disposal of infected animals is recommended.

Acknowledgement

I thank Dr. Enatfanta for her support during surgical removal of content.

3.3.3. Heifer Black Leg

Abstract

Blackleg is a highly fatal infectious disease of mainly large ruminants characterized by lesions of myonecrosis caused by *Clostridium chauvoei*, usually presenting as a sudden onset of sporadic mortalities. A 1-year-old crossbreed heifer was presented with a history of shivering, anorexia, skin swelling, and depression to AAU, CVMA, Professor Feseha G/AB Memorial Veterinary Teaching Hospital on December 9, 2022. The heifer was febrile, with a body temperature of 39.8 °C at arrival. Subcutaneous palpation reveals characteristic swelling and gaseous, a crepitating sound felt under the skin at her hindquarters, and mucous membranes that were congested. There was also lameness, rapid breathing, depression, and reluctance. These findings, in combination with vaccination status, led to a presumptive clinical diagnosis of blackleg. A blood sample was taken from the jugular vein by sterile syringe; the needle was closed urgently, and it was submitted to the microbiology laboratory for bacteriological examination. Anaerobic culture tests performed from blood were positive for *C. chauvoei*, Gram and rod-shaped, confirming a diagnosis of blackleg. The case was aggressively treated with broad-spectrum antibiotics with Procaine penicillin 24 mg/kg and dihydrostreptomycin sulphate 30 mg/kg (Interchemieweken "De Adellar" BV, Netherland), IM, for five consecutive days, dexamethasone (0.2 mg/kg/day, IM) for three successive days, and multivitamin 8 ml/cattle stat. The heifer was fully recovered within a week of treatment. So aggressive antibiotic treatment of black leg diseases could save animals from death.

Keywords*: Blackleg; Cattle; Clostridium chauvoei*

Introduction

Blackleg is a virulent infectious disease affecting large animals, characterised by muscular necrotic lesions caused by anaerobic, rod-shaped, gas-forming bacteria known as *Clostridium chauvoei*. These bacterial pathogens secrete highly potent toxins that swiftly result in a fatal condition (Zaragoza *et al*., 2019). *Clostridium chauvoei* is a gram-positive bacillus that exists in the soil as highly resistant spores and is responsible for an acute and severe disease in cattle and buffalo recognised as per acute disease (Disasa *et al*., 2020; Tagesu *et al*., 2019). The transmission of the disease does not occur through direct contact from diseased animals to uninfected ones (Hansford, 2020). It occurs globally and causes significant losses in livestock production from a disease-causing lesion characterised primarily as myonecrosis with high mortality, usually in animals of good condition and aged between 6 months and 2 years (Uzal, 2012). According to Abreu *et al*. (2017), animals are susceptible to *C. chauvoei*spore infections via oral ingestion from soil contamination, and infected animals mostly die rapidly, despite the sudden onset of clinical signs that may include lethargy, reluctance to move, recumbency, swelling, and crepitus (Nampanya *et al*., 2019).

The disease is distributed globally; however, its manifestation is often restricted to specific areas, even within farms or pastures (Rycroft, 2022). Due to the limited scope in which the phenomenon occurs, there is a generally accepted assumption about the organism. Chauvoei is a pathogen that primarily resides in soil; however, it does not grow in soil (Parish *et al*., 2009). Bacterial proliferation occurs within the gastrointestinal tract of bovines, facilitating the possibility of their reintroduction to soil contamination by faeces. The microorganism *C. chauvoei* can conveniently generate spores that are capable of surviving for prolonged periods, lasting several years, when found in soil (Maxie *et al*., 2007). Spores, either that directly ingested or those formed after germinating in the gut, are then carried across the intestinal mucosa (Heckler *et al*., 2018). Then, they are taken up by macrophages that distribute the spores throughout the body (Useh *et al*., 2003). *C. Chauvoei* spores have been found in numerous tissues within the body, typically in muscle tissue but not limited to muscle tissue. These spores are preserved over extended durations within phagocytic cells (Gohari, 2022).

Animals presenting with clinical disease display symptoms including fever, lameness, subcutaneous gaseous swelling, and edoema, with a particular emphasis on the dorsal region of the affected animal (Daly *et al*., 2009). At necropsy, swelling areas contained straw-colored fluid with gas bubbles (Underwood *et al*., 2015). At the time of incision, the muscle displays swelling and exhibits crepitation sounds. Additionally, the muscles present a dark to black coloration accompanied by a rancid odour. The presence of pulmonary edoema, myocarditis with petechial haemorrhages, as well as hepatic and splenic enlargement and congestion, can be observed (Hussain *et al*., 2019).

Observation of one or multiple gaseous swellings situated in the areas encompassing the hip, shoulder, neck, jaw, brisket, or loin is possible. It is characterized by a crackling sound that is produced under conditions of pressure (Gyles *et al.*, 2004). The use of the fluorescent antibody technique has an efficient diagnosis approach for distinguishing and characterizing *C. chauvoei* disease from infected animals or bacteriological cultures (Disasa *et al*., 2020).

Blackleg can be prevented by vaccination, a procedure that is an important component of the health management of many cattle-producing operations. Conventional blackleg vaccines are bacterins, prepared from formalin-treated cultures of *C. chauvoei*, that are generally available in polyvalent formulations together with other clostridial components (Lewis, 2007). Calves less than 6 weeks old should not be vaccinated, as passive immunity passes from the dam (Nicholson *et al*., 2009). Generally, the case report diagnoses the causative agent and treats the animal diseased black leg, which is almost entirely preventable by vaccination.

Case descriptions

History

A 1-year-old Holstein crossbreed heifer was presented to AAU, CVMA, Professor Feseha G/AB Memorial Veterinary Teaching Hospital on December 9, 2022, with a history of shivering, loss of appetite, skin swelling, being reluctant to walk, and depression starting before a day.

Clinical Diagnosis

The heifer was febrile, with a body temperature of 39.8°C at arrival. Subcutaneous palpation reveals characteristic swelling and gaseous swelling, a crepitating sound felt under the skin at her hindquarters, and mucous membranes that were congested. There was also lameness, rapid breathing, depression, and reluctance. These findings, in combination with vaccination status, led to a presumptive clinical diagnosis of blackleg. A blood sample was taken from the jugular vein by sterile syringe; the needle was closed urgently, and it was submitted to the microbiology laboratory for bacteriological examination. A sample taken at the point of the jugular vein was cleaned with alcohol to avoid areal contamination.

Laboratory Examination

A blood sample was taken and processed for anaerobic culture, and identification of the organism by Gram staining was done. Bacterial culture on 5% sheep agar blood and incubated anaerobically for 48 h at 37 °C in an incubator after inserting in a jar (Annex 10A). After 24 hr. of incubation Circular colonies (Annex 10B) were identified by conventional observation, and gram staining was done, which revealed the presence of small, single, and pairs of gram-positive rods with subterminal spores (Annex 10C).

Case Management and Outcome

Clinical treatment of the cases was performed with aggressive administration of penstrip intramuscular injections and non-steroidal anti-inflammatory drugs (NSAIDS), including Dexamethasone. The case was aggressively treated with broad-spectrum antibiotics with Procaine penicillin 24 mg/kg and dihydrostreptomycin sulphate 30 mg/kg (Interchemieweken "De Adellar" BV, Netherland), IM, for five consecutive days, dexamethasone (0.2 mg/kg/day, IM) for three successive days, and multivitamin 8 ml/cattle stat. The heifer was also treated with a multivitamin (8 ml) stat as supportive therapy. The following figures (A) show the diagnosis of the heifer on day one of arrival; (B) the diagnosis of the heifer by palpation; and (C) the heifer on the last day of treatment.

Figure 15: Clinical diagnosis and post treatment of heifer

Discussion

Clostridium chauvoei is an anaerobic, Gram-positive, histiocytic, spore-forming bacillus and the well-known cause of blackleg disease in cattle (Hansford, 2020). This case report discusses the clinical appearance of black leg in a crossbreed calf with *Clostridium chaovoei as the* identified causative agent. Jubb, (2012) indicated ruminants housed on pasture are most associated with the black leg disease because the endospores reside in the soil and prefer moist conditions. The present case age history has a similar idea to that of Abreu, *et al*. (2017), who indicated cattle diseased with black leg are most found within the age range of six months to two years and are frequently recognized as the most susceptible animals.

The present case report observes that the clinical manifestations of skeletal muscle function problems, which primarily consist of lameness, weakness, fever, swelling, palpable crepitation, and increased temperature, fit with Jubb, (2012) clinical signs, which include lameness, weakness, fever, swelling, palpable crepitation, and heat over the affected area of skeletal muscle. Songer, (2014) illustrated *C. chavoi* on blood agar; most colonies of *C. chauvoei* are circular and surrounded by a thin ring of hemolysis. This argues with the laboratory characteristics of the present case study.

According to Tagesu, *et al*. (2019), antimicrobials are the drug of choice (procaine penicillin) in affected tissues. According to Cockcroft, (2015), treatment of clostridial myositis is rarely successful due to its rapid course, which is in indirect agreement with this case report. Abreu *et al*. (2017) forecast that preventative vaccination against clostridial diseases is the most effective way to prevent death and illness in ruminants.So, aggressive antibiotic treatment of black leg diseases could save animalsfrom death.Generally, the effective management of blackleg disease necessitates the implementation of rigorous husbandry practices alongside a well-planned and scheduled vaccination protocol.

Acknowledgement

I thank Dr. DirribaNegassa (Veterinarian) for his passion and genuine support during diagnosis and case follow up.

3.3.4. Calf Salmonellosis

Abstract

Salmonellosis is a major disease of young calves characterised by severe diarrhoea, calf scour, septicemia, and death. This case report describes the clinical manifestation of calf diarrhoea caused by salmonella bacteria presented to AAU, CVMA, Professor Feseha G/AB Memorial Veterinary Teaching Hospital, with complaints of bloody, watery diarrhoea for the past three days, lethargy, and recumbency. The calf shows clinical findings of dullness and depression, diarrhoea, dehydration, a bilateral sunken eyeball, and a congested mucus membrane. An early and accurate diagnosis of septicemic salmonellosis and colibacillosis was suspected, and the case was managed as an emergency. Dehydration was corrected by administering lactateRinger's, sodium chloride 5% solution and 40% glucose (40 ml) intravenously. Later, Enrofloxacin 100 mg/ml, inoculated in a Ringer lactate fluid bag intravenously, was given. The calf shows good recovery and shows a response to walking around. To mitigate cascade of inflammation and to reduce pain dexamethasone, 2mg/kg, intramuscular injection was administered. The calf was constantly monitored for two hours at the hospital with supportive and medical treatment, showed a good prognosis, and was admitted for three antibiotic follow-ups. On the second day, the case shows a good outcome. A microbiological examination was performed on a swab sample of faeces and jagular vein blood from the calf. Generally, to avoid the potential adverse effects of both introduced and endemic Salmonella, effective strategies typically involve proper feed management and the implementation of effective husbandry practises.

Keywords*: Calf, Diarrhoea, Salmonellosis,*

Introduction

Salmonellosis is a major disease of young calves characterized by severe diarrhoea, calf scour, septicemia, and death. The occurrence of diarrhoea in young calves is attributed to the pathogenic activity of a gram-negative salmonella bacterium, which is known to predominantly affect dairy calves (Holschbach *et al*., 2018). There are diverse Salmonella serotypes that can infect calves within hours of birth (Anderson, 2001). Acute diarrheal disease is most common with *S. typhimurium* and systemic disease with *S. dublin* in cattle (Muktar*et al*., 2015). Although Salmonella is capable of inducing diarrhoea in adult cattle as well as calves, its incidence is more frequent and typically results in more severe symptoms in calves aged between 10 days and 3 months (Fossler *et al*., 2005). In adults, *S. typhimurium* infection is most associated with diarrhoea and dullness (Veling*et al*., 2002). The diarrhoea induced is characterized by watery and mucous evacuations that exhibit an abundance of fibrin and blood content. The pathophysiology of diarrhoea is associated with salmonella infection, involves inflammation and necrosis, and is complex (Mohler *et al*., 2009).

It is a highly infectious bacterium, with the primary mode of transmission being through the consumption of contaminated feed or water by animals (Smith, 2002). Infections may be asymptomatic, mild, bacteremia/septicemia, or endotoxemia in nature. The expression of symptoms is subject to the level of virulence displayed by the pathogenic strain, the amount of infectious agent that enters the host's system, and the level of immunity possessed by the host organism. The bacteria are characterized as an opportunistic pathogen, as they tend to establish an infection within the host organism under immunosuppression, in the absence of competing gut microbiota, and depending on the age of the host.In calves, the disease most commonly affects colostrum-deficient calves and causes fever, diarrhoea (yellow with or without flecks of blood and mucus), rapid dehydration, and death within hours (Moxley, 2022). The incidence of infection can vary widely, ranging from asymptomatic carrier animals to acute manifestations of the condition. An episode of human outbreak resulting from exposure to Salmonella-infected dairy calves has previously been observed (Canning *et al*., 2023).

Upon ingestion, salmonellae establish colonization within the gastrointestinal tract and invade through specialized M-cells located in intestinal lymphoid tissue, enterocytes, and tonsillar lymphoid tissue to initiate invasion (Reis, 2003). In lymphoid tissue, salmonella enters mononuclear phagocytes and is rapidly disseminated throughout the body (Holt, 2000). Then, they invade the intestinal mucosa, multiply in lymphoid tissues, and evade host defense systems, leading to systemic disease. The diarrhoea associated with salmonellosis is mediated by the inflammatory response to infection. Sloughing of the intestinal epithelial cells leads to acute haemorrhage, fibrin production, maldigestion, and malabsorption (Wray and Davies, 2000). The resultant hyperosmotic condition established within the intestinal lumen provokes the inflow of fluid into the intestinal tract, resulting in a net negative balance of water, sodium, potassium, and bicarbonate. Mucosal damage is a contributory factor to both protein loss and hypoproteinemia (Mohler *et al*., 2009). The calves develop septicemia and die, or they may suffer from necrosis of the extremities as a sequel, especially the feet, tail, and ear tips.

The mortalities depend on the serotype of Salmonella infected. Salmonella *enterica, serovar typhimurium,* and *S. dublin* are the predominant causative agents of salmonellosis in cattle (Jones *et al*., 2002). The typical duration of clinical illness ranges from 7 to 10 days, with recovery occurring within a period of 2 to 3 weeks. The age group was one of the risk factors for the disease since *S. Dublin* is an established cause of diarrhoea and septicemia in calves within this age range (Pecoraro, 2017).

Environmental conditions have the potential to influence outcomes by impacting each of these variables. Salmonella can survive in low-oxygen environments, such as manure lagoons, and are known to survive for up to 4–7 months in water and soil (Holley *et al*., 2006). Salmonella bacteria like wet, dark environments. They have the remarkable ability to survive under adverse conditions, such as pHs between 4 and 8 and temperatures between 46 °F and 113°F. Various laboratory methods have been applied for the detection of infectious agents of calf diarrhoea in faecal samples, such as bacterial culture, electron microscopy, molecular-based techniques, and serological techniques.

The mitigation of potential detrimental outcomes arising from the presence of introduced and endemic Salmonella can be achieved through the effective management of feed and the implementation of sound husbandry practises that do not compromise herd immunity. Significant actions comprise waste management, preparation and storage of forage and commodities, and management of nutritional, environmental, and reproductive aspects (Radostits, 1998). The use of poultry manure as animal feed has led to an increase in the emergence of previously fewer common serotypes as causes of neonatal salmonellosis (Matthew, 2007). The objective of this paper is to discuss the calf diarrhoea caused by salmonella and its diagnosis, treatment, and outcome.

Case Description

History

A one-month-old female Holstein Friesian cross calf weighing about 30 kg was presented to AAU, CVMA, ProfessorFeseha G/AB Memorial Veterinary Teaching Hospital with complaints of inappetence, depression, bloody watery diarrhoea for the past three days, lethargy, and recumbency. The owner also said his calf started diarrhoea without blood the first day of starting it, and then it became bloody and watery diarrhoea. He also said the calf refused to feed and was kept in an isolation pen. The owner mentioned he feeds his cattle poultry litter, vegetables, food left over, and silage.

Clinical Diagnosis

Physical examination shows the calf was dehydrated, dull, and depressed, had bilateral sunken and congested eyes, a congested mucus membrane (Figure 16C), faeces in the perineal region, and watery faecal material with evident blood. The rectal temperature of the calf was 39.9 CO, pulse rate cannot be measured before fluid therapy, respiratory rate was 48/minute, capillary refill time (CRT) was 4 seconds, and the skin tent shows prominent dehydration. There was ruminal stenosis, as evidenced by a lack of rumen motility during auscultation, and cardiac arrhythmia with heart auscultation. The clinical examinations revealed loose body condition, profuse watery diarrhoea, fibrin fragments, and undigested blood (Figure 16B). However, the severity and character of the scour and the age of the affected calf help to make a professional judgement for the cause, suspecting either salmonellosis or colibacillosis. Faeces and jagular vein blood of diarrheal calves were collected for bacteriological examination for common disease-causing calf diarrhoea, salmonellosis, and colibacillosis.

Figure 16: Clinical diagnosis, fluid theraphy and second day out come of calf.

The following figure indicates (A) diagnosis and recording of the body parameters of the diarrheal calf; (B) watery diarrhoea containing blood; (C) congested mucus membrane of the calf anal; and (D) anal sampling by sterile cotton swabs. Figures E and F show intrajagullar and intraperitoneal fluid therapy, and the last figure shows the second day of follow-up.

Laboratory Examination

A microbiological examination was performed on a swab sample of faeces and blood from the jagular vein of the calf. The swab sample from the rectal was obtained using sterile swab cotton (Figure 16G) and inoculated into 9.0 ml of buffered peptone water transport media and taken to the microbiology laboratory for bacterial isolation. After a 24-hour swab sample from peptone water cultured in rapport enrichment broth selective media for salmonella showed a positive result, it was cultured on selective media, XLD, to characterise the bacterial growth. After 24 hours, the media showed black growth media (Annex 11), which is positive for salmonella bacteria. The blood sample was cultured on EMB and revealed a negative result. Depending on history, clinical findings, and laboratory results, the case confirmed a salmonella infection.

Treatment and case management

An early and accurate diagnosis of septicemic salmonellosis and colibacillosis was suspected, and the case was managed as an emergency. Dehydration was corrected by administering Ringer's lactate (LR) sodium chloride 5% solution and 40% glucose (40 ml) intravenously (Figure 16A). Later, Enrofloxacin 100 mg/ml, 3 ml, was inoculated in a Ringer lactate fluid bag and given intravenously. The calf shows recovery and a response to walking around. To mitigate the cascade of inflammation and reduce pain, dexamethasone, 2 mg/kg, in a 2 ml intramuscular injection, was administered. The calf was constantly monitored for two hours at the hospital with supportive and medical treatment, showed a good prognosis, and was admitted for three antibiotic follow-ups. On the second day, the calf had a good health outcome (Figure 16G). The owner advised feeding soft, clean feed with enough water.

Discussion

Calf diarrhea is a serious infection of the digestive tract caused by Salmonella bacteria. The present case study provides discussion on the diagnosis, treatment, and outcome of diarrheal calves, which are in similar agreement with Fecteau *et al*. (2018). The indicated diagnosis of salmonellosis was established by taking a history and clinical presentation and subsequently confirmed with the aid of microbial culture techniques.

Current calf salmonellosis is characterised by fever, dullness, and loss of appetite, followed by a pasty scour with fluid and offensive faeces that may contain a little blood. Affected calves rapidly become dehydrated, quickly lose condition, and become weak and emaciated. A similar report was also forwarded by Smith, (2002). According to Cho, (2012), 80% of diarrheal calves tested were positive for at least one of the target enteric pathogens, suggesting that the infectious factor is still a major cause of calf diarrhoea.

The current case report suggests bacteriological culture with pre-enrichment and selective media is an important method for identifying Salmonella and is in strong agreement with Nielsen, (2013). Together with pathogen detection, clinical history and necropsy are important tools in the diagnosis and treatment of calf disease pathogenesis Blanchard, (2012).

Supportive treatment with fluid and aggressive treatment with antimicrobials and NSAIDs were urgently recommended in the current case report, arguing with the idea of Constable, (2004) that treatment of salmonellosis in calves is directed at replacing fluid and electrolyte losses, limiting inflammatory cascades using nonsteroidal anti-inflammatory drugs, and using antimicrobials by fluid therapy is fundamental to managing calves with salmonellosis. Generally, to avoid the potential adverse effects of both introduced and endemic Salmonella, effective strategies typically involve proper feed management and the implementation of effective husbandry practices.

Acknowledgement

I really Thanks Dr. Mehari for his support during case treatment and follow-ups.

3.3.5. Foot and Mouth Disease

Abstract

Foot and Mouth Disease is an extremely contagious, acute viral disease of all cloven-hooved animals. This case report describes foot and mouth viral disease management and outcome in Bishoftu, Ethiopia. A local breed aged ox was examined at AAU, CVMA, Professor Feseha G/AB Memorial Veterinary Teaching Hospital on December 8th, 2022, with complaints of dropping of ingesta during feeding, loss of appetite, depression, and being reluctant to walk. Also, from a phone call, another Holstein crossbreed cow complained of an oral lesion and was unable to feed within the same week. The diagnosis of the cases shows normal body temperature, respiratory rate, and heart rate, along with clinical signs of excess salivation, gum and muzzle erosions, congested mucus membranes, and prescapular lymph node swelling. The physiological clinical finding on crossbreeds looks more severe than local ox, showing excess salivation and oral mucosal lesions. Both cases were treated with broad-spectrum antibiotics for secondary bacterial complications: oxytetracycline 20%, anti-inflammatory injection, meloxicam injection, multivitamin intramuscularly for supportive treatment, and ivermectin for deworming. Samples of tissues from oral lesions were taken with virus transport media. The ox's wound erosions were also cleaned gently by diluted iodine tincture, and the cow's oral mucosal lesions were also cleaned by acetic acid diluted in 6% water (locally, Acheto). Both cases show a good prognosis and become healthy after two weeks of posttreatment. Generally, the objective of this case report is to provide an effective treatment approach and alert the public to the presence of foot and mouth disease in Bishoftu, Ethiopia.

Key words: *FMD, Virus, Vaccination*

Introduction

Foot and Mouth Disease (FMD) is an extremely contagious, acute viral disease of all cloven-hooved animals like cattle, buffalo, pigs, sheep, and goats, characterised by fever and vesicular eruptions in the mouth, snares, muzzle, foot, teats, and other hairless soft areas of the body (Hasan *et al*., 2016). Mortality rates among adults are infrequent, yet significantly high in calves (Mesfine *et al*., 2019). This virus, a member of the genus Aphthovirus in the family Picornaviridae, is a small RNA virus that causes a highly infectious disease affecting up to 70 species of cloven-hooved mammals (Yalew, 2019). Domesticated species: cattle, pigs, sheep, goats, and buffalo are susceptible and more sensitive to FMD (Mohamoud, 2011). The African buffalo plays a significant role as a natural maintenance host in Africa (Admassu *et al.,* 2015). Foot-and-mouth disease is a disease that is widely prevalent in East Africa, wherein six out of the seven serotypes, specifically types O, A, C, and SAT types 1, 2, and 3, have been reported to occur, thus complicating the epidemiology and control of the disease in the region (Sahle, 2004) and maintaining it due to pastoralist livestock that host the virus (Tesfaye, 2016). Five of the seven serotypes of FMDV (O, A, C, SAT 2, and SAT 1) were endemic in Ethiopia (Sulayeman *et al*., 2018).

The disease's economic significance arises not only from its impact on production losses but also from the restrictions on the trade of animals, both domestically and globally (James and Knight, 2015). The disease exhibits direct production impacts in extensive production systems, such as milk loss due to udder involvement and decreased draught animal power resulting from lesions on the feet, a high number of deaths among young animals, and fertility impairment due to an increased abortion rate (Admassu *et al.,* 2015). According to Hailu *et al*. (2017), the seroprevalence of FMD in different districts and localities in the central, southwest, northwest, and south pastoral areas of Ethiopia revealed a seroprevalence of FMD in the range of 2.5% to 21%, and at present the disease is uncontrolled in the country (Wubshet *et al*., 2019).

Transmission is facilitated through the shedding of viruses from disrupted vesicles as well as bodily excretions and secretions, including breath, milk, and semen (Alexandersen *et al*., 2003). Ruminants that are susceptible have been found to be capable of contracting the virus via inhalation of minimal viral doses, either directly through contact with the respiratory exhalation of other animals undergoing acute infection or indirectly through the resuspension of aerosols from materials that have been contaminated. FMDV could persist in the environment and in diverse animal products, such as meat, for durations ranging from several days to several months, depending on prevailing conditions (Paton *et al*., 2018). The clearance of the foot-and-mouth disease virus (FMDV) is commonly accompanied by a rapid immune response to infection. However, certain ruminant hosts persist in containing the virus, thus assuming the role of carriers. Low levels of FMDV are detected in sites of nasopharyngeal epithelial tissue (Stenfeldt *et al*., 2016) and associated lymphoid tissues (Juleff *et al*., 2008).

One of the features of FMDV infection that has a major impact on control policies is the "carrier state" (Alexandersen *et al*., 2002). A carrier of FMDV is defined as an animal from which live virus can be recovered from scrapings of the oropharynx after 28 days following infection (Juleff *et al*., 2008). Ruminants exposed to viral challenge, whether vaccinated or not, can become carriers (Paton *et al*., 2006). The infectious virus from oropharyngeal scrapings of cattle that have recovered from foot-and-mouth disease is sporadic, and the viral titer retrieved from carrier animals typically falls below the threshold considered below for effective transmission to vulnerable animals (Salt, 2019).

Effective control measures for foot-and-mouth disease (FMD) require the implementation of diverse interventions such as appropriate quarantine protocols, the restriction of animal movement, the isolation of infected animals, vaccination programmes, proper disposal of an infected carcass, and other economically feasible methods (Lombard, 2012). Therefore, this case report approaches the treatment of secondary bacterial infection and the cleaning of lesions with broad-spectrum antibiotics and diluted disinfectants.

Case Description

History

A local breed aged ox was examined in the AAU CVMA, Professor Feseha G/AB Memorial Veterinary Teaching Hospital, on December 16th, 2022, with complaints of dropping of ingesta during feeding, oral lesion, loss of appetite, depression, and being reluctant to walk. Also, another Holstein crossbreed cow from a phone call was diagnosed with an oral lesion and was unable to feed.

Clinical Diagnosis

In both cases, the body physiological parameters of temperature, respiratory rate, and heart rate were in the normal range. The mucus membrane of the ox was congested, and the prescapular lymph node also swelled. The ox shows clinical signs of excess salivation, gum, muzzle, and dental pad tissue erosion. The crossbreed cow has excess salivation and feed reduction, followed by milk drops. A sample of tissue from the oral mucosa was taken with VTM and taken to the CVMA, Molecular Biology Laboratory (Figure 17 D). Due to the PCR machine electrophoresis problem the laboratory confirmation was unsuccessful.

Treatment and outcome

The ox was treated with broad-spectrum antibiotics for secondary bacterial complications: oxytetracycline 20% (Hebei Hope Pharmaceutical Co., Ltd., China), 30 ml, intramuscularly for three days, with a one-day gap, and anti-pain injection meloxicam, 5mg, 15 ml, IM, for three days. The patient also injected Multivitamin intramuscularly for supportive treatment and Ivermectin 1% subcutaneously for deworming (8 ml and 6 ml, respectively). The erosion wound was also cleaned gently with diluted iodine tincture and mopping gauze (Figure 17B). The cow was also treated with similar systemic antibiotic medicine as the ox, in addition to acetic acid and water of 6% acidity (locally acheto, HKO, Food Processing Enterprise, Ethiopia) and oral mucosal lesion soaking by gauze to reduce viral load and transmission. Both cases show a good

prognosis for the disease and are healthy after two weeks of treatment. Post-treatment owners are advised to vaccinate their animals periodically with the FMD vaccine.

Figure 17: Mucosal lesion of FMD infected animals and tissue sampling.

Discussion

Foot and mouth disease is endemic and widely prevalent in all areas of Ethiopia (Abdela, 2017). Control and eradication of FMD are difficult due to the complicated nature of the pathogen, which is easily transmitted and affects multiple hosts in a diverse environment. Kibebew *et al*. (2017). According to Hailu *et al*. (2017), the seroprevalence of FMD in different districts and localities in the central, southwest, northwest, and south pastoral areas of Ethiopia revealed a range of 2.5 to 21%, and at present the disease is uncontrolled in the country.

According to Tesfaye *et al*. (2016) and Gelana, (2016), the seroprevalence investigation undertaken in Ethiopia indicates that the prevalence ranges from 0.8% to 53.6% in cattle. These case report discuss the presence of FMD disease in and around Bishoftu town depending on clinical findings and epidemiological observations of the disease, which have similar forwarding in Sulayeman *et al.* (2018). A similar paper was also forwarded by Alemayehu *et al*. (2014), stating that the seroprevalence of FMD in cattle is 10.88% in Bishoftu and 24.22% in Central Ethiopia.

In England, McLaws *et al*. (2007) identified the FMD case as an epidemic and argued that determination of FMD status based on clinical signs alone can be a fairly accurate diagnostic test, which is supported by this case report. Davies (2000) observed that the symptoms of FMD in cattle are usually discernible during clinical examination, and, for the most part, the identification of FMD-infected herds relies on clinical judgements.

Radostits, *et al*. (2010) illustrated that sick animals could be treated by applying broad-spectrum antibiotics, such as tetracycline by parenteral route, to control secondary bacterial infections, which have a similar treatment approach to the current case report of a broad-spectrum antibiotic, oxytetracycline, 20% intramuscular injection. Generally, this case report recommends that more effective disease treatment approaches, control, and strategies, including appropriate vaccination policies against foot and mouth disease, are needed in Ethiopia.

Acknowledgment

I want to thank Mrs.Meskerm CVMA, Molecular laboratory techncian and Dr. Fanos Tadesse (PhD, lecturer) for assisting in the diagnosis, treatment, and follow-up of this case and laboratory action support, respectively.

Limitation

A tissue sample from the oral mucosa was taken to process in AAU, CVMA in Molecular laboratory due to an electrophoresis gel problem. The result was not appreciated.

3.4. Poultry Case reports

3.4.1. Newcastle Disease

Abstract

Newcastle disease (ND) is a highly contagious viral disease that constantly threatens poultry production. This case report discusses the variety of clinical presentations and the clinicopathologic features of Newcastle disease among chicken flocks and its pathotype type in one poultry farm found in Dambi Kebele, Bishoftu, Ethiopia. The farm was small scale and had a history of coughing, depression, breathing problems, and inappetence before death. There were 8 chicken deaths on the first day, 6 on the second, and on arrival day, some chickens were depressed and showed inappetence to drinking and feeding, and the owner called us for fear of total death. The disease diagnosis was made based on the flock's history, clinical indicators, mortality, and necropsy lesion findings. The chicken was treated with herbal medicine, Garlic Mint (Vetlines sp. z o.o.sp. k, Poland), and a multivitamin, Vita Stress (PT, MedionFarma Jaya, Indonesia), with drinking water for five consecutive days. Death ceases after a week, and the owner advised to correct the build of the farm, to clean the drinker and feeder, change the litter, and disinfecting the ground twice aggressively before entering new chickens. A reported infection was classified as a lentogenic form of Newcastle disease based on clinical signs, gross postmortem findings on tissues (lung, trachea, intestines), and death per day. This paper encourages a day-one old, vaccinated chicken for farmerand supports Garli Mint herbal medicine for the purpose of preventing antibiotic resistance and residuals. Generally, this paper argues that to control and prevent Newcastle virus in poultry production, effective biosecurity implementation and systemic vaccination are required to obtain the desired level of production.

Keywords: *Clinical sign; Newcastle disease; Lesions; Poultry*

Introduction

Newcastle disease (ND) is a highly contagious viral disease that constantly threatens the poultry industry, particularly in underdeveloped nations (Sharif *et al*., 2014). The Newcastle disease virus impacts more than 250 avian species across all stages of development and possesses the potential to be transmitted to humans. The aetiology of this disease can be attributed to a virulent strain of *avian paramyxovirus type 1*, which is a linear, non-segmented, enveloped, and negative-sense RNA virus belonging to the genus Rubulavirus of the subfamily Paramyxovirinae and family Paramyxoviridae (Ashraf and Shah, 2014). Newcastle poultry disease has significant concern within the poultry industry due to its devastating impact on both the financial performance of the poultry sector and the overall growth of poultry production (Narayanan *et al*., 2010).

The virulence of the Newcastle disease virus exhibits variability across various viral strains. The total symptoms observed in diseased birds are dependent on the viral strain hosted by the affected species (Rauw *et al*., 2009). The clinical manifestations of the infection are not only dependent upon the virulence of the virus; other factors include host-related variables like age, route of infection, immune competence, and concurrent environmental stress. Investigations revealed that the incidence of disease was observed to be notably higher in crossbreed chickens as compared to their local counterparts. Furthermore, a significant increase in the prevalence of disease was observed in chickens inhabiting low-altitude regions as compared to those residing in mid- and high-altitude regions. Additionally, it was observed that chickens were more susceptible to severe acute manifestations of the disease as compared to older chickens (Abdisa and Tagesu, 2017).

Depending on the incidence and severity of clinical signs, Newcastle can be classified into five forms: asymptomatic enteric strain, a form that has sub-clinical enteric infection without clear symptoms; Lentogenic strain, which virus is present with mild respiratory infections; Mesogenic stain, which virus presents with rare nervous and respiratory signs while mortality rate is related to the age of susceptible birds (young birds are more susceptible as compared to adults); viscerotropic velogenic strain, which virus causes hemorrhagic intestinal lesions and is highly pathogenic; and neurotropic velogenic strain,

which virus causes high mortalities followed by respiratory and nervous signs (Alexander and Senne, 2008).

The lentogenic strains exhibit a wide geographical distribution; however, they are associated with infrequent disease epidemics. In general, manifestations of the condition are typically in the form of respiratory disease, depression, neurological problems, or diarrhoea. Although some lentogenic NDV strains have been shown experimentally to cause moderate lesions in the respiratory system, these changes were obtained only through aerosolization, the use of very high viral titers, direct air sac instillation of the virus, or when very young chickens were used. The lentogenic form typically manifests as a subclinical entity; mild respiratory indications and a decline in egg production may be observed.

The pathological lesions are observed in the mucosal lining of the proventriculus, ceca, small, and large intestines. The observed lesions exhibit hemorrhagic characteristics and are believed to be a consequence of necrotic changes in intestinal mucosa or lymphoid tissues, such as the cecal tonsils and Peyer's patches. It is generally observed that gross lesions are not present in the central nervous system of birds infected with the lentogenic form of the Newcastle Disease Virus (Abdisa and Tagesu, 2017).

The transmission of Newcastle disease occurs through respiratory aerosols, contact with faeces and excretions from infected avian hosts, the introduction of newly infected birds into the healthy flock, the buying and selling of infected birds, and contact with contaminated feed, water, equipment, and clothing (Desalegn, 2015). The virus can survive for several weeks in the environment, which explains why cleaning and disinfection are so important. When the virus is introduced into a susceptible flock, all the birds will be infected within two to six days. It is excreted from infected birds into the environment through respiratory discharges, exhaled air, and faeces, and can infect susceptible chickens by aerosols or by ingestion of contaminated feed or water. Clinically healthy vaccinated birds can excrete virulent viruses after they have been exposed (Caupa and Alexander, 2009).

In semi-intensive systems where birds are confined within the house, hygiene and vaccination approaches are needed to control and prevent Newcastle disease in poultry rearing. Hygiene includes cleaning, disinfection, limiting access to wild birds, and the personal hygiene of the farm staff. The administration of a vaccine against vND would immunise against viral infection and replication. Both live and inactivated vaccines are available for Newcastle disease. The administration of ND vaccination typically provides protection to chickens against severe outbreaks of the disease, but viral reproduction and elimination may remain a possibility (Bello *et al*., 2021). It significantly reduces mortality and allows farmers to increase their income through sales.

Generally, live vaccines are made from viruses of lentogenic strains, and mesogenic strains are used for the manufacture of inactivated vaccines. Live vaccines are fragile and have very precise rules for use, requiring a cold chain up to the point of application to the bird. The immune response increases as the pathogenicity of the live vaccine increases. So, to obtain the desired level of protection without serious reactions, vaccination programs are needed that involve the sequential use of progressively more virulent viruses or live viruses followed by inactivated vaccines. Killed vaccines give good immunity but require priming with a live vaccine for best results, unless there is a natural infection.

Some African countries implement effective NCD control programs, which, in combination with improved management strategies, result in increased chicken stocks, improved households' food security and access to nutritious food, and empowered women. When the disease appears in a previously disease-free area, a stamping out policy is practiced in most countries. This includes strict quarantine of outbreaks, humane destruction of all infected and exposed birds (WOAH *Terrestrial Animal Health Code*), thorough cleaning and disinfection of premises, proper carcass disposal (WOAH *Terrestrial Animal Health Code*), pest control in flocks, depopulation followed by 21 days without poultry before restocking, avoidance of contact with birds of unknown health status, and control of access to poultry farms.

Newcastle disease is widely prevalent in Ethiopia and is a significant contributor to high mortality rates. The implementation of routine vaccination has proven to be effective in mitigating the effects of NCD on poultry production (FAO, 2014), and vaccination has been reported as the only safeguard against endemic NCD. However, vaccines currently in use are mainly of benefit to commercial poultry producers whose chickens are kept in large, single-age, confined flocks. The objective of this case report is to identify the presence of poultry Newcastle virus disease, provide supportive treatment, and recommend control and prevention of the disease.

Case Description

History

There was a phone call for veterinary service, from one of the small-scale poultry farms in Bishoftu Town, Dambi Kebele, and the area where poultry production is abundant. The farm owner complained that she had 1,000 chickens that were 51 days old. She bought a day-old chicken from Ethio Chicken Private Limited Company. She mentioned that her pullets showed symptoms of coughing, depression, breathing problems, and inappetence before starting to die; there were 8 deaths on the first day, 6 on the second day, and on arrival day, some chickens were depressed and not eating or feeding (Figure 18B). She also quarantined around 10 chickens in an isolated area of her home. On arrival, she was treating all her chickens with herbal remedies according to veterinary drug store personnel's advice.

Clinical Diagnosis

Clinical diagnosis was made based on history, signs and symptoms, death rate, and necropsy lesions to establish a strong index of disease, but laboratory confirmation was not done due to an unfulfilled college laboratory for viral isolation. From active and quarantined chickens, three were taken for necropsy, and postmortem lesions were recorded, including ascaris intestinal infestation, cecal tonsil haemorrhage, bursa Fabricius haemorrhage, and bloody enteritis. A virological examination was done on a tracheal swab.

Figure 18: Clinical observation, presentation of diseased chicken flock

The above picture shows (A) physical examination and observation of the flock and (B) a depressed flock indicative of some problem.

Clinical Findings and Clinical Signs

Clinical signs of flock include depression, diarrhoea, inappetence, respiratory signs of gasping, coughing, sneezing, and rales, and nervous signs of tremors, laying down, and ruffling feathers (Figure 18). Symptoms from the respiratory tract include gasping, coughing, sneezing, and rales after respiratory checking.

Necropsy findings

Newcastle disease virus was suspected, and chickens were examined, and gross pathological changes were recorded. Postmortem examination of highly sick (quarantined) and healthy-looking chickens illustrates typical proventricular lesion (Figure 18A from severely diseased, 18B from healthy-looking chicken), necrosis of the lung (Figure 18E), adult ascaris parasites in the intestinal lumen (Figure 18C), haemorrhage in the intestine lumen (Figure 18D), and haemorrhage in the cecal tonsil (Figure 18F). The necropsy result indicates typical Newcastle virus infection, and the tracheal swab sample process was unsuccessful due to a primer shortage problem, as the National Veterinary Institute says.

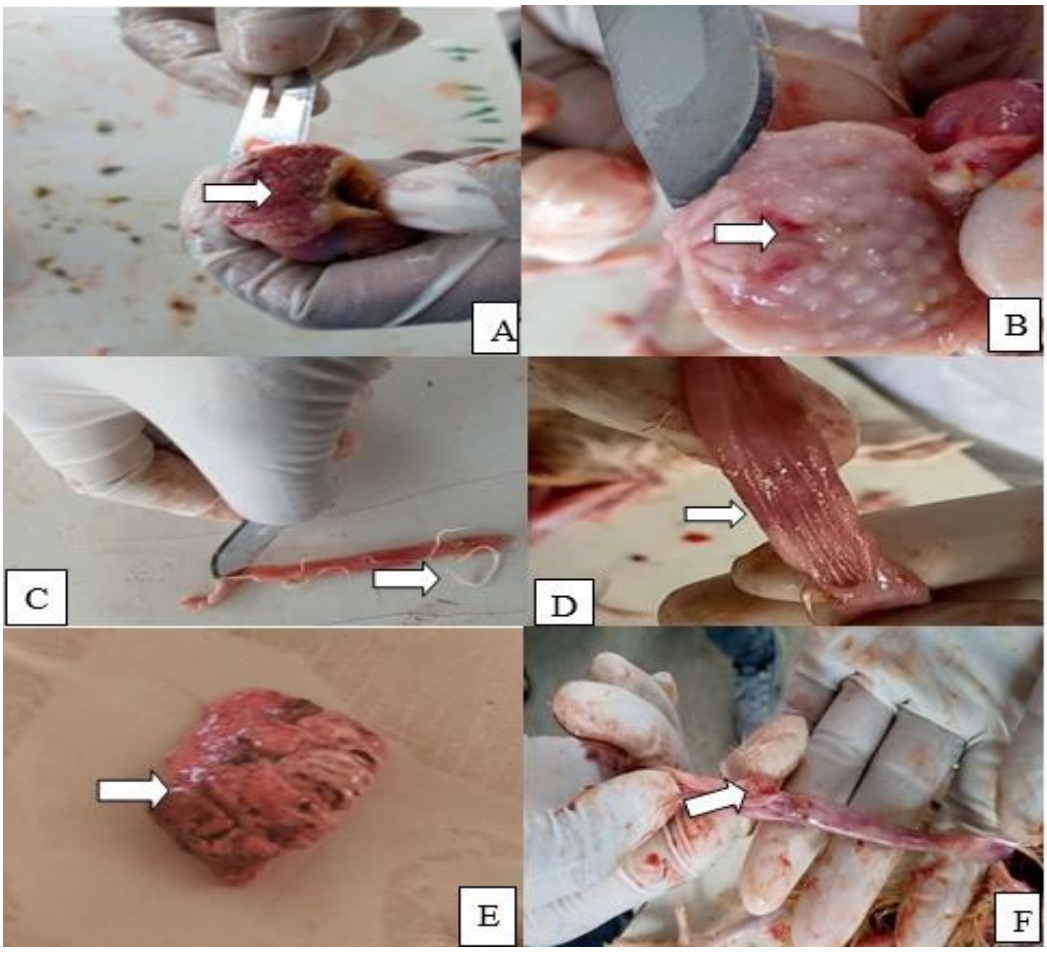


Figure 19: Postmortem result of Newcastle diseased chickens

Case management and outcome

At arrival, the flocks were under treatment with herbal medicine, Garlic Mint (Vetlines sp. z o.o., Poland), recommended from a pharmacy by local veterinary technicians to be given with water twice per day for five consecutive days. The owner advised supplementing with Vita Stress (PT, MedionFarma Jaya, Indonesia), which contains multivitamins and electrolytes, and continuing with herbal medicine for five days. The phone call report says the deaths stopped after a week, and she sold the pullets to another farm. Death ceases after a week, and the owner advises correcting the build of the farm, drinker, and feeder, changing the litter, and disinfecting the ground aggressively before entering new chickens. The farmer also recommended entering day-one-vaccinated chickens at the next round of farming. The outcome indicates herbal medicine with garlic, mint, and a multivitamin supplement is important for the host immune development of flocks.

Discussion

The current case report reveals that distinctive clinical signs of Newcastle virus disease, including depression, sneezing, ruffling of feathers, and gasping, were observed in the affected chickens. This result agrees with Mossie and Abera (2022) and Khorajiya *et al.* (2015). Indicated history, clinical signs and symptoms, necropsy findings, serological, and molecular diagnostic approaches can be used to diagnose Newcastle virus disease in poultry. A previous report by Wise *et al.* (2004) shows enlargement and inflammation of the eyes, diarrhoea, dizziness, and lack of appetite, which is a slight variation from this finding. However, the clinical signs of Newcastle disease vary depending on the host organs affected.

Ahmed and Odisho, (2018) reported infection with Newcastle disease based on clinical signs and gross postmortem findings on tissues of the liver, trachea, intestines, and lymphatic system consistent with Newcastle disease history reports from specific farms around the world. Worku, (2022) forwarded the presence of Newcastle positive cases in and around Bishoftu and agrees with the present report saying the occurrence of Newcastle disease in Bishoftu by necropsy findings from infected chickens shows hemorrhagic intestine walls and haemorrhages in lymphatic nodes.

Current case report is dependent on the history, clinical findings and signs, necropsy results, and risk factors of vaccination history, biosecurity observation, and management problems. This is in relative agreement with Mossie and Abera, (2022), who found that the frequency of the infection was related to the geographical location of the farm, distance between neighbouring poultry farms, age of the host, structure of the flock, restocking chickens from markets, the presence of migratory wild birds, poor biosecurity measures, insufficient sanitary and quarantine measures, and inadequate vaccination programs. These factors appeared to have a significant impact on the severity and resistance of Newcastle virus disease.

In Ethiopia, there is high commercial and small poultry farm production in and around Bishoftu town, where non-uniform and non-legal reporting and follow-up of Newcastle disease are poor. Almost all smallholder and backyard owners consult private physicians seeking disease treatment support, which is also forwarded by Magothe *et al. (2012)*, who suggest the endemicity of Newcastle disease, particularly in highly poultry-producing areas. The paper recommends and supports a day-one vaccinated poultry commercial system for small-scale farms. Generally, to control and prevent the disease, the following recommendations are given systematic vaccination; programmed and improved biosecurity in commercial farms; regular vaccination of local free-range chickens; strengthening diagnostic capacities; involvement of all stakeholders in vaccination; and raising public awareness.

Acknowledgement

I thank Mrs. MarshetNetsere and my friend Mensur Sabril (Veterinarian), for their support during Necropsy procedure.

Limitations

Tracheal nasal swab laboratory confirmation was unsuccessful due to primer kit problem at National Veterinary Institute.

3.4.2. Chicken Coccidiosis

Abstract

Chicken coccidiosis is a protozoan disease of poultry that is caused by the intracellular parasite of the genus Eimeria and results in significant economic losses worldwide. The case report was done in Bishoftu, far from Addis Ababa (42 km), where poultry production is well known as a country. A phone call was received for veterinary service from one of the medium-scale poultry farms in Bishoftu, Ethiopia. The farm owner mentioned that he had more than 4000 chickens. The owner complains of the presence of blood in the faeces and clinical signs of depression, diarrhoea, lowered feed intake, and huddling. The owner reported that the growth of the chicken was not uniform and had unexpected growth. There is also a complaint of chicken deathsa total of 10 chickens through time. There are cases of neck twist in birds isolated alone that were followed for more than three weeks by antibiotics recommended from a veterinary pharmacy. The diagnosis was made based on clinical signs and a faecal sample examination. The flock had clinical signs of torticollis, blood in the faeces, depression, and low mortality. Microscopic examination of faecal sampling shows numerous coccidian oocyst infections. Based on clinical signs and symptoms, observational, and faecal examination, the chicken diseases reveal protozoal disease. The flock was treated with therapeutic medicines like Amprolium and anticoccidial for five days, and the farm owner advised intensive house management like enough ventilation and light, proper handling of drinkers and feeders, and deworming his birds periodically.Generally, this paper recommends the implementation of proper Applicable poultry commercial policy, hygiene management on the farm, biosecurity measures, and the use of suitable anticoccidial drugs at the appropriate time and dose for the control, and prevention of poultry farm coccidiosis.

Keywords: *Coccidia, Poultry, Oocyst*

Introduction

Poultry coccidiosis is caused by the intracellular protozoan parasite of the Eimeria species (Taylor *et al*., 2007). The disease is endemic in numerous tropical and subtropical regions of the globe and has an impact on commercial poultry production, causing losses of three billion dollars per year around the world (Dalloul *et al*., 2006). It commonly affects young chickens and chickens managed under an intensive system. The disease seriously impairs the growth and feed utilisation of infected birds, resulting in a loss of productivity. This is a significant parasitic disease that targets the epithelial membrane of poultry intestines (Conway and Mckenzie, 2007). It causes diarrhoea, weight loss, and decreased production in poultry, which occurs worldwide.

Infection occurs through the ingestion of sporulated oocysts that are infective and present in an environment. Upon the ingestion of sporulated oocytes, the sporozoites are liberated and proceed through asexual and sexual cycles of development and the generation of numerous new oocytes within the intestinal tract of the host (Kheysin, 2013). The disease course is rapid (4–7 days), and the parasites extensively damage the intestinal epithelial lining and underlying connective tissue of the mucosa, leading to catarrhal inflammation and haemorrhage (Tan *et al*., 2014).

Pathological and morphological analysis of the lesion site, oocyst shape, and size could be used to confirm the presence of coccidiosis; thus, the identification of precise Eimeria species is needed for the control of the disease as it reveals the level of resistance either to drugs or vaccines (Lee *et al*., 2010). The morphology of coccidia oocysts is similar for most Eimeria species. They are ellipsoidal or circular-shaped with a thick cell wall and sporocysts. The majority of Eimeria oocysts have an ovoid shape (Clark and Blake, 2012). Eimeria species are very host-specific, and sites of development are the intestine, epithelial cells of the intestinal villi, or cells of the crypts (Varghese, 2004).

Coccidiosis represents a significant challenge in the global poultry industry, mainly due to the prevalence of subclinical forms of the disease that severely impact body weight and feed conversion. In Ethiopia, coccidiosis is identified as a cause of direct and indirect losses on all farms (Abebe and Gugsa, 2018). Losses occurred in the form of mortalities,

coccidiostat costs, reduced weight gains, reduced market value of affected birds, culling, delayed offtake, and reduced egg production. Previous studies conducted in the country showed that coccidiosis contributes to 8.4% and 11.86% losses in profit on large and small-scale farms, respectively (Safari *et al*., 2004). In Ethiopia, average total losses were estimated at 898.8 and 5,301.8 Ethiopian Birr per farm in small- and large-scale farms, respectively (Kinunghi *et al*., 2004).

The pathogenicity of coccidiosis is influenced by host genetics, nutritional factors, concurrent diseases, the age of the host, and the species of the coccidia (Davies *et al*., 2009). Young chickens are very susceptible to coccidiosis, and outbreaks usually occur when birds are between 3 and 8 weeks of age. But birds can be infected at any time, if never exposed before (Fanatico, 2006). *Eimeria necatrix* and *Eimeria tenella* are the most pathogenic in chickens because schizogony occurs in the lamina propria and crypts of the small intestine and ceca, respectively (Fernando, 2019).

The possible risk factors associated with the outbreak of coccidiosis are the absence of litter disposal from leaking pipes, the absence of an all-in, all-out system, the prevalence of stressors, and the extensive use of coccidiostats (Chanie *et al*., 2009). There are several factors that have been identified as contributing to the occurrence of clinical coccidiosis outbreaks (Chalchisa and Deressa 2016). These include litter moisture levels that surpass 30%, immunosuppression, inadequate inclusion of anticoccidials in feed, as well as environmental and management-related stresses (Pathak *et al*., 2012). The degree of severity of coccidiosis is predicated upon two key factors: the species of Eimeria involved and the magnitude of the inoculating oocyte dosage. The presence of sporulated oocysts in the environment for extended periods constitutes a crucial factor in the epidemiology of coccidiosis (Nahed *et al*., 2022). The oocysts are extraordinarily resistant to environmental stress factors and disinfectants, remaining viable in the litter for many months (McDougald *et al*., 2020). Most Eimeria species affect birds between 3 and 18 weeks of age and can cause high mortality in young chicks (Al-Natour *et al*., 2002).

The detrimental impact of coccidiosis has hindered the potential poultry industry in many nations (Fatoba and Adeleke, 2018). The fight against chicken coccidiosis has been ongoing for several decades. Currently, methods of anticoccidial drugs, vaccines, and strict management practises have proven effective, but the emergence of genetic and antigenic diversity poses a major threat to the effectiveness of the present anticoccidial vaccines and drugs (Attree *et al*., 2021). The use of anticoccidial agents depends on the type of management concerned (Taylor *et al*., 2007). Antibiotics and increased levels of vitamin A and K are sometimes used in the ration to improve the rate of recovery and prevent secondary infection (Kahn, 2008).

There are two types of available vaccines for the immunization of chickens: attenuated and virulent vaccines. Attenuated vaccines lack a part of the life cycle (less asexual reproductive cycles) of the original strain they were derived from and consequently have a lower reproductive and pathogenic potential. A live attenuated vaccine is available as an alternative to coccidiostats for the control of coccidiosis in chickens (Chapman, 2002). This consists of selected precocious strains of each of the pathogenic species of coccidia that affect poultry; these strains show rapid development in vivo with minimal damage to the intestine but stimulate an effective immune response (Arabkhazaeli *et al*., 2014).

The intensive use of anticoccidial agents has resulted in the emergence of drug resistance, and public concern about chemical residues in poultry products has stimulated alternative control methods for vaccines (Yim *et al*., 2011). Amprolium is structurally like and is a competitive antagonist of thiamine (vitamin B) because rapidly dividing coccidians have relatively high requirements for thiamine; nitrobemzamibles exert their greatest coccidiostat activity against the asexual stages (Kahn, 2008). Generally, this case report discusses the occurrence of poultry protozoal disease on a medium-scale farm and its diagnosis, treatment, prevention, and control.

Case Description

History

A phone call was received for veterinary service from one of the medium-scale poultry farms in Bishoftu, Ethiopia. The farm owner mentioned that he had more than 4000 chickens with an average age of 52 days. The owner complains of the presence of blood in the faeces and clinical signs like depression, frequent closing of the eyes, lowered feed intake, and huddling. The owner reported that the growth of the chicken was not uniform and had unexpected growth. There is also a complaint of chicken deathsa total of 10 chickens through time. There are cases of neck twist in isolated birds that were followed for more than three weeks by antibiotics.

Diagnosis

A tentative diagnosis of coccidiosis was made based on clinical signs and findings, like the presence of faeces with blood and diarrhoea, which suggest coccidiosis. The case was diagnosed based on clinical signs, farm observation, and a faecal laboratory examination. The flock faeces have white spots and blood-tinged contents. Clinical signs revealed bloody diarrhoea, which was observed around Federer and on litter, and the birds appeared emaciated and inappetent. Observational diagnosis indicates undergrowth with respect to their age (52 days), implicating digestive system problems with parasites.

Laboratory Examination Finding

Faecal samples were collected with a screwed-on bottle from freshly voided faeces. The faecal samples were placed into sampling bottles and transported with an ice box to CVMA's parasitology laboratory for processing and identification. Before microscopic observation, the floatation technique was used to concentrate the oocysts to increase the sensitivity of the examination. A sodium chloride solution was used as a floating medium. After the flotation procedure, microscopic observation was positive for coccidia oocysts (Figure 20) under the 40x optical lens of the microscope. Depending on morphological characterization, the species looks like *Eimeria maxima*, which has oval- to egg-shaped oocysts with double-layered walls.

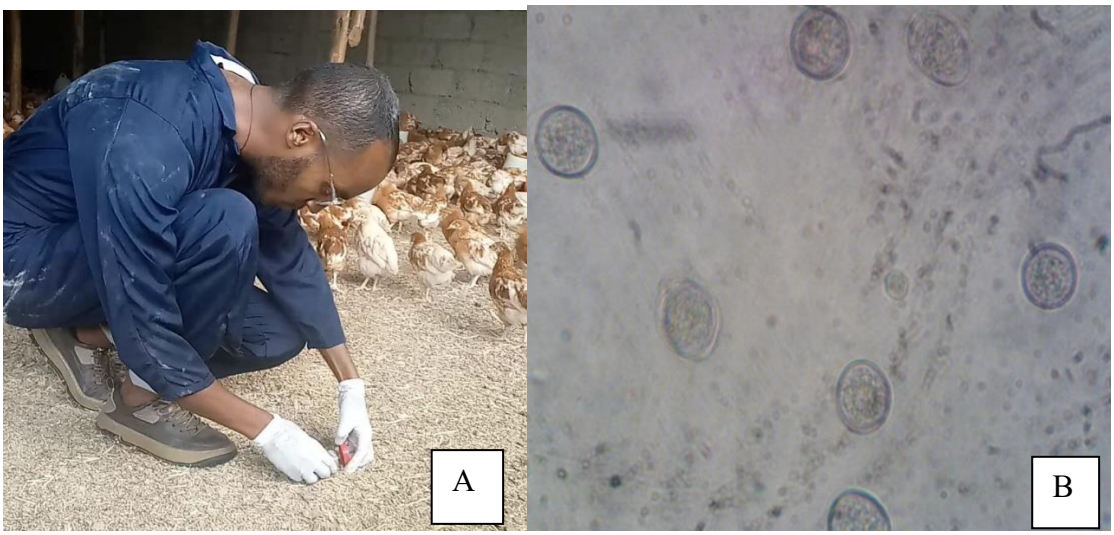


Figure 20: Chicken fecal sampling and result of coccidia egg

Treatment and Outcome

After observational diagnosis and faecal examination, proper treatment was recommended with suitable anticoccidial drugs, and management advice was provided to the entire flock. The whole flock was treated with Amprolium (Amprolium Soluble Powder® Virbac, India, 30 g/30 litres of drinking water) for 5 days. The owner advised to care for his flock with good ventilation by opening shedding plastic from the roof of the house, to correct Federer and drinker sitting positions continuously, and to change litter with dry litter (locally sagatura, wood shavings, from carpenters or furniture homes) to prevent contamination from the previous bedding litter and disinfect the ground aggressively with chemicals. For the torticollis case, the flock was suspected of having Newcastle virus or fowl cholera disease, so to reduce the secondary bacterial load, an oral broad-spectrum antibiotic, Enrofloxacin 200 mg/ml (KEPRO B.V., Holland), was recommended to be given with drinking water for three days. After a week, the owner reported by phone that his flock had become alert and active, and there had been no mortality reports following treatment and control measures. As soon as the flock showed a healthy condition, the owner sold the flock to another farmer.

Discussion

Coccidiosis is classified as an intestinal disease affecting the small intestine and the cecal portion of the large intestine. The present case report discussed coccidiosis in poultry with a history of blood in the faeces and clinical signs of depression, unbalanced growth, lowered feed intake, and huddling. Olabode *et al*. (2020) studied coccidiosis with clinical signs of faeces with blood dysentery and diarrhoea, which have parallels with this case report.

Vegad (2015) forwarded that in the intestine of a 12-week-old bird, coccidia are usually found, but they can be diagnosed as coccidiosis only when the gross lesions are serious and associated with mortality. Abebe and Gugsa (2018) revealed that the wall of the oocyst was smooth, ovoid in outline, and devoid of shape. It causes massive destruction of the epithelial cells and is characterised by droopiness, diarrhoea, and the occasional appearance of blood in droppings, which agree with the current case report.

Similarly, Fanatico, (2006) emphasised that the death rate can occur both in chicks and in adults in poultry infected with coccidiosis. Generally, this paper recommends the implementation of proper Applicable poultry commercial policy, hygiene management on the farm, biosecurity measures, and the use of suitable anticoccidial drugs at the appropriate time and dose for the control, and prevention of poultry farm coccidiosis.

Acknowledgement

I thank Dr. Mensur (Veterinarian) for his unmeasurable support during flocks follow up and treatment.

3.5. Canine Case Reports.

3.5.1. Dog Aural Hematoma

Abstract

Aural hematoma is a blood-filled subcutaneous fluctuant swelling on the pinna formed when traumatic rupture of the capillaries and separation of the auricular cartilage and skin occur. It is a common condition in dogs and cats. A 4-year-old intact male German Shepherd dog was brought to AAU, CVMA, Professor Feseha G/AB Memorial Veterinary Teaching Hospital with a history of swelling on the concave of the right ear in the past 2 weeks. Physical examination revealed hot, painful, fluid-filled, soft, and fluctuant swelling on the concave surface of the pinna, and there was high fleece infestation on the head and affected ear. On examination, the condition was diagnosed as aural hematoma from head shaking and ear scratching secondary to heavy fleece infestation, and the case was decided to be treated by surgical intervention. After the dog was kept under general anaesthesia by combining different anaesthetic agents, all preoperative preparations were performed, and the hematoma was drained by making a full-length longitudinal incision over the entire length of the hematoma. The hematoma was drained, fibrin clots were removed, and the cavity was irrigated with normal saline. Securing the cartilage in apposition with horizontal interrupted sutures parallel to the incision line and blood supply until scar tissue forms A pressure bandage was applied. The dog was followed by antibiotics and painkillers for three days, and the primary cause of the hematoma was treated. The suture was removed on day 14, and the dogs recovered well without recurrence. The relevant information should be displayed in veterinary hospitals and private clinics regarding the incidence rate of aural hemomatoma formation by taking preventive measures.

***Keywords**: Aural hematoma, Dog, Longitudinal incision, Unilateral*

Introduction

Aural hematoma is the accumulation of blood within the subcutaneous tissue of the pinna because of traumatic rupture of the capillaries or separation of the auricular cartilage and skin and the formation of a fluctuant swelling inside (Hewitt and Bajwa, 2020). It is a common condition in dogs and cats (Reddy and Kumar, 2020). Aural hematoma may occur unilaterally with occasional subsequent development of hematoma in the contralateral ear; it is less commonly present bilaterally and generally occurs on a concave surface or the pinna (Falih, 2010).

Regardless of aetiology, it is agreed that rupture of the branches of the caudal auricular artery causes blood to pool between the skin on the inside of the pinna and the cartilage (O'Neill *et al*., 2021). The pathogenesis of aural haemorrhage remains unclear, although some studies have documented erosion and fracture of the auricular pinnal cartilage as possible causative factors in dogs with aural haemorrhage (O'Neill *et al*., 2021). A few theories for cartilage damage have been proposed that mainly focus on self-infected trauma from head shaking with subsequent blunt force to the pinna or immunological factors (Evangelista *et al*., 2012).

Otitis externa and otitis media have been proposed to lead to head-shaking and therefore act as predisposing factors for aural haemorrhage (Pye, 2018). Dogs with long and heavy droopy ears are also prone to bacterial infection, as the droopy ears prevent natural airing and drying of the ear canal, block light, and maintain a dark, moist, and warm environment suitable for yeast and bacteria growth. In addition, a foreign body, parasites, or neoplastic growth may become a source of irritation, cause ear scratching, and make the dog shake its head vigorously to get rid of the itch (Brown, 2010).

In the early stages of development, the hematoma can be warm to the touch, the skin may be erythematous, and the pet may experience discomfort. A sero-hemorrhagic, fibrotic-rich fluid is aspirated early in the formation of an aural hematoma. During normal healing, fluid resorbs, and fibrosis occur; contraction of the fibrotic tissue results in malformation of the pinna (Hewitt and Bajwa, 2020). Aural hematomas are diagnosed by physical examination. The auricular region is swollen; palpation reveals a fluid and

floating content (acute phase), which can be firm and thick due to fibrosis (chronic phase). The history of the patient must be considered to identify and eliminate predisposing factors to the disease, preventing recurrence (Valle *et al*., 2020).

Aural hematomas are, in general, self-limiting due to the occurrence of fluid reabsorption and healing in the natural evolution of the disease. Therefore, it is characterized as a dynamic method (Makker *et al*., 2020). However, the disease resolution is slow, and fibrosis may occur in the healing process, increasing the thickness and, consequently, the deformation of the ear. Recurrence rates are also high (Valle and Carvalho, 2021). The treatment of aural hematoma varies, and different therapies are available for its clinical improvement (Valle *et al*., 2020). There are many treatment options, including nonpharmacologic, pharmacologic, and surgical treatment options (MacPhail, 2016). The most common and effective procedure is surgical intervention by incising over the hematoma, removing all blood, clots, and fibrin, and then securing the cartilage in apposition with sutures until scar tissue forms (Brown, 2010).

The surgical approach provides an expeditious and effective resolution with the least conformational changes to the ear. Generally, the objective of removing the hematoma is to prevent recurrence and retain the natural appearance of the animal's ears (Falih, 2010). Avoidance of infection, careful placement of sutures, and use of stents are important to avoid necrosis of the pinna postoperatively (Brown, C., 2010). Therefore, the present case study reports successful management of an aural hematoma in a German shepherd dog using surgical correction by making a longitudinal incision on the pinna.

Case description

History

A 4-year-old intact male German Shepherd dog was brought to AAU, CVMA, Professor Fesseha G/AB Memorial Veterinary Teaching Hospital with a history of swelling on the concave of the right ear for 2 weeks (Figure 21A). As the owner suggested, the dog had a neck belt that had anti-parasitic activity for a long time, but before 3 months, the dog lost his belt. After that, the dog tried to itch his body and shake his head. Clinical examination revealed that physiological parameters: body temperature, heart rate, and respiratory rate were 38.7 °C, 80 beats per minute, and 20 breaths per minute, respectively; mucous membranes and dehydration status were also normal. Physical examination revealed hot, painful, fluid-filled, soft, and fluctuant swelling on the concave surface of the pinna, and there was high fleece infestation on the head and affected ear (Figure 21A, blue arrow). On examination, the condition was diagnosed as aural hematoma from head shaking and ear scratching secondary to heavy fleece infestation, and the case was decided to be treated by surgical intervention.

Case management and outcome

Before commencing the operation, the dog was withheld feed and water for 12 and 6 hours, respectively. Preoperative preparation was performed by clipping and shaving the hair of both the concave and convex parts of the pinnae, washing gently with water, and scrubbering with a diluted 2% iodine solution (Taflen Industries, Addis Ababa, Ethiopia). All preoperative preparations were performed after adequately sedating the dog, and the affected ear canal was packed with sterilised gauze (Figure 21D, blue arrow) to prevent washing fluid and hematoma from draining into the internal ear canal. Then the dog was secured on the surgical table, and a surgical aperture drape was applied, exposing only the surface of the inner pinna (Figure 21B).

The dog was kept in general anaesthesia by combining different anaesthetic agents such as premedication, induction, and maintenance. The dog was premedicated with ketamine (8 mg/kg intramuscularly) for sedation. Later, the dog was induced by the combination of ketamine (Ketamine Hydrochloride, Germany) at 5 mg/kg IV and diazepam (Intas Pharmaceutical Ltd., India) at 0.5 mg/kg IV and maintained by a half dose of induction IV. A lactate ringer solution was given through the cephalic vein throughout the surgical procedure at a rate of 10 ml/kg/hr. Finally, the dog was kept in lateral recumbence on the surgical table with the affected ear uppermost.

The dogs were positioned in lateral recumbency such that the affected ear was facing the operation. A longitudinal incision on the skin of the ventral surface of the pinna was made to include the entire length of the hematoma; the incision was made under complete septic technique and made in the midline of the pinna. Hematoma and its contents were exposed (Figure 19C). The hematoma was drained, and fibrin clots were removed (Figure 21D). Then the cavity is irrigated with normal saline. Then, using 2-0 sterile silk suture material, horizontally interrupted sutures parallel to the incision line were placed on the concave surface of the ear, incorporating the skin on the convex surface of the ear. After surgical correction, the operated ear was cleaned and scrubbed with 2% diluted iodine solution (Taflen Industry, Addis Ababa, Ethiopia), and a pressure bandage was applied (Figure 21F) to prevent deformity of the ear or recurrence.

Figure 21: Unilateral aural hematoma and its surgical management of dog

A). Clinical presentation of aural hematoma

B). Aseptically prepared surgical site

C). Making longitudinal incision on ventral surface of the pinna and oozing of hematoma

D). Draining and removing of hematoma and fibrin clots

E). Putting ample number of sutures in both side of incision

F). Application of pressure bandage

Postoperative Outcome

Postoperatively, the dog was administered procaine penicillin (24 mg/kg) and dihydrostreptomycin sulphate (30 mg/kg) (PenStrep® Norbrook UK) I.M. for three days. Tramadol HCL 50 mg/kg (Huons Co., Ltd., China) I.M. for three consecutive days was also used for pain management, and the aetiology of aural hematoma (Fleece) infestation was treated with ivermectin 0.2 mg/kg (InterchemieWerken "De Adelaar" B.V., Netherland). After all, the operated ear was bandaged with sterile gauze over the dog's head to support the ear, minimise movement, and accelerate the healing process. The bandage was changed on the third day because the dog was removing the bandage from his head. Bandaging continued for two weeks. The owner recommended that you examine the dog closely to keep the bandage clean and not too tight. The suture was removed on day 14, and the dogs recovered well without recurrence.

Discussion

Surgery is the most common treatment choice for recurrent or persistent ear hematomas in dogs and cats. In the present case report, a unilateral aural hematoma was surgically managed on a 4-year-old intact male German Shepherd dog with a history of fleece infestation in the past 3 months. This is strongly agreed with the study of Parte*et al*. (2022), who reported that the overall incidence of aural haemorrhage in dogs was 0.35% in hospitals in Indore and Mhow city. The incidence of aural haemorrhage was higher in the age group between 4-6 years. Male dogs were affected more as compared to female dogs. The German shepherd breed was affected more than other breeds.

Gyorffy and Szijarto, (2014), forwarded aural hematomas are treated either surgically or conservatively. Both techniques usually require several interventions and rechecks. Hall *et al*. (2016) say the most reported surgical approach is a linear or longitudinal incision with sutures, which argues with the present case report of a hematoma treated by making a full-thickness longitudinal incision through the concave surface of the pinna overlying the hematoma. Interrupted horizontal mattress sutures are placed parallel to the long axis of the pinna over the entire area of the hematoma.

According to Hewitt and Bajwa's, (2020) study, the prognosis for aural hematoma in dogs is good to excellent if the underlying aetiology is addressed. Primary, predisposing, and perpetuating factors leading to otitis and aural hematoma development need to be addressed to have a successful resolution of the hematoma. In the present case report, the aetiology of aural hematoma was also identified, and treatment was provided directly for the aetiology in addition to surgical management. The minimal postoperative care and minimal complication rates made this amenable for the correction of an aural hematoma. This case report implicates surgical management of aural hematomas, which provides an expeditious and effective resolution with the least conformational changes to the ear.

Acknowledgement

I really glad and Thank Eeba Externship students from Haromaya University.

3.5.2. *Urolithiasis in Male Dog*

Abstract

Urolithiasis is the formation of sediment anywhere within the urinary tract, consisting of one or more of the poorly soluble crystalloids of urine. Uroliths occur when mineral solutes precipitate to form crystals in urine; these crystals aggregate and grow to macroscopic size. This case report explains the diagnosis, treatment, and outcome of urolithiasis that occurred in the os penis of a dog. A 7-year-old local breed dog named Jacky was brought to AAU, CVMA, Professor Feseha G/AB Memorial Veterinary Teaching Hospital on March 16th, 2023, with complaints of vomiting, refusing feeding, and depression starting two days before arrival for treatment. Physical abdominal palpation reveals an abdominal mass, and ultrasound radiography prescribes bladder distension and kidney cysts. After the dog was kept under general anaesthesia ketamine, Catheterization was made, and approximately 700 ml of urine was drained. For two days, the case has been attended to with antibiotics, but when the owner tried to clean the dog's body at the hospital, the dog died. Clinical and postmortem evaluations confirmed the condition to be os penis urolithiasis is complicated by a ruptured bladder due to os penis blockage by two urolith stones. Postmortem findings illustrate two struvite stones in the middle os pennis, a congested intestine, urinary bladder rupture, fibrosed kidneys, and a consolidated lung. The death of the dog was caused by urolithiasis blockage at the middle of the os penis, but there might be an infection disease concurrently. Owners should claim the exact clinical history of their animal to avoid misdiagnosis and early submission to the clinic for treatment intervention. The current case history of complaining was misleading in that the owner never complained regarding the problem of urination. Early clinical presentation, an appropriate history, and an appropriate examination are keys to successful diagnosis and treatment of urolithiasis.

Keywords*: Dog, Urolithiasi, Uroliths, Struvite*

Introduction

Urolithiasis is the formation of sediment anywhere within the urinary tract consisting of one or more of the poorly soluble crystalloids of urine (Defarge *et al*., 2020). The formation of uroliths involves multiple physiological and pathological processes (Dvorska, 2015). Uroliths are organized organic and inorganic solutes that precipitate around the nidus because of oversaturated urine and grow to macroscopic size (Breshears and Confer, 2017). Struvite urolithiasis in dogs is formed when urine is saturated with magnesium, ammonium, and phosphate. The organic component known as mucoprotein acts as a cementing agent for the formation of calculi (Blood and Henderson, 1997). The formation of uroliths has many etiological factors, and their chemical composition also differs according to the mode of formation (Sharun*et al*., 2021).

However, there are mainly four types of mineral deposits in uroliths: urea, cystine, struvite (magnesium ammonium phosphate), and calcium (Tion *et al*., 2015). The aetiology of struvite urolithin in dogs is due to a concurrent urinary tract infection (Tiruneh and Abdisa, 2017). The two most common minerals found in the uroliths of dogs were calcium oxalate and magnesium ammonium phosphate, identified using accurate quantitative analytical techniques (Stevenson, 2002; Low *et al*., 2006). The major urinary risk factors for calcium oxalate formation in dogs were found to be calcium and oxalate, although uric acid concentrations were also increased in some dogs. Differences in the urine composition of breeds susceptible to calcium oxalate formation (Ling, 2003) were identified when compared to a breed with a low risk of calcium oxalate formation (Okafor, 2014).

Urolith is formed in all species of domestic animals and is one of the most important lower urinary tract diseases in dogs. The formation of uroliths is not a disease but rather a complication of several disorders, which is often the result of a combination of both pathological and physiological factors (Hoxha, 2017). Some disorders can be identified and corrected, but some can be identified but not corrected, although for others, the underlying etiopathogenesis is not known (Bartges, 2016). Some risk factors that are known to affect canine uroliths include breed, gender, age, anatomical and metabolic abnormalities, urinary tract infections, diet, and urine pH 2–5 (Stevenson, 2002).

Treatment of sterile struvite can be done by consuming dissolution and prevention diets that have limited amounts of magnesium and phosphorus, acidifying diets, and increased water intake, and in the case of infection-induced struvite, appropriate antibiotics should be used (Bartges and Callens, 2015). Urolithiasis dietary therapy is to dissolve calculi (struvite) and limit the risk of recurrence. Increased dietary moisture and sodium were shown to reduce the severity of these differences, thereby reducing the risk of calcium oxalate crystallization in susceptible breeds. Dietary treatment for mixed or compound stones should depend on the salt content of the nidus. Controlling the quantity of crystal precursors in food as well as the pH of the urine is critical for all stones (Queau, 2019). Either in the use of medicine or surgical approaches to treatment, there is the presence of side effects. So, herbal use may have a beneficial effect on it. For example, extracts from the herbs Herniariahirsuta, *Phyllanthus niruri, and Dolichos biflorus are* used to treat calculi through their inhibitory effect on the lithogenesis process since they interfere with calcium oxalate crystallisation (Butterweck and Khan, 2009).

A general recommendation for prevention of urolithiasis is to increase water consumption to encourage diuresis and reduce time for aggregation and crystallisation. Increasing urine volume to increase urination frequency decreases crystal growth and aggregation time and dilutes solutes in urine (Bartges and Callens, 2015). This may be most effectively completed with a transition to a moist diet, and providing flavoured water may encourage increased water intake (Westropp and Buffington, 2005). Dietary therapy may reduce calculus recurrence. Epidemiologic studies suggest that a urine pH of approximately 6.0 to 6.3 and consumption of a low-magnesium diet reduce the recurrence of naturally occurring sterile struvite (Kimani, 2020). Control of urinary tract infections and changes in diet can help prevent urolithiasis in dogs and cats (Bartges, 2013).

Fluid treatment should be closely monitored to prevent overhydration. In dogs, in addition to propulsive treatment for uroliths, broad-spectrum antimicrobials IV should be administered. Intervention should only be considered when an experienced operator is available (Lulich, 2016). Therefore, the objective of this case report is to diagnose dogs with a history of vomiting and depression complicated with the sequel of magnesium ammonium phosphate (Struvite) urolithiasis.

Case Description

History

A 7-year-old local breed dog named Jacky was brought to AAU, CVMA, Professor G/AB, Memorial Veterinary Teaching Hospital on March 16th, 2023, with complaints of vomiting, refusing feeding, and depression starting two days before arrival for treatment. The dog had a vaccination history against rabies before four months.

Clinical findings and examination

Jacky was restrained for a clinical and physical examination. Physiological examination of body parameters with respect to rectal temperature, pulse beat, and respiratory rates shows 37.2 C^0, 112 beats/min., and 20 breaths/min., respectively. Clinical findings were little diarrhoea around the tail, distension of the pelvic abdomen, hard consistency, and a reluctance to walk and sit on the hind leg recurrently. Abdominal palpation revealed generalised hardness and mass presentation. Following diagnosis, in addition to misleading history, differential diagnoses were considered: urolithiasis, abdominal mass, canine parvovirus infection, and cystitis.

Case treatment and management

The dog was attended for over three days with broad-spectrum antibiotics with procaine benzyl penicillin, 24 mg/kg, and dihydrostreptomycin sulphate, 30 mg/kg (Shanghai Gongyi Pharmaceutical Co., Ltd., China), with no prominent progression. The dog was first supported with sodium chloride B.P. 0.9 gm (Ethiopian pharmaceutical manufacturing) intravenous fluid infusion plus glucose 40%, 10 ml, IV. During palpation diagnosis, mass organs with consistency in the abdomen were appreciated, and ultrasound imaging was recommended for further diagnosis. Based on the abdomen ultrasonography, revealed distension of urinary bladder and kidney cyst. For evaluating the patency of the urethra and mass differentiation, catheterization was conducted with a tube lubricated by lignocaine gel according to the size of the animal by experienced veterinarians (Figure 22 below). During catheterization, urine containing blood and exceptionally fine hard content was discharged through the catheter before the tube

reached the neck of the bladder, which made the catheter rigid to move inside the os penis. After 600 ml of urine (Figure 22C, arrow indicating urine bottle) was drained, the dog admitted to taking antibiotics for two days. The case was assumed to be relieved from the problem after catheterization, and ultrasound imaging also didn't show uroliths in the os penis, so surgery was not recommended. After two days of antibiotic follow-up, the dog was brought in for a checkup at the hospital. Unexpectedly, death occurred suddenly when the owner tried to wash the dog's abdominal body part.

Figure 22: Urine draining by cathetrization of a dog.

The above figure (A) shows inserting a catheter, and the arrow indicates blood content with urine; (B) draining urine gently to a bottle with minor pressure as indicated by the white arrow; (C) showing a removed catheter and 600 ml of urine as indicated by the arrow; and (C) showing the dog after urine drainage and showing little releif.

Postmortem Finding

A postmortem was made at the pathology and necropsy laboratory. Two stone caliculi (struvite-like urolith) were appreciated at the middle of the os pennis of the dog (Figure 22C); a highly distended bladder (Figure 22A); intestinal haemorrhage; and glomerular basement fibrosis (Figure 22B) were also appreciated.

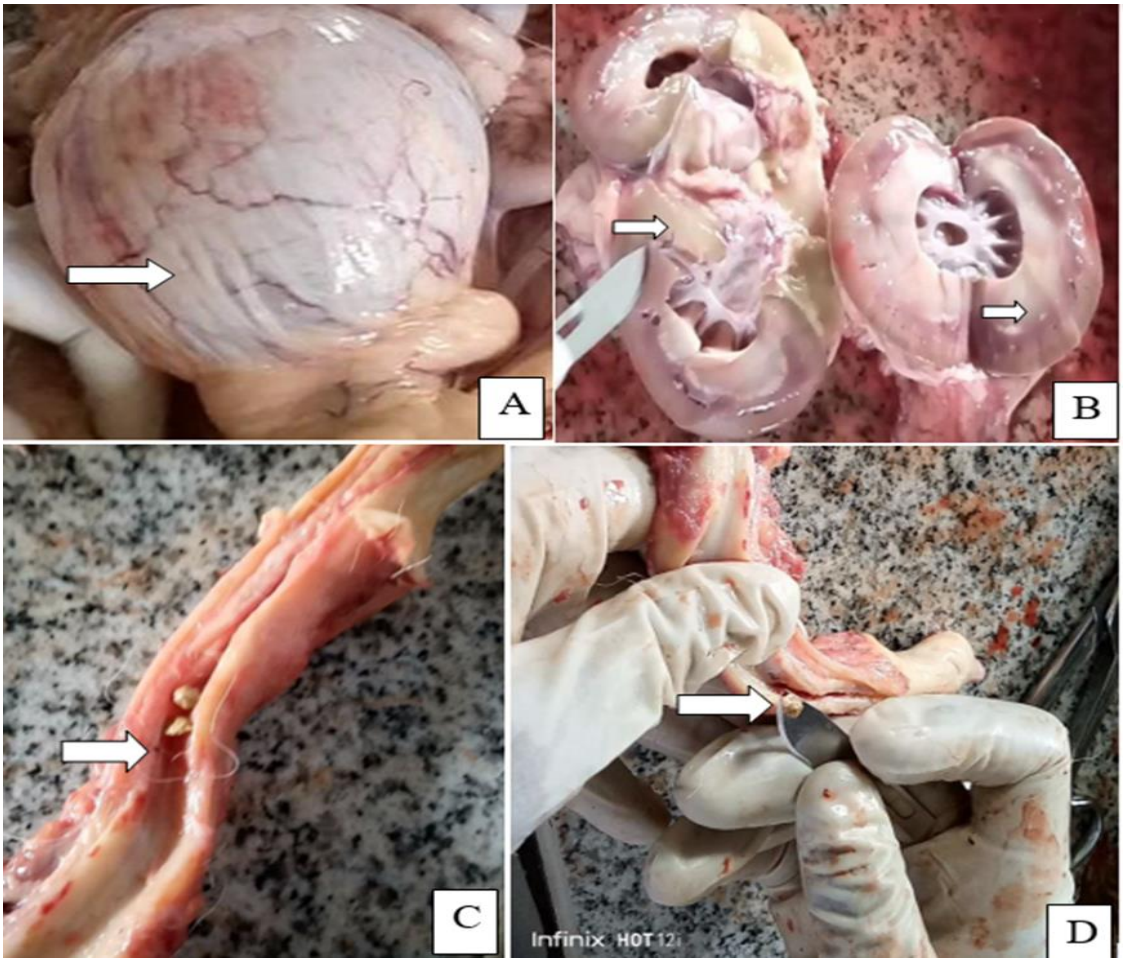


Figure 23: Illustrates postmortem result of urolithiasis positive dog.

Discussion

Urolithiasis and subsequent obstruction of the urinary tract are relatively common problems in dogs. The severity of urolithiasis depends on the anatomical location of the obstruction, whether it is partial or complete. The present case report study reports a dog case with a misdiagnosed healthy urination history presented to a veterinary hospital and diagnosed to have urolithiasis. The presence of a urolith stone in the groove of the os penis after postmortem, which was supported by Houston *et al.* (2004), indicated struvite uroliths were most common in dogs.

The patient in this report died after receiving three transfusions and medical treatment attempts, with a good initial response to the use of antibiotics. Março *et al.* (2021) suggested the use of antibiotics could increase the quality and survival of patients with urolithiasis. For evaluating the patency of the urethra and mass differentiation, catheterization was conducted, which has a similar approach to that taken by Reshma (2004). Mendoza-Lopez *et al.* (2020); Studied in Mexico, male dogs over the age of six and big breeds, particularly Labradors and Golden retrievers, were at high risk of canine urolithiasis.

Thilagar and Balasubramanian (1996) reported that the incidence of urolithiasis was higher in males and lower in females. In males, single large-sized urethral caliculi were common in larger breeds, while many small-sized caliculi were more common in smaller breeds. This idea is similar to the current case, in which Jacky is classified as a small breed. Lulich *et al*. (2011) demonstrated the importance of dietary modifications in medical protocols to prevent urolith recurrence. Pharmacological consideration of methionine or ammonium chloride to acidify the urine of patients consuming non-acidifying diets is recommendable. Generally, pet owners should arrive as soon as a health problem with the dog occurs with a correct history and anamnesis.

Acknowledgement

I want to thank Professor Alemayehu Lema and Dr. TilayeDemisie (PhD) for their support during ultrasound and catheterization of the dogs.

3.5.3. *Canine Parvo Virus Infection*

Abstract

Canine parvovirus is the most widely recognised cause of transmissible viral diarrhoea in dogs and one of the most common infectious diseases in dogs worldwide. Canine parvovirus type 2 is the cause of highly contagious acute enteritis and infectious illness in young unvaccinated or vaccinated dogs, associated with very low survival rates in untreated dogs. This case report discusses a three-month-vaccinated puppy who arrived at AAU, CVMA, Professor Feseha G/AB Memorial Veterinary Teaching Hospital with complaints of watery and bloody-tinged diarrhoea, vomiting, and inappetence. There was a complaint that the dog had been vaccinated with modified live viruses of canine distemper, parvovirus, and Leptospira canicola in the first round before three weeks and was scheduled to take the next round after a week. There is a death of a puppy before 1 month from the same kennel. During physiological parameter diagnosis, the body temperature was 41.3 °C, respiratory rate was 22 breaths per minute, heart rate was 68 beats per minute, and the puppy was dehydrated. As parvovirus mostly infects young puppies and is associated with diarrhoea, dehydration, and anorexia, the current infection was tentatively diagnosed as parvovirus based on history and presenting signs. Intensive supportive treatment was provided by intravenous fluid therapy plus antibiotic and anti-mimetic medicine, Ringer lactate infusion, gentamicin, and metoclopramide, respectively. The follow-up was made for five days to prevent vomiting, dehydration, and secondary bacterial complications. After three days of treatment, the puppy started to take up water and recovered after a week. Two weeks after the checkup, the puppy was in good health with a good appetite, a good mood, and was active. Lastly, the owner was appreciated for his early vaccination and early submission of his puppy to the veterinary clinic and advised to maintain a well-ventilated and cleaned kennel for his dog.

Keyword: *Dog, Parvo virus, Puppy*

Introduction

Canine parvovirus is a highly transmissible viral diarrhoea and one of the most common infectious diseases in dogs worldwide (Apaa *et al*., 2016). Canine parvovirus type 2 is the cause of highly contagious acute enteritis and infectious illness in young unvaccinated or vaccinated dogs and is associated with very low survival rates in untreated dogs (Sayed-Ahmed *et al*., 2020; Mylonakis *et al*., 2016). Despite the widespread use of inactivated or live attenuated vaccines, the emergence of antigenic variants raises concerns regarding the efficacy of commercial vaccines (Zhou *et al*., 2017). Canine parvovirus is a protoparvovirus genus and member of the Parvoviridae family (Cotmore *et al*., 2019), and they are small, non-enveloped single-stranded DNA viruses that can survive for long periods in the environment (Stuetzer and Hartmann, 2014).

The virus is separated into two antigenic forms known as canine parvovirus type 2 (CPV-2) and canine parvovirus type 2a (CPV-2a) (Parrish, 1990). CPV-1 was non-pathogenic (Binn *et al*., 1970). However, CPV-2 was discovered as the second type of parvovirus infection. It is recognized as a pathogenic form that can cause a disease associated with high contagiousness and mortality that primarily affects puppies that are unvaccinated or have incomplete vaccination regimes between the ages of 6 weeks and 6 months (Kahn and Line, 2010). Infections caused by CPV-2 manifest in two forms: enteritis and myocarditis (Goddard and Leisewitz, 2010). The enteritis form causes various symptoms such as vomiting, pyrexia, dehydration, and hemorrhagic diarrhoea, whereas the myocarditis form leads to myocarditis in utero or after birth, showing symptoms before the age of 3-months-old.

Predisposing factors for parvovirus infection include intestinal parasites, inadequate protective immunity, sanitary compromises, overcrowding, and stressful conditions (Hurley *et al*., 2021). Viral replication takes place in rapidly dividing cells such as precursor cells in the bone marrow, intestinal crypt epithelial cells, and myocardiocytes (Schoeman *et al*., 2013). The virus attacks cells in a dog's intestines and stops them from being able to absorb vital nutrients. This means that a dog or puppy will become very weak and dehydrated (Tuteja *et al*., 2022).

The disease attacks the small intestine lining, causing it to stop replicating effectively. This makes it impossible for young dogs to absorb nutrients, and it allows other bacteria in the intestines to infect the rest of their body (Sykes, 2014). Puppies between the ages of six weeks and six months are most vulnerable to parvo (Hasan *et al*., 2016).

The primary source of the virus is the faeces of infected dogs. The virus begins to be shed in the faeces just before clinical signs develop, and shedding continues for about fourteen days (Freisl *et al*., 2017). Clinical signs of parvoviral infection generally develop within 5–7 days of infection but can range from 2–14 days (Tuteja *et al*., 2022). Susceptible dogs become infected by ingesting the virus. After ingestion, the virus enters the tonsils or lymph nodes, where it invades lymphocytes that then carry it in the bloodstream to many areas of the body, most notably the bone marrow and the lining of the intestine (Boes*et al*., 2017). Unlike most other viruses, CPV is stable in the environment and is resistant to heat, detergents, alcohol, and many disinfectants. A 1:30 bleach solution will destroy the infective virus (Rakowska *et al.*, 2021).

There is no treatment to kill the virus once it infects the dog. However, the virus does not directly cause death; instead, it causes loss of the lining of the intestinal tract and weakens the immune system by affecting the white blood cell numbers (Qiu *et al*., 2017). The intestinal damage results in severe dehydration (water loss), electrolyte (sodium and potassium) imbalances, and infection in the bloodstream (septicemia). Septicemia occurs when the bacteria that normally live in the intestinal tract can enter the bloodstream; if septicemia develops, the dog is more likely to die (Mylonakis *et al*., 2016).

The prognosis for canine parvovirus infection in puppies varies with the severity of the illness and the owners' ability to afford appropriate treatment (Parrish *et al*., 2021). The first step in treatment is to correct dehydration and electrolyte imbalances, which requires the administration of intravenous fluids containing electrolytes (Thakuri *et al*., 2023). In severe cases, plasma transfusions may be given (Brown and Otto, 2008). Antibiotics and anti-inflammatory drugs are given to prevent or control septicemia (De Sousa *et al*., 2020). Antinausea drugs are used to inhibit the vomiting that perpetuates the problems. Newer treatments currently being investigated include anti-viral drugs such as Tamiflu® and faecal transplantation from healthy dogs (Zhou *et al*., 2019). Most dogs with CPV

infection recover if aggressive treatment is used and if therapy is started before severe septicemia and dehydration occur. Vaccination is the best method of protecting dogs against CPV infection. Puppies receive a parvovirus vaccination as part of their multiple-agent vaccine series. It is recommended to be given at 8, 12, and 16 weeks of age (Ogbu *et al*., 2017; Day *et al*., 2016). The objective of this paper is to diagnose, treat, and report the outcome of treatment.

Case Description

History

A three-month-old German Shep herd puppy arrived on March 6th, 23rd, to AAU, CVMA, Professor Feseha G/AB Memorial Veterinary Teaching Hospital with complaints of watery, blood-tinged diarrhoea, foamy vomiting, and loose feed intake. The owner says his puppy was vaccinated before a month for canine diseases (Canine Distemper, Hepatitis, Parvo, Leptospirosis, and Para Influenza) and had a schedule after a few days (Annex 14). He also said that before six months, one of his dogs was dead after treatment for susceptibility to canine parvovirus infection.

Tentative Diagnosis

On physical examination, the animal was lethargic, depressed, and dehydrated. During physiological parameter reveals, body temperature 41.3, respiratory 22 breath/min., Heart rate 60beat/min. A tentative diagnosis of canine parvovirus disease was deduced based on the symptoms shown and the history given by the owner. Clinical signs observed were lethargy, fever, progression of vomiting, and blood-content diarrhoea. Bloody diarrhoea that contained sloughed intestinal mucosa occurred every few hours for three days. The dog presented with a prolonged capillary refill time and low pulse quality.

Treatment Approach and Outcome

Based on the history, clinical signs and symptoms observed, and therapeutic response, the case was tentatively diagnosed as a canine parvovirus infection. Intensive supportive treatment was provided by intravenous fluid and electrolyte therapy, parenteral antibiotic injections, and anti-mimetic drug therapy for five consecutive days. A mixed Ringer lactate and glucose 40% intravenous infusion, Gentamicin 8 mg/ml, 2 ml (Cisen Pharmaceutical Co., Ltd.), intramuscular injection, and metoclopramide 5 mg/ml, 2 ml (Reyoung Pharmaceutical Co., Ltd.) injection, supported with a multivitamin B-Complex injection, were made. The puppy showed a good prognosis starting from the second day (Annex 14); at the third day of follow-up, vomiting and diarrhoea stopped, and Hatchy started to take up rice and a small quantity of water.

At the fifth day of follow-up, Hatchy showed a good recovery. Lastly, the owner was appreciated for the early vaccination of his puppy and early submission to the veterinary clinic and advised to maintain a well-ventilated, cleaned, and disinfected kennel (cage) for his dog. After a month of treatment, the puppy was in good health, had a good appetite, and was active (Figure 24C).

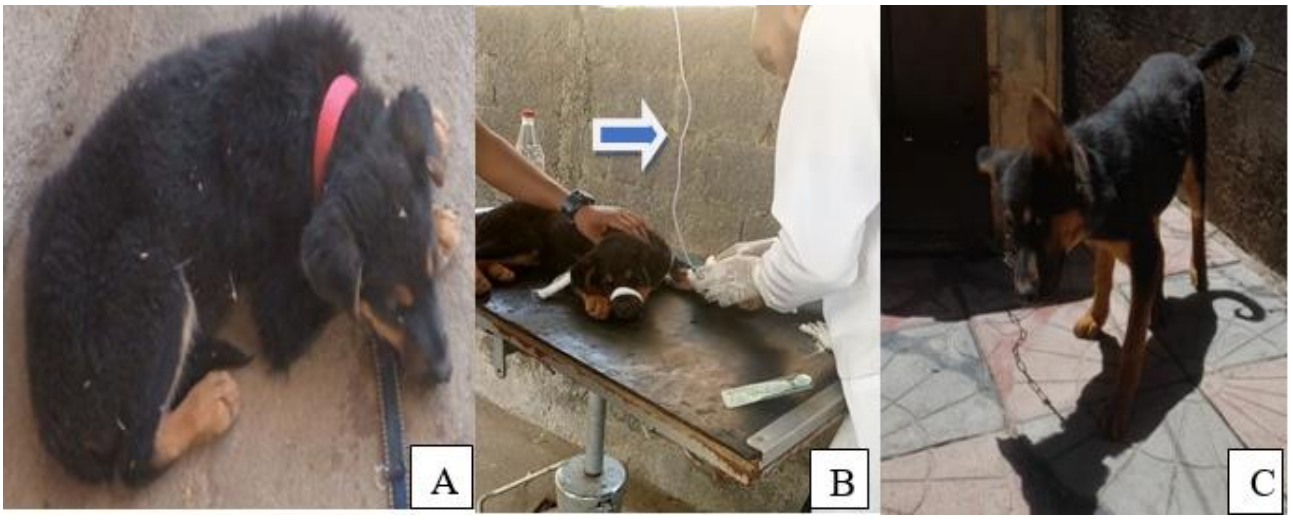


Figure 24: Clinical presentation, treatment and outcome of puppy**.**

The above figure (A) shows a depressed and lethargic puppy during a clinic presentation; (B) shows fluid therapy with an intravenous catheter, as the blue arrow indicates; and (C) shows a hatchling after 2 months of posttreatment treatment.

Discussion

Canine parvovirus infection (CPV) is an acute disease of dogs. The tentative diagnosis in this case report agrees with the report of Ain-Fatin *et al*. (2020) that canine parvoviral enteritis is continuously related to a low survivability of 9.1% when no treatment is given, but it is significantly increased to 64% when treatment is given intensively. Fluid therapy, aimed at restoring fluid and electrolyte balance, and antibacterial therapy, aimed at reducing secondary bacterial complications, were similar treatment protocols in another study by Sykes (2014). Also, Prittie (2004) warned that parenteral administration of wide-spectrum bactericidal antibiotics is warranted in dogs with severe parvo infection due to the high risk of septicemia associated with the disruption of the mucosal barrier.

The current report diagnoses a tentative canine parvovirus infection in vaccinated dogs, arguing that, as Zhou *et al*. (2019) indicated, commercial vaccines cannot provide complete protection against all canine parvovirus variants. Also, there is no effective drug available to control canine parvovirus infection except for supportive and symptom-based care. Nandi *et al*. (2013) indicated that prevention by vaccination is effective in controlling the disease. Generally, this paper recommends that owners vaccinate their puppies to decrease the risk of parvovirus infection and death.

Acknowledgment

I would like to thank the owner for his willingness to bring the puppy on each day of admission and have good awareness about parvo and follow every advice told to him.

Limitations

Further laboratory confirmation was not performed for this case because of lack of specific kits for the virus hence the pup was treated based on clinical findings and other indications.

3.5.4. *Dog Flea Allergic Dermatitis*

Abstract

Flea allergy dermatitis (FAD) is a disease in which a hypersensitive state is produced in a host in response to the injection of antigenic material from the salivary glands of fleas. This case report discusses a dog brought to AAU, CVMA, Professor G/AB Memorial Veterinary Teaching Hospital on January 1, 23, with a history of losing hair, restlessness, inappetence, biting and scratching of the hair coat, and loss of body condition since a year ago. The case shows clinical findings of scratching himself, half-body alopecia, and a high flea infestation. The owner mentions the dog hasn't had any vaccination exposure or deworming, but during severe alopecia, the local veterinary technician treated it with an unknown drug, and the disease relapsed again after a time. After soaking the alopecic area of skin with diluted Savlon, the dog was treated with procaine penicillin 24 mg/kg and dihydrostreptomycin sulphate 30 mg/kg (PenStrep® Norbrook UK), prednisolone 1 mg/kg, Vitamin B-Complex 2mg for five days, and ivermectin 0.2 mg/kg. The dog showed a good prognosis starting with a second-day follow-up that reduced licking and restlessness, but the problem was not totally avoided due to age and the management problem of flea control. The owner was advised to clean and disinfect the dog's kennel with amitraz acaracides according to the pharmacist's recommendation. Generally, pet owners should vaccinate and deworm their dogs periodically and control fleas in the environment of their dog cage.

Key words: *Allergic dermatitis, Dog, Fleas, Scratching*

Introduction

Flea allergy dermatitis (FAD) is a hypersensitivity reaction to one or more components of fleas, especially allergens in flea saliva (Gryphon, 2013). It is the most common skin allergy encountered in small animal medicine (Narang *et al*., 2019). There are several types of hypersensitivities, such as cutaneous basophil hypersensitivity, immunoglobulin E (IgE)-mediated immediate hypersensitivity, late-onset IgE reactions, and delayed-type hypersensitivity, which can occur alone or in combination (Gross and Halliwell, 1985). In dogs (Mueller *et al*., 2016), 80% of clinical flea allergies have an IgE response to C te f 1 flea antigen, making this a major allergen involved in pathogenesis. The hypersensitivity reactions cause inflammation, leading to pruritus and the generation of most of the lesions on the skin (Shmuel and Cortes, 2013). Secondary problems that may occur often represent focal sites of infection, foci of severe trauma, possibly from the itch-scratch cycle, or a different pathologic reaction. Acute dermatitis, acral pruritic nodules, eosinophilic plaques, and eosinophilic granulomas may be seen in dogs (Gryphon, 2013).

Flea infestations pose serious health problems for dogs and cats and increase the risk of transmitting numerous pathogens. Several types of fleas infest the hair coat of dogs and are primarily responsible for FAD. *Ctenocephalides felis* and *Ctenocephalides canis* are common fleas in dogs (Grifffin, 2006). Flea saliva contains histamine-like compounds, proteolytic enzymes, and anticoagulants, which can act as inflammatory or antigenic stimuli in sensitive animals. Various immunologic responses are provoked, including immediate hypersensitivity reactions, late-phase Ig E-mediated responses (Kumar *et al*., 2013), and cutaneous basophil hypersensitivity reactions (Halliwell *et al*., 2021). Non-allergic animals may have few clinical signs and only show occasional scratching due to irritation caused by fleas or their bites (Dhillon *et al*., 2020).

Animals that are allergic to or develop immunological reactions to flea saliva show pruritus, alopecia, and skin lesions (Diesel, 2017). Untreated canines and other hosts can act as infestation sources. Flea infestation is commonly found in animals with poor body condition, low immune status, and chronic debilitating diseases (Dhillon *et al*., 2020). At the site of the flea bite, an area of ischemia with a surrounding wheal appears.

Effective control of flea populations and prevention of exposure to adult fleas require an understanding of many aspects of the flea life cycle and biology (Bourne *et al*., 2018). Adult fleas only represent a small percentage of the total flea population. Eggs, larvae, and pupae make up the vast majority. The life cycle of the flea ranges from as few as 12 to 190 days, with an average of 21 days. The time needed for development depends heavily on environmental conditions, particularly temperature and humidity. The optimal environment is a low-altitude geography with a temperature of 23.8°C and a relative humidity of 78% (Pet MD, 2018). The best sites for searching for fleas on pet animals are the lumbosacral area (flea triangle), hind quarter, base of tail, stomach, and groyne region (Tiwari).

Treatment of FAD involves three approaches: flea treatment, allergy treatment, and treatment of skin infections that invariably result from a pet's response to the allergy. Many safe drugs and products have been designed to effectively kill fleas. Antihistamines and corticosteroids are effective in breaking the itch-scratch cycle initiated by the body's allergic response. Oral antibiotics are sometimes necessary, but, in many cases, topical therapies like shampoos can be highly effective for the treatment of skin infections (Paterson, 2009). A combination of the presence of fleas and response to treatment, together with the elimination of other possible causes, confirms the diagnosis of FAD. Therefore, the objective of this case report is to diagnose the causative agent and treat the alopecic dog that arrived at the veterinary hospital.

Case Description

History and clinical diagnosis

A seven-year-old male dog was presented to AAU, CVMA, and Professor Feseha G/AB Memorial Veterinary Teaching Hospital, Bishoftu, with a complaint of restlessness, inappetence, hair loss, biting and scratching of the hair coat, and loss of body condition for a year. The owner mentions the dog hasn't had any vaccination exposure, but during severe alopecia, a local veterinary technician treated it with an unknown drug, and the disease relapsed again after a time. The clinical examination revealed rashes, erythema, scaling, alopecia, hyperpigmented skin, intense pruritus, and hair loss affecting the dorsum, mainly the caudo-dorsal aspect.

The affected dog typically exhibits thinning of the hair along the tail base in a classical lion shape (Figure 25D). Fleas were also found moving and jumping all over the animal's body. The blackish debris, fleas' dirt (flea faeces), was also observed on the skin at the base of the hair during the physical examination. Deep skin scrapings were also collected using blunt scalpel blades to check for mite infestation, and they showed negative results for two felis species, *Ctenocephalides felis*and *Ctenocephalidescanis* (Annex 15). The animals body parametersrectal temperature, heartbeat, and respiration rateswere within the normal range. The case was depressed, actively scratched himself, and had a slightly pale mucous membrane. During clinical diagnosis, the dog scratched himself aggressively (Figure 25B), there were highly infested fleas in the hair and skin, and there was a pruritus wound (Figure 25C).

Figure 25: Clinic presented dog with flea allergic dermatitis and treatment outcome.

Laboratory Examination

The whole blood examination reveals PCV 21%, haemoglobin 7.1, Giemsa stain for inflammatory cell diagnosis, neutrophil abundance, the presence of lymphocytes, and adult fleas of *Ctenocephalides felis* and *Ctenocephalides canis.*

Treatment and outcome

Treatment of FAD was made by advising and directing the owner to break the life cycle of fleas in the environment. Supportive medical therapy for secondary bacterial skin infection with antibiotics and attempts to hyposensitize to control pruritus (self-itch) by glucocorticosteroid therapy was made during follow-up. After soaking the alopecic area of skin with diluted Savlon, the dog was treated with procaine penicillin 24 mg/kg and dihydrostreptomycin sulphate 30 mg/kg (PenStrep® Norbrook UK), prednisolone 1 mg/kg, Vitamin B-Complex 2mg for five days, and ivermectin 0.2 mg/kg. The outcome shows a good prognosis, but the problem was not totally avoided due to the age of the dog and the management problem of flea control. The dog responded, showing resolution of clinical signs, a decreased number of fleas, and reduced nuisance after five days post-treatment. The owner recommended spraying the cages (kennels) of the dog and indoor areas where the dog could sleep aggressively with Diazinon according to the pharmacy order with a two-week gap to control fleas. He also ordered that the dog be washed continuously with shampoo. The dog showed a good prognosis starting with a second-day follow-up that reduced licking and restlessness, but the problem was not totally avoided due to age and the management problem of flea control. The owner advised cleaning and disinfecting the dog's kennel with amitraz acaracides according to the pharmacist's recommendation. After a month of admission, the dog shows a good prognosis with hair growing (Figure 26B), but the problem was not avoided at all due to age and an uncontrolled flea infestation.

Figure 26: Pretreatment and Posttreatment of Flea Allergic Dermatitis.

Discussion

The key to success or failure when treating an animal with flea allergic dermatitis is owner education. The owner should know that the treatment of the hypersensitive animal must start with flea control, especially environmental flea control. In this case report, clinical flea allergic dermatitis was diagnosed and treated in dogs highly infested by fleas. A similar case was reported by Narang *et al.* (2019) indicated the presence of adult fleas on the body surface with jumping movement. History, clinical findings, and response to treatment were used to confirm this FAD.

The Merck Veterinary Manual (2016) discussed FAD with clinical signs such as pruritus, excoriation, hyperpigmented skin, scaling, erythema, and alopecia, involving the posterior and ventral parts of the body and becoming more severe in warmer months; similar findings were observed in the present study.

In contrast, Dhillon *et al.* (2020) reported blackish flea faeces on the skin at the base of the hair and a typical "Christmas tree" pattern like alopecia mainly on the dorsal lumbosacral aspect, which also had similarities with the present case report, which gives the dog lion shape. Rynhoud*et al.* (2021) recommended that systemic drugs be used to alter the allergic reactions of dogs. FAD is best treated by eliminating exposure to the flea allergen, i.e., effective flea control.

Rust, (2017) when a complete flea control programme is used, more than 90% of cases can be controlled without additional treatment, and this approach is good to avoid flea allergic reactions, which strongly argues with present case management. Generally, pet owners should vaccinate and deworm their dogs periodically and control the flea environment in their home.

Acknowledgment

I am grateful to Addis Ababa University college of Veterinary medicine, Veterinary Teaching Hospital staff in particular Mrs. Marta and the owner of the animal for their contribution.

3.6. Case reports on Horse

3.6.1. Ulcerative Lymphangitis

Abstract

Ulcerative lymphangitis is a bacterial infection of the cutaneous lymphatic vessels. It is most frequently caused by *Corynebacterium pseudotuberculosis*. The case report discusses the case follow-up of a male draught horse presented to the Society for the Protection of Animals Abroad (SPANA), open air clinic, Bishoftu, Ethiopia, with a history of hind limb swelling and abscess formation at fetlock areas. The owner complained that the disease was recurrent and happened many times, and the disease resisted treatment for a long time. A few of these abscesses drained to the surface of the skin and contained blood. Based on clinical appearance, the main attention was given to ulcerative lymphangitis and the isolation of *Corynebacterium pseudotuberculosis*, which always causes vesicular abscesses. Bacterial culture from aspirates of abscesses and identification in accordance with its cultural and morphological characteristics confirmed the presence of *Corynebacterium pseudotuberculosis*. The faecal examination was positive for internal parasites. Based on the clinical examination and laboratory findings, the case was diagnosed and treated as ulcerative lymphangitis. Antibiotic therapy of procaine penicillin G (44,000 IU/kg, IM) for 5 days, zinc oxide 15%, and 20mg topical ointment cream (Ethiopian Pharmaceuticals Manufacturing Sh. Co.) The therapy indicated relief of swelling and the observation of a blackish scar formed at the inflamed area, and the owner was advised to care for the horse intensively. Generally, this paper recommends owners present their animals to the hospital as soon as their animal becomes ill or shows health problems.

Keywords*: Bacteria, Ulcerative lymphangitis, Corynebacterium pseudotuberculosis*

Introduction

Ulcerative lymphangitis is a bacterial infection primarily caused by *Corynebacterium pseudotuberculosis*, is an important infectious disease of horses (Olajide and Alaba, 2023). *Corynebacterium pseudotuberculosis* is gram-positive, soil-borne bacterium with a worldwide distribution, and it is the causative agent of various clinical manifestations in goats, sheep, cattle, horses, and humans (Spier, 2006). In human infection causes ulcerative lesions and associated necrotizing and suppurative granulomatous lymphadenitis (Recreo, 2016). This bacterium is host specific. Two different biotypes are described, biovar equi and biovar ovis, with horse strains differing from those affecting small ruminants in genetic characteristics respectively (Sutherland *et al*., 1998). It is characterized by painful inflammation, edematous swelling, and skin nodules on the lower limbs, usually the hindlimbs of the horse (Rendle, 2017).

Corynebacterium pseudotuberculosis disease in horses presents typically in one of three forms, including ulcerative lymphangitis, cutaneous abscesses, internal abscesses (Recreo, 2016). The most common form, deep intramuscular external abscessation, has been given the names such as chest abscess, pigeon fever, pigeon breast (Doherr *et al*., 1998). Internal *C. pseudotuberculosis* infections occur seasonally but more commonly two months after the typical external abscess presentation (Pratt *et al*., 2005).

Ulcerative lymphangitis form of the disease has a worldwide distribution and in contrast to the other forms of the disease which tend to occur in fall months (Recreo, 2016). The onset of lymphangitis is slow, and severe cellulitis and edema develop in the affected limbs with ulcerated nodules that exude thick, odorless, greenish, blood-tinged pus (Rand *et al*., 2016). The most remarkable clinical sign is non-weight-bearing lameness, associated with fever, deformity of the limbs in affected animals, lethargy, and anorexia (Recreo, 2016). The disease in horses is a generally self-limiting, suppurative inflammatory process most commonly affecting the pectoral, axillary, ventral abdominal and inguinal regions (Hall *et al*., 2001).

Mixed infection, soil-borne infection (sporadic), or sterile abscesses have also occurred (Brown and Bertone, 2003). Wound contamination and poor hygienic conditions in stables are predisposing factors to ulcerative lymphangitis. Sex, breed, or age has no significant effect on the prevalence of the disease (Radostits *et al*., 2007). Portal entry of this soil-borne organism is thought to be through abrasions in the skin or mucous membranes. Many insects have been incriminated as vectors for the transmission of the disease to horses, and recent studies have incriminated *Haematobiairritans*, *Musca domestica* and *Stomoxyscalcitrans*as vectors of this disease (Recreo, 2016).

Corynebacterium pseudotuberculosis possesses a cytotoxic surface lipid coat that appears to facilitate intracellular survival and abscess formation. It also produces a phospholipase exotoxin that increases vascular permeability, has an inhibitory effect on phagocytes and may facilitate spread of infection in the host (Spier, 2006). Factors that may be contributing to this increase in the number of cases include environmental and climatic conditions facilitating infection, such as changing insect populations, a variety of conditions that promote persistent survival of the organism in the soil (Kilcoyne *et al*., 2016).

A presumptive diagnosis of ulcerative lymphangitis in horses is based on presence of characteristic clinical signs such as pectoral or ventral abscesses in horses in endemic regions (Aleman *et al*., 1996). Culture of *C. pseudotuberculosis* from aspirated discharge provides a definitive diagnosis (Hall *et al*., 2001). Other potential tests include a polymerase chain reaction (PCR) method to identify bacteria isolated from abscesses (Quinn *et al*., 2011). Treatment of external abscesses typically consists of conservative management until the abscess is mature and can be surgically lanced, drained, and lavage (Braid and Ireland, 2022).The use of antimicrobial therapy for external abscesses is controversial, but it is the only option for internal abscesses and ulcerative lymphangitis (Rhodes *et al*., 2015). Generally, the present case study reports successful diagnosis, treatment and outcome of horse infected by *C. pseudotuberculosis.*

Case Description

History

On April 13th, cart horse stallion was presented to the Society for the Protection of Animals Abroad (SPANA), open air clinic, Bishoftu Ethiopia with major history of hind limb swelling and abscess formation at bottom of both hind legs. The owner complained about the disease recurrent occurrence many times and the disease resisted for long time. The examined skin abscesses were present around the hock joints to fetlock of hind limbs especially on right hind leg.The horse had a post-exercise skin problem, stuck skin hair due to high sweating and on physical examination it had hair loose during palpation.The main complaint according to the owner was blood like ooze from abscesses on the skin of the hind limbs, which had not responded to previous unknown treatment.

Clinical diagnosis

The clinical examination of the stallion tentatively diagnosed as ulcerative lymphangitis based on presence of characteristic lesions at the dorsal aspects of the hindlegs, below the hock and distally (figures 27B) and sample for culture of *C. pseudotuberculosis* from nodule discharge was taken for definitive diagnosis. Skin lesions, in the form of large nodules, swellings and ulcers, were encountered on both hind legs of the horse. Occasional lesions were observed on the right hind legs (figure 27C). Abscesses that have not yet ruptured were punctured with a fine needle, and exudates were withdrawn. Even, after nodule content drainage, there was a secretion of blood mixed discharge as show on figure (27B) below.

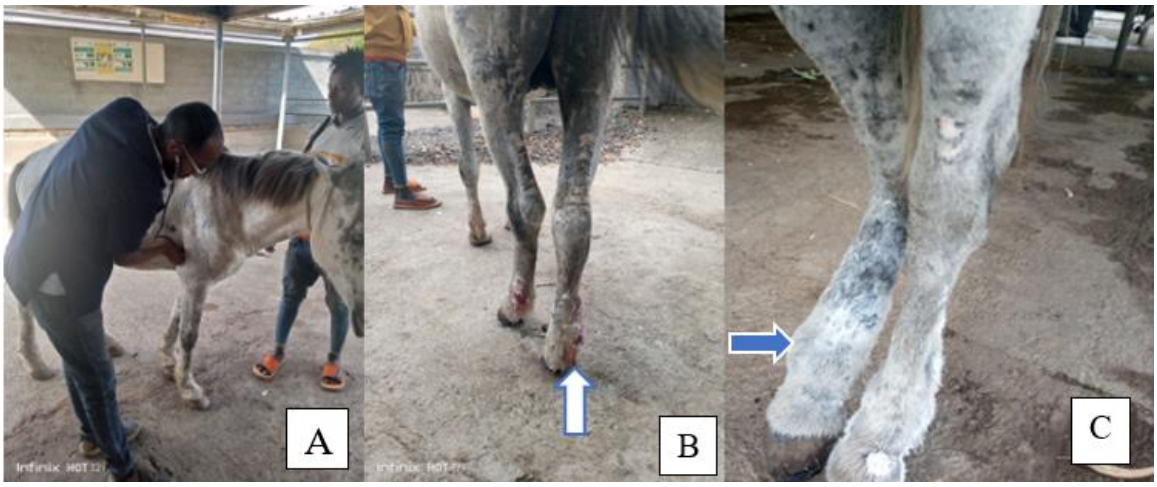


Figure 27: Horse presented to clinic with hind leg swelling**.**

The above figure shows (A) the clinical diagnosis of body parameters of the horse; (B) the causal appearance of the right hind leg, showing more swelling than the left one and a prominent scar formed from infection, at the first day of submission; and (C) the hind legs, especially the right hind leg, with more prominent swelling than the left leg after a week of follow-up.

Laboratory Examination

The definitive diagnosis of infection was made by culture of the nodules abscess content. The nodule abscess swab was taken from a fresh dissected nodule and preserved in tryptone water (Annex 16B) as a bacteria transport medium. It was taken to a microbiology laboratory and incubated for 24 hours at 37 C. Then, the sample was streaked on prepared blood agar and incubated in $37C^0$ for 24 hours. Small whitish-free colonies with week hemolysis were observed on cultured blood agar, which are special characteristics of *C. pseudotuberculosis* (Annex 16A), and gramme staining reveals road-shaped cocci gramme-positive bacteria (Annex 16C).

Case management and treatment

The case was managed by washing the swollen hind leg with enough tap water and diluted Savlon gently, then shaving the skin around the prominent abscess and swelling nodules. Some large, swollen nodules were opened and drained, disinfected with iodine tincture, and the owner was advised to apply zinc oxide (15%), 20mg (Ethiopian

Pharmaceuticals Manufacturing Sh. Co.), and daily for a week. After a week of admission, the case doesn't show a prominent prognosis. We decided to treat it with a systemic antibiotic injection. Procaine penicillin G (44,000 IU/kg, IM) for 5 days injection was recommended for five days, plus ivermectin 10mg, 6 ml, per Os.

Figure 28: Treatment and outcome of ulcerative lymphangitis infected horse.

The above figure shows (A) cleaning the left side leg of the horse; (B) left hind cleaning and application of zinc oxide at the second week; (C) right hind leg showing a good prognosis; and (D) horse after a three-week follow-up.

Discussion

Ulcerative lymphangitis is a bacterial infection of the lymphatic vessels of the skin in horses. This case report diagnoses and treats a stallion with ulcerative lymphangitis on the hind legs based on the clinical picture of the typical lesions, which was confirmed by bacterial culture from nodule lesions and confirmed *Corynebacterium pseudotuberculosis*. Hall *et al*. (2001) indicated that culture of *C. pseudotuberculosis* from aspirated discharge provides a definitive diagnosis.

The present stallion was treated with intensive wound management and systemic antibiotic follow-up, and a successful healing was observed. Similar findings were reported by Aleman and Spier (2002) and Zavoshti *et al*. (2009), who reported that Corynebacterium pseudotuberculosis is the classical cause of ulcerative lymphangitis in horses. Abu-Samra *et al*. (1980) previously investigated a similar case in the Sudan involving an 8-year-old horse.

The occurrence of C. pseudotuberculosis infection in horses varies markedly among years and seasons. The present study shows that the case became severed in March of the dry season; these observations are supported by Recreo (2016). Spier (2006) reported that sites for abscess formation commonly on limbs have similar findings to the present case report.

Smith (2009) reported lesions and abscesses commonly occurring on the hind limbs, especially on the fetlock joints, and extending to the hock joints or the proximal part of the limbs in cases of ulcerative lymphangitis, which have similar clinical findings to the current case report. Generally, this paper recommends owners should present their animals to the hospital as soon as their animal becomes ill or shows signs of a healthy problem.

Acknowledgment

I thank the SPANA-Ethiopia project veterinary clinic team members for their help during the treatment and management of this case.

5. CONCLUSION AND RECOMMENDATION

Agriculture is the basis of Ethiopia's economy and is the most important economic sector in terms of the generation of foreign currency. The sector is the primary source of livelihood for more than 88% of Ethiopian rural households that practice subsistence crop and livestock production. But the country couldn't earn much from the sector due to different problems, among which is animal disease. In addition to the existence of many different types of diseases in the country, the diagnosis of diseases based on only clinical signs worsens the health condition of the livestock. But investigation of any animal disease problem should be done through careful and thorough clinical examination with the objective of recognizing the nature of the infection so that effective treatment and, where practicable, control measures can be adopted.

So based on the above conclusion, the following points were recommended:

- Further and repeated case studies should be done to prepare treatment guidelines at a national level.
- Laboratory facilities should fulfilled in educational institutes with efficiently trained laboratory
- Inpatient animal care facilities need to be constructed in VTH.
- Diagnostic imaging tools need to be installed and applied in routine diagnoses.
- Farmers and farm attendants must get awareness training on the handling and management of diseases.

4. REFERENCES

Abd El-Rahim, I.H., Asghar, A.H., Fat'hi, S.M. and Ahmed, O.B., (2015): Serodiagnosis of *Listeria monocytogenes* infection in sheep. *International. Journal. Bioassays*, **4**:3847-3850.

Abdela N., (2017): Seroprevalence, risk factors, and distribution of foot and mouth disease in Ethiopia. Acta Tropica; **169**:125-132.

Abdeta, D., Zenebe, T., Fikirte, L., Negessu, D. and Hirpa, E., (2015): Retrospective Survey on Major Cattle Diseases in Guto Gida woreda, Eastern Wollega, Nekemte, Ethiopia. Science, Technology and Arts Research Journal, **4**(4):120-123.

Abdisa, T. and Tagesu, T., (2017): Review on Newcastle disease of poultry and its public health importance. *Journal of. Veterinary. Science. Technology*, **8**(3):441.

Abdisa, T., (2017): Review on practical guidance of veterinary clinical diagnostic approach. *International Journal Veterinary Science Research*, **3**(1):030-049.

Abdullah, F.F.J., Naidu, N.R.G., Sadiq, M.A., Abba, Y., Tijjani, A., Mohammed, K., Chung, E.L.T., Norsidin, M.J.M., Lila, M.A.M., Haron, A. et al., (2015): Prevalence of Moraxella ovis Infection in Goats under the Ladang AngkatProgramme, Universiti Putra Malaysia: A Cross-Sectional Study. *IOSR Journal of Agriculture and Veterinary Science*, **8** (11):99- 102.

Abdullah, F.F.J., Radzuan, N.S., Tijjani, A., Adamu, L., Abba, Y., Mohammed, K., Osman, A.Y., Roslim, N., Awang, D.N., Saharee, A.A. and Saad, M., (2014): Stage II keratoconjunctivitis in a goat: a case report. *IOSR Journal of Agriculture and Veterinary Science*, **7**(1):16-18.

Abebe, E. and Gugsa, G., (2018): A review on poultry coccidiosis. *Abyssinia Journal of Science and Technology*, **3**(1):1-12.

Abera, D. and Mossie, T., (2023): A review on pneumonic pasteurellosis in small ruminants. *Journal of Applied Animal Research*, **51**(1):1-10.

Abera, M., Demie, B., Aragaw, K., Regassa, F. and Regassa, A., (2010): Isolation and identification of Staphylococcus aureus from bovine mastitic milk and their drug resistance patterns in Adama town, Ethiopia. *Journal of Veterinary Medicine and Animal Health*, ***2***(3):29-34.

Abera, S., Wubit, T. and Nejash, A., (2016): Cerebral coenurosis in small ruminants: A review. *J Anim Sci Adv*, ***6***(3):1595-1608.

Abraham, G., Sintayehu, A., Libeau, G., (2005): Antibody seroprevalences against peste des petits ruminants (PPR) virus in camels, cattle, goats and sheep in Ethiopia, Preventive Veterinary Medicine, **70**(1-2): 51–57.

Abreu, C.C., Edwards, E.E., Edwards, J.F., Gibbons, P.M., Leal de Araujo, J., Rech, R.R. and Uzal, F.A., (2017): Blackleg in cattle: a case report of fetal infection and a literature review. *Journal of Veterinary Diagnostic Investigation*, ***29***(5): 612-621.

Adel, A.A., Abu-Elzein, E., Al-Naeem, A.M. and Amin, M., (2004): Serosurveillance for peste des petits ruminants (PPR) and rinderpest antibodies in naturally exposed Saudi sheep and goats. *Veterinarskiarhiv*, **74**(6): 459-465.

Admassu, B., Getnet, K., Shite, A. and Mohammed, S., (2015): Review on foot and mouth disease.*Academic Journal of Animal Diseases*,**4**(3): 160-169

Adzitey, F. and Huda, N., (2010): Listeria monocytogenes in foods: incidences and possible control measures, *African Journal of Microbiology Research,* **4**(25): 2848-2855.

Afata, AW., (2018): Isolation and identification of Mannheimiahaemolytica, Bibersteiniatrehalosi and Pasteurella multocida from cattle and sheep from selected areas of Ethiopia, *MSc Thesis, Addis Ababa University, Ethiopia.*

Ahmed, A.I. and Odisho, S.M., (2018): Isolation identification and pathotyping of Newcastle disease viruses form naturally infected chickens in iraqikurdistan region. *The Iraqi Journal. of Agri. Scencei*, **49**(1):132-141.

Ain-Fatin, R., Nur-Fazila, S.H., Yasmin, A.R., Sifa-Shaida, A.H., Ayuni, W.N. and Muhamad-Alif, Z., (2020): Canine parvovirus (CPV) infection in a great dane puppy: a case report. *Advantage Animal Veterinary Science*, **8**(10):1075-1078.

Akerstedt, J. and Hofshagen, M., (2004): Bacteriological investigation of infectious keratoconjunctivitis in Norwegian sheep. *Acta Veterinaria Scandinavica*, **45**(1):1-8.

Al Jassim, R., Gordon, G., and Rowe, J., (2003): The effect of basal diet on lactate-producing bacteria and the susceptibility of sheep to lactic acidosis. *Animal Science*,**77**:459-469.

Albornoz L, Sali G., (2012): Case report of enzootic cutaneous actinobacillosis in dairy heifers in a pasture-based production system. *Veterinaria (Montevideo)*; **48**:29–31.

Aleman, M, Spier, S., Wilson, WD., Doherr, M., (1996): Corynebacterium pseudotuberculosis infection in horses: 538 cases (1982-1993). *Journal of American Veterinary Medicine Association*, **209**(4):804-809.

Alemayehu, G., Zewde, G., Admassu, B., (2014): Seroprevalence of foot and mouth disease and associated economic impact on central Ethiopian cattle feedlots. *Journal of Veterinary Medicine Animal Health*; **6**:154-8.

Alemnew, E., Asfaw, T., Demis, C., Yitagesu, E. and Areaya, A., (2020). Clinical report on outbreaks of peste des petits ruminants in goat in north Shewa, Ethiopia. *Agricultural and Veterinary Sciences*, **4**:125-131.

Alemu, S., Kemal, J., Muktar, Y., Terefe, G., (2015): Immunological and Molecular Diagnostic Tests for Cestodes and Metacestodes: *Review. World Appl. Sci. J*., **33**(12): 1867-1879.

Alemu, S., Zegeye, B., (2011): Occurrence and Associated Risk Factors of Clinical Diseases of Farm Animals Presented to Gondar University Veterinary Clinic. *American-Eurasian Journal of Agriculture and Environimental Science*, 11: 237-241.

Alexander, D.J. and Senne, D.A., (2008): Newcastle disease, other avian paramyxoviruses, and pneumovirus infections. Diseases of Poultry.

Alexander, D.J., (2000): Newcastle disease and other avian paramyxoviruses. *Revue scientifique et technique (International Office of Epizootics)*, **19**(2):443–462.

Alexandersen, S, Zhang, Z, Donaldson, AI., 2002. Aspects of the persistence of foot-and-mouth disease virus in animals - the carrier problem. *Microbes Infection*, **4**: 1099–1110

Alexandersen, S., Zhang, Z., Donaldson, A.I. and Garland, A.J.M., (2003): The pathogenesis and diagnosis of foot-and-mouth disease. *Journal of comparative pathology*, **129**(1):1-36.

Al-Natour, M.Q., Suleiman, M.M. and Abo-Shehada, M.N., (2002): Flock-level prevalence of Eimeria species among broiler chicks in northern Jordan. *Preventive veterinary medicine*, **53**(4):305-310.

Amirul, F.M.A., Mokrish, A., Lai, K.S., Zamri-Saad, M., Zuki, A.B. and Hassim, H.A., (2016): Clinical, Biochemical and Histological Changes during Development of Pregnancy Ketosis in Goats. *Journal of Veterinary. Malaysia*, **28** (1):1-6.

Anderson, D.E. and Wang, L., (2016): Zoonotic Paramyxoviruses. *Clinical Virology*, 40: 949-966.

Anderson, R.J., House, J.K., Smith, B.P., Kinde, H., Walker, R.L., Steeg, B.J.V. and Breitmeyer, R.E., (2001): Epidemiologic and biological characteristics of salmonellosis in three dairy herds. *Journal of the American Veterinary Medical Association*, **219**(3):310-322.

Angelos, J.A. (2010b): Pathogenesis of Bacterial Infections in Animals. **4**:469-481. https://doi.org/10.1002/9780470958209.ch24

Apaa, T.T., Daly, J.M. and Tarlinton, R.E., (2016): Canine parvovirus (CPV-2) variants circulating in Nigerian dogs. *Veterinary Record Open*, **3**(1): e000198.

Arabkhazaeli, F., Nabian, S., Modirsaneii, M., Mansoori, B., &Rahbari, S., (2011): Bio-pathologic characterization of three mixed poultry Eimeria species isolates. Iranian Journal of Parasitology, **6**(4):23-32.

Argaw, A., (2016): Review on epidemiology of clinical and subclinical mastitis on dairy cows. *Food Sci Qual Manag*, ***52***(6):56-65.

Ashraf, A., Shah, MS., (2014): Newcastle Disease: Present status and future challenges for developing countries. African Journal of Microbial Research, **8**: 411-416.

Asresie, A., Zemedu C. (2015): Contribution of Livestock sector in Ethiopian Economy:A Review. Advanced Life Science and Technology 29.

Athira, G.R., Chandrasekaran, D., Arunaman, C.S., Senthil, N.R. and Vaiaramuthu, S., (2018): Successful management of keratoconjunctivitis in goats in Chennai. *Journal of Applied and Natural Science*,**10**(4):1196-1198

Attree, E., Sanchez-Arsuaga, G., Jones, M., Xia, D., Marugan-Hernandez, V., Blake, D. and Tomley, F., (2021): Controlling the causative agents of coccidiosis in domestic chickens; an eye on the past and considerations for the future. *CABI Agriculture and Bioscience*, **2**:1-16.

Avcioglu, H., Terim, K.A. and Yildirim, A., (2012): Clinical, morphological, and histopathological features of bovine coenurosis. *Rev Med Vet*, **163**(6):295-298.

Ayele, B., Tigre, W., Deresa, B., (2015): Investigation of major cattle production constraints in KembataTambaro zone of Southern Ethiopia using participatory epidemiology methods. *Tropical Animal Health and Production*.

Aziz, P.R., Kamal, K.K., Gaurav, K. and Saini, M., (2019): Actinobacillosis in a cross-bred heifer: A case report. *Journal of Entomology and Zoology Studies*, **7**(1):278-279.

Baker, S.E., Bashiruddin, J.B., Ayling, R.D. and Nicholas, R.A., (2001): Molecular detection of Mycoplasma conjunctivae in English sheep affected by infectious keratoconjunctivitis. *The Veterinary Record*, **148**(8): 240-241.

Balamurugan, V., Hemadri, D., Gajendragad, M.R., Singh, R.K. and Rahman, H., (2014): Diagnosis and control of peste des petits ruminants: a comprehensive review. *Virus disease*, **25**:39-56.

Balamurugan, V., Saravanan, P., Sen, A., Rajak, K.K., Venkatesan, G., Krishnamoorthy, P., Bhanuprakash, V., and Singh, R.K., (2012). Prevalence of peste des petits ruminants among sheep and goats in India. *Journal of veterinary science*, **13**(3):279-285.

Bartges, J., (2013): Rock n roll: Medical management of struvite and urate uroliths. *In Proceedings of the Western Veterinary Conference 2013.*

Bartges, J., and Callens, A., (2015): Urolithiasis. Vet. Clin. North Am. Small Anim. Pract., **45**: 747–768. https://doi.org/10.1016/j. cvsm.2015.03.001.

Bartges, J.W., (2016): Feline calcium oxalate urolithiasis: risk factors and rational treatment approaches. *Journal of Feline medicine and Surgery*, **18**(9):712-722.

Basavanagouda, H.G., Sarangamath, S.P., Kumar, M.A., Ramesh, H.A. and Sagare, R., (20210: Prevalence of subclinical ketosis in sheep in and around Ballari. *The Pharma Innovation Journal*,**10**(8): 930-933.

Bayne, J. E. (2023): Pregnancy Toxemia Therapeutic Options. Veterinary Clinics: *Food Animal Practice*, **39**(2): 293-305.

Belege, T., Kefale, A, Awraries K, Wondosen K, Malede E., (2017). Ruminant pneumonic pasteurellosis: review on epidemiology, pathogenesis, and virulence mechanism. *Academic Journal of Animal Disease*, **6**:30–39.

Bell, G., (2007): Recognition and treatment of encephalitic listeriosis in cattle. *UK Veterinary Livestock*, **12**(3):27-32.

Bello, M.B., Yusoff, K., Ideris, A., Hair-Bejo, M., Peeters, B.P. and Omar, A.R., (2018): Diagnostic and vaccination approaches for Newcastle disease virus in poultry: the current and emerging perspectives. *BioMed research international*.

Beyene, T.J., Eshetu, A., Abdu, A., Wondimu, E., Beyi, A.F., Tufa, T.B., Ibrahim, S. and Revie, C.W. (2017). Assisting differential clinical diagnosis of cattle diseases using smartphonebased technology in low resource settings: a pilot study. *BMC veterinary research*, **13**(1):1-11.

Bider, Zegeye, S.A. and Temesgen, W., (2013): Temporal distribution of diseases of farm animals presented to Gondar University Veterinary Clinic, Ethiopia, during the years 2007 to 2009. *Journal of Veterinary Medicine and Animal Health*, **5**(8):237-242.

Biffa, D., Jobre, Y. and Chakka, H., (2006): Ovine helminthosis, a major health constraint to productivity of sheep in Ethiopia. *Animal Health Research Reviews*, **7**(1-2): 107-118.

Binn, LN., Lazar, EC., Eddy, GA., Kajima, M., (1970). Recovery and characterization of a minute virus of canine. *Infection Immunology,* 1(5): 50.

Birhanu, M., Leta, S., Mamo, G. and Tesfaye, S., (2017): Prevalence of bovine subclinical mastitis and isolation of its major causes in Bishoftu Town, Ethiopia. *BMC research notes,* **10**(1):1-6.

Blackall, PJ., Bojesen, AM., Christensen, H., (2007). Reclassification of (Pasteurella) trehalosi as Bibersteiniatrehalosi gen. nov., comb. nov. Int J Syst EvolMicrobiol. **57**:666–674. https://doi.org/10.1099/ijs.0.64521-0

Blanchard, P.C., (2012): Diagnostics of dairy and beef cattle diarrhea. *Veterinary Clinics: Food Animal Practice*, **28**(3):443-464.

Blood, D.C., and Henderson, J.A., (1997): A textbook of veterinary medicine. 10th Edition. Cassell Ltd.

Bobbo, T., Biffani, S., Taccioli, C., Penasa, M. and Cassandro, M., (2021): Comparison of machine learning methods to predict udder health status based on somatic cell counts in dairy cows. *Scientific Reports*, **11**(1):1-10.

Boes, K.M. and Durham, A.C., (2017): Bone marrow, blood cells, and the lymphoid/lymphatic system. *Pathologic basis of veterinary disease*, **2**:724–804. doi: 10.1016/B978-0-323-35775-3.00013-8.

Bourne, D., Craig, M., Crittall, J., Elsheikha, H., Griffiths, K., Keyte, S., Merritt, B., Richardson, E., Stokes, L., Whitfield, V. and Wilson, A., (2018): Fleas and flea-borne diseases: biology, control & compliance. Companion Animal, **23**(4):204-211.

Braid, H.R, and Ireland, J.L., 2022. A cross-sectional survey of the diagnosis and treatment of distal limb cellulitis in horses by veterinary surgeons in the United Kingdom. *Equine Veterinary Education*, **34**(6): 234-244.

Braun, U., Stehle, C. and Ehrensperger, E., (2002): Clinical findings and treatment of listeriosis in 67 sheep and goats. *Veterinary Record*, **150**(2):38-42.

Breshears, M.A., and Confer, A.W., 2017. The urinary system. *Pathology. Basis Veterinary Disease*. **4**:621-637. https://doi.org/10.1016/B978-0-323- 35775-3.00011-4.

Brown, A.J. and Otto, C.M., (2008): Fluid therapy in vomiting and diarrhea. *Veterinary Clinics of North America: Small Animal Practice*, **38**(3):.653-675.

Brown, C., (2010): Surgical management of canine aural hematoma. *Lab animal*, **39**(4):104-105

Brown, C.M. and Bertone J., (2002): The 5- minute veterinary consult equine. *A Wolters Kluwer Co., Philadelphia.* 1:288- 289.

Brown, CC, Baker, DC., Barker, IK., (2007): Alimentary system. Pathology of domestic animals. Maxie MG, Jubb, Kennedy and Palmers. *Elsevier Saunders*, **5**(2):20-22.

Brown, M.H., Brightman, A.H., Fenwick, B.W. and Rider, M.A., (1998): Infectious bovine keratoconjunctivitis: a review. *Journal of Veterinary Internal Medicine*, ***12***(4):259-266.

Brozos, C., Mavrogianni, V.S. and Fthenakis, G.C., (2011): Treatment and control of peri-parturient metabolic diseases: pregnancy toxemia, hypocalcemia, hypomagnesemia. *Veterinary Clinics: Food Animal Practice*, **27**(1):105-113.

Brugere-Picoux, J., (2008): Ovine listeriosis. *Small Ruminant Research*, **76**(1-2):12-20.

Butterweck, V. and Khan, S.R., (2009: Herbal medicines in the management of urolithiasis: alternative or complementary? *Planta medica*, **75**(10):1095-1103.

Butterweck, V., and Khan, S.R., (2019): Herbal medicines in the management of urolithiasis: Alternative or complementary? Plant. Med., 75: 1095. https://doi.org/10.1055/s-0029-1185719.

Caffarena, R.D., Rabaza, A., Casaux, L., Rioseco, M.M., Schild, C.O., Monesiglio, C., Fraga, M., Giannitti, F. and Riet-Correa, F., 2018. Natural lymphatic ("atypical") actinobacillosis in cattle caused by Actinobacillusligniеresii. *Journal of Veterinary Diagnostic Investigation*, **30**(2):218-225.

Cal-Pereyra, L., González-Montaña, J.R., Benech, A., Acosta-Dibarrat, J., Martín, M.J., Perini, S., Abreu, M.C., Da Silva, S. and Rodríguez, P., (2015): Evaluation of three therapeutic alternatives for the early treatment of ovine pregnancy toxaemia. *Irish veterinary journal*, *68*(1):1-7.

Camara, A.C.L., Olinda, R.G., Batista, J.S., Feijó, F.M.C. and Almeida, R.D., (2014): Listeriosis in sheep associated with silage consumption in Rio Grande do Norte. *Brazilian Journal of Veterinary Science*, **21**(1):19-22.

Canning, M., Birhane, M.G., Dewey-Mattia, D., Lawinger, H., Cote, A., Gieraltowski, L., Schwensohn, C., Tagg, K.A., Watkins, L.K.F., Robyn, M.P. and Marshall, K.E., (2023): Salmonella Outbreaks Linked to Beef, United States, 2012–2019. *Journal of Food Protection*, **86**(5):100071.

Catry, B., (2005): Pasteurella and Mannheimia species from calves: differentiation and antimicrobial resistance. *PhD thesis Merelbeke, Belgium: Ghent University*.

Caupa I, Alexander, DJ., (2009): Avian Influenza and Newcastle Disease a Field and Laboratory Manual. *Milan: Springer-Verlag*.

Celi, P., (2011): Oxidative stress in ruminants. *Studies on veterinary medicine*, 191-231. DOI: 10.1007/978-1-61779-071-3_13.

Cerny, H.E., Rogers, D.G., Gray, J.T., Smith, D.R. and Hinkley, S., (2006). Effects of Moraxella (Branhamella) ovis Culture Filtrates on Bovine Erythrocytes, Peripheral Mononuclear Cells, and Corneal Epithelial Cells. Journal of Clinical Microbiology **44**(3):772-776. https://doi.org/10.1128/JCM.44.3.772-776.2006.

Chalchisa, T. and Deressa, F.B., (2016): Poultry coccidiosis: Prevalence and associated risk factors in extensive and intensive farming systems in Jimma Town, Jimma, Ethiopia. *Journal of Veterinary Medicine and Animal Health*, **8**(12):223-227.

Chanie, M., Negash, T. and Tilahun, S.B., (2009): Occurrence of concurrent infectious diseases in broiler chickens is a threat to commercial poultry farms in Central Ethiopia. *Tropical animal health and production*, **41**:1309-1317.

Chapman, D., (2002): Sustainable coccidiosis control in poultry production: The role of live vaccine. International Journal of Parasitology, **32**:617-620.

Chauhan, H.C., Lambade, P.S., Sen, A., Dadawala, A.I., Ranaware, P.B., Chandel, B., Joshi, D.V., Patel, S.S., Pankaj, K., Shah, N.M. and Kher, H.N., (2011): The use of pathological and histopathological techniques in the diagnosis of peste des petits ruminants in India. *VeterinariaItaliana*, **47**(1):41-47.

Chenais, E., Wennström, P., Kartskhia, N., Fischer, K., Risatti, G., Chaligava, T., Enukidze, T., Stahl, K. and Vepkhvadze, N.G., (2021): Perceptions of pastoralist problems: A participatory study on animal management, disease spectrum and animal health priorities of small ruminant pastoralists in Georgia. *Preventive veterinary*

medicine, 193:105412.https://doi.org/10.1016/j.prevetmed.2021.105412

Cho, Y.I. and Yoon, K.J., (2014): An overview of calf diarrhea-infectious etiology, diagnosis, and intervention. *Journal of veterinary science*, **15**(1):1-17.

Christodoulopoulos, G., (2007): Two rare clinical manifestations of coenurosis in sheep. *Veterinary parasitology*, **143**(3-4):368-370.

Clark, E. L, and Blake, D. P., (2012): Genetic mapping and coccidial parasites: Past achievements and prospects. Journal of Biosciences, **37**: 879-886.

Cockcroft, P., (2015): Bovine Medicine, John Wiley and Sons, 3:575.

Constable P., (2004): Antimicrobial is used in the treatment of calf diarrhea. Journal Veterinary International Medecine; **18**:8–17

Conway, D. P., and Mckenzie, M. E., (2007): Poultry Coccidiosis, Diagnostic and Testing Procedures. *Ames, Iowa: Blackwell publishing*, **3**: 37-40.

Cotmore, S.F., Agbandje-McKenna, M., Canuti, M., Chiorini, J.A., Eis-Hubinger, A.M., Hughes, J., Mietzsch, M., Modha, S., Ogliastro, M., Pénzes, J.J. and Pintel, D.J., (2019): ICTV virus taxonomy profile: Parvoviridae. *Journal of General Virology*, **100**(3):367-368.

Couacy-Hymann, E., Bodjo, C., Danho, T., Libeau, G. and Diallo, A., (2007b): Evaluation of the virulence of some strains of peste-des-petits-ruminants virus (PPRV) in experimentally infected West African dwarf goats. *The Veterinary Journal*, **173**(1):178-183.

Couacy-Hymann, E., Bodjo, S.C., Danho, T., Koffi, M.Y., Libeau, G. and Diallo, A., (2007a): Early detection of viral excretion from experimentally infected goats with pets des petits ruminant's virus. *Preventive Veterinary Medicine*, **78**: 85-88.

CSA, (2021). Agricultural sample survey volume ii, report on livestock and livestock characteristics.

Dagnall, G.J.R., (1994): The role of Branhamella (Moraxella) Ovis, Mycoplasma conjunctivae and Chlamydia psittaci in conjunctivitis of sheep. *British Veterinary Journal*, **150**(1):65-71.

Dalloul, R.A. and Lillehoj, H.S., (2006): Poultry coccidiosis: recent advancements in control measures and vaccine development. Expert review of vaccines, **5**(1):143-163.

Daly, R.F., Miskimins, D.W., Good, R.G. and Stenberg, T., 2009. Blackleg (Clostridium chauvoei infection) in beef calves: a review and presentation of two cases with uncommon pathologic presentations. *The Bovine Practitioner*, 153-158.

Davies, G., (2002): Foot and mouth disease. *Research in veterinary science*, **73**(3):195-199.

Davies, G., Genini, S., Bishop, S.C. and Giuffra, E., (2009): An assessment of opportunities to dissect host genetic variation in resistance to infectious diseases in livestock. *Animal*, **3**(3):415-436.

Day, M.J., Horzinek, M.C., Schultz, R.D. and Squires, R.A., (2016): WSAVA Guidelines for the vaccination of dogs and cats. *The Journal of small animal practice*, **57**(1):1-45.

De Sousa, Alves, F.S., (2020): Canine Parvovirus and Sepsis: SIRS Criteria Evaluation and Implementation of a PIRO Classification *(Doctoral dissertation, Universidade de Lisboa (Portugal).*

Defarges, A., Evason, M., Dunn, M. and Berent, A., (2020): Urolithiasis in small animals. *Clinical small animal internal medicine*, **3**:1123-1156.

Delano, M. L., Mischler, S. A., & Underwood, W. J. (2002). Biology and diseases of ruminants: Sheep, goats, and cattle. *Laboratory animal medicine*, **1**:519-614. Doi 10.1016/B978-012263951-7/50017-X

Demissie, T., Dawo, F., Sisay, T., (2014): Biochemical and antigenic characterization of Mannheimia, Pasteurella and mycoplasma species from naturally infected pneumonic sheep and Goats, Bishoftu, Ethiopia. *African Journal of Basic Application Science*.**6**:198–204.

Deressa, A., Tilahun, T., Tadesse, A., Beyene, M., Gebrewold, G. and Pal, M., (2012): Assessment of Coenurus cerebralis and its economic impact in sheep brain harvested at Ethiopian Health and Nutrition Research Institute, Ethiopia. *International Journal Livestock Res*, ***2***(2):217-226.

Dhama, K., Karthik, K., Tiwari, R., Shabbir, M.Z., Barbuddhe, S., Malik, S.V.S. and Singh, R.K., (2015): Listeriosis in animals, its public health significance (food-borne zoonosis) and advances in diagnosis and control: a comprehensive review. *Veterinary Quarterly*, **35**(4):211-235.

Dhand, N.K., Sandhu, K.S., Singh, J. and Randhawa, S.S., (2003): Outbreak of actinobacillosis in dairy cows. *The Veterinary record*, **153**(9):280.

Dhillon, K.S., Bansal, G., Singh, K. and Dhillon, S.S., (2020): Therapeutic management of concurrent flea allergy dermatitis and Dipylidium caninum infestation in a Pitbull dog.*Journal of Entomology and Zoology Studies,***8**(3): 2034-2036.

Diesel, A., (2017): Cutaneous hypersensitivity dermatoses in the feline patient: a review of allergic skin disease in cats. *Veterinary Sciences*, **4**(2):25.

Diop, M., Sarr, J. and Libeau, G. (2005): Evaluation of novel diagnostic tools for peste des petits ruminant's virus in naturally infected goat herds. Epidemiology and Infection, **133**(4):711- 717.

Disasa, D. D., Balcha, M. T., Negewo, S. M., Mamo, M. E., W/Sanbat, T. B. and Disasa, W. K., (2020): Review on the blackleg disease in domestic animals. *Global scientific journal*, **8**(8), 1133-1148.

Disassa, H., Teklu, T., Adem, H., (2013): A study on ovine pneumonic pasteurellosis: isolation and identification of Pasteurellae and their antibiogram susceptibility pattern in Haramaya District, Eastern Hararghe, Ethiopia. *Biomedical Veterinary Science*. **9**:1–8. https://doi.org/10.1186/1746-6148-9-239.

Doherr, MG, Carpenter, TE, Hanson, KM, Wilson, WD, Gardner, I., (1998): Risk factors associated with Corynebacterium pseudotuberculosis infection in California horses. *Preventive Veterinary Medicine*, **35**(4):229-239.

Driehuis, F., Wilkinson, J.M., Jiang, Y., Ogunade, I. and Adesogan, A.T., (2018): Silage review: Animal and human health risks from silage. *Journal of Dairy Science*, **101**(5):4093-4110.

Dvorska, J. and Saganuwan, S.A., (2015): A review on urolithiasis in dogs and cats. *Bulgarian Journal of Veterinary Medicine*, **18**(1):1-18.

Egwu, G.O., Faull, W.B., Bradbury, J.M. and Clarkson, M.J., (1989): Ovine infectious keratoconjunctivitis: a microbiological study of clinically unaffected and affected sheep's eyes with special reference to Mycoplasma conjunctivae. *The Veterinary record*, **125**(10):253-256.

El-Din., MMM., (2010): The significance of subarachnoid cerebrospinal fluids (CSF) in the development of metacestode of Coenuruscerebralis in sheep with reference to its pathological effect. *Global Veterinary*, **4**(4): 343-348.

Evangelista, L.D.M., Carvalho, Y.N.T., Branco, M., Lopes, R.R.F.B., Amorim Neto, J. and Quessada, A.M., (2012): Retrospective aural hematoma in dogs presented to a University Veterinary Hospital. *Acta VeterinariaBrasilica*, ***6***(1):48-51.

Evangelisti, M.A., Varcasia, A., Deiana, R., Zobba, R., Passino, E.S., Scala, A., Melosu, V., Pipia, A.P., Tamponi, C. and Manunta, M.L., (2016). Clinical evolution of cerebral coenurosis from invasive to chronic infection in sheep and goats. *The Journal of Infection in Developing Countries*, ***10***(10):1151-1155.

Falih, A.J., (2010): Surgical Treatment of Ear Haematoma in Dogs. *Basrah Journal of. Veterinary Research*, ***9***:65-70.

Fanatico, A., (2006): Parasite management for natural and organic poultry Coccidiosis. http://attra. ncat. Org/attar- pub/PDF/coccidiosis

FAO. Food And Agriculture Organization Ethiopia Country Programming Framework. 2012-2015. Food and Agriculture Organization of the United Nations office of the FAO representative In Ethiopia To AU And ECA- Addis Ababa, December, 2011. 2011. http://www.fao.org/3/a-aq402e.pdf.

Farjani Kish, G.H., Khodakaram-Tafti, A., Hajimohammadi, A. and Ahmadi, N., (2015): Clinical and morphopathological characteristics of an enzootic occurrence of acute coenurosis (Coenurus cerebralis) in a sheep herd. *Journal of Parasitic Diseases*, *39*: 280-283.

Fatoba, A.J. and Adeleke, M.A., (2018): Diagnosis and control of chicken coccidiosis: a recent update. *Journal of Parasitic Diseases*, **42**:483-493.

Fecteau M, House JK, Kotarski SF., (2003): Efficacy of ceftiofur for treatment of experimental salmonellosis in neonatal calves. *American Journal of Veterinary Research*; **64**:918–25.

Fentahun, T. and Fresebehat, A., (2012): Listeriosis in small ruminants: a review. *Adv Biol Res*, **6**(6):202-209.

Fernando, M.A., (2019): Eimeria: infections of the intestine. In *Coccidiosis of man and domestic animals*. CRC Press. **2**:63-76.

Freisl, M., Speck, S., Truyen, U., Reese, S., Proksch, A.L. and Hartmann, K., (2017): Faecal shedding of canine parvovirus after modified-live vaccination in healthy adult dogs. *The Veterinary Journal*, **219**:15-21.

Galdhar, C.N and Roy, S., (2003): Recent trends in therapeutic management of mastitis. Journal of Remount Veterinary Corps. **42** (1): 5-11.

Ganguly, S., Trivedi, S., Patil, S., Das, O. and Gohil, B., (2018): Recent Research Trends in Veterinary Sciences and Animal Husbandry. *International Journal Medicine*, *2*:548.

García, J.A., Micheloud, J.F., Campero, C.M., Morrell, E.L., Odriozola, E.R. and Moreira, A.R., (2016): Enteric listeriosis in grazing steers supplemented with spoiled silage. Journal of Veterinary Diagnostic Investigation, **28**(1):65-69.

Garde, E., Kutz, S., Schwantje, H., Veitch, A., Jenkins, E., and Elkin, B. (2005): Examining the risk of disease transmission between wild Dall's sheep and

mountain goats, and introduced domestic sheep, goats, and llamas in the Northwest Territories. *Other Publications in Zoonotics and Wildlife Disease*, 29.

Gasanov, U., Hughes, D. and Hansbro, P.M., 2005. Methods for the isolation and identification of Listeria spp. and Listeria monocytogenes: a review. *FEMS microbiology reviews*, **29**(5):851-875.

Gelagay, A., (1996): Epidemiological and serological investigation of multi-factorial ovine respiratory disease and vaccine trial on the high land of North Shewa, Ethiopia. *Doctor in Veterinary Medicine Thesis*.

Gelana, M., (2016): Seroprevalence study on foot and mouth disease in selected districts of western Oromia. *Journal of Pharmaceutical Alternative Medicine*; **13**:15-8.

Gelormini, G., Gauthier, D., Vilei, E.M., Crampe, J.P., Frey, J. and Ryser-Degiorgis, M.P., (2016): Infectious keratoconjunctivitis in wild Caprinae: merging field observations and molecular analyses sheds light on factors shaping outbreak dynamics. *BMC veterinary research*, **13**(1):1-19. DOI 10.1186/s12917-017-0972-0.

Gohari, I.M. and Prescott, J.F., (2022): Clostridium. *Veterinary Microbiology*, 309-334.

Gordan E, D., (2012): Ewe and flock health overview. Proceedings of the 18th Annual Dairy Sheep Association of North America Symposium.50-63.

Grifffin, CE., (2006): Flea Allergy Dermatitis. In: Saunders manual of small animal practice. *Elsevier*, **3**:474-480.

Griffin, C.E., (2013): Diagnosis of canine atopic dermatitis. *Veterinary allergy*, **2**: 70-77.

Gross, T.L. and Halliwell, R.E.W., (1985): Lesions of experimental flea bite hypersensitivity in the dog. *Veterinary Pathology*, **22**(1):78-81.

Gyles, C.L., Prescott, J.F., Songer, J.G. and Thoen, C.O., (2004): Pathogenesis of Bacterial Infection in Animals, *Blackwell, Ltd*, **3**:125- 128.

Gyorffy, A. and Szijarto, A., (2014): A new operative technique for aural haematoma in dogs: A retrospective clinical study. *Acta VeterinariaHungarica*, ***62***(3): 340-347).

Hailu, D., Abera, B., Lemma, D., Eticha, E. and Deferes, D., (2017): Outbreak investigation and epidemiology of foot-and-mouth disease virus circulating in central areas of Ethiopia. *Academic Journal of Animal Diseases*, **6**(3):75-82.

Haligur, M.., Aydogan, A., Ozmen, O. and Ipek, V., (2019): Immunohistochemical evaluation of natural cases of encephalitic listeriosis in sheep. *Biotechnic and Histochemistry*, **94**(5):341-347.

Hall, J, Weir, S, Ladlow, J., (2016): Treatment of canine aural haematoma by UK veterinarians. *Journal of Small Animal Practice*.;**57**:360–364.

Hall, K, McCluskey, BJ, Cunningham, W., (2001): Corynebacterium pseudotuberculosis infections (Pigeon Fever) in horses in Western Colorado: An epidemiological investigation. *Journal Equine Veterinary Science*, **21**(6):284-286.

Halliwell, R., Banovic, F., Mueller, R.S. and Olivry, T., (2021): Immunopathogenesis of the feline atopic syndrome. *Veterinary dermatology*, **32**(1):13-e4.

Hansford, J., (2020): Blackleg without skeletal muscle involvement as a cause of sudden death in unvaccinated calves. *The Canadian Veterinary Journal*, ***61***(2):189.

Harmeyer, J. and Schlumbohm, C., (2006): Pregnancy impairs ketone body disposal in late gestating ewes: Implications for onset of pregnancy toxaemia. *Research in Veterinary Science*, **81**(2):254-264.

Harwood, D.G., Higgins, R.J. and Aggett, D.J., (2007): Outbreak of intestinal and lingual Clostridium chauvoei infection in two-year-old Friesian heifers. *The Veterinary Record*, **161**(9):307.

Hasan, M., Islam, A., Akhter, S., Chowdhury, T.J., Riaz, M.M., Kader, M.A. and Hossain, M.M., 2016. Clinical cases of foot and mouth disease (FMD) in cattle recorded at upazila veterinary hospital, Kulaura, Bangladesh. *Veterinary Research International*, **4**(3):110-113.

Hasan, M.M., Jalal, M.S., Bayzid, M., Sharif, M.A.M. and Masuduzzaman, M., (2016): A comparative study on canine parvovirus infection of dog in Bangladesh and India. *Bangladesh Journal of Veterinary Medicine*, **14**(2):237-241.

Heckler, R.F., de Lemos, R.A., Gomes, D.C., Dutra, I.S., Silva, R.O., Lobato, F.C., Ramos, C.A. and Brumatti, R.C., (2018): Blackleg in cattle in the state Mato Grosso do Sul, Brazil: 59 cases. *PesquisaVeterináriaBrasileira*, **38**: 06-14.

Herdt, T.H. and Gerloff, B.J., (2008). Chapter Ketosis. *Current Veterinary Therapy: Food Animal Practice*,141.

Hernandez, J., Benedito, J.L., Abuelo, A. and Castillo, C., (2014): Ruminal acidosis in feedlot: from aetiology to prevention. *The Scientific World Journal*. https://doi.org/10.1155/2014/702572

Herrera, E. and Ortega-Senovilla, H., (2018): Metabolism in normal pregnancy. *Textbook of diabetes and pregnancy*, 17-27.

Hewitt, J. and Bajwa, J., (2020): Aural hematoma and it's treatment: a review. *The Canadian Veterinary Journal*, ***61***(3): 313.

Holley, R.A., Arrus, K.M., Ominski, K.H., Tenuta, M. and Blank, G., (2006): Salmonella survival in manure-treated soils during simulated seasonal temperature exposure. *Journal of environmental quality*, **35**(4):1170-1180.

Holschbach, C.L. and Peek, S.F., (2018): Salmonella in dairy cattle. *Veterinary Clinics: Food Animal Practice*, **34**(1):133-154.

Hoxha, Z., (2017): Types of Stones and their Frequency in Dogs. *ANGLISTICUM. Journal of the Association-Institute for English Language and American Studies*, ***6***(7):75-80.

Hurley, K.F., Kraus, S. and Sykes, J.E., (2021): Prevention and management of infection in canine populations. In *Greene's Infectious Diseases of the Dog and Cat*. **2**:197-203. WB Saunders.

Hussain, R., Javed, M.T., Khan, I., Siddique, A.B., Aslam, B., Ghaffar, A., Tariq, N., Qayyum, A. and Wareth, G., (2019): Pathological and clinical investigations of an outbreak of Blackleg disease due to C. chauvoei in cattle in Punjab, Pakistan. *The Journal of Infection in Developing Countries*, **13**(09): 786-793.

Ibrahim, N., (2017): Review on mastitis and its economic effect. *Canadian Journal of Research*, **6**:13-22.

Ismail, ZB., (2017): Mastitis vaccines in dairy cows: recent developments and recommendations of application. *Veterinary World*, **10**(9):1057–62.

Jana, D. and Ghosh, N. (2013): Essentials of Veterinary Practice. *Delhi: Daya Publishing House; A Division Of Astral International (P) Ltd*, 508:11

Jaramillo-Lopez, E., Itza-Ortiz, M.F., Peraza-Mercado, G. and Carrera-Chávez, J.M., (2017): Ruminal acidosis: strategies for its control. *Austral journal of veterinary sciences*, **49**(3):139-148.

Jarso, D., (2015): Epidemiology of village chicken diseases: a longitudinal study on the magnitude and determinants of morbidity and mortality—the case of Newcastle and infectious bursal disease *(Doctoral dissertation, Addis Ababa University).*

Jesse, Abdullah, F.F., Tijjani, A., Adamu, L., Teik, Chung, E.L., Abba, Y., Mohammed, K., Saharee, A.A., Haron, A.W., Sadiq, M.A., and Mohd, A.M.L., (2014): Pneumonic pasteurellosis in a goat. *Iranian Journal of Veterinary Medicine*, **8**(4):293-296.

Ji, X., Liu, N., Wang, Y., Ding, K., Huang, S. and Zhang, C., (2023): Pregnancy Toxemia in Ewes: A Review of Molecular Metabolic Mechanisms and Management Strategies. *Metabolites*, ***13***(2):149.

Jilo, K., (2016): Peste des petits ruminants (PPR): global and Ethiopian aspects. a standard review. *Global Veterinaria*, **17**(2):142-153.

Jones, G.M. and Bailey, T.L., (2009): Understanding the basics of mastitis. *Virginia Tech Invent the Future,* 404-233.

Jones, Y.E., Chappell, S., McLaren, I.M., Davies, R.H. and Wray, C., (2002): Antimicrobial resistance in Salmonella isolated from animals and their environment in England and Wales from 1988 to 1999. *Veterinary Record*, **150**(21):649-654.

Jubb, K.V.F., Kennedy, P.C. and Palmer, N., (2012): *Pathology of domestic animals*. *Academic press*,**2**(92):12263

Juleff, N., Windsor, M., Reid, E., Seago, J., Zhang, Z., Monaghan, P., Morrison, I.W. and Charleston, B., 2008. Foot-and-mouth disease virus persists in the light zone of germinal centers. *PloS one*, **3**(10):3434.

Kabir, M.H., Reza, M.A., Razi, K.M.A., Parvez, M.M., Bag, M.A.S. and Mahfuz, S.U. (2010): A report on clinical prevalence of diseases and disorders in cattle and goat at the Upazilla Veterinary Hospital, Ulipur, Kurigram. International Journal of Biological Research 2:17-23.

Kahn, C. (2005):The Merck Veterinarian Manual, 9th ed, Merck & Company, Incorporated, New Jersey, USA,828-830

Kahn, C. M., (2008): The Merck Veterinary Manual. *White house station*, **9**:2201-2206.

Karthik, K., Manimaran, K., Mahaprabhu, R. and Shoba, K., (2017): Isolation of Moraxella sp. from cases of keratoconjunctivitis in an organized sheep farm of india. *Open Journal of Veterinary Medicine*, **7**(10):138-143.

Kehrenberg, C., Schulze-Tanzil, G., Martel, J. L., Chaslus-Dancla, E., and Schwarz, S. (2001): Antimicrobial resistance in Pasteurella and Mannheimia: epidemiology and genetic basis. *Veterinary research*, **32**(3-4):323-339.

Kelay, A. and Assefa, A., (2018): Causes, Control and Prevention Methods of Pregnancy Toxemia in Ewe: *A Review. Journal of Life Science and Biomedicine*: **8**(4): 69-76.

Kenyon, P.R., Maloney, S.K. and Blache, D., (2014): Review of sheep body condition score in relation to production characteristics. *New Zealand Journal of Agricultural Research*, **57**(1):38-64.

Kersting, A.L., (2008): Listeria monocytogenes, zoonotic exposure, rural residency, and prevention (*Doctoral dissertation, The Ohio State University*).

Khan, A., Saleemi, M.K., Ali, F., Abubakar, M., Hussain, R., Abbas, R.Z. and Khan, I.A., (2018): Pathophysiology of peste des petits ruminants in sheep (Dorper &Kajli) and goats (Boer &Beetal). *Microbial pathogenesis*, **117**:139-147.

Khan, Y. R., Durrani, A. Z., Muhammad, I. J. A. Z., Ahmad, A. L. I., Khan, R. L., Hussain, K., and Rabbani, A. H. (2021): Determination of Hemato-Biochemical Biomarkers, Associated Risk Factors and Therapeutic Protocols for Pregnancy Toxemia in Beetal Goats. *KafkasÜniversitesiVeterinerFakültesiDergisi*, *27*(4).

Khasanah, H., Setyawan, H.B., Yulianto, R. and Widianingrum, D.C., (2021): Subclinical mastitis: Prevalence and risk factors in dairy cows in East Java, Indonesia. *Veterinary World*, **14**(8): 2102.

Kheysin, Y.M., (2013): Life cycles of coccidia of domestic animals. Elsevier.

Khorajiya, JH, Pandey, S, Ghodasara, PD., (2015): Patho-epidemiological study on Genotype-XIII Newcastle disease virus infection in commercial vaccinated layer farms. *Vet World*. ;**8**(3):372–381.

Kibebew, K., 2017. Bovine mastitis: A review of causes and epidemiological point of view. *Journal Biological Agricultural Health care*, **7**(2):1-14.

Kilcoyne, I., Spier, S.J., Carter, C.N., Smith, J.L., Swinford, A.K. and Cohen, N.D., (2014): Frequency of Corynebacterium pseudotuberculosis infection in horses across the United States during a 10-year period. *Journal of the American Veterinary Medical Association*, ***245***(3):309-314.

Kimani, W.K., (2020): Occurrence and Outcomes of Urolithiasis and Other Urinary Tract Conditions in Domestic Cats in Nairobi *(Doctoral dissertation, University of Nairobi).*

Kinunghi, S. M., Tilahun, G., Hafez, H. M., Woldemeskel, M., Kyule, M., Grainer, M., and Baumann, M. P., (2004): Assessment of economic impact caused by poultry

coccidiosis in small and large poultry farms in DebreZeit, Ethiopia. *International Journal Poultry Science*, **3**(11) 715- 718.

Kish, G.F., Naeini, A.T., Namazi, F. and Ariyzand, Y., (2014): Atypical actinobacillosis in a dairy cow. *Journal Animal Poultry Science*, 1:1-7.

Kneipp, M., Green, A.C., Govendir, M., Laurence, M., and Dhand, N.K., 2021. Risk factors associated with pinkeye in Australian cattle. *Preventive Veterinary Medicine*, 194:105432.

Koondhar, M.Q., Khaskheli, A.A. and Jariko, A.A., (2020): Magnesium hydroxide as curative strategy against lactic acidosis in Goat. *Asian Journal of Dairy and Food Research*, **39**(2):121-125.

Kumar, P., Kumar, R., Sharma, A. and Tripathi, B.N., (2002): Pathology of peste des petits ruminants (PPR) in goats and sheep: spontaneous study. *Indian Journal Veterinary pathology*, ***26***(1&2):15-8.

Kumar, S., Kumar, R., Mishra, K.K. and Mondal, M., (2013): Therapeutic management of flea allergy dermatitis (FAD) in a dog. *IntasPolivet*, **14**(2):272-273.

Kumari, T., Bhakat, C. and Choudhary, R.K., (2018): A review on subclinical mastitis in dairy cattle. *International Journal Pure Application Biosciences* **6**(2): 1291-1299.

Lakew, B.T., Fayera, T. and Ali, Y.M., (2019): Risk factors for bovine mastitis with the isolation and identification of Streptococcus agalactiae from farms in and around Haramaya district, eastern Ethiopia. *Tropical animal health and production*, **51**:1507-1513.

Lee BH, Kim WH, Jeong J, Yoo J, Kwon YK, Jung BY, Kwon JH, Lillehoj HS, Min W (2010): Prevalence and cross-immunity of Eimeria species on Korean chicken farms. *Journal of Veterinary Medicine Science*,**72**(8):985–989.

Legas, M., (2022): Molecular Detection and Antibiogram of Pasteurella Multocida and MannheimiaHaemolyticaisolates from Suspected Pneumonic Sheep in Selected Districts of South Wollo, Ethiopia (*Doctoral dissertation*).

Legesse, A., Abayneh, T., Mamo, G., Gelaye, E., Tesfaw, L., Yami, M., Belay, A., (2018): Molecular characterization of Mannheimiahaemolytica isolates associated with pneumonic cases of sheep in selected areas of Central Ethiopia. *BMC Microbiol*. **18**:1–10.

Lewis, C.J., (2007): Clostridial diseases. *Diseases of sheep*, 156-168.

Lima, M.S., Pascoal, R.A., Stilwell, G.T. and Hjerpe, C.A., (2012): Clinical findings, blood chemistry values, and epidemiologic data from dairy goats with pregnancy toxemia. *The Bovine Practitioner*,102-110.

Linder, M., Paduch., JH, Grieger, AS., Mansion-de Vries E., Knorr N, Zinke C., (2013): Cure rates of chronic subclinical Staphylococcus aureus mastitis in lactating dairy cows after antibiotic therapy. *Berl Munch TierarztlWochenschr*, **126**(7–8):291–6

Ling, G.V., Thurmond, M.C., Choi, Y.K., Franti, C.E., Ruby, A.L. and Johnson, D.L., (2003): Changes in proportion of canine urinary calculi composed of calcium oxalate or struvite in specimens analyzed from 1981 through 2001. *Journal of veterinary internal medicine*, **17**(6):817-823.

Lombard, MF, (2012): FAO/OIE Global Conference on Foot and Mouth Disease Control.

Lorenz I, Gentile A., (2014): D-lactic acidosis in neonatal ruminants. *Veterinary Clinic North America Food Animal Practice*, **30**:317–31.

Lorenz, I., (2015): Subacute Ruminal Acidosis. In Merck Veterinary Manual. https://www.merckvetmanual.com/digestive-system/diseases-of-the-ruminant-forestomach/subacute-ruminalacidosis (Accessible online in June 2020).

Low, W., Uhl, J., Kass, P., Ruby, A., and Westropp, J., (2006): Evaluation of trends in urolith composition and characteristics of dogs with urolithiasis: 25,499 cases (1985-2006). J. Am. Vet. Med. Assoc., **236**(2): 193–200. https://doi. org/10.2460/javma.236.2.193

Lulich, J.P., Berent, A.C., Adams, L.G., Westropp, J.L., Bartges, J.W. and Osborne, C.A., (2016): ACVIM small animal consensus recommendations on the treatment

and prevention of uroliths in dogs and cats. *Journal of veterinary internal medicine*, **30**(5):1564-1574.

Lulich, J.P., Osborne, C.A. and Albasan, H., (2011): Canine and feline urolithiasis: diagnosis, treatment, and prevention. *Nephrology and urology of small animals*, **2**(5):685-706.

MacPhail, C., (2016): Current Treatment Options for Auricular Hematomas. *Veterinary Clinics of North America: Small Animal Practice*, **46**(4):635–641. doi: 10.1016/j.cvsm.2016.01.003

Magothe, T.M., Okeno, T.O., Muhuyi, W.B. and Kahi, A.K., (2012): Indigenous chicken production in Kenya: I. Status. *World's Poultry Science Journal*, **68**(1):119–132

Mahajan, S., Agrawal, R., Kumar, M., Mohan, A. and Pande, N., (2012): Sandwich ELISA based evaluation of clinical samples for Peste des petits ruminants (PPR) virus detection. *Small Ruminant Research*, **106**(2-3):206-209.

Makker, S.S., Singh, J. and Arora, S., (2021): Homeopathic treatment of aural hematoma in a Labrador dog: A case report. *Indian Journal of Veterinary Medicine.* **41**(1): 86-88.

Março, K.S., da Costa Neto, J.J., Tsuruta, S.A., de Souza Costa, A., Borin-Crivellenti, S., Medeiros-Ronchi, A.A. and Joao, C.F., (2021): Lymphoplasmacytic hemorrhagic cystitis in dog: case report. *Acta VeterinariaBrasilica*, ***15***(1). https://doi.org/10.21708/avb.2021.15.1.9320.

Margineda, C.A., Odriozola, E., Moreira, A.R., Cantón, G., Micheloud, J.F., Gardey, P., Spetter, M. and Campero, C.M., (2013): Atypical actinobacillosis in bulls in Argentina: granulomatous dermatitis and lymphadenitis. *PesquisaVeterináriaBrasileira*, 33:1-4.

Marru, H.D., Anijajo, T.T. and Hassen, A.A., (2013): A study on Ovine pneumonic pasteurellosis: Isolation and Identification of Pasteurellae and their antibiogram susceptibility pattern in Haramaya District, Eastern Hararghe, Ethiopia. *BMC Veterinary Research*, **9**(1):1-8.

Maxie, M.G., Jubb, K.V.F., Kennedy, P.C. and Palmer, N., (2007): pathology of domestic animals. *Elsevier Saunders*.

McDougald, L.R., Cervantes, H.M., Jenkins, M.C., Hess, M. and Beckstead, R., (2020): Protozoal infections. *Diseases of poultry*, **4**:1192-1254.

McDougall, S., (1998): Efficacy of two antibiotic treatments in curing clinical and subclinical mastitis in lactating dairy cows. *New Zealand veterinary journal*, **46**(6) :226-232.

McDougall, S., Bryan, M.A. and Tiddy, R.M., (2009): Effect of treatment with the nonsteroidal antiinflammatory meloxicam on milk production, somatic cell count, probability of re-treatment, and culling of dairy cows with mild clinical mastitis. *Journal of Dairy Science*, **92**(9): 4421-4431.

McGuirk, S.M., (2008): Disease management of dairy calves and heifers. *Veterinary Clinics of North America: Food Animal Practice*, **24**(1):139-153.

McLaws, M., Ribble, C., Stephen, C., McNab, B. and Barrios, P.R., (2007): Reporting of suspect cases of foot-and-mouth-disease during the 2001 epidemic in the UK, and the herd sensitivity and herd specificity of clinical diagnosis. *Preventive veterinary medicine*, **78**(1):12-23.

Mekibib, B., Mikir, T., Fekadu, A. and Abebe, R., (2019): Prevalence of pneumonia in sheep and goats slaughtered at Elfora Bishoftu export abattoir, Ethiopia: A pathological investigation. *Journal of veterinary medicine*,https://doi.org/10.1155/2019/5169040

Mekonnen, S.A., Lam, T.J.G.M., Hoekstra, J.V.P.M.G., Rutten, V.P., Tessema, T.S., Broens, E.M., Riesebos, A.E., Spaninks, M.P. and Koop, G., (2018): Characterization of Staphylococcus aureus isolated from milk samples of dairy cows in small holder farms of North-Western Ethiopia. *BMC veterinary research, 14*:1-8.

Melendez PG, Giangreco M, Mcnulty ME. An outbreak of actinobacillosis (woody tongue) in a beef cattle herd in central Florida. *Large Animal Practice*. (1999): **20**:15-18.

Merck Veterinary Manual., (2016): Fleas and Flea Allergy Dermatitis. *Merck and Co., Inc. Rahway, NJ, USA*, 11: 880-882.

Mesfine, M., Nigatu, S., Belayneh, N. and Jemberu, W.T., (2019): Sero-epidemiology of foot and mouth disease in domestic ruminants in Amhara Region, Ethiopia. *Frontiers in Veterinary Science*, **6**:11:130.

Michael, G. B., Bosse, J. T., & Schwarz, S., (2017): Antimicrobial resistance in Pasteurellaceae of veterinary origin. *MicrobiolSpectr 2018*; doi: 10.1128/microbiolspec. ARBA-0022-2017.

Milne MH, Barrett DC, Mellor DJ, Oneill R, Fitzpatrick JL. Clinical recognition and treatment of bovine cutaneous actinobacillosis. *Veterinary Record.* (2001): **148**:273-274.

Miran, M.B., Nzalawahe, J., Kassuku, A.A. and Swai, E.S., 2015. Prevalence of coenurosis in sheep and goats at three slaughter slabs in Ngorongoro District, Tanzania. *Tropical animal health and production*, **47**:1591-1597.

Mitku, F., Fentie, T., Tekle, Z., Mihret, T., Abebaw, R., (2017): Review on ovine respiratory disease complex in Ethiopia: significance, causes and possible management methods. *Academic Journal of Animal Disease*. **6**:13–22. https://doi.org/10.5829/idosi.ajad.2017.13.22.

Mohammadi, P., Zakian, A., Farjanikish, G., Yeganeh, F.F., Raisi, A. and Samadipoor, M., (2021): Clinical report of Coenurosis cerebralis outbreak in Lori sheep. *Comparative Clinical Pathology*, **30**(5):729-733.

Mohamoud, A., Tessema, E. and Degefu, H., (2011): Seroprevalence of bovine foot and mouth disease (FMD) in Awbere and Babille districts of Jijiga zone, Somalia

Regional State, Eastern Ethiopia. *African Journal of Microbiology Research*, **5**(21):3559-3563.

Mohler, V.L., Izzo, M.M. and House, J.K., (2009): Salmonella in calves. Veterinary clinics of North America: Food animal practice, **25**(1):37-54.

Mondal, B., Sen, A., Chand, K., Biswas, SK., De, A., Rajak, KK., Chakravarti, S., (2009): Evidence of mixed infection of peste des petits ruminant's virus and bluetongue virus in a flock of goats as confirmed by detection of antigen, antibody, and nucleic acid of both the viruses. *Tropical Animal Health Production*, **41**(8):1661–7.

Mongini, A., and Van Saun, R. J., (2023): Pregnancy Toxemia in Sheep and Goats. *Veterinary Clinics: Food Animal Practice*, **39**(2): 275-291.

Mossie, T. and Abera, D., (2022): A Compressive Review on Newcastle Disease Virus in Ethiopia. *Journal of veterinary science and technology*, **13**(6):30

Motha, M.X.J., Frey, J., Hansen, M.F., Jamaludin, R. and Tham, K.M., (2003): Detection of Mycoplasma conjunctivae in sheep affected with conjunctivitis and infectious keratoconjunctivitis. *New Zealand veterinary journal*, **51**(4):186-190.

Moxley, R.A., 2022. Enterobacteriaceae: Salmonella. *Veterinary Microbiology*, pp.75-87.

Mueller, R.S., Janda, J., Jensen-Jarolim, E., Rhyner, C. and Marti, E., (2016): Allergens in veterinary medicine. *Allergy*, **71**(1):27-35.

Mukasa-Mugerwa, E., Lahlou-Kassi, A., Anindo, D., Rege, J.E.O., Tembely, S., Tibbo, M. and Baker, R.L., (2000): Between and within breed variation in lamb survival and the risk factors associated with major causes of mortality in indigenous Horro and Menz sheep in Ethiopia. *Small Ruminant Research*, **37**(1-2):1-12.

Muktar, Y., Mamo, G., Tesfaye, B. and Belina, D., (2015): A review on major bacterial causes of calf diarrhea and its diagnostic method. *Journal of Veterinary Medicine and Animal Health*, **7**(5):173-185.

Mylonakis, M.E., Kalli, I. and Rallis, T.S., (2016): Canine parvoviral enteritis: an update on the clinical diagnosis, treatment, and prevention. *Veterinary Medicine: Research and Reports*, **9**: 91-100.

Nagaraja TG, Lechtenberg KF., (2007): Acidosis in feedlot cattle. Veterinary Clinic North America Food Animal Practice; **23**:333–50.

Naglic, T., Seol, B., Hajsig, D., Busch, K., Frey, J. and Lojkic, M., (2000): Epidemiological and microbiological study of an outbreak of infectious keratoconjunctivitis in sheep. *Veterinary Record*, **14***7*(3):72-75.

Nahed, A., Abd El-Hack, M.E., Albaqami, N.M., Khafaga, A.F., Taha, A.E., Swelum, A.A., El-Saadony, M.T., Salem, H.M., El-Tahan, A.M., AbuQamar, S.F. and El-Tarabily, K.A., (2022): Phytochemical control of poultry coccidiosis: a review. *Poultry science*, **101**(1): 101542.

Nampanya, S., Khounsy, S., Dhand, N.K., Bush, R.D. and Windsor, P.A., (2019): Financial impact of an outbreak of clinically diagnosed blackleg–a case study from Lao PDR. *Veterinary Medicine and Science*, **5**(2):118-128.

Nandi, S., Kumar, M., Mohapatra, T.K. and Ravishankar, C., (2013): Emergence of canine parvovirus-2 variants and its impact on vaccination. *World Applied Sciences Journal*, **23**(10):1366-1376.

Narang, A., Arora, N. and Rajora, V.S., (2019): Management of Concurrent Flea Allergy Dermatitis and Dipylidium caninum Infestation in a Dog. *IntasPolivet*, **20**(1):188-189.

Narayanan, M. S., Parthiban, M., Sathiya, P., &Kumanan, K., (2010): Molecular detection of Newcastle disease virus using Flinders Tehnology Associates-PCR. Veterinarskiarhiv, **80**(1):51-60.

National Research Council, (2001): Nutrient requirements of dairy cattle: 2001. *National Academies Press*.

Navarre, C.B. and Pugh, D.G., (2002): Diseases of the gastrointestinal system. *Sheep and Goat Medicine*, **2**:71–82

Nejash A. (2016): Review of Important Cattle Tick and Its Control in Ethiopia. *Open access library journal* 3: e2456.

Nicholson, F.A., Groves, S.J. and Chambers, B.J., (2005): Pathogen survival during livestock manure storage and following land application. *Bioresource technology*, **96**(2):135-143.

Nicholson, P., Furrer, J., Hässig, M., Strauss, C., Heller, M., Braga-Lagache, S. and Frey, J., (2019): Production of neutralizing antibodies against the secreted Clostridium chauvoei toxin A (CctA) upon blackleg vaccination. *Anaerobe*, **56**: 78-87.

Nielsen, L.R., (2013): Review of pathogenesis and diagnostic methods of immediate relevance for epidemiology and control of Salmonella Dublin in cattle. *Veterinary microbiology*, **162**(1):1-9.

Niemann, L., Feudi, C., Eichhorn, I., Hanke, D., Müller, P., Brauns, J., Nathaus, R., Schäkel, F., Hoeltig, D., Wendt, M. and Kadlec, K., (2019): Plasmid-located dfrA14 gene in Pasteurella multocida isolates from three different pig-producing farms in Germany. *Veterinary microbiology*, ***230***:235-240.

Nightingale KK, Schukken YH, Nightingale CR, Fortes ED, Ho AJ, Her Z, Grohn YT, McDonough PL, Wiedmann M., (2004): Ecology and transmission of Listeria monocytogenes infecting ruminants and in the farm environment. *Applied Ecology, environmental microbiology*, **70**(8):4458-67.

O'Neill, D.G., Lee, Y.H., Brodbelt, D.C., Church, D.B., Pegram, C. and Halfacree, Z., (2021): Reporting the epidemiology of aural haematoma in dogs and proposing a novel aetiopathogenetic pathway. Scientific Reports, **11**(1): 1-13.

Ogbu, K.I., Anene, B.M., Nweze, N.E., Okoro, J.I., Danladi, M.M.A. and Ochai, S.O., (2017): Canine Parvovirus: A Review.

OIE., (2013): World organisation for animal health-manual of diagnostic tests and vaccines for terrestrial animals. Paris: OIE;1–14.

Ojo, O.E., Oluwole, O.A. and Adetosoye, A.I. (2009): Isolation of Moraxella bovis from infectious keratoconjunctivitis in a flock of goats. Nigerian veterinary journal **30**(1):56-59. DOI: 10.4314/nvj. v30i1.65162

Olabode VB, Gunya DY, Alsea UM, Choji TPP, Barde IJ, (2020): Histopathological lesions of coccidiosis natural infestation in chickens. *Asian Journal of Research Animal Veterinary Science*, **5** (2): 41-45.

Olajide, E.O. and Alaba, B.A., (2023): Ulcerative Lymphangitis in a 12-Year-Old Stallion in Ibadan, Nigeria A Case Study. *Journal of Applied Veterinary Sciences,* **8**(2):62-66.

O'Neill, R., Abbotstown, C. and Dublin, E., (2001): *veterinary record*, **148**:273-274.

Oryan A, Akbari M, Moazeni M, Amrabadi OR (2014). Review of Paper Cerebral and non-cerebralcoenurosis in small ruminants. Tropical Biomedicine, **31**(1): 1-16.

Pal, M., Shuramo, M.Y., Shiferawu, F. and Parmar, B.C., (2022): Listeriosis: an emerging foodborne disease of public health concern. *Journal of Advances in Microbiology Research*, **3**(2):29-33.

Parish SM, Valberg SJ., (2009): Clostridial myonecrosis, in Smith BP: Large Animal Internal Medicine, *St. Louis, Mosby*, **4**:1400-1402.

Parrish, C.R. and Sykes, J.E., (2021). Canine Parvovirus Infections and Other Viral Enteritides. In *Greene's Infectious Diseases of the Dog and Cat*, 341-351.

Parte, S., Jain, R., Parihar, A.S., Shrivastava, N., Gangil, R., Shukla, B.P. and Singh, T., (2022): Aural haematoma in dogs: An epidemiological study. *Dermatitis*, *24*: 22.

Paterson, S., (2009): Manual of skin diseases of the dog and cat. John Wiley and Sons.

Pathak, N., Regon, M., Bordoloi, G., Saikia, K., Boruah, K., Sarma, B.K. and Nath, A.J., (2021): Diagnosis and Therapeutic Management of Poultry Coccidiosis-A Case Report. *Environment and Ecology*, **39**(4):927-930.

Paton, D.J., de Clercq, K., Greiner, M., Dekker, A., Brocchi, E., Bergmann, I., Sammin, D.J., Gubbins, S. and Parida, S., (2006): Application of non-structural protein antibody tests in substantiating freedom from foot-and-mouth disease virus infection after emergency vaccination of cattle. *Vaccine*, **24**(42-43):6503-6512.

Paton, D.J., Gubbins, S. and King, D.P., (2018): Understanding the transmission of foot-and-mouth disease virus at different scales. *Current opinion in virology*, ***28***:85-91.

Pecoraro, H. L., Thompson, B., and Duhamel, G. E. (2017): Histopathology case definition of naturally acquired Salmonella enterica serovar Dublin infection in young Holstein cattle in the northeastern United States. *Journal of Veterinary Diagnostic Investigation*,**29**(6): 860-864.

Pegram, R., Tereke, F., (1981): Observation on the health of afar livestock, *Ethiopian Veterinary Journal*,**5**:11–14.

Polkinghorne, A., Borel, N., Becker, A., Lu, Z.H., Zimmermann, D.R., Brugnera, E., Pospischil, A. and Vaughan, L., (2009): Molecular evidence for chlamydial infections in the eyes of sheep. *Veterinary microbiology*, **135**(1-2):142-146.

Pratt, S.M., Spier, S.J., Carroll, S.P., Vaughan, B., Whitcomb, M.B. and Wilson, W.D., (2005): Evaluation of clinical characteristics, diagnostic test results, and outcome in horses with internal infection caused by Corynebacterium pseudotuberculosis: 30 cases (1995–2003). *Journal of the American Veterinary Medical Association*, **227**(3): 441-449

Prittie, J., 2004. Canine parvoviral enteritis: a review of diagnosis, management, and prevention. *Journal of veterinary emergency and critical care*, **14**(3):167-176.

Pye, C., (2018): Pseudomonas otitis externa in dogs. *The Canadian veterinary journal*, ***59***(11): 1231.

Qiu, J., Söderlund-Venermo, M. and Young, N.S., (2017): Human parvoviruses. *Clinical microbiology reviews*, **30**(1):43-113.

Quadir, A., Islam, S.T., Bhat, I.A., Khan, M., Dar, P.S., Lone, I.A., Gojri, B.A. and Nazir, M., (2017): Clinical case of pregnancy toxaemia and its therapeutic management in a she goat: A case study. *The Pharma Innovation Journal*, **6**:179-182.

Queau, Y., (2019): Nutritional management of urolithiasis. Veterinary Clinical. North America. *Small Animal Practitioner*, **49**(2): 175-186. https://doi. org/10.1016/j.cvsm.2018.10.004

Quinn, P.J., Markey, B.K., Carter, M.E., Donnelly, W.J.C. and Leonard, F.C., (2002): *Veterinary microbiology and microbial disease*. Blackwell science.

Quinn, P.J., Markey, B.K., Leonard, F.C., Hartigan, P., Fanning, S. and Fitzpatrick, E., (2011): Veterinary microbiology and microbial disease. John Wiley and Sons book 2nd edition.

Radostitis,OM., Gay, CC., Blood, DC., Hinchcliff, KW., (2007): Veterinary medicine. A textbook of the diseases of cattle, horses, sheep, pigs, and goats. London: WB Saunders Ltd: 10:934–947.

Radostits OM, Gay CC, Hinchcliff KW, et al., (2007): Acute carbohydrate engorgement of ruminants (Ruminal lactic acidosis, rumen overload)., editors. Veterinary medicine. *Philadelphia: Saunders Elsevier*; **10**: 314–25.

Radostits, O.M. and Acres, S.D., (1980): The prevention and control of epidemics of acute undifferentiated diarrhea of beef calves in western Canada. *The Canadian Veterinary Journal*, **21**(9):243.

Radostits, O.M., Gay, C., Hinchcliff, K.W. and Constable, P.D. eds., (2006): Veterinary Medicine E-Book: A textbook of the diseases of cattle, horses, sheep, pigs and goats. *Elsevier Health Sciences*.

Radostits, O.M., Gay, C., Hinchcliff, K.W. and Constable, P.D. eds., (2006): Veterinary Medicine E-Book: A textbook of the diseases of cattle, horses, sheep, pigs and goats. Elsevier Health Sciences.

Radostits, O.M., Gay, C.C., Hinchcliff, K.W. and Constable, P.D., (2007): A textbook of the diseases of cattle, horses, sheep, pigs and goats. Veterinary medicine, **10**:2045-2050.

Radostits, OM., Gay, CC., Hinchcliff, KW., (2010): Constable PD. Veterinary Medicine: A Textbook of the Diseases of Cattle, Horses, Sheep, Pigs and Goats. *Saunders, USA: CVJ*, **10**(51):2065

Radostits, RM, Gay, CC., Hinchcliff, KW., Constable, PD., (2007): Veterinay Medicine. **10**: 1046-1048.

Rainard, P., Foucras, G., Fitzgerald, J.R., Watts, J.L., Koop, G. and Middleton, J.R., 2018. Knowledge gaps and research priorities in Staphylococcus aureus mastitis control. *Transboundary and emerging diseases*, **65**:149-165.

Rakowska, P.D., Tiddia, M., Faruqui, N., Bankier, C., Pei, Y., Pollard, A.J., Zhang, J. and Gilmore, I.S., (2021): Antiviral surfaces and coatings and their mechanisms of action. *Communications Materials*, **2**(1):53.

Ramaswamy, V., Cresence, V.M., Rejitha, J.S., Lekshmi, M.U., Dharsana, K.S., Prasad, S.P. and Vijila, H.M., (2007): Listeria-review of epidemiology and pathogenesis. Journal of Microbiology Immunology and Infection, **40**(1):4:88.

Rana, C., Subedi, D., Kunwar, S., Neupane, R., Shrestha, B., Khan, S., Singh, D.K. and Kaphle, K., (2022): Cystic urolithiasis in dogs: A case report and review of the literature. *Veterinary Sciences: Research and Reviews*, **8**(1):1-7.

Rand, C.L., Hall, T.L., Aleman, M. and Spier, S.J., (2012): Otitis media-interna and secondary meningitis associated with Corynebacterium pseudotuberculosis infection in a horse. *Equine Veterinary Education*, **24**(6):271-275.

Recreo, M.B., (2016): Corynebacterium pseudotuberculosis biovar equi Infection in Horses: *Transmission and Diagnosis* (Doctoral dissertation, Auburn University).

Reddy, G.A.K. and Kumar, A.A., (2020): Surgical management of aural hematoma in dogs.

Reis, B.P., Zhang, S., Tsolis, R.M., Bäumler, A.J., Adams, L.G. and Santos, R.L., (2003): The attenuated sopB mutant of Salmonella enterica serovar Typhimurium has the same tissue distribution and host chemokine response as the wild type in bovine Peyer's patches. *Veterinary microbiology*, **97**(3-4):269-277.

Rendle, D., (2017): Cellulitis and lymphangitis. *UK-Vet Equine*, **1**(1):16-20.

Reshi, A.A., Husain, I., Bhat, S.A., Rehman, M.U., Razak, R., Bilal, S. and Mir, M.R., (2015): Bovine mastitis as an evolving disease and its impact on the dairy industry. *International Journal of Current Research and Review*, **7**(5):48.

Reshma, D., (2004): Evaluation and management of urolithiasis in dogs *(Doctoral dissertation, Department of Veterinary Surgery and Radiology, College of Veterinary and Animal Sciences, Mannuthy)*.

Rhodes, D.M., Magdesian, K.G., Byrne, B.A., Kass, P.H., Edman, J. and Spier, S.J., (2015): Minimum inhibitory concentrations of equine Corynebacterium pseudotuberculosis isolates (1996–2012). *Journal of veterinary internal medicine*, **29**(1):327-332.

Ribeiro, L.S., Scheid, H.V., dos Santos Marques, L., da Rosa Venancio, F., da Silva, E.R., Ladeira, S.R. and Schild, A.L., 2022. Listeriosis Outbreak in Sheep Raised in Feedlots in the Southern Region of Rio Grande do Sul State, Brazil. *Acta Scientiae Veterinariae*, .https://doi.org/10.22456/1679-9216.119176

Rissi, D.R., Kommers, G.D., Marcolongo-Pereira, C., Schild, A.L. and Barros, C.S., 2010. Listeria monocytogenes meningoencephalitis in sheep. *Brazilian Veterinary Research*, **30**:51-56.

Roeder, P.L., Abraham, G., Kenfe, G. and Barrett T., (1994): Peste des petits ruminants in ethiopian goats. Tropical Animal Health and Production, **26**(2): 69–73.

Roger, F., GuebreYesus, M., Libeau, G., Diallo, A., Yigezu, L.M. and Yilma, T., (2001): Detection of antibodies of rinderpest and peste des petits ruminants viruses (Paramyxoviridae, Morbillivirus) during a new epizootic disease in Ethiopian camels (Camelus dromedarius). *Journal of Veterinary Medicine*, **152**(3):265-268

Rook, J.S., (2000): Pregnancy toxemia of ewes, does, and beef cows. *Veterinary Clinics of North America: Food Animal Practice*, **16**(2):293-317.

Roubies, N., Polizopoulou, Z., Minas, A. and Papasteriadis, A., (2003) A pre-and postpartum study of selected biochemical parameters in ewes for the early detection of pregnancy toxemia. *Journal of the Hellenic Veterinary Medical Society*, **54**(1):11-20.

Roy, M.E., Wrigley, R.H., Kraft, S.L., Steyn, P., Zekas, L.J., Park, R.D. and Withrow, S.J., (2007) Of the international veterinary radiology association and the American college of veterinary radiology. *Veterinary. Radiology Ultrasound*, **48**(2):163-188.

Rust, M.K., (2017): The biology and ecology of cat fleas and advancements in their pest management: a review. *Insects*, **8**(4):118.

Rycroft, A.N., (2022): Histotoxic Clostridia. Pathogenesis of Bacterial Infections in Animals, 635-647. Doi.10.1002/9781119754862

Rycroft, AN., Garside, LH., (2000): Actinobacillus species and their role in animal disease. *The Veterinary Journal*, **159**:18-36.

Rynhoud, H., Gibson, J.S., Meler, E. and Soares Magalhães, R.J., (2021): The association between the use of oclacitinib and antibacterial therapy in dogs with allergic dermatitis: a retrospective case-control study. *Frontiers in veterinary science*, *8*:631443.

Sadeghian, S., Dezfouli, M.R.M., Kojouri, G.A., Bazargani, T.T. and Tavasoli, A., (2011): Pasteurella multocida pneumonic infection in goat: Hematological, biochemical, clinical and pathological studies. *Small Ruminant Research*, **100**(2-3):189-194.

Sadowsky, M.J. and Whitman, R.L., (2010): The fecal bacteria. *American Society for Microbiology Press.* 5:44:100

Safari, M. H., Kinung, T., Getachew, W., Hafez, K., &Mathios, G., (2004): Assessement of economic impact caused by poultry coccidiosis in small- and large-scale poultry farm in Debrezeit, Ethiopia. *International Journal of poultry Science,***3**: 715-725.

Sagare, R. and Kumar, M.C., (2020): Pregnancy Toxaemia and its Management in a Doe. IntasPolivet, **21**(2)445-447.

Sahle, M., (2004): An epidemiological study on the genetic relationships of foot and mouth disease viruses in east Africa *(Doctoral dissertation, University of Pretoria).*

Salt, J., (2019): Persistence of foot-and-mouth disease virus. *In Foot and mouth disease*, 103-143. CRC Press.

Salvaggio, A., Giunta, R.P., Percipalle, M., Scalzo, F. and Marino, A.M.F., (2023): Infection Due to Actinobacillusligniеresii in Cattle with Brain and Ocular Involvement: Histological and Microbiological Features. Veterinary Sciences, **10**(5):311.

Sargison, N., (2009): Sheep flock health: a planned approach. John Wiley and Sons.

Sayed-Ahmed, M.Z., Elbaz, E., Younis, E. and Khodier, M., 2020. Canine parvovirus infection in dogs: Prevalence and associated risk factors in Egypt. *World's Veterinary Journal*, **10**(4), **4**:571-577.

Scala, A., Cancedda, GM., Varcasia, A., Ligios, C., Garippa, G., Genchi, C., (2007): A survey of Taenia multicepscoenurosis in Sardinian sheep. *Veterinary Parasitology*, **143**(3): 294-298.

Scala, A., Varcasia, A., (2006): Updates on morphobiology, epidemiology and molecular characterization of coenurosis in sheep. *Parassitologia*, **48**(1-2): 61-63

Schmidt, G.A., (2002): Treatment of Acidosis: Sodium Bicarbonate and Other Drugs. **Springer Milan**, **4**:681-693).

Schoeman, J.P., Goddard, A. and Leisewitz, A.L., (2013): Biomarkers in canine parvovirus enteritis. *New Zealand veterinary journal*, **61**(4):217-222.

Schoeman, J.P., Goddard, A. and Leisewitz, A.L., (2013): Biomarkers in canine parvovirus enteritis. *New Zealand veterinary journal*, **61**(4):217-222.

Scott, P.R., (2011): Treatment and control of respiratory disease in sheep. *Veterinary Clinics: Food Animal Practice*, **27**(1):175-186.

Scott, P.R., (2015): Sheep medicine. CRC press.

Scott, P.R., 2015. *Sheep medicine*. CRC press.

Seid, A., (2019) Review of infectious bovine keratoconjunctivitis and its economic impacts in cattle. *Diary and Vet Sci J*, *9*: 555774.

Shant Kumar, V.S., Prathviraj, D., Ranganath, G.J., Chandrashekara, N., Raghunath, B.V. and Ramesh, D., (2022): Incidence of acute ruminal acidosis in Kenguri sheep of Bidar district of Northern Karnataka. *The Pharma Innovation Journal*, **11**(10): 808-810

Sharif, A., Ahmad, T., Umer, M., Rehman, A. and Hussain, Z., (2014): Prevention and control of Newcastle disease. *International Journal of Agriculture Innovations and Research*, **3**(2):454-460.

Sharma, N., Singh, N.K. and Bhadwal, M.S., (2011): Relationship of somatic cell count and mastitis: An overview. *Asian-Australasian Journal of Animal Sciences*, **24**(3):429-438.

Sharma, V. and Kundu, P.P., (2010): Biocatalysts in microbial fuel cells. *Enzyme and microbial technology*, **47**(5):179-188.

Sharun, K., Manjusha, K.M., Kumar, R., Pawde, A.M., Malik, Y.P., Kinjavdekar, P., Maiti, S.K., Amarpal., (2021): Prevalence of obstructive urolithiasis in domestic animals: An interplay between seasonal predisposition and dietary imbalance. Iraq. *Journal Veterinary Science*., **35**(2):227–232. https://doi.org/10.33899/ijvs.2020.126662.1358.

Shmuel, D.L. and Cortes, Y., (2013): Anaphylaxis in dogs and cats. *Journal of Veterinary Emergency and Critical Care*, **23**(4):377-394.

Silveira, J.E.M., (2015): Usefulness of certain clinical observations and blood chemistry values (BHBA, glucose, ions, and blood gases) for predicting clinical outcomes when treating dairy goats with pregnancy toxemia *(Doctoral dissertation, Universidade de Lisboa (Portugal)).*

Simoes, P.B.A., Bexiga, R., Lamas, L.P. and Lima, M.S., (2020): Pregnancy Toxaemia in Small Ruminants. In *Advances in Animal Health, Medicine, and Production: A Research Portrait of the Centre for Interdisciplinary Research in Animal Health (CIISA), University of Lisbon, Portugal. Springer International Publishing*, 541-556).

Simpson, K.M., Taylor, J.D. and Streeter, R.N., (2019): Evaluation of prognostic indicators for goats with pregnancy toxemia. *Journal of the American Veterinary Medical Association*, **254**(7):859-867.

Smith, B.P, (2002): Large Animal Internal Medicine. *Mosby, Inc., Missouri*, 3:183.

Smith, B.P., (2002): Large animal internal medicine, 775–779.

Smith, B.P., (2014): Large animal internal medicine-E-Book. Elsevier Health Sciences.

Smith, BP., (2009): Disease of the alimentary tract. In Large Animal Internal Medicine. *Mosby Elsevier*, **4**:782-784.

Smith, BP., (2009): Salmonellosis in ruminants. Large animal internal medicine. St. Louis (MO): *Mosby*; **4**: 877–81.

Snyder, E. and Credille, B., (2017): Diagnosis and treatment of clinical rumen acidosis. *Veterinary Clinics: Food Animal Practice*, **33**(3):451-461

Songer, J.G. and Uzal, F.A., (2016): Diseases produced by Clostridium spiroforme. *Wiley-Blackwell, Ames, Iowa.*, **2***:*221-227.

Songer, JG., Post, KW., (2005): Veterinary Microbiology - Bacterial and Fungal Agents of Animal Disease, *Elsevier Saunders, St. Louis, Missouri*, 174-180.

Sordillo, L.M., (2018): Mammary gland immunobiology and resistance to mastitis. *Veterinary Clinics: Food Animal Practice*, **34**(3):507-523.

Soundararajan, C., Sivakumar, T., Ramesh, S., Muthukrishnan, S., Palanidorai, R., (2006): Peste des petits ruminants among sheep and goats in an organized farm in Tamil Nadu. *Indian Veterinary journal*, **83**(10):1045–7.

Spier SJ, (2006): Dryland Distemper- Corynebacterium pseudotuberculosis infections in horses. *California Vet*, 38: 24-26

Spindola, C.Z., (2017): Listeriosis in sheep and goats in the state of Santa Catarina: epidemiology, clinic, and diagnosis.*Diagnosis and Research of Diseases in Farm Animals*, **1**: 53-53.

Stenfeldt, C., Eschbaumer, M., Rekant, S.I., Pacheco, J.M., Smoliga, G.R., Hartwig, E.J., Rodriguez, L.L. and Arzt, J., (2016): The foot-and-mouth disease carrier state divergence in cattle. *Journal of virology*, **90**(14):6344-6364.

Stevenson, A.E., (2002): The incidence of urolithiasis in cats and dogs, and the influence of diet in formation and prevention of recurrence *(Doctoral dissertation, University of London, University College London (United Kingdom).*

Stuetzer, B. and Hartmann, K., (2014): Feline parvovirus infection and associated diseases. *The Veterinary Journal*, **201**(2):150-155.

Sulayeman, M., Dawo, F., Mammo, B., Gizaw, D. and Shegu, D., (2018): Isolation, molecular characterization, and sero-prevalence study of foot-and-mouth disease virus circulating in central Ethiopia. *BMC veterinary research*, **14**(1):1-10.

Sutherland, S.S., Hart, R.A. and Buller, N.B., (1996): Genetic differences between nitrate-negative and nitrate-positive C. pseudotuberculosis strains using restriction fragment length polymorphisms. *Veterinary microbiology*, **49**(1-2): 1-9.

Sykes, J.E., 2014. Canine parvovirus infections and other viral enteritides. *Canine and feline infectious diseases*, **1**:141:543.

Tadesse, B., Alamirew, K., Ketema, A., Kiflie, W. and Endashaw, M., (2017): Ruminant pneumonic pasteurellosis: Review on epidemiology, pathogenesis and virulence mechanism. *Academic Journal. Animal. Diseases*, **6**(2):30-39.

Tagesu, T., Abdisa, T., Hasen, R., Regea, G. and Tadesse, G., (2019): Review on blackleg in cattle. *Journal of. Dairy Veterinary. Science*, **9**(5):555771.

Tan, J., Applegate, T.J., Liu, S., Guo, Y. and Eicher, S.D., (2014): Supplemental dietary L-arginine attenuates intestinal mucosal disruption during a coccidial vaccine challenge in broiler chickens. *British Journal of Nutrition*, **112**(7):1098-1109.

Tassew, A., Negash, M., Demeke, A., Feleke, A., Tesfaye, B. and Sisay, T., (2016): Isolation, identification, and drug resistance patterns of methicillin resistant Staphylococcus aureus from mastitic cow's milk from selected dairy farms in and around Kombolcha, Ethiopia. *Journal of Veterinary Medicine and Animal Health*, **8**(1):1-10.

Taylor, M. A., Coop, R. L., and Wall, R., (2007): Veterinary Parasitology. *Oxford, UK: Blackwell Publishing*, **3**: 475-483.

Taylor, W.P., (1984): The distribution and epidemiology of PPR, Preventive Veterinary Medicine, **2**(1-4): 157–166.

Tesfaye A, Sehale M, Abebe A, Muluneh A., (2016): Seroprevalence of foot and mouth disease in cattle in Borena Zone, Oromia Regional State, Ethiopia. *Ethiopian Veterinary Journal*, **20**:55-66.

Thakuri, R.R., Shrestha, Y., Rana, S. and Pathak, N., 2023. Case Report: Effect of Oral Rehydration Solutions Added to the Conventional Treatment Protocol for the Treatment of Parvoviral Enteritis. *Journal of Current Veterinary Research*, **5**(1): 69-79.

Thilagar, S. and Balasubramanian, N.N., (1996): A retrospective study of urinary obstruction in dogs: A radiographic study. *Indian veterinary journal*, **73**(11):1183-1184.

Tikuye, S., (2019): Antigen detection and molecular characterization of foot and mouth disease virus from outbreak cases in Ethiopia *(Doctoral dissertation, Addis Ababa University).*

Tion, M.T., Dvorska, J., and Saganuwan, S.A., (2015): A review on urolithiasis in dogs and cats. *Bulgaria Journal Veterinary Medicine*, 18: 1–18.

Tiruneh, D. and Abdisa, T., (2017): Review on canine urolithiasis. *American Research Journal of Veterinary Medicine*, **1**(1):1-7.

Tiwari, D.K., Tiwari, V. and Shukla, T., (2013): Clinical management of flea allergic dermatitis in a dog. *IntasPolivet,***14**(2):274-275.

Townsend, W. M. (2013): ANIMAL OPHTHALMOLOGY. *Essentials of veterinary ophthalmology*, 379.

Tuteja, D., Banu, K. and Mondal, B., (2022): Canine parvovirology-A brief updated review on structural biology, occurrence, pathogenesis, clinical diagnosis, treatment, and prevention. *Comparative Immunology, Microbiology, and Infectious Diseases*, 101765.

Uma Rani, R., Palanichamy, V. and Muruganandan, B., (2015): Clinical and serobiochemical studies on pregnancy toxaemia in does. *International Journal of Current Innovation Research*, ***1***:102-104.

Underwood, W.J., Blauwiekel, R., Delano, M.L., Gillesby, R., Mischler, S.A. and Schoell, A., (2015): Biology and diseases of ruminants (sheep, goats, and cattle). *In Laboratory animal medicine*, **2***:* 623-694.

UNDP (1994): United Nation Development Program. Technical report: Rough guide to animal disease in Ethiopia.

Useh, N.M., Nok, A.J. and Esievo, K.A.N., (2003): Pathogenesis and pathology of blackleg in ruminants: the role of toxins and neuraminidase. A short review. *Veterinary quarterly*, **25**(4):155-159.

Uzal FA., (2012): Evidence-based medicine concerning efficacy of vaccination against Clostridium chauvoei infection in cattle. *Veterinary Clinic North America Food Anim Practitioner*; **28**:71– 77.

Valle, A.C.V. and Carvalho, A.C., (2021): Auricular Hematoma in a Dog Treated by Homeopathic. *International Journal of Science Research*, **10**(4):1061-1063.

Valle, A.C.V., Brunell, H. and Carvalho, A.C., (2020): Treatment of aural hematoma in a dog (Canis familiaris) by homeopathy: Case report. *PubVet*, **14** :9-a647.

Van Metre DC, Tyler JW, Stehman SM., (2000): Diagnosis of enteric disease in small ruminants. Veterinary Clinic North America Food Animal Practice, **16**:87–115.

Van Saun, R.J., (2000): Pregnancy toxemia in a flock of sheep. *Journal of the American Veterinary Medical Association*, **217**(10):1536-1539.

Varcasia, A., Tamponi, C., Ahmed, F., Cappai, M.G., Porcu, F., Mehmood, N., Dessì, G. and Scala, A., (2022) Taenia multicepscoenurosis: A review. *Parasites and Vectors*, **15**(1):1-18.

Varghese, T., (2004): Eimeria paradise species and Isosporaragglara species from the Ragyiana birds of paradise (Paradisaearagginasciates) from papua New Guinea. *Journal of Parasitology*, **63**:887-889.

Vazquez-Boland, J.A., Kuhn, M., Berche, P., Chakraborty, T., Domínguez-Bernal, G., Goebel, W., González-Zorn, B., Wehland, J. and Kreft, J., (2001): Listeria pathogenesis and molecular virulence determinants. Clinical microbiology reviews, **14**(3):584-640.

Vegad, J.L., (2004): Poultry diseases: a guide for farmers and poultry professionals. *International Book Distributing Company,***5***:33:444*

Vinayagamurthy, B., (2017): Peste des Petits Ruminants. *Emerging and Re-emerging Infectious Diseases of Livestock*, 55-98. https://doi.org/10.1007/978-3-319-47426-7_2

Waret-Szkuta, A., Roger, F., Chavernac, D., Yigezu, L., Libeau, G., Pfeiffer, D.U. and Guitián, J., (2008): Peste des Petits Ruminants (PPR) in Ethiopia: Analysis of a national serological survey. *BMC Veterinary Research*, **4**:1-10.

Weiser, G.C., DeLong, W.J., Paz, J.L., Shafii, B., Price, W.J. and Ward, A.C., (2003): Characterization of Pasteurella multocida associated with pneumonia in bighorn sheep. *Journal of Wildlife Diseases*, **39**(3):536-544.

Westropp, J. L. and C. A. Buffington, (2005): Feline lower urinary tract disease. In: Textbook of Veterinary Internal Medicine. *S. J. Ettinger and E. C. Feldman, WB Saunders, Philadephia,* **6** :1828– 1850.

Wilkie, I.W., Harper, M., Boyce, J.D. and Adler, B., (2012): Pasteurella multocida: diseases and pathogenesis. *Pasteurella multocida: Molecular Biology, Toxins and Infection,***1**: 1-22.

Williams, H.J., Duncan, J.S., Fisher, S.N., Coates, A., Stokes, J.E. and Gillespie, A., (2019): Ovine infectious keratoconjunctivitis in sheep: the farmer's perspective. *Veterinary Record Open*, ***6***(1): e000321.

Wise, M.G., Suarez, D.L., Seal, B.S., Pedersen, J.C., Senne, D.A., King, D.J., Kapczynski, D.R. and Spackman, E., (2004): Development of a real-time reverse-transcription PCR for detection of Newcastle disease virus RNA in clinical samples. *Journal of clinical microbiology*, ***42***(1):329-338.

Wohlsein, P. and Saliki, J., (2006): Rinderpest and peste des petits ruminants.The diseases: Clinical signs and pathology. In *Rinderpest and peste des petits ruminants*. Academic press, 68.https://doi.org/10.1016/B978-012088385-1/50034-4

Worku, T., Dandecha, M., Shegu, D., Aliy, A. and Negessu, D., (2022): Isolation and Molecular Detection of Newcastle Disease Virus from Field Outbreaks in Chickens in Central Ethiopia. *Veterinary Medicine: Research and Reports*, **2**:65-73.

World Bank. Agriculture for development world development report (2008). Washington,DC:TheWorldBank;2007.http://siteresources.worldbank.org/INTWDR2008/Resources/WDR_00_book.pdf.

World Bank. Minding the stock: bringing public policy to bear on livestock sector development, Report no. 44010-GLB. Washington, DC: The World Bank,

World Organization for Animal Health, (2012). Manual of diagnostic tests and vaccines for terrestrial animals. *Infection Bursal Diseases*, **12**:549-565.

Wray, C, Davies R., (2000): Salmonella infections in cattle. Salmonella in domestic animals. *New York: CABI Publishing;* 169–90.

Wray, C., 1991 Salmonellosis in cattle. In Practice. ;**13**(1):13

Wubshet, A.K., Dai, J., Li, Q. and Zhang, J., (2019): Review on outbreak dynamics, the endemic serotypes, and diversified topotypic profiles of foot and mouth disease virus isolates in Ethiopia from 2008 to 2018. *Viruses*, **11**(11):1076.

Yener, Z., Saglam, Y.S., Temur, A. and Keleş, H., (2004): Immunohistological detection of Peste des petits ruminants' viral antigens in tissues from cases of naturally occurring pneumonia in goats. *Small Ruminant Research,* **51**:273-277.

Yim D, Kang SS, Kim DW, Kim SH, Lillehoj HS, Min W., (2011): Protective effects of Aloe vera-based diets in Eimeria maxima infected broiler chickens. *Experimental Parasitology*, **12**(1):322–325.

Younis E.E., El-Sawalhy A.A., Soumaya E.A. & El-Beskawy M.A.A., (2010): Epidemiological studies on Listeriosis in sheep. *Journal of Veterinary Medical Research.***20**(1): 141-148.

Zaitoun, A., Elseleny, M. and El Khabaz, K., (2021): Clinical study on Moraxella-associated infectious keratoconjunctivitis (IKC) of small ruminants. *Benha Veterinary Medical Journal*, **40**(2):1-4.

Zaragoza, N.E., Orellana, C.A., Moonen, G.A., Moutafis, G. and Marcellin, E., (2019): Vaccine production to protect animals against pathogenic clostridia. *Toxins*, **11**(9):.525.

Zavoshti, F.R., Sioofy-Khojine, A.B. and Mahpeikar, H.A., (2009) A case report of ulcerative lymphangitis (a mini review of causes and current therapies). *Turkish Journal of Veterinary & Animal Sciences*, **33**(6): 525-528.

Zheng, W., Porter, E., Noll, L., Stoy, C., Lu, N., Wang, Y., Liu, X., Purvis, T., Peddireddi, L., Lubbers, B., (2019): A multiplex real-time PCR assay for the detection and differentiation of five bovine pinkeye pathogens. *Journal of Microbiological Methods,***160**: 87–92.

Zhou, H., Su, X., Lin, L., Zhang, J., Qi, Q., Guo, F., Xu, F. and Yang, B., (2019): Inhibitory effects of antiviral drug candidates on canine parvovirus in F81 cells. *Viruses*, **11**(8):.742.

Zobel, G., Leslie, K., Weary, D.M. and Von Keyserlingk, M.A.G., (2015): Ketonemia in dairy goats: Effect of dry period length and effect on lying behavior. *Journal of Dairy Science*, ***98***(9):6128-6138

5. APPENDICES

Annex 1: Clinical case recording form

ADDIS ABABA UNIVERSITY

COLLEGE OF VETERINARY MEDICINE AND AGRICULTURE

Daily Clinical Activity Recording Form

Date: ----------

Site/Name of the clinic: _____ Address: _____

Owner's name: _____ Address: _____Phone number: _____

Patient identification: _____

Species: _____ Breed: _____ Sex_____ age: _____Color: _____

History:

Past immediate: _____Immediate history: _____ environment:_____management and feeding: _____: Number of affected, no, at risk:_____ place of origin etc.:_____

General physical examination: temperature:_____ heart rate:_____ respiratory rate:_____ , visible mucous membrane etc.

Systemic physical examination: detailed examination of the affected system

Laboratory diagnosis methods employed_____ Tentative and definitive diagnosis_____, prognosis_____

Treatment: drug_____, dose_____, route, follow-up_____

Control and prevention: control methods prescribed, prevention and corrective management measures recommended_____

Annex 2: Clinical examination protocols, from jana and ghosh (2013)

Recording of Rectal Temperature

Recording of body temperature of animal is most important in clinical diagnosis. Temperature should be recorded while the animal is at rest. Generally rectal temperature is recorded in animals by inserting the bulb of a clinical thermometer in the rectum, placed in contact of the rectal mucosae, and keeping it for one to two minutes.

Recording of Pulse Rate

Usually, the pulse rate is equal to the rhythmic contraction and expansion of the heart. Increased pulse rate is common and occurs in most cases of septicaemia, toxaemia, circulatory failure, excitement and in pain-stricken condition. Marked slowing of heartbeat (bradycardia) is common in traumatic reticuloperitonitis in cattle.

Site for Recording Pulse

- *Cattle*: Middle coccygeal artery, ventral coccygeal artery under the tail, facial artery, maxillary and median artery; femoral arteries (in case of calf).
- *Dog*: Femoral artery on the inner side of thigh.

Recording of Respiration Rate

In cattle average respiration rate per minute is 12-16. Variation occurs due to high ambient temperature, after exercise and it is normal. Respiratory rate is accelerated during fever and respiratory distress due to disease. Respiration rate should be noted when the animal is at rest. The type of respiration like costal, intercostal, abdominal, jerkey*etc*. are also to be noted. There is a ratio of 1:3 between respiration rate and pulse rate in healthy animals. Examination of respiration rate of animals is indicated for primary respiratory disease as well as secondary respiratory disease due to cardiac involvement, allergy, and anaphylaxis.

Examination of Visible Mucous Membrane

This includes the examination of conjunctiva, buccal, nasal, vulval, vaginal and rectal mucosae. In normal and healthy conditions of animals, the mucous membrane is moist and rosy in coloration. The following changes of mucous membrane are seen in unusual conditions of animals.

- *Congestion*: Signs of fever and inflammation, systemic diseases, and allergic sensitization.
- *Paleness*: Revealing anaemia, internal haemorrhage, hypoproteinaemia, excessive blood loss and shock.
- *Yellow discoloration*: Signs of ecterus and hepatic disorder, jaundice.
- *Pinpoint/Petechial haemorrhages*: Indicates septicaemia, surra, phosphorus and arsenic poisoning.
- *Cyanotic changes*: bluish discoloration owing to dyspnoea, hypoxia, venous stasis, congestive cardiac failure, pleurisy, HCN and nitrate poisoning.
- *Ulcerations*: Typical ulcers on oral mucous membrane seen in FMD, PPR and RP.
- *Pinkish*: Equine infectious anemia.

Examination of Eyes

Ophthalmic examination gives some clues in diagnosing some diseases.

- *Sunken appearance*: Indicates chronic wasting disease and dehydration.
- *Pupillary reflex*: Loss of pupillary reflex and pupillary response to light are seen in toxaemia and shock, poisoning and CNS disease.
- *Dilatation of pupil*: Seen in poisoning and shock.
- *Corneal opacity, ulcers*: Commonly occurs in mechanical injury or trauma. In canine it could also be due to canine distemper.

Normal Color of Conjunctiva of Various Animals

Cattle and Buffalo – Pale pink

Horse – Pale roseate

Sheep and Goat – Pale pink

Pig – Reddish tinged

Dog – Roseate

Cat – Pale.

Palpation

Consistency of an organ or tissues or a part of the body can be felt by lying hand with gentle pressure. Tips of fingers and flat of the hand are mostly used for handling the tissues or organs. When tissue appears firm, hard, solid like muscle, that could be a neoplasm (tumour). When structure appears bone like consistency – it could be the exostosis or ossification of cartilage. Hot 136 and painful swelling, hard or soft could be the abscess (hard in initial stage, soft in maturity/ripened abscess).

- *Doughy* – Where soft tissues retain finger points or causes pits on pressure – oedema and impaction of rumen.
- *Cold and painless (fluctuating)* – could be the cyst distended with gas (bloat), distended with food (impaction), distended with fluid (ascites), crepitating sound (Black Quarter or Subcutaneous emphysema). Abnormalities of abdominal and urogenital organs can be felt by rectal palpation.

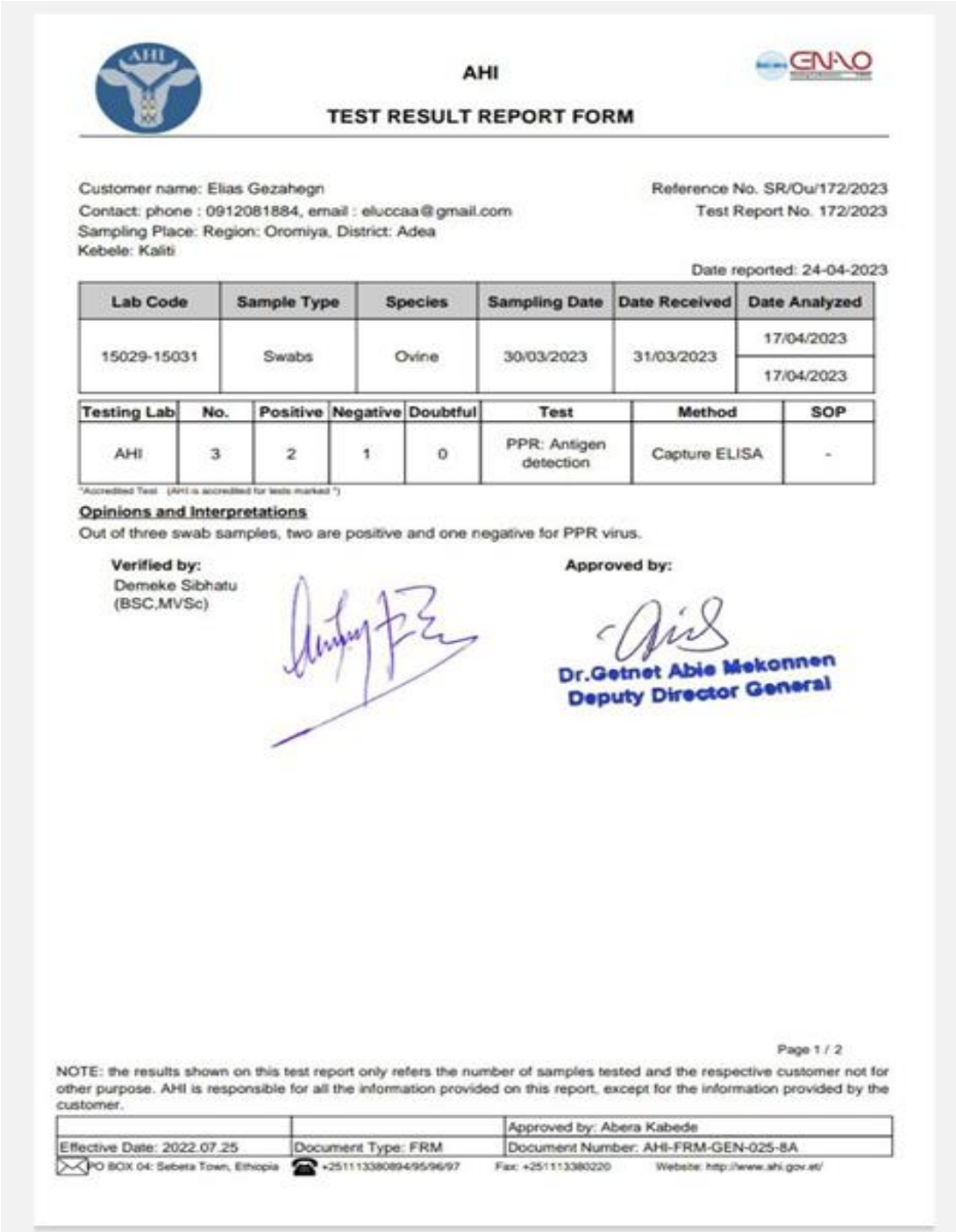
Percussion

Striking of any part of the body with a short, sharp blow that enables underlying organs to vibrate and generate an audible sound is called percussion. Drum like sound audible from rumen indicates tympanitis, dull resonance in impaction. Hyper resonant sound is observed while the lungs are filled with excessive air. Increased number of gases will emit tympanic sound in abdomen. This method is useful in small animals than the large animals.

Auscultation

It means listening of various functional sounds produced by some thoracic and abdominal organs by use of stethoscope for ascertaining the pathological condition of lungs, pleura, heart and certain parts of alimentary tract. It is useful for hearing peristaltic sounds during ruminal and intestinal contractions, listening sounds produced in course of normal functioning of trachea and lungs (dry rales in congestion and moist rales in exudation), cardiac sounds like cardiac murmurs in valvular disease, splashing sounds in pericarditis and hydro pericardium.

Annex 3: Elisa laboratory result of PPR suspected.



AHI

TEST RESULT REPORT FORM

Customer name: Elias Gezahegn
Contact: phone : 0912081884, email : eluccaa@gmail.com
Sampling Place: Region: Oromiya, District: Adea
Kebele: Kaliti

Reference No. SR/Ou/172/2023
Test Report No. 172/2023

Date reported: 24-04-2023

Lab Code	Sample Type	Species	Sampling Date	Date Received	Date Analyzed
15029-15031	Swabs	Ovine	30/03/2023	31/03/2023	17/04/2023
					17/04/2023

Testing Lab	No.	Positive	Negative	Doubtful	Test	Method	SOP
AHI	3	2	1	0	PPR: Antigen detection	Capture ELISA	-

*Accredited Test (AHI is accredited for tests marked *)

Opinions and Interpretations

Out of three swab samples, two are positive and one negative for PPR virus.

Verified by:
Demeke Sibhatu
(BSC,MVSc)

Approved by:
Dr.Getnet Abie Mekonnen
Deputy Director General

Page 1 / 2

NOTE: the results shown on this test report only refers the number of samples tested and the respective customer not for other purpose. AHI is responsible for all the information provided on this report, except for the information provided by the customer.

		Approved by: Abera Kabede
Effective Date: 2022.07.25	Document Type: FRM	Document Number: AHI-FRM-GEN-025-8A

PO BOX 04: Sebeta Town, Ethiopia +251113380894/95/96/97 Fax: +251113380220 Website: http://www.ahi.gov.et/

ATTACHMENT

Samples type: Swabs- Species: Ovine

List of Positive Samples: PPR: Antigen detection / Capture ELISA

SR No	Lab Code	Sample's Id	Result	Location
1	15029	01	Positive	Kaliti
2	15030	03	Positive	Kaliti

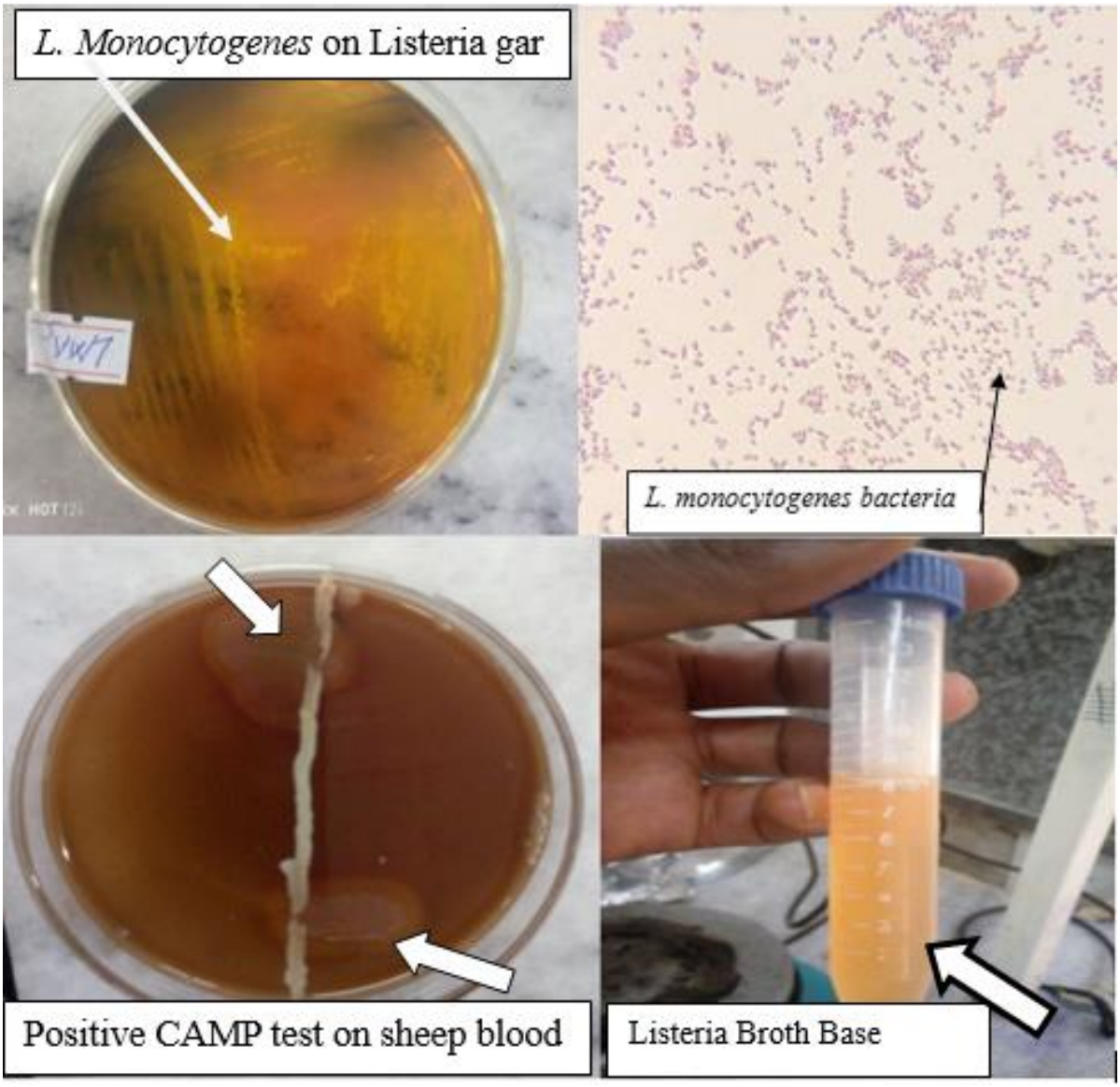
List of Negative Samples: PPR: Antigen detection / Capture ELISA

SR No	Lab Code	Sample's Id	Result	Location
1	15031	04	Negative	Kaliti

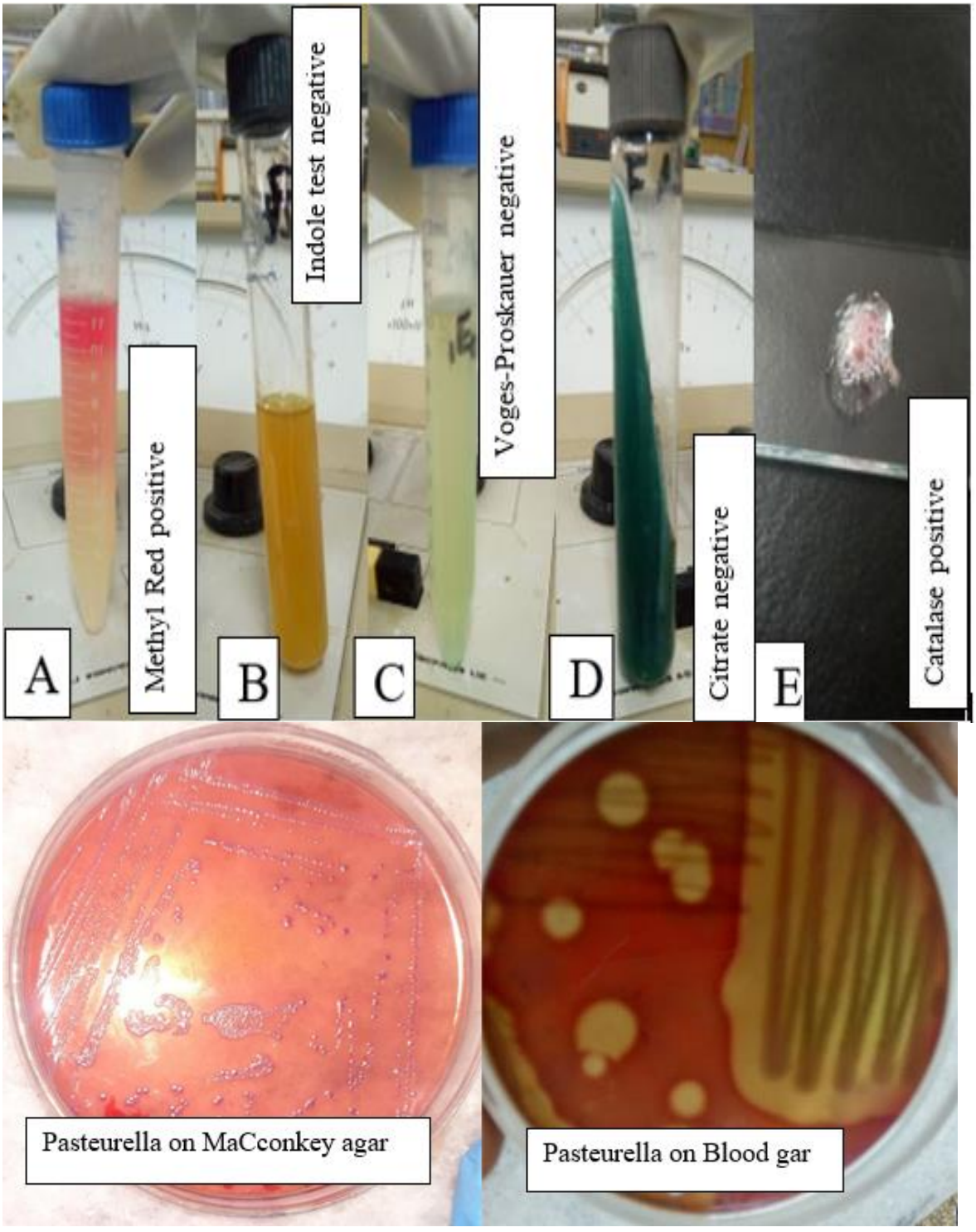
NOTE: the results shown on this test report only refers the number of samples tested and the respective customer not for other purpose. AHI is responsible for all the information provided on this report, except for the information provided by the customer.

PO BOX 04: Sebeta Town, Ethiopia +251113380894/95/96/97 Fax: +251113380220 Website: http://www.ahi.gov.et/

Annex 4: Listeria laboratory result



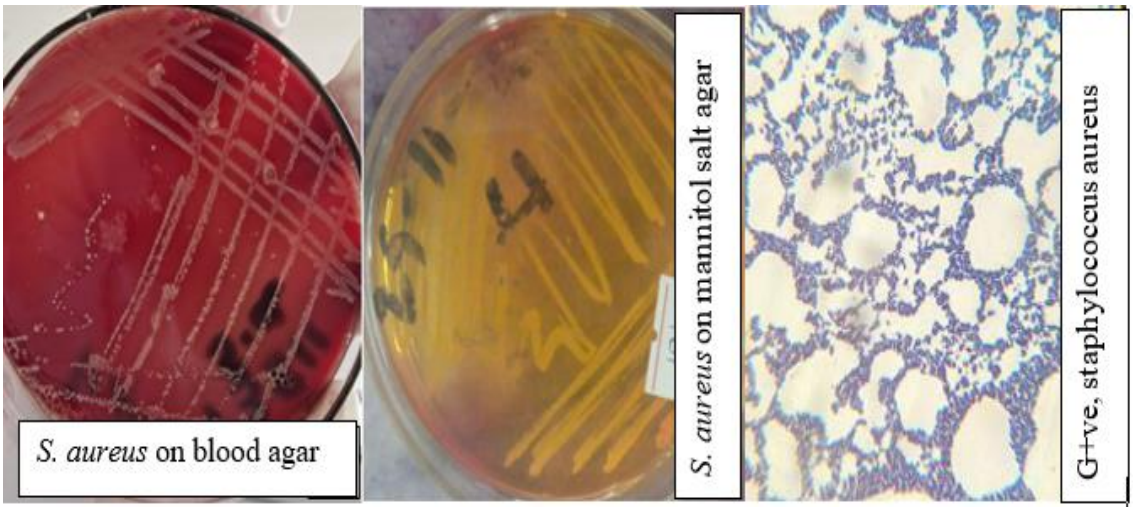
Annex 5: *Mannhemia haemolytica* laboratory results



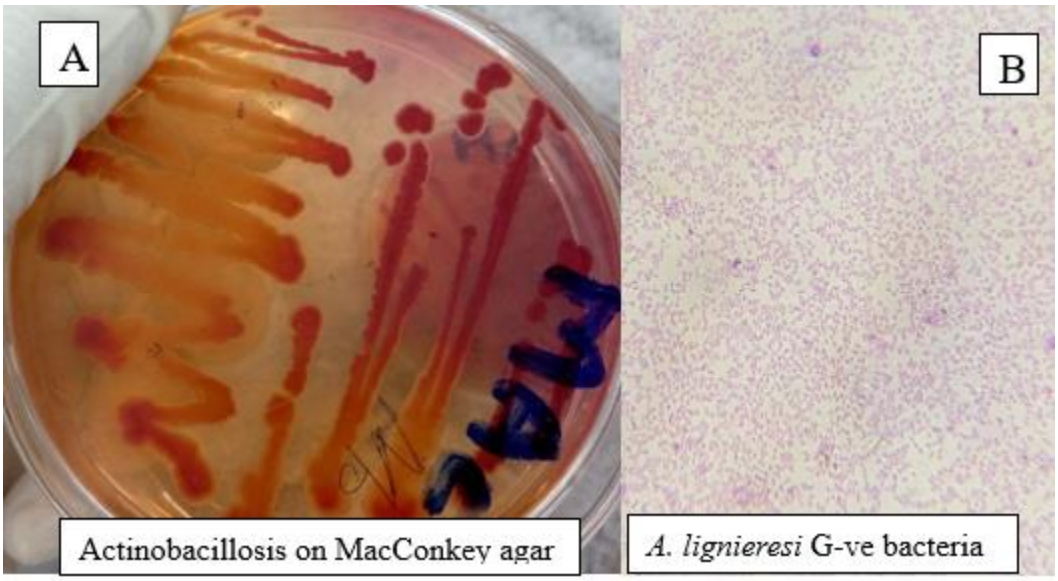
Annex 6: Moraxella bacteria laboratory test

Annex 7: Postmortem results of pregnancy toxemia

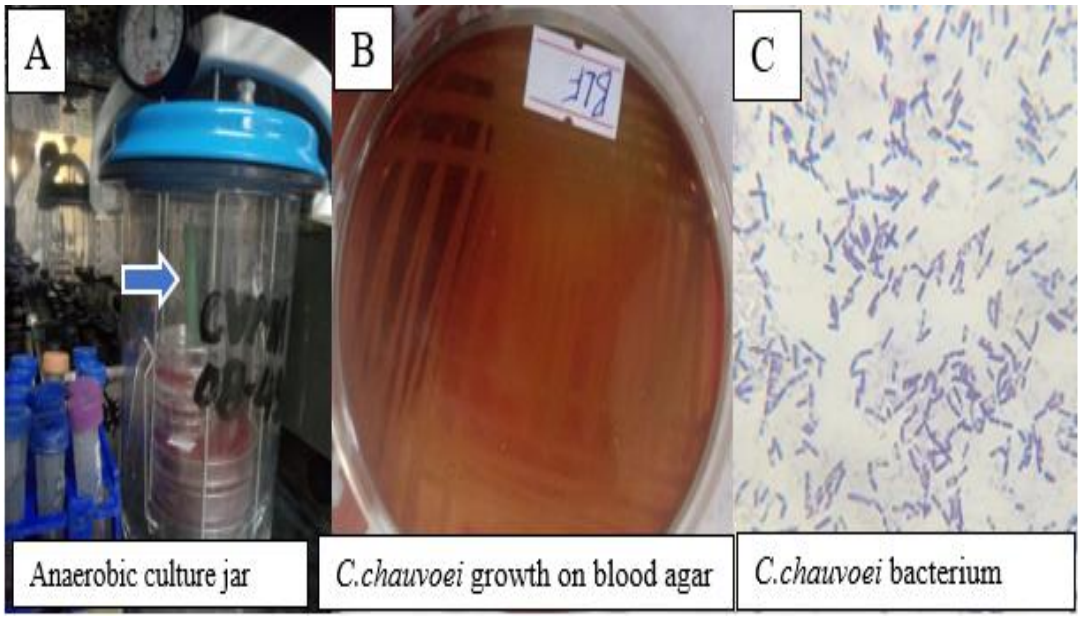
Annex 8: Mastitis laboratory result



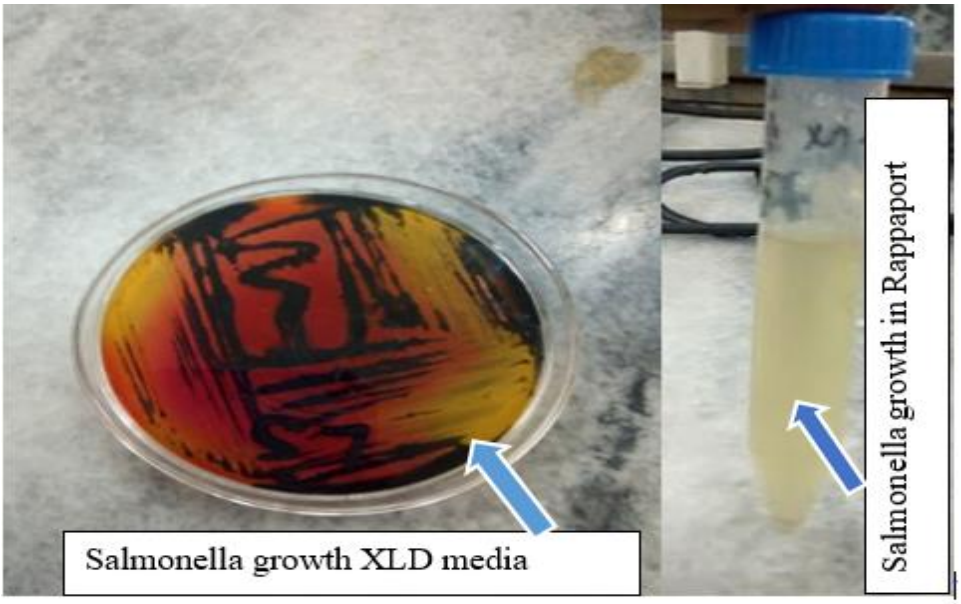
Annex 9: Actinobacillus bacteria Examination



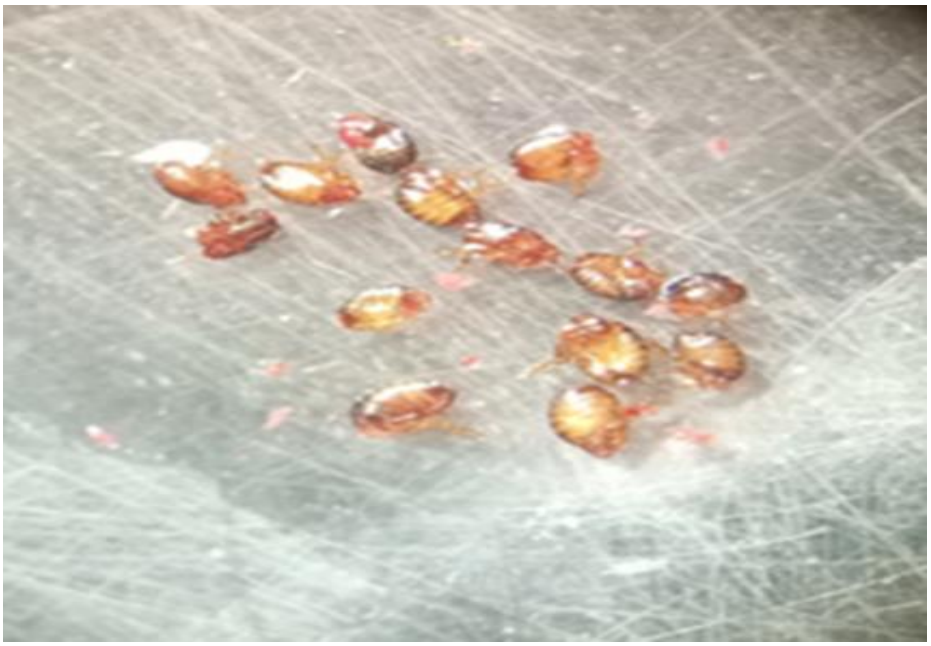
Annex 10: Black leg laboratory result



Annex 11: Salmonella laboratory results



Annex 12: Stereomicroscopic (10x) examination of ticks from ear of dog**.**

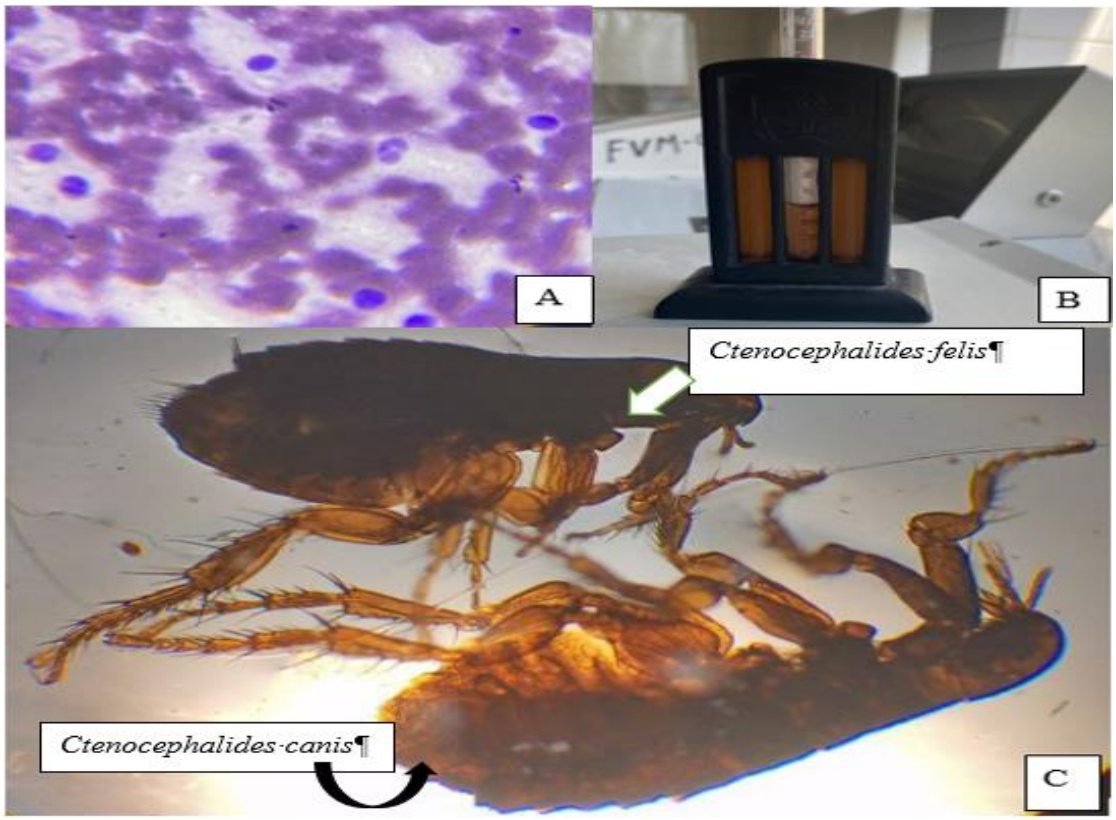


Annex 13: Ultrasound result of urolithiasis dog

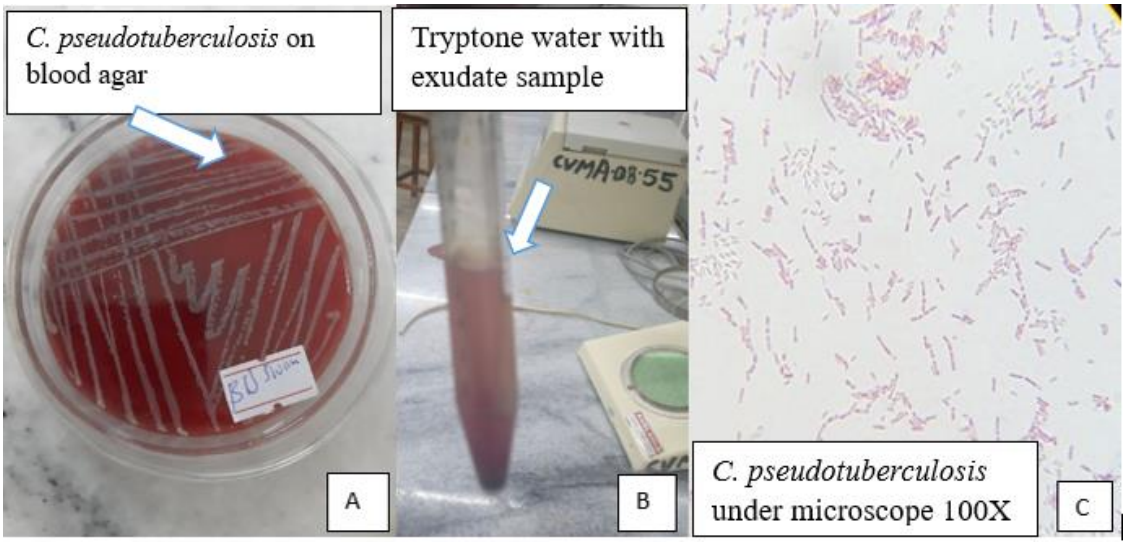
.

Annex 14: Vaccine certificate and outcome of puppy.

Annex 15: FAD laboratory result



Annex 16: Ulcerative lymphangitis laboratory result



Annex 17: Plagiarism check result

6/16/23, 2:16 AM Turnitin - Originality Report - CASE REPORTS ON SELECTED CLINICAL CASES OF ANIMALS PRESENTED TO ANIMAL HEAL...

Turnitin Originality Report

Processed on: 16-Jun-2023 12:09 PM EAT
ID: 2117207959
Word Count: 37353
Submitted: 1

CASE REPORTS ON SELECTED CLINICAL CASES OF ANIMALS PRESENTED TO ANIMAL HEALTH FACILITIES IN AND AROUND BISHOFTU, ETHIOPIA By Firaol Simework

Similarity Index 19%

Similarity by Source
Internet Sources: 20%
Publications: 2%
Student Papers: 2%

3% match (Internet from 11-Oct-2021)
http://etd.aau.edu.et/bitstream/handle/123456789/25765/Hanna%202018.pdf?isAllowed=y&sequence=1

2% match (Internet from 10-Oct-2021)
http://etd.aau.edu.et/bitstream/handle/123456789/12161/ABDI%20THESIS%20FINAL2018.pdf?isAllowed=y&sequence=1

2% match (Internet from 11-Oct-2021)
http://etd.aau.edu.et/bitstream/handle/123456789/20456/wolkite2019.pdf?isAllowed=y&sequence=1

2% match (Internet from 09-Feb-2020)
http://wujournals.com/data/documents/A-Review-on-Poultry-.....pdf

1% match (Internet from 16-Sep-2022)
https://core.ac.uk/download/pdf/199937347.pdf

1% match (Internet from 06-Oct-2022)
https://www.entomoljournal.com/archives/2020/vol8issue3/PartAI/8-3-318-659.pdf

1% match (Internet from 12-May-2022)
https://www.msdvetmanual.com/metabolic-disorders/hepatic-lipidosis/pregnancy-toxemia-in-sheep-and-goats?query=pregnancy+toxemia+ewes

1% match (Internet from 30-Aug-2017)
https://etd.auburn.edu/bitstream/handle/10415/5222/Barba%20PhD%20dissertation%20final%20submitted.pdf?isAllowed=n&sequence=2

1% match (Internet from 09-Nov-2021)
https://docshare.tips/saunders-manual-of-small-animal-practice_58aeb264b6d87f798d8b5bd3.html

1% match (Internet from 21-Mar-2023)
https://vcahospitals.com/know-your-pet/parvovirus-in-dogs?ad=semD&am=broad&an=msn_s&askid=736a93d8-3516-4b7f-a714-2bfb1e427f36-0-ab_msb&l=sem&o=23753&q=Parvovirus+In+Puppies&qsrc=999

1% match (Internet from 26-Sep-2022)
http://jomardpublishing.com/UploadFiles/Files%5Cjournals%5CRV%5Cv4n3%5CAlemnew_et_al.pdf

1% match (Internet from 13-Nov-2022)
http://researchersliinks.com/current-issues/Cystic-Urolithiasis-Dogs-A-Case-Report-Review-the-Literature/18/25/4796/html

1% match (Internet from 29-Aug-2022)
https://www.hilarispublisher.com/open-access/review-on-newcastle-disease-of-poultry-and-its-public-health-importance-2157-2579-1000441.pdf

1% match (Internet from 04-Jul-2022)
http://ijcar.com/10-5-2022/Dessie%20Abera%20and%20Tesfa%20Mossie.pdf

1% match (Internet from 29-Dec-2020)
https://archive.org/stream/BLOODRADOSTITSVeterinaryMedicine10thEdition/BLOOD%20RADOSTITS%20Veterinary%20Medicine%2010th%20E

1% match (Internet from 15-Dec-2020)
http://nexusacademicpublishers.com/table_contents_detail/4/1526/html

1% match (student papers from 22-Mar-2022)
Submitted to University of Limpopo on 2022-03-22

ABSATRACT Agriculture is a source of livelihood for an estimated 2.5 billion people and provides employment for 1.3 billion people globally. In developing countries, such as Ethiopia, livestock contributes around 30% of agriculturally related income. Despite the large number of livestock in Ethiopia, the sector is characterised by low productivity due to a wide range of animal diseases. This case report thesis describes the approach to handling clinical cases of various infectious and non-infectious diseases and their therapeutic management in different species of animals that were brought to veterinary facilities in and around Bishoftu, Ethiopia. Animals of different ages and species with different physiological statuses were examined from November 2022 to June 2023. The examination method involves owner complaints, anamnesis, and detailed clinical examinations of animals. Animals are treated and managed based on tentative and confirmatory diagnoses using broad-spectrum antimicrobials, anti-inflammatory drugs, and supportive drugs based on the manufacturer's guidelines. Parallel to treatment, samples from the diseased animals were collected and processed following laboratory procedures to reach a definitive diagnosis. The case follow-up was carried out to know the status of recovery through telephone and in-person communication. A total of 30 animals (bovine, equine, ovine, caprine, poultry, and canine) were examined and treated.

https://www.turnitin.com/newreport_printview.asp?eq=1&eb=1&esm=-1&oid=2117207959&sid=0&n=0&m=2&svr=30&r=43.199623680587528&lang=e... 1/25