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**CLINICAL CASE STUDIES ON MAJOR ENCOUNTERED DISEASES OF
VETERINARY IMPORTANCE AND EVALUATION OF SMART PHONE
BASED MOBILE APPLICATION AS A DIAGNOSTIC TOOL IN AND
AROUND BISHOFTU; CENTRAL ETHIOPIA**

MVSc Thesis

By

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Addis Ababa University, College of Veterinary Medicine and Agriculture,

Department of Clinical Studies

MVSc program in veterinary Clinical Medicine

June, 2019

Bishoftu, Ethiopia

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Science in Veterinary Clinical Medicine

By

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DEDICATION

I dedicated this thesis manuscript to all my families for their continuous love, appreciation, encouragement, moral, and financial support during my studies.

STATEMENT OF THE AUTHOR

First, I declare that this thesis is my own original work and has not been presented for a degree in any University and that all sources of materials used for this thesis have been correctly acknowledged. This thesis has been submitted in partial fulfilment of the requirements for an advanced (MVSc) degree at the AA University and is deposited at the University Library to be made available to borrowers under rules of the Library. Brief quotations from this thesis are allowable without special permission provided that accurate acknowledgement of source is made. 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 School of Graduate Studies 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.

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LIST OF ABBREVIATIONS AND ACRONYMS

AHS	Africa Horse Sickness
APMV	Avian Paramyxoviruses
APP	Application
BB	Bovine Babesiosis
BVD	Bovine Viral Diarrhea
CaPV	Capripox Virus
CaPV	Capri Poxvirus
CMT	California Mastitis Test
CRT	Capillary Refill Time
DPI	Days Post Infection
DS	Donkey Sanctuary
CE	Contagious Ecthema
EDDIE	Ethiopia differential diagnosis and investigation center
EL	Epizootic Lymphangitis
EMB	Eosin Methylene Blue
EPEC	Enteropathogenic <i>E.coli</i>
FAD	Flea Allergy Dermatitis
GDP	Gross Domestic Product
GTPV	Goat Poxvirus
GPCR	G-Protein-Coupled Chemokine Receptor
HCC	Histoplasma Capsulatum var. Capsulatum
HCF	Histoplasma Capsulatum var. Farcinosum
HCD	Histoplasma Capsulatum var. Duboisii
HI	Haemagglutination Inhibition
HN	Hemagglutinin Neuraminidase
IGR	Insect Growth Regulator
IMI	Intra Mammary Infection
LSD	Lumpy Skin Disease

LSDV	Lumpy Skin Disease Virus
NB	Nutrient Broth
ND	Newcastle Disease
NMSA	National Meterological Service Agency
NP	Nucleoprotein
NVI	National Veterinary Institute
OIE	Office International des Epizooties
PCR	Polymerase Chain Reaction
PCV	Packed Cell Volume
PPR	Pestes des Petites Ruminants
PPRV	Pestes des Petites Ruminants Virus
PT	Pregnancy Toxemia
RBC	Red Blood Cell
RFM	Retained Fetal Membrane
SCC	Somatic Cell Count
SGP	Sheep Goat Pox
SPANNA	Society for the Protection of Animal Abroad
SPPV	Sheep Poxvirus
TSB	Tyrophthan Soyan Broth
VTH	Veterinary Teaching Hospital
VVND	Velogenic Virus of Newcastle Disease
XLD	Xylosine Lysine Deoxycalcate

ABSTRACT

Livestock sector supports the livelihoods of a large proportion of rural households in most African countries and also Ethiopia is known for its high livestock population. Despite the large number of livestock in Ethiopia the sector is characterized by low productivity due to wide range of disease prevalence. The present case studies described different clinical cases of various infectious and non infectious diseases and their therapeutic management in different species of animals brought to Veterinary Teaching Hospital and Society for the Protection of Animal Abroad of Addis Ababa University from Bishoftu and its surrounding. Animals of different age and different species with different physiological status were examined from September 2018 to June 2019. The examination method involved owner complaint/anamnesis, detail clinical examinations of animals and usage of Ethiopia differential diagnosis and investigation center smart phone as a diagnostic tool. Animals were treated and managed based on tentative diagnosis using broad-spectrum antimicrobials and supportive drugs based on the manufacturer guideline. Parallel to treatment, samples from the diseased animals were collected and processed following laboratory procedures to reach on definitive diagnosis. The cases were then well followed to know status of recovery through telephone conversation. A total of 25 animals were examined of which 76% (19/25) were ruminants while 24% (6/25) were equine, poultry, and canine. Among these, 32% (8/25), 24 % (6/25), 16 % (4/25), 12% (3/25), 8% (2/25), 4% (1/25) and 4% (1/25) of the diseases were caused by virus, bacteria, parasites, miscellaneous, metabolic, fungal and protozoal respectively based on clinical pictures, therapeutic diagnosis and laboratory results. Among the treated animals 80 % (20/25) were recovered, 12 % (3/25) were died and 8% (2/25) passed for postmortem examination. From a total of 22 animals, in 12 (54.5%) animals; the EDDIE diagnosis was matched with the laboratory confirmation of the case, but not in 7 (31.8%) of animals. In conclusion, this study revealed viruses and bacteria were the most common pathogen causing disease followed by parasites. In general, highest proportions of animal diseases could be cured if appropriate therapeutic management and rational drug use are applied. Based on this finding, creating awareness on early treatment of animals for farmers; accessing all necessary data of disease and including all species of animals on smartphone, and installing advanced diagnostic tools in VTH and training of animal health workers were recommended to facilitate the routine animal health care service and reduce the prevalence of disease.

Keywords: *Animals, Bishoftu, Case Studies, Disease, Smart Phone, Spana, VTH*

1. INTRODUCTION

Globally, livestock contributes about 40 percent to the agricultural gross domestic product (GDP). These estimates highlight the important contribution of livestock to sustainable agricultural development. The contribution of livestock to the world's food supply, family nutrition, incomes, employment, soil fertility, livelihoods, transport and sustainable agricultural production continues to be a subject of significant review and debate (Chilonda and Otte, 2006).

In order to increase livestock's contribution to the livelihoods of developing communities requires improved understanding of livestock's multiple and complex roles. The contribution of food from animal origin to the nutritional status of the world population is well documented. Livestock products account for almost 30 percent of human protein consumption. Beyond the important role that livestock play in the provision of food and nutrition in people's diets, they also have important social functions. They raise the social status of owners and contribute to gender balance by affording women and children the opportunity to own livestock, especially small stock (Freeman *et al.*, 2007; Letty and Waters-Bayer, 2010).

Livestock sector supports the livelihoods of a large proportion of rural households in most African countries and it is believed to play a paramount role in rural poverty reduction strategies. Livestock production has been considered as the main component of agricultural development in most parts of Sub-Saharan Africa. Like in many developing countries, domestic animals play a crucial role in Ethiopia. They provide food in the form of meat and milk, and non-food items such as draft power, manure and transport services as inputs into food crop production and fuel for cooking. Livestock are also a source of cash income through sales of animal hides and skins. Furthermore, they act as a store of wealth and determine social status within the community (Gelan *et al.*, 2012).

Ethiopia is known for its high livestock population, being the first in Africa and tenth in the world (Gebrecherkos, 2012). The recent livestock population estimates that the country has about 52.1 million heads of cattle, 24.2 million sheep, 22.6 million goats and 44.9 million poultry (MOARD, 2013). Despite the large number of livestock in Ethiopia the sector is characterized by low productivity and, hence, income derived from this sector of agriculture

could not impart significant role in the development of the Ethiopia economy (Molla, 2010). The low productivity is attributed to high disease incidence and parasite burden, low genetic potential of indigenous breeds, inadequate management, poor nutrition and reproductive performance. Among these constraints, diseases have numerous influences on productivity and fertility of herds. The effect of livestock diseases could be expressed in terms of losses due to mortality and morbidity, loss of weight, slow down growth, poor fertility performance and decrease physical power (Haftu *et al.*, 2014).

The widespread prevalence of a wide range of diseases and parasites in all agro ecological zones of the country causes direct economic losses through high mortality of animals and contributes to the poor productive and reproductive performance of the animals. The annual mortality of livestock is estimated at 8-10%, 14-16% and 11-13%, for cattle, sheep and goats respectively (Asresie and Zemedu, 2015). Various bacterial, viral, protozoal, endoparasites and ectoparasites are frequently encountered livestock diseases all over the country and accounts for the momentous economic losses (Abdeta *et al.*, 2015). Despite a number of diseases affecting productivity of the livestock sector, 40% of the national economy is still tuned on livestock agriculture; however potential and productivity of the sector stays inversely related (Asresie *et al.*, 2015).

Identifying the type of the common and major health problems is very important so that Veterinarians, researchers and other responsible governmental and non governmental bodies can assist in the development of animal health strategies and the selections of possible interventions that will ultimately assist in poverty alleviation, by improving the productivity of the animals. The veterinary clinic is an ideal and reliable source of information about animal diseases and their treatment. People of the surrounding local areas bring their sick animals every day in veterinary Clinic to treat diseased conditions. It is important to know the disease occurrence pattern to resolve the problems in the local area via clinical records of the veterinary hospital through using appropriate technique and technologies (Haftu *et al.*, 2014).

Among important technologies; diagnosis through Smart phone based mobile application is very paramount. The application and use of Smartphone technology has been explored in the field of public health care and community-based reporting within low resource settings. Such tools and

services have been proposed as a means to substantially improve animal health recording, reporting, and surveillance in developing countries, but few detailed field-based trials have been reported in the literature. The value of a previously developed smartphone application, whose main aim is to assist cattle disease diagnosis, was assessed in terms of its utility for disease reporting, with the outcomes for its use in the field being compared with the traditional manual disease reporting system (Beyene *et al.*, 2018).

Accurate disease diagnosis and reporting is a prerequisite to detect disease outbreaks and implementing appropriate measures for their control. Protecting animal health requires adequate disease reporting to allow appropriate action to be taken to mitigate potential risks quickly and effectively. Timely and accurate diagnosis at animal health center is critical to support continuous improvements in animal health and in detecting outbreaks of diseases. More information is required to describe the pattern of occurrence of clinical diseases for the provision of appropriate veterinary care and effective disease control program. However, the current approach taken to animal health service in Ethiopia at different animal health centers is based on paper based reports often prepared on a monthly basis that depends on tentative diagnosis which lacks accurateness on diagnosis of the disease due to lack of laboratory facilities and financial constraints (Beyene *et al.*, 2018).

Therefore the objectives of this research were:

General objective

- ❖ The general objective of this research was to report most encountered disease of animals presented at animal health facilities center in and around bishoftu (VTH and Spana)

Specific objectives

- ❖ To depict clinical manifestations, diagnosis, differential diagnosis, treatment, treatment outcome, control and prevention of each clinical cases
- ❖ To evaluate diagnosis through smartphone based mobile app with clinician diagnosis and laboratory confirmation
- ❖ To give appropriate recommendation based on the findings

2. MATERIAL AND METHODS

2.1. Study Area

The study was conducted from September 2018 to June 2019 on veterinary clinical cases at animal health facilities center in and around bishoftu, central Ethiopia (VTH, SPANA). Bishoftu is located 45kms south east of the capital of Ethiopia, Addis Ababa. It is situated at latitude of about 9° north and longitude of 4° east. The city lies at an altitude of 1850 meters above sea level in central high land of Ethiopia. The area has three distinct seasons, namely main rain, short rain and dry seasons. Based on weather data, the mean annual rainfall of the area is 866 ml with mean minimum and maximum temperatures of 14°C and 26 °C, respectively, with mean relatively humidity of 61.3%. Farmers in the vicinity of Bishoftu town use a mixed crop and livestock farming system. Moreover, Bishoftu and its surrounding have variable and yet representative agro-ecologies of the country (NMSA, 2006).

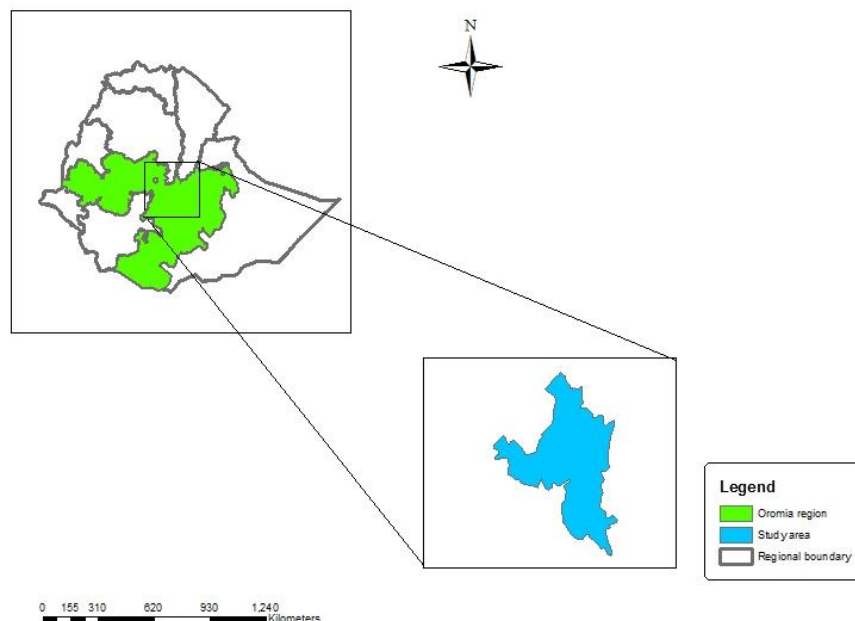


Figure 1: Map representation of a study area

2.2. Study Design and Study Population

A descriptive case study was used in this study. Purposive sampling technique was used on animals coming to the clinics. Different animals with different species (bovine, equine, ovine, caprine, poultry and pets), age group and different sex group were included in this study. This case study was undertaken at animal health facilities center in and around bishoftu, central Ethiopia, to report important encountered clinical diseases and disorders in livestock during the study period from September 2018 to June 2019 with a detailed report and description of species, parameters, the symptoms, diagnosis, differential diagnosis, treatment, and follow-up of an individual patient animals.

2.3. Case Handling Protocols

Clinical case recording format (Addis ababa university) and clinical case handling protocol (Jana and Ghosh, 2013) was used in this case study as indicated in Annex part (**Annex 1 and Annex 2**) respectively.

2.3.1. History taking/anamnesis

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 are very important in disease diagnosis. For completeness and accuracy of history taking, the following points should be well considered (Patient data, Immediate/present history, past history, Management and Environment history) and history of each case was carefully taken which gave a guideline for examination of the animals (Duguma, 2016).

2.3.2. Physical and General examination

Physical condition, behavior, posture, gait, superficial skin wound, prolapsed of the uterus and vagina, salivation, nasal discharge, distension of the abdomen and locomotive disturbance were observed by visual examination of the patient. Examination of different parts and system of the body of each of the sick animals were examined by using procedure of palpation, percussion, auscultation, needle puncture and walking of the animals. The temperature, pulse, and respiratory

rate from each of sick animals were recorded. Clinical examinations of all livestock of different ages were conducted on the basis of diseases history, owner complaint, symptoms, to diagnose diseases and disorders (Kabir *et al.*, 2010).

2.3.3. EDDIE *Smart phone diagnosis and laboratory investigation*

In addition to clinical examination; application of smart phone based mobile application as a diagnostic tool was used in this research and laboratory techniques were also performed to confirm the individual cases. In this research, EDDIE soft ware was developed as a smart phone diagnostic tool. Different data with species of animals excluding pet and poultry, clinical signs, disease and treatment of each disease were recorded on Ethiopia differential diagnosis and investigation center (EDDIE). Based on the data recorded by the mobile app (EDDIE) the diagnosis of the disease, scoring differential diseases diagnosis and its treatment was done. The way in which EDDIE works was mentioned under **annex 3**. At the end clinician's/veterinarian's tentative disease diagnosis was compared with the Smartphone based mobile App result as a diagnostic tool. The appropriate samples was collected from tentatively diagnosed cases (by clinician) from the study sites and transported to Addis Ababa University College of Veterinary Medicine and Agriculture laboratories (Biomedical, Parasitological and Pathology) and National veterinary institute for confirmation. From this result the uses of the smart phone-based mobile App in disease diagnosis was evaluated and compared with the gold standard laboratory finding and used to confirm the underlying causes for each disease.

2.4. Ethical Consideration

Before starting the research a nine page request that explained the purpose of this study and the possibility management planned to reduce pain and suffereing of animals during sampling was submitted to Addis Ababa University college of veterinary medicine and agriculture minutes of animal research ethics and review committee. After the committee evaluated the importance of this study through different aspect, approval was given on minute number VM/ERC/07/09/017, with the reference number (VM/ERC/32/07/09/2017) (**Annex 4**)

3. COMPILED AND REPORTED CLINICAL CASES OF ANIMALS

3.1. Lumpy Skin Disease in Cow

Abstract: Lumpy skin disease is a viral disease of cattle characterized by an appearance of circumscribed firm skin nodules covering all parts of the body with generalized lymphadenopathy. A local breed cow was presented at Veterinary teaching Hospital of Addis Ababa University College of Veterinary Medicine on February 21, 2019 with the complains of nodular eruptions on different body parts especially on the neck parts. According to the owner`s complaints, the other groups (bull) also suffered from the same problem and the feed intake of the cow was also reduced. The animals were kept in communal grazing land with other herds and there was no previous vaccination history for more than a year. Based on physical examinations, the cow was depressed and febrile with the rectal body temperature of 41°C and 72 beats/min and 24 breaths/min heart and respiratory rates, respectively. There was small to large sized circumscribed nodules on the neck part of the cow. The nodules were also seen around the mouth and the ear; and swelling of both prescapular and prefemural lymph nodes was observed. EDDIE Smartphone app result reported the case as Lumpy skin disease. Based on the history, EDDIE result and typical clinical signs the case was diagnosed as Lumpy skin disease. Hence, therapy of 20% Oxytetracycline (Shanghai Thongren Pharmaceutical Co., Ltd, China) at 20mg/kg stat and Dexamethasone (Sokar Healthcare Pvt.Ltd. Gujarat India) 0.2mg/kg/day were given intramuscularly. The owner was also informed to isolate and nurse the cow at home until fully recovered. The cow was recovered from the problem after three month of treatment. In conclusion, lumpy skin disease is very important viral disease of cattle which brings significant economic problem and Vaccination of cattle was effective control measures in preventing the spread of LSD.

Keywords: *Cow, Lumpy skin disease, Oxytetracycline*

3.1.1. Introduction on lumpy skin disease

Lumpy skin disease is a viral disease of cattle characterized by an appearance of circumscribed firm skin nodules covering all parts of the body with generalized lymphadenopathy (Abdallah *et al.*, 2018). In severe cases continuous high pyrexia (40–41.5°C), depression and anorexia may observed (Patterson, 2017). It results in great economic losses due to damage of the skin, reduced milk yield, mastitis, lowered fertility, abortion, and sometimes death due to secondary bacterial infections (Ahmed and Dessouki, 2013). Histopathological changes in the skin lesions of LSD are mainly characterized by vasculities, necrotic epidermis, and eosinophilic intracytoplasmic inclusion bodies (Neamat-Allah, 2015). LSD is common in Ethiopia and responsible for the economic loss due to damage to hide and skin (Ayelet *et al.*, 2014)



Figure 2: Nodular Lesion on whole body due to Lumpy skin disease.

Source: (Neamat-Allah, 2015)

Etiology and clinical signs: LSD is caused by LSD virus (LSDV), for which Neethling strain is the prototype, which together with *sheep poxvirus* (SPPV) and *goat poxvirus* (GTPV) belongs to the genus *Capripoxvirus* (CaPV), subfamily *Chordopoxvirinae*, of the family *Poxviridae*. The CaPV homolog of G-protein-coupled chemokine receptor (GPCR) gene is one of the variable genes within the CaPVs and is a suitable target for genetic differentiation between members of CaPV (Abdallah *et al.*, 2018). Lumpy skin disease (LSD) is an acute or in apparent cattle disease characterized by fever (40–41°C), prescapular and prefemoral lymph nodes become noticeably

enlarged. Shortly after the onset of fever, skin nodules (1–5 cm in diameter) become apparent, in varying numbers, from only a few to multiple lesions covering the entire animal. In severely affected animals, ulcerative lesions appear in the mucous membranes of eye and oral/nasal cavities causing excessive salivation, lachrymation and nasal discharge. All these secretions may contain LSDV and Pox lesions may also be present in the pharynx, larynx, trachea, lungs and throughout the alimentary tract. In postmortem examination of severe cases, pox lesions may be present on the surface of almost any organ (Babiuk *et al.*, 2008). Some infected animals develop oedematous swelling of one or more legs and lameness. The incubation period in natural outbreaks is estimated to be 1–4 weeks. In outbreaks of the disease, the morbidity rate varies widely depending on the immune status of the hosts and the abundance of mechanical arthropod vectors. The mortality rate is generally low (1–3%) but may sometimes reach 40% (Coetzer and Tuppurainen, 2004).

Pathogenesis: There have been few studies conducted on the pathogenesis of LSD in cattle. In the generalized form there is viremia and fever, followed by localization in the skin and development of inflammatory nodules. Following Subcutaneous or intradermal inoculation of cattle with LSDV, localized swelling at the site of inoculation developed 4 to 7 DPI which is varying in size from 1 to 3 cm and covering up to approximately 25% of the skin surface. Enlargement of the regional lymph nodes and generalized eruption of skin nodules usually follows 7 to 19 DPI. Viremia and Low levels of viral shedding in oral and nasal secretions was detectable between 6 and 15, and 12 and 18 DPI, respectively following febrile reaction (El-Kenawy and El-Tholoth, 2010).

LSDV is also demonstrated in saliva, semen and skin nodules for at least 11, 42 and 39 days after the development of fever, respectively. Viral replication in macrophages, fibroblasts, endothelial cells and probably other cells in blood vessel and lymph vessel walls causes vasculitis and lymphagitis in some vessels in affected areas, while thrombosis and infarction may result in severe cases. In natural infection, very young calves, lactating cows, and malnourished animals seem to develop more severe disease that may be due to an impaired humoral immunity. Antibodies was detectable 21 DPI using serum neutralization tests. Immunity after recovery from natural infection is life-long; calves of immune cows acquire maternal antibody and are resistant

to clinical disease for about six months. Eventually, affected animals clear the infection and there is no known carrier state for LSDV (Tuppurainen *et al.*, 2017).

Transmission: Cattle breeds of both sexes and all ages are susceptible to LSDV, and infection has been observed in wild ruminants such as water buffalo (El-Nahas *et al.*, 2011). The transmission of LSDV is believed to occur mainly by blood-feeding arthropods. During the first LSD outbreaks in southern Africa, it was observed that isolated outbreaks occurred in widely scattered herds in the absence of cattle movements. These outbreaks were associated with wet and warm weather conditions with an abundance of blood-feeding arthropod populations, and it was not possible to control the spread of the disease effectively by quarantine measures (Chihota *et al.*, 2001).

Currently, it is widely agreed that LSDV is transmitted mechanically via arthropod vectors. LSD is thought to be transmitted mechanically by biting insects (*Aedes aegypti* mosquitoes) and Culicoides, and ticks have also been implicated in the transmission cycle (Hussein *et al.*, 2014). Female *Aedes aegypti* mosquitoes were shown to transmit LSDV from infected to susceptible cattle for 2–6 days post-feeding on experimentally infected animals. Experimentally, stable flies (*Stomoxys*) are able to mechanically transmit *capripoxvirus* between sheep and live LSDV has been isolated from stable flies after feeding on infected cattle. However, attempts to transmit LSDV between experimentally infected and susceptible cattle by *Stomoxys calcitrans* have failed, as did the transmission of LSDV by two species of mosquito (*Anopheles stephensi* and *Culex quinquefasciatus*) and the biting midge (*Culicoides nubeculosus*). Recently, new evidence has been published reporting a possible role for hard ticks in the transmission of LSDV. The study showed molecular evidence of transtadial and transovarial transmission of LSDV by *R. decoloratus* ticks and mechanical or intrastadial transmission by *R. appendiculatus* and *A. hebraeum* ticks (Chihota *et al.*, 2003).

Diagnosis and its differential diagnosis: Diagnosis of LSDV is performed by observation of characteristic clinical signs, virus isolation, electron microscopy, histopathological examination and serological technique. The differential diagnosis are photosensitization, Pseudo lumpy skin disease; Bovine herpes virus, Besnoitiosis, Insect bites and allergic reactions, Demodicosis and Onchocerciosis (Sameea Yousefi *et al.*, 2017).

Prevention and control: vaccination is the only effective method to control the disease in endemic areas as movement restrictions and removal of affected animals alone are usually not effective. Effective vaccines against LSD exist and the sooner they are used the less severe the economic impact of an outbreak is likely to be (Tuppurainen *et al.*, 2017). Members of the *capripoxvirus* are known to provide cross protection. Hence, homologous (Neethling LSDV strain) and Heterologous (*sheep pox or goat pox virus*) live attenuated vaccines can all be used to protect cattle against LSD infection. Commercially available *capripoxvirus* (CaPV) vaccine strains include LSDV Neethling strain, Kenyan sheep and *goat pox virus* (O-240) and O-180 strains, *Yugoslavian RM65 sheep pox* (SPP) strain, *Romanian SPP*, and *Gorgan goat pox* (GTP) strains (Abutarbush, 2017).

In addition, rapid confirmation of a clinical diagnosis is essential so that eradication measures, such as quarantine, slaughter-out of affected and in-contact animals, proper disposal of carcasses, cleaning and disinfection of the premises and insect control can be implemented as soon as possible during the eruption (Tuppurainen *et al.*, 2005). Moreover, rigorous import restrictions on livestock, carcasses, hides, and semen from endemic areas must be in place in disease free areas. The treatment of LSD is only symptomatic and targeted at preventing secondary bacterial complications using combination of antimicrobial and anti-inflammatory drugs (Abutarbush *et al.*, 2015). Thus the present case report described the case of Lumpy skin disease in cow.

3.1.2. Case description of lumpy skin disease

A local breed cow was presented at Veterinary teaching Hospital of Addis Ababa University College of Veterinary Medicine on February 21, 2018, with complaint of nodular eruptions on different body parts especially on the neck parts. According to the owner's complains, the other groups (bull and calf) also suffered from the same problem and the feed intake of the cow was also reduced. The animals were kept in communal grazing land with other herds and there was no previous vaccination history for more than a year. Upon physical examinations, the cow was depressed and febrile with the rectal body temperature of 40°C and 72 beats/min and 24 breaths/min heart and respiratory rates, respectively. There was small to large sized circumscribed nodules on the neck part of the cow as indicated below in figure. The nodules were also seen around the mouth and the ear and swelling of both prescapular and prefemoral

lymph nodes was observed. EDDIE Smartphone app result also reported the case as Lumpy skin disease. Based on the history, EDDIE result and typical clinical signs the case was tentatively diagnosed as Lumpy skin disease.



Figure 3: Nodular Lesion on Neck and head part of the cow.

3.1.3. Laboratory investigation and findings

For confirmatory diagnosis of the case, excisional biopsy of cutaneous nodule was collected for PCR. During biopsy sampling, the cow was held in crush, the selected nodule (on the left neck) was prepared aseptically, anaesthetized locally using 2% Lidocaine, and the entire nodular biopsy (excisional biopsy) was taken aseptically and washed with Iodine texture 7% as antiseptic. Sample was placed in phosphate buffered saline contained in universal sterile bottle and submitted with cold chain to NVI (National Veterinary institute, Ethiopia) for PCR protocol. The NVI report showed the negative result this could be due to too little sample brought or ways of handling of the sample (**Annex 4** (paper of result from NVI)). Based on History, clinical signs observed, EDDIE Result and its occurrence within group the case was finally diagnosed as Lumpy skin disease.

3.1.4. Case management and treatment outcome

The treatment of the cow was concerned at reducing pain to the animal and losses of the disease. Hence, therapy of 20% Oxytetracycline (Shanghai Thongren Pharmaceutical Co., Ltd, China) at 20mg/kg stat and Dexamethasone (Sokar Healthcare Pvt.Ltd. Gujarat India) 0.2mg/kg/day were managed I.M. The owner was also informed to isolate and nurse the animal at home until fully recovered and vaccinating other group of animals. Three months later the cow was fully recovered and nodules were also disappeared but with some sort of scars on the skin as indicated below in figure.



Figure 4: Cow after three months of Treatment.

3.1.5. Discussion

Lumpy skin disease is an economically devastating viral disease of cattle and it is currently endemic in most African countries and has recently spread out of Africa into the Middle East region (Hamid, 2016). Based on the clinical signs, history, EDDIE Result and its occurrence within group of animals, the current case was finally as LSD and agreed with the report of Al-Salihi (2014), in its clinical signs. Clinical signs observed in the current case such as fever, depression, nodules over the skin around the neck were in agreement with of Oman in 2009 (Kumar, 2011). The EDDIE result and laboratory finding were not agreed to each other.

In the current case, the clinical signs like fever, nodules over the body especially around the neck and enlargement of lymph nodes observed were in agreement with the clinical sign

observed in infected animals by Al-salihi (2014). The usual manifestations of LSD are multiple firm circumscribed nodules developed in the skin of the animals in which head, neck, the perineum, the genitalia, udder, and the limbs are principally involved and also the regional lymph nodes are easily palpable and enlarged 2 times than their normal size observed in Constable *et al* (2017) was in agreement with the present case of lumpy skin diseases. Multiple skin nodules are the characteristic features of LSD, which have inverted conical necrosis with enlargement of superficial lymph nodes observed in present case report were consistent with the LSD clinical lesions recorded by Wainwright *et al.*(2013).

The treatment of LSD is only symptomatic and targeted at preventing secondary bacterial complications using antimicrobial therapy (Abutarbush, 2017). Treatment trials performed by Salib and Osman (2011) with the aim of preventing LSD complications and saving life has been successful using combination of antimicrobials, anti-inflammatory, supportive therapy and antiseptic solutions and also in the present case report, 20% Oxytetracycline and 0.2mg/kg dexamethasone were given.

In conclusion, lumpy skin disease is very important viral disease of cattle which brings significant economic problem and characterized by distinctive nodular lesions principally on the skin, hence reduces hide quality. The treatment of LSD (its complications) is costly as well as does not ensure full recovery therefore; prevention is more beneficial to avoid the substantial economic losses due to hide damages, loss of milk due to mastitis and loss of animal product due to death. Vaccination of cattle was effective control measures in preventing the spread of LSD.

3.2. Salmonellosis in Ox

Abstract: Salmonellosis is an important disease of cattle resulting in increased morbidity and mortality of affected animals as well as a high cost of treatment. A local old breed Ox weighted 200kg was presented to veterinary teaching hospital of Addis Ababa university on December 30, 2018 with the complains of inappetance, diarrhea, the ox kept in house and fed enjera which is left over from the family as a past history. On physical examination the ox experienced severe depressed, febrile 40°C, heart rate 76 beat/min, respiratory rate 24 breath/min and moderate dehydration with 3 seconds capillary refill time and watery feces with mucous, fetid and profuse diarrhea. The smart phone EDDIE application revealed the case as salmonellosis. Based on the history, EDDIE result and clinical sign observed the case was tentatively diagnosed as salmonellosis. The laboratory finding for salmonellosis was negative. As the best medical therapy for this case, Trimethoprim Sulfadiazine 30 mg/kg (Hebei Yuanheng Pharmaceutical Co., Ltd, China) was used as a treatment option for three days intramuscularly and 1ml/10kg Multivitamin was given. The ox was responded well to the treatment and healed from the disease. In conclusion, salmonellosis is an infectious disease of human and animal caused by organisms of *Salmonella*. Basic hygiene practices and the implementation of best management strategies can efficiently mitigate the risks associated with animal contacts.

Keywords: Ox, salmonellosis, sulfadiazine

3.2.1. Introduction on salmonellosis

Salmonellosis is an important disease of cattle resulting in increased morbidity and mortality of affected animals as well as a high cost of treatment. The serovars *typhimurium* and *dublin* are the most common serovars associated with disease outbreaks. *S. typhimurium* is commonly isolated in cases of enteritis in calves less than 2 months old, while *S. dublin* is often present in cases of septicemia, meningoencephalitis and septic arthritis associated or not with enteritis (Costa *et al.*, 2012). Salmonellosis is a major economic and animal welfare problem in the cattle industry worldwide. It is an illness caused by infection with *Salmonella* bacteria. It is primarily an intestinal infection. In cattle, salmonellosis is manifested in two main clinical patterns. In young animals, *Salmonella typhimurium* is the predominant etiological agent of salmonellosis, causing

acute enteritis, which results in severe dehydration and high mortality if left untreated. In contrast, *Salmonella dublin* is predominant in older animals, causing both enteric and systemic infections, including septicemia and abortion (Wray *et al.*, 1991).

In addition to *S. dublin* and *S. typhimurium* other serotypes are also capable of causing Salmonellosis in cattle as well. Salmonellosis is mostly associated with fever, anorexia, prominent diarrhea, and dehydration, which are secondary to acute necrotizing enteritis. Lethality is inversely proportional to the age of the infected calf. Feces tend to be watery, with variable amounts of mucus, fragments of the intestinal mucosa or blood clots. *S. dublin* is highly adapted to cattle, affecting both young and adult animals (Costa *et al.*, 2012; Kemal, 2014).

In young calves, *S. dublin* causes disease that is clinically indistinguishable from *S. typhimurium* and is characterized primarily by diarrhea. However, *S. dublin* has a much higher potential for systemic dissemination, which can result in meningoencephalitis, polyarthritis or pneumonia, occasionally in the absence of diarrhea. In adult cattle, infection with this serotype is common, and it can be asymptomatic or characterized by abortion as the only detectable clinical sign. *S. dublin* infection can also be associated with fever, reduced milk production, and mild to moderate diarrhea. Individual animals may shed *S. Dublin* intermittently leading to sporadic or repeated outbreaks of disease in a given herd (Costa *et al.*, 2012).

Etiology and its clinical sign: There are host specific and non-host specific *salmonella* serotypes. The host specific *salmonellae* include *Salmonella* Paratyphi (man), *Salmonella* Gallinarum (fowl), *Salmonella* Pullorum, *Salmonella* Abortus equi (horse), *Salmonella* Abortus ovis (sheep), *Salmonella* Abortus suis (pig) and *Salmonella* Dublin (mainly in cattle). Non-host specific *salmonella* is *Salmonella* Typhimurium (man, cattle, sheep, pig, horse, fowl and rodents) (Kemal, 2014). The major syndromes in livestock are enteritis and septicemia. Acute enteritis occurs in adult animals and in young animals such as calves over a week old. It is characterized by profuse diarrhea, dehydration, depression, abdominal pain and anorexia. The feces are watery to pasty, often foul smelling, and may contain mucus, pieces of mucous membrane, casts or blood. A fever occurs early in the infection, but can disappear by the time diarrhea develops. In dairy cows, milk production drops acutely. Intestinal salmonellosis usually lasts from several days to a week. Death can occur as the result of dehydration and toxemia (Pender, 2003).

Subacute enteritis may be seen in adult animals including horses, cattle and sheep. The most obvious symptoms are persistent soft feces or diarrhea, and weight loss. There may also be mild fever, inappetence and some dehydration. Chronic enteritis is mainly seen in older calves, adult cattle and growing pigs. The clinical signs can include progressive emaciation, low-grade intermittent fever and inappetence. Enteritis with septicemia is the most common syndrome in newborn calves, lambs, foals, fowl, and piglets. It may also be seen in pigs up to 6 months of age and occurs in adult animals (Molla *et al.*, 2003).

Source of Infection and transmission: Most *Salmonella* infection in farm animals are likely to acquire from animals of the same species, especially in the case of the host adapted serovars. In adult cattle there are important differences in the behavior of *S. dublin* and *S. typhimurium*. Those animals which recover from clinical *S. dublin* infection may become persistent excreters, shedding up to 10⁶ organisms per gram of feces daily. Other herd may harbor infection and excrete the organisms only when stressed particularly at parturition. Pasture contamination also important source of salmonellosis; results when flooding occurs and there are many reports of clinical case in adult cattle arising from grazing recently flooded pasture (Wray, 1994).

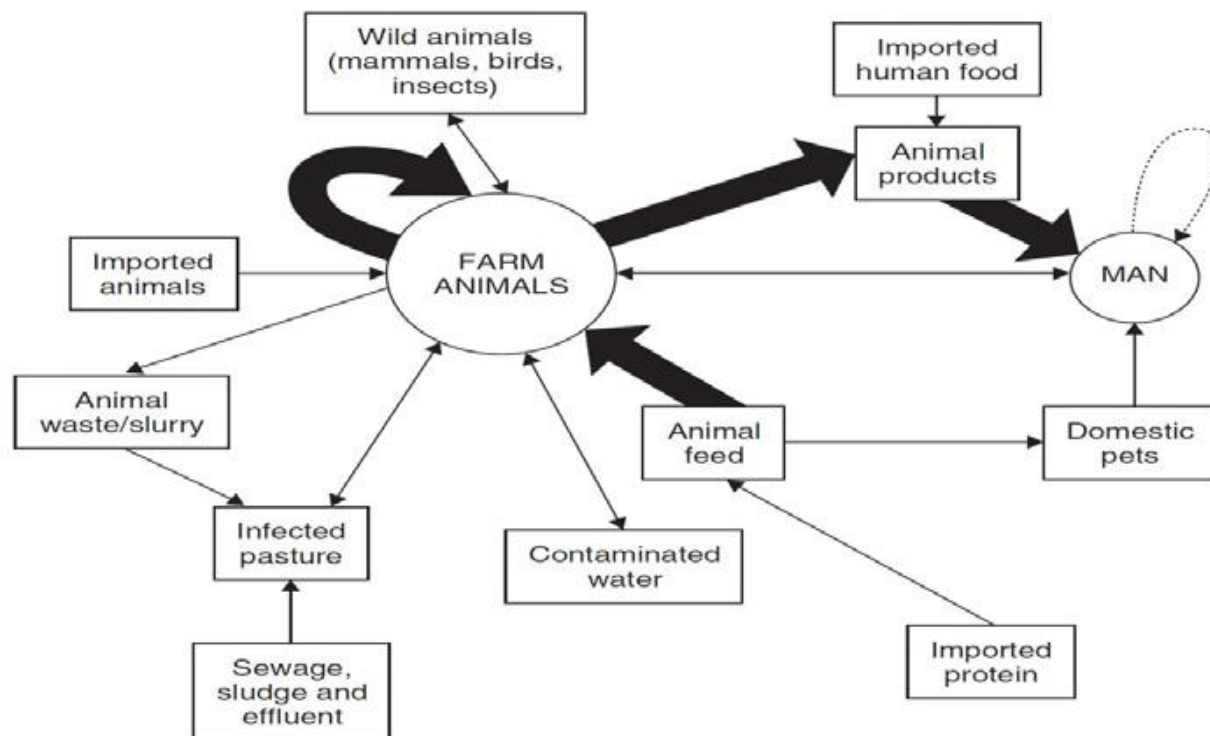


Figure 5: Representation of *Salmonella* spp. indicating source of infection and transmission.

Source: (Adem and Bushra, 2016).

Pathogenesis: After oral inoculation with the bacteria, *salmonella* invades the intestinal wall and progresses to localize in the mesenteric lymph nodes. Development of disease then depends on the immune status and age of host, virulence of the organism, and stresses on the animal. Diarrhea occurs due to enteritis and the elaboration of an enterotoxin, which causes an increased secretion of sodium, chloride, and water into the gut lumen (Kemal, 2014).

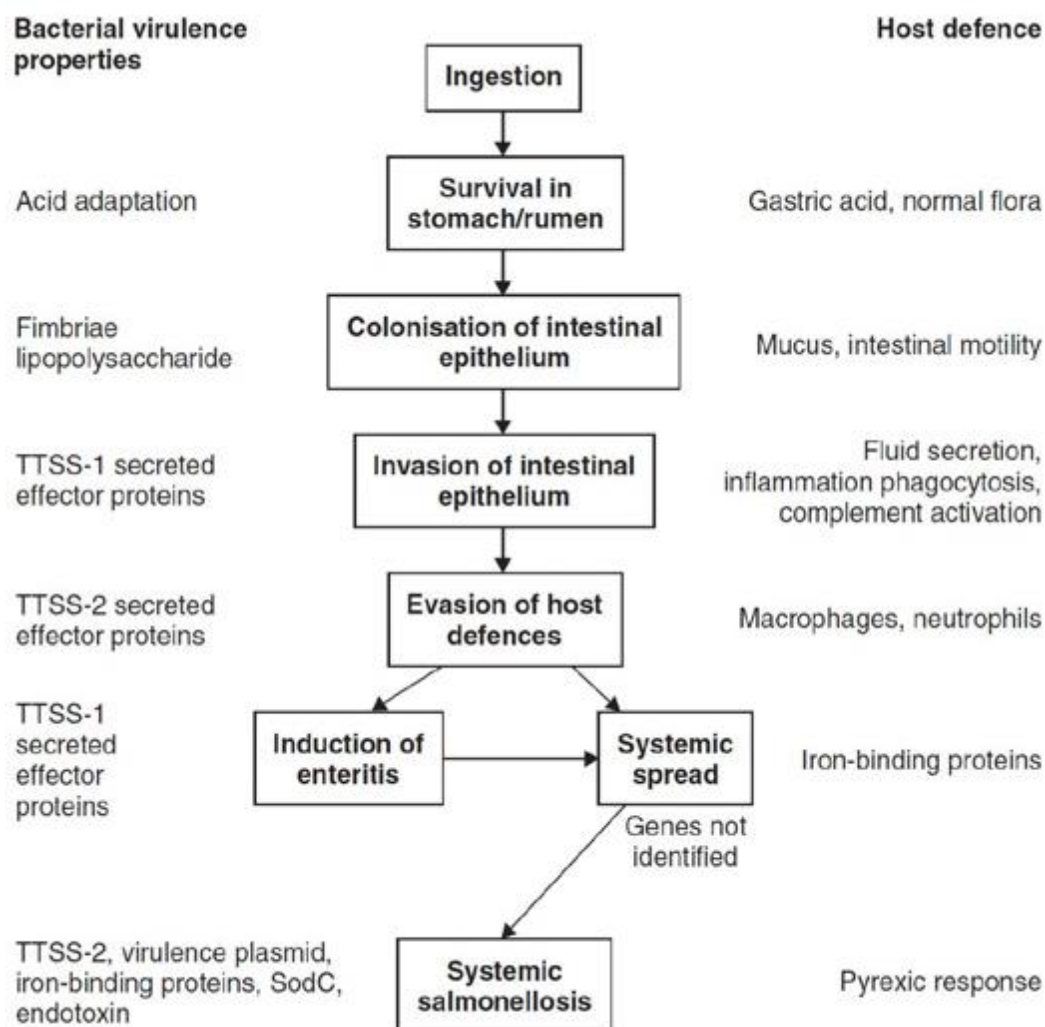


Figure 6: The pathogenesis and host defence mechanism of *Salmonella*.

Source: (Kemal, 2014).

Diagnosis and its differential diagnosis: Definitive diagnosis of salmonellosis is typically made by bacterial culture, usually of the feces and serological test. However, because *Salmonella* can be found in healthy individuals, a positive culture alone does not necessarily indicate that the organism is the cause of the disease rather observing important clinical sign of salmonellosis is also important. Campylobacteriosis, parasitic diarrhea, shigellosis, vibriosis, viral gastroenteritis and yersiniosis are differential diagnosis to salmonellosis (Kemal, 2014).

Treatment and prevention of salmonellosis: Treatment of non-typhoidal *Salmonella* infection is different from typhoid infection. In treatment of non-typhoidal *Salmonella* infection antibiotics should not be used routinely, as used in typhoid. Antibiotic should be only used if required as most infection with non-typhoidal *Salmonella* is self-limiting type and duration of diarrhea and fever are not much affected by use of antibiotics. Additionally antibiotic therapy can increase relapse of infection and also prolong the duration of gastrointestinal carrier states. The main treatment should be aimed at correcting dehydration that may arise due to prolonged diarrhea by fluid and electrolyte replacement (Kemal, 2014).

Condition that contribute to an increasing incidence of epidemic salmonellosis include large herd size, more intensive and crowded husbandry and the trend of free-stall barn with loose housing, which contribute to the fecal contamination of the entire premise. When salmonellosis has been confirmed in a herd, the following control measure should be considered; isolate obviously affected animals to one group if possible, treat severely affected animals, affected animals institute measure to minimize public health concern like (no raw milk should be consumed) physically clean the environment and disinfect the premise following resolution of the outbreak or crises period. Prevention is best accompanied by maintaining a cross herd and culturing new feed additives and components before using the entire ration (Molla *et al.*, 2003). Thus the present case report described the case of salmonellosis in ox.

3.2.2. Case description of salmonellosis

A local breed Ox weighted around 200kg was presented to veterinary teaching hospital of Addis Ababa university on December 30, 2018 with the complains of inappetance, diarrhea, the ox kept in house and fed over enjera which is left over from the family as a past history. On physical examination the ox experienced severe depressed, febrile 40°C, heart rate 75 beat/min, respiratory rate 22 breath/min and moderate dehydration with 3 seconds capillary refill time and watery feces with mucous, fetid and profuse diarrhea which is prominent as indicated in the following figure. The smart phone EDDIE application revealed the case as salmonellosis. Based on the history, EDDIE result and clinical sign observed the case was tentatively diagnosed as salmonellosis and its differential diagnoses to this case were: Colibacillosis, coccidiosis and Campylobacteriosis.

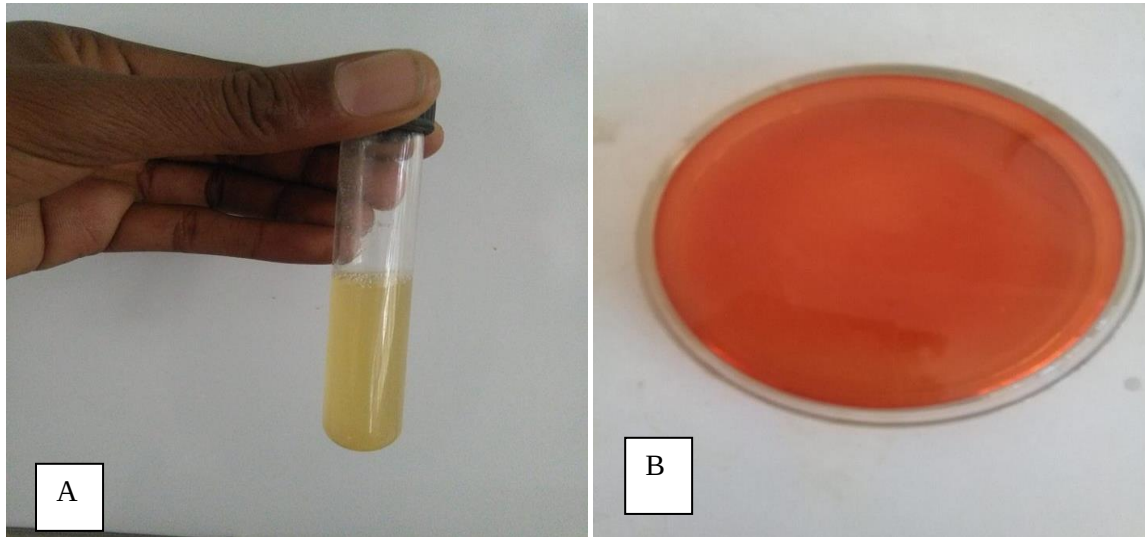


Figure 7: A photograph of diarrheic ox due to suspect salmonellosis case.

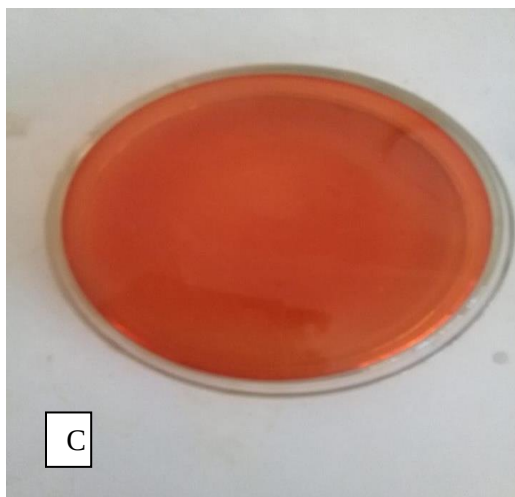
3.2.3. Laboratory findings and its investigation

The fecal sample was taken from the ox and sent to biomedical and parasitology laboratory of Addis Ababa University for further confirmation. Fecal floatation technique was performed for the detection of Eimeria/Coccidian oocytes and the result was negative. The sample was enriched in Tryptone soya broth for 24 hours. The sample from the enriched media was transferred to selenite F broth tube. At the end the sample from rappaport was subcultured on XLD media. No

bacteria (*salmonella*) growth was observed on the XLD media and also checked for *E.coli* by sub cultured on nutrient agar medium and EMB, no growth of bacteria was detected.



A) Selenite f broth tube transferred to rappaport, B) XLD agar



C) The suspect *salmonella* Sample was not grown on XLD

Figure 8: Sample on rappaport, XLD media and cultured sample on XLD.

3.2.4. *Salmonellosis management and its treatment outcome*

Even if the laboratory finding was negative for the current case; based on history, clinical signs observed and report of smart phone EDDIE application the case was finally diagnosed as salmonellosis. The laboratory finding was disagreement with the report of the clinician and EDDIE smart phone report. As the best medical therapy for this case Trimethoprim Sulfadiazine 30mg/kg (Hebei Yuanheng Pharmaceutical Co., Ltd, China) was used as a treatment option for three days intramuscularly and 1ml/10kg Multivitamin was given; the owner was also informed to manage the ox alone with good management and keeping the hygienic status of animal housing and their feeding. The ox was responded well to the treatment and healed from the disease as indicated in figure as follow after a four month.



Figure 9: photography of Ox after fours month of treatment.

3.2.5. *Discussion*

Infections due to *Salmonella* spp. remain a global problem. These infections may cause significant morbidity and mortality both in humans and animal production as well as considerable economic losses. People, other livestock and companion animal species are also susceptible to infection and could suffer serious illness. Carrier animals can maintain the infection within a herd and may continue to shed organisms contributing to repeat exposure of healthy and sick animals (Al-Otaibi, 2003).

The current case was diagnosed as a Salmonellosis based on the history and clinical signs observed and also the EDDIE smart phone app report as it was salmonellosis; but, the laboratory finding was negative for this case, this may be due to false negative result of laboratory or due to misdiagnosis of the case. However, the typical clinical signs observed were almost related to salmonellosis. The laboratory finding was also disagreed with the diagnosis obtained by EDDIE Result; since it reported as the case was salmonellosis. The clinical changes seen in the current case report were fever, lethargy, lack of appetite and fetid diarrhea which was agreed with the clinical signs observed in an outbreak of *S. dublin* (Marques *et al.*, 2013). The severity of the clinical signs and course of the salmonellosis in cattle infected with *S. dublin* depend on factors such as infectious dose, route of infection, host resistance and strain, which often result in severe clinical manifestations in affected animals (Nielsen, 2013). The treatment given for this case was Trimethoprim sulfadiazine 30mg mg/kg for three days. The treatment option used in the current case provided good response to the disease and it was in agreement with the treatment recommended for salmonellosis by kemal (2014).

In conclusion, salmonellosis is an infectious disease of human and animal caused by organisms of the two species of *Salmonella* (*S. enterica* and *S. bongori*). A *Salmonella* pathogen are highly adaptive and potentially pathogenic to human and other domestic animals; young, pregnant and lactating animals are the most susceptible and are capable of producing a serious of infections having foodborne zoonosis importance. Basic hygiene practices and the implementation of scientific based management strategies can efficiently mitigate the risks associated with animal contacts.

3.3. Fasciolosis in Ox

Abstract: Parasitism including *fasciolosis* is one of the major limitations in livestock productions in most of the tropical and sub-tropical countries of the world. An old Ox weighted 180kg was presented to Veterinary Teaching Hospital of Addis Ababa university, college of veterinary medicine on November 23, 2018 with the complains of inappetance for three days, bottle jaw under its neck before three weeks ago, the herd of cattle managed extensively in a field around swampy area and no history of previous medication. Based on physical examination the ox was depressed, minor dehydration, rough hair coat, pale mucous membrane,

temperature was 36.7°C, heart rate 70 beat/min, respiratory rate 28 breath/min and prescapular and prefemoral lymphnodes were normal. The EDDIE Result revealed the case as GIT parasite. Based on the history, clinical finding and laboratory result it was diagnosed as *fasciolosis* and its differential diagnosis to this case were: Strongylosis, *Haemonchosis* and Concurrent GIT parasite. The current case was treated with Triclabendazole 12 mg/kg and multivitamin 1ml/10kg as a supportive therapy since the ox was suffered from inappetence. As the owner responded to me the ox was recovered from the disease and sold to the local people for draft purpose. In conclusion, *fasciolosis* is an important limiting factor for ovine production and causes several economic losses due to morbidity and mortality and can be controlled by reducing the populations of the intermediate snail host, or by appropriately deworming with anthelmintic drugs.

Keywords: *Fasciolosis, Ox, Triclabendazole*

3.3.1. Introduction on *fasciolosis*

Parasitism is one of the major limitations in livestock productions in most of the tropical and sub-tropical countries of the world. Cattle become susceptible to various parasitic infections under arid conditions especially when reared under unhygienic management system. The parasitic diseases could cause great economic losses and might induce a mortality of 30-40% in affected animals. Among several helminthes parasites of economic importance in ruminants, *F. gigantica* is the most important and widely prevalent species in Asia and Africa. *Fasciolosis* is distributed worldwide and causes enormous economic losses in terms of reduction in milk and meat production, condemnation of liver, loss of draught power, reproductive failure and mortality. Recently, worldwide losses in animal productivity due to *fasciolosis* were conservatively estimated over US\$ 3.2 billion per annum (Mungube *et al.*, 2006).

Fasciola hepatica is a “well-known, old parasite of sheep” (Rojo-Vázquez *et al.*, 2012), which continues to be a serious challenge to the health, welfare, productivity and reproduction of livestock throughout the world (Charlier *et al.*, 2014). Due to its persistence and zoonotic role, more attention has been paid in the last few years towards this particular liver fluke. Aspects of

the biology, epidemiology, diagnosis and control of *F. hepatica* infection in sheep have recently been reviewed (Taylor, 2012).

Etiology and Clinical Sign: Fascioliasis is a worldwide disease caused by *Fasciola* spp. and is often neglected despite its common occurrence in endemic areas and it is caused by two species of parasitic flatworms or trematodes that mainly affect the liver. It is caused by Digenean trematode of the Genus *Fasciola* consisting of two species usually implicated in causing the disease namely *F. hepatica* and *F. gigantica* (Urquhart *et al.*, 2007) .

The clinical features of *Fasciolosis* can have acute, sub-acute and chronic forms. Acute *Fasciolosis* occurs as disease outbreak following a massive, but relatively short-term, intake of metacercaria (Asrat, 2004). Several clinical syndromes are acute *Fasciolosis* in sheep most often occurs as sudden death without other apparent clinical abnormality. Animals suffering from acute *Fasciolosis* especially sheep and goat, may display no clinical signs prior to death; while some may display abdominal pain and discomfort and may develop jaundice. In some cases, the liver capsule may rupture and fluid may leak into the peritoneal cavity causing death due to peritonitis. More commonly, on ingestion of fewer metacercariae, fever and eosinophilia is seen. It is usually seen in the summer and autumn but may occur at any time when sheep have the opportunity to graze heavily contaminated herbage. If the disease is observed clinically in sheep it is manifested by dullness, weakness, lack of appetite, pallor and edema of mucosa and conjunctiva and pain when pressure is exerted over the area of the liver (Spithill and Dalton, 1998).

Death usually results from blood loss due to hemorrhage and tissue destruction caused by the migratory juvenile flukes in the liver resulting in traumatic hepatitis. This is more commonly seen in sheep than in other hosts. Sub-acute *Fasciolosis* is caused by ingestion of a moderate number of metacercariae and is characterized by anemia, jaundice and ill-thrift. The migrating fluke causes extensive tissue damage, hemorrhage and in particular liver damage. The result is severe damage, anemia, liver failure and death 8 - 10 weeks (Ngategize *et al.*, 1993).

Chronic *Fasciolosis* is the most common clinical syndrome in sheep. It occurs when the parasite reaches the hepatic bile duct. The principal effects are bile duct obstruction, destruction of liver

tissue, hepatic fibrosis and anemia. The onset of clinical signs is slow. Animals become anemic and anorectic, as the adult fluke becomes active within the bile duct and signs may include dependent edema or swelling under the jaw ('bottle jaw'). Affected animals are reluctant to travel. Death eventually occurs when anemia becomes severe. Additional stress upon anemic animals, such as droving, may lead to collapse and death. Cattle typically present with signs of weight loss, anemia and chronic diarrhea (Abdisa, 2017b). Chronic *Fasciolosis* does not become apparent until several weeks after the danger of acute disease has receded. It occurs when the parasite reaches the hepatic bile duct (Mitchell, 2003).

Pathogenesis: The development of *fasciolosis* infection in definitive host is divided into two phases: the parenchymal (migratory) phase and the biliary phase. The parenchymal phase occurs during migration of flukes in the liver parenchyma and is associated with liver damage and hemorrhage. During the parenchyma stage of the infection, liver damage caused by the migrating flukes compromise liver function, which in sheep is reflected in a decline in plasma albumin concentrations, attributed partly to reduced rate of synthesis and partly to an expansion of the plasma volume (Abdisa, 2017b). Early infection, during fluke migration, there is hyper proteinemia, hyper globulinemia, and hypo-albuminemia. The hypo-albuminemia is associated with plasma volume expansion caused by liver damage and reduced albumin synthesis. When excysted juvenile flukes penetrate the intestinal wall then flukes migrate within the abdominal cavity and penetrate the liver or other organs. *F. hepatica* has a strong predilection for the tissues of the liver (Asrat, 2004). The biliary phase occurs when the parasite is in the bile ducts, and results from the hematophagic activity of the adult flukes and from the damage to the mucosa, by their cuticles spines and in biliary ducts, flukes mature, feed on blood, and produce eggs. Hypertrophy of biliary ducts associated with obstruction of the lumen occurs as a result of tissue damage. Thus, a progressive loss of plasma albumin occurs in all infected host species, starting from around the time the fluke commences blood feeding (Zeryehun, 2012).

Diagnosis and differential diagnosis *fasciolosis*: *Fasciolosis* can be diagnosed based on clinical sign, grazing history and seasonal occurrence, examination of feces by laboratory tests and post mortem examination. The differential diagnosis of *fasciolosis* are *Haemonchosis*, GIT and chronic disease (Terefe *et al.*, 2012).

Treatment and prevention of *fasciolosis*: Not all compounds are equally effective against all stages of development of *F. hepatica* in the body. For the treatment of acute *fasciolosis*, it is essential to choose a product which is highly effective against the juveniles that damage the liver parenchyma. For chronic disease a compound active against adult fluke is required. Triclabendazole is considered as the most common drug due to its high efficacy against adult as well juvenile flukes. It is effective against adult *F. hepatica* at a dose rate of 10mg/kg in cattle. It is ovicidal and will kill any *F. hepatica* eggs present in the bile duct or the alimentary tract at the time of treatment (Hansen and Perry, 1994).

The control and prevention of *fasciolosis* is mostly associated with average rainfall and temperature records of any geographic regions. Reduction of snail population before any scheme of snail control is under taken as a survey of the snail habitat should be made to determine whether they are localized or widespread. The prophylactic used of anthelmintics aiming to reduce pasture contamination by fluke eggs at times most suitable for development of fluke, April to august and removing fluke population at times of heavy burdens or at periods nutritional stress to animal. Prophylactic treatment in sheep is therefore directed at reducing the fluke burdens in the winter at a time when the nutritional status of the animal is at its lowest level (Rai *et al.*, 1996). Thus the present case report described *fasciolosis* in Ox.

3.3.2. Case description of *fasciolosis*

An old Ox weighted 180kg was presented to Veterinary Teaching Hospital of Addis Ababa university, college of veterinary medicine on November 23, 2018 with the complains of inappetance for three days, bottle jaw under its neck before three weeks ago, the herd of cattle managed extensively in a field around swampy area and no history of previous medication. Based on physical examination the ox was depressed, minor dehydration and minor swelling under neck, rough hair coat, pale mucous membrane, temperature was 36.7°C, heart rate 70beat/min, respiratory rate 28 breath/min and prescapular and prefemoral lymphnodes were normal. Based on the history and clinical finding the tentative diagnosis was *fasciolosis* and its differential diagnosis to this case was: Strongylosis, *Haemonchosis* and Concurrent GIT parasite. But the EDDIE was revealed as the case as gastrointestinal parasite.



Figure 10: Photography of ox infected by fasciolosis.

3.3.3. Laboratory finding and its investigation

Fresh Fecal sample was taken from the rectum of the ox and taken to veterinary parasitology laboratory of Addis Ababa University. Simple Flootation technique and sedimentation technique were performed. No more egg was observed under 40xmicroscope in flotation, but in sedimentation technique An ellipsed operculum eggs of *fasciola* was seen under microscope; as indicated figure as follow. Based on the history, clinical signs observed, EDDIE smart phone app and laboratory finding the case was finally diagnosed as *fasciolosis*.

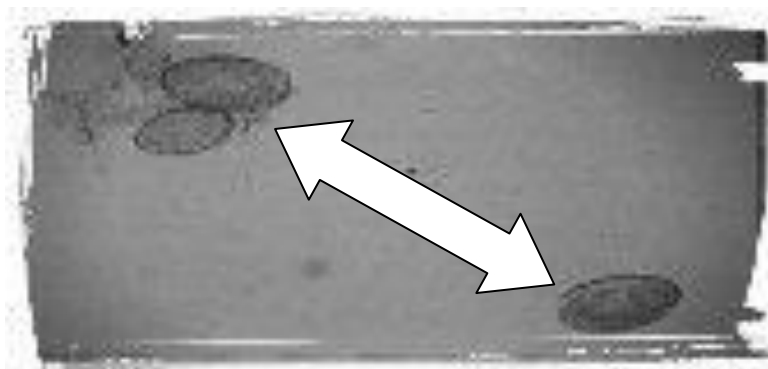


Figure 11: Egg of *fasciola* under a microscope.

3.3.4. Case management and its treatment outcome

The current case was treated with Triclabendazole 12 mg/kg stat bolus and multivitamin 1ml/10kg as a supportive therapy since the ox was suffered from inappetence and the owner also

recommended to deworm their animals. As the owner responded through phone calling; the ox was recovered from the disease and sold to the local people for draft purpose.

3.3.5. Discussion

Fasciolosis, caused by *Fasciola* species, is a disease of herbivorous animals and has a worldwide distribution (Haseeb *et al.* 2002). In this case report, the history obtained, clinical signs observed and laboratory finding revealed the case as *fasciolosis* and the clinical signs observed in the current case including the history met with the review of (Abdisa, 2017b). Parasitological laboratory of sedimentation also revealed the eggs of *fasciola* which agreed with finding of hashemnia *et al.* (2015). The laboratory finding obtained was not agreed with the result obtained by EDDIE smart phone app.

In this case report, clinical signs observed were similar to other reports Martinez-Moreno *et al.* (1999); Radostits *et al.* (2007). For the treatment of *Fasciolosis*, it is essential to choose a product highly effective against the juveniles that damage the liver parenchyma. For chronic disease, a compound active against adult fluke is required. Triclabendazole is considered as the most common drug due to its high efficacy against adult as well juvenile flukes and in the current case report also triclabendazole was used for treatment purpose (Abdisa, 2017b).

In conclusion, *Fasciolosis* is an important limiting factor for ovine production and causes several economic losses due to morbidity and mortality and also due to liver condemnation thereby contributing to loss hide and wool productivity of sheep industry. *Fasciolosis* may be controlled by reducing the populations of the intermediate snail host or by appropriate anthelmintic treatment and the population of snail should be destroyed by applying Molluscicide and destroying the environment that suit for snail's reproduction and the owner was also advised to deworm his animals.

3.4. Abscess Developed Due to Wound in cow

Abstract: Abscess, a localized collection of pus in a cavity formed from tissues that have been broken down by infectious bacteria or through wound. A local breed cow of 180 kg was presented to Veterinary teaching hospital of Addis Ababa university on December 10, 2018 with the complains of the animal had previously suffered a traumatic injury on the left hind leg. The injury was not treated before and left as it is for six month. Upon physical examination the body temperature was 38.3 °C, respiratory rate 24 breath/min, heart rate 78 beat/min and the mucus membrane of the cow was normal. Upon admission at veterinary teaching Hospital, the cow was with localized infection (Abscess) with smooth and circled swelling on the left hind leg and matured abscess was detected based upon palpation. The wound appeared superficial, was abscessed and collection of pus was detected. The wound was first cleaned with saline and matured abscess was lanced and lavaged to remove pus and much pus was removed and washed well with Iodine texture 2% for three days along with antibiotic therapy. The animal had previously not treated and treatment with penstrip (Chongqing Fantong Animal Pharmaceutical Co.Ltd, China) for three successive days at 1ml/20kg/day was recommended. On follow up period after three weeks of post treatment, the cow totally healed from the problem. In conclusion, In order to avoid abscess due wound problem or traumatic lesions; proper animal handling technique is important.

Keywords: *Abscess, cow, Penstrip, wound*

3.4.1. Introduction on wound and its role for abscess formation

The skin is one of the most important organs of the body with numerous complex functions essential for our survival. Its primary function is to serve as a protective barrier against the environment. It can protect against harmful chemicals, ultraviolet radiation, and pathogenic organisms, while at the same time it can produce vitamin D and regulate body temperature and moisture loss. Wound is a disruption of cellular, anatomical, and functional continuity of a living tissue that may lead to abscess formation. It may be produced by physical, chemical, thermal, microbial, or immunological insult to the tissue. When a small wound found on the skin it facilitates entrance of pathogens like staphylococci or streptococci to solid tissue and sometimes

develops abscess. When skin is torn, cut, or punctured it is termed as an open wound and when blunt force trauma causes a contusion, it is called closed wound, whereas the burn wounds are caused by fire, heat, radiation, chemicals, electricity, or sunlight (Shuid *et al.*, 2005; Jalalpure *et al.*, 2008).

According to the duration and nature of healing process, the wound is categorized as acute and chronic (Szycher and Lee, 1992; Robson *et al.*, 2001). An acute wound is an injury to the skin that occurs suddenly due to accident or surgical injury. It have the potential to move from the acute wound to chronic wounds, requiring the physician to have a thorough understanding of outside interventions to bring these wounds back into the healing cascade; if it is not managed early, abscess would takes place. It heals at a predictable and expected time frame usually within 8-12 weeks depending on the size, depth and the extent of damage in the epidermis and dermis layer of the skin (Schreml *et al.*, 2010; Rajendran and Anand, 2011).

Chronic wounds on the other hand fail to progress through the normal stages of healing and cannot be repaired in an orderly and timely manner. There is more chance of abscess formation in chronic wound than acute wound (Lazarus *et al.*, 1994; Dhivya *et al.*, 2015). Wound healing is a dynamic and complex process of tissue regeneration and growth progress through four different phases: the coagulation and haemostasis phase (immediately after injury); (ii) the inflammatory phase, (shortly after injury to tissue) during which swelling takes place; (iii) the proliferation period, where new tissues and blood vessels are formed and (iv) the maturation phase, in which remodeling of new tissues takes place (Tarnuzzer and Schultz, 1996). These phases occur in an ordered manner overlapping with each other in a well-connected cascade (Rivera and Spencer, 2007; Strecker-McGraw *et al.*, 2007). Promotion of these phases are largely depends on the wound type (Baxter Jr, 2015).

Abscess, a localized collection of pus in a cavity formed from tissues that have been broken down by infectious bacteria or through wound. An abscess is caused when bacteria such as staphylococci or streptococci gain access to solid tissue (e.g., by means of a small wound on the skin). The toxins released by these multiplying bacteria destroy cells and thus trigger an acute inflammation at the site, with its characteristic signs of redness, pain, swelling, and heat. White blood cells (leukocytes) collect at the site; these leukocytes break down the dead tissues

and absorb the bacteria by means of phagocytosis. Thick yellowish pus is formed from the broken-down tissues, the dead bacteria and leukocytes, and the extracellular fluid that has accumulated. At the same time, nearby healthy cells form a capsule of tissue around the pus and develop a cell wall that delimits the abscess from nearby healthy tissues. When the abscess is ruptured, either naturally or through medical intervention, the pus escapes, the swelling and pain are relieved, and the delimiting cell wall eventually grows back into the abscess cavity (Bernard *et al.*, 1989).

Etiology and clinical sign of Abscess: Common skin contaminant bacteria causing abscess include: *Staphylococcus*, *Actinomyces pyogenes*, *Fusobacterium necrophorum*, *Streptococcus* and rarely in *clostridial* infections, *Corynebacterium pseudotuberculosis* which causes caseous lymphadenitis in sheep and goat and ulcerative lymphangitis in horses, *Rhodococcus equi* which causes pulmonary and subcutaneous abscesses in horses and cervical lymphadenitis in pigs and *Pseudomonas mallei* which causes glanders in horses (Bernard *et al.*, 1989; Zidan *et al.*, 2013).

Clinical signs of abscesses and other localized aggregations of pyogenic lesions differ according to their causes: General clinical signs may include: Fever, depression, lack of appetite and have signs of toxemia, Pain resulting in abnormal posture, e.g. arching of the back, or gait abnormality, including severe lameness, Weight loss, which can be dramatic in degree and rapidity, Obstruction of lymphatic and venous drainage, which can cause local swelling and edema (Singer and Talan, 2014).

Diagnosis and its differential diagnosis: An abscess is a localized collection of pus (purulent inflammatory tissue) caused by suppuration buried in a tissue, an organ, or a confined space, lined by pyogenic membrane. Ultrasound imaging in the emergency department can help in diagnosis. Abscesses should be differentiated from empyemas, which are accumulations of pus in a preexisting rather than a newly formed anatomical cavity. Other conditions that can cause similar symptoms include: cellulitis, a sebaceous cyst and necrotising fasciitis. Cellulitis typically also has an erythematous reaction, but does not confer any purulent drainage (Singer and Talan, 2014).

Treatment and prevention of Abscess: The standard treatment for an uncomplicated skin or soft tissue abscess is opening and draining and it is recommended to use antibiotics in minimum cases. The abscess should be inspected to identify if foreign objects are a cause, which may require their removal. If foreign objects are not the cause, incising and draining the abscess is standard treatment. In critical areas where surgery presents a high risk, it may be delayed or used as a last resort. Warm compresses and elevation of the limb may be beneficial for a skin abscess (Singer and Talan, 2014) . Thus the present case report described the Abscess in a cow.

3.4.2. Case description on abscess

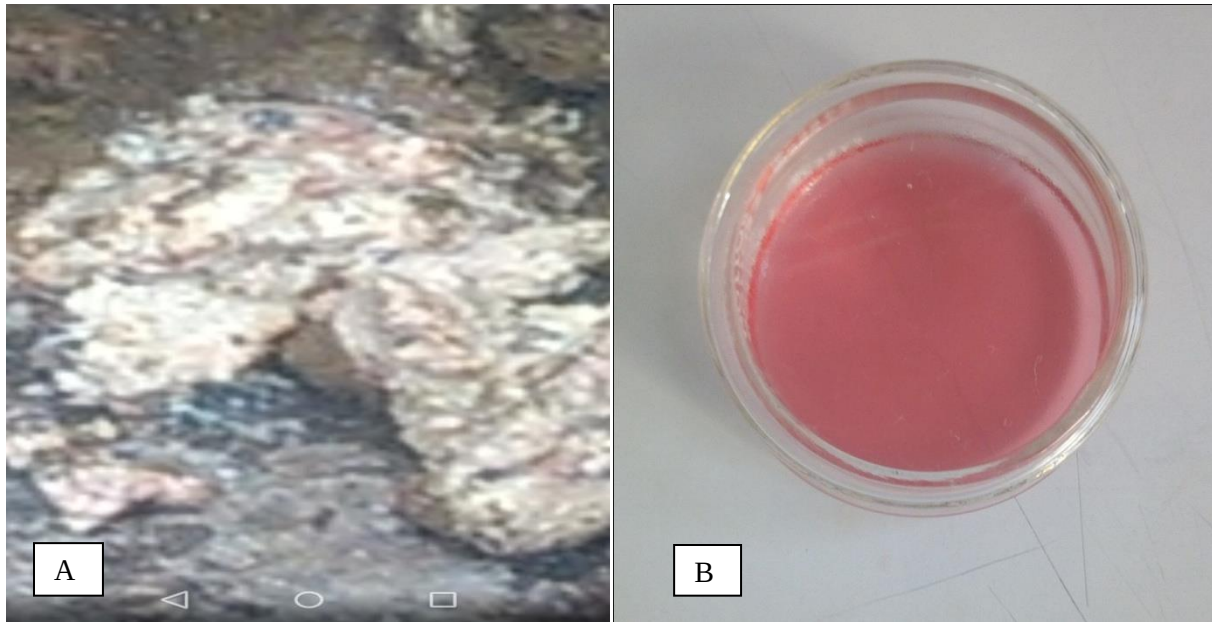
A local breed cow of 180 kg was presented to Veterinary teaching hospital of Addis Ababa university on December 10, 2018 with the complains of the animal had previously suffered a traumatic injury on the left hind leg as indicated below in figure. The injury was not treated before and left as it is for six month. Upon physical examination the body temperature was 38.3 C⁰, respiratory rate 24 breath/min, heart rate 78 beat/min and the mucus membrane of the cow was normal. Upon admission at veterinary teaching Hospital, the cow was with localized infection (Abscess) with smooth and rounded swelling on the left hind leg as indicated below in figure and matured abscess was detected based upon palpation. The wound appeared superficial, was abscessed and collection of pus was detected. This case was taken as abscess due to traumatic injury. In this case report the smartphone EDDIE result was not work or not accessed for Abscess.



Figure 12: Photograph of cow suffered from abscess.

3.4.3. Laboratory finding and its investigation

The wound was first cleaned with saline and matured abscess was lanced and lavaged to remove as much pus as possible and much pus was removed as indicated below in figure and washed well with Iodine texture 10%. All material drained and lavaged from the abscesses is collected and appropriately discarded, thus limiting the contamination of the immediate environment and the sample of pus was collected for the purpose to detect the Etiology of the abscess. The pus sample was enriched for 24 hours in enrichment media Tryptone soya broth and cultured on selective media mannitol agar media and *staphylococcus* organism was grown on the media as indicated in the following in figure and the cause for abscess formation was due to *staphylococcus* organism. The colony morphology of *S. aureus* appear as yellow colonies with yellow zones in the media on mannitol salt agar and this principle observed in this case report as indicated below in figure (C).



A) Evacuated pus B) Mannitol salt agar

Figure 13: Photographies of pus evacutaed (A) and mannitol salt agar media (B).



Figure 14: *staphylococcus* grown on mannitol salt agar.

3.4.4. Abscess management and its treatment outcome in cow

The wound was first cleaned with saline and matured abscess was lanced and lavaged to remove as much pus as possible and much pus was removed and washed well with Iodine texture 10% for three days along with antibiotic therapy. The animal had previously not treated and treatment with penstrip (Chongqing Fantong Animal Pharmaceutical Co.Ltd, China) for three successive

days at 1ml/20kg/day was recommended and treated and the owner advised to treat their animals in early stage of disease. On follow up period after three weeks of post treatment, the cow totally healed from the problem as indicated in figure as follow.



Figure 15: Photography of Cow after three weeks of post treatment.

3.4.5. Discussion

An abscess in farm animals is detrimental to the livestock due to the tremendous economic losses of animals, meat, skin, and wool production associated with this affection. In this case report, an Abscess due to minor wounds resulting from traumatic injury can safely and successfully be treated by lavage with Iodine texture 10% and antibiotic which was agreed with the treatment given by Anderson and White (2000). Abscess due to minor wound infection described in this case report is of the common occurrence in animals. Abscess caused by traumatic injury have previously been reported both in humans and animals and the current case report agreed with Anderson and White (2000).

An abscess is a circumscribed inflammatory lesion, which consist of purulent exudates caused due to infection, trauma by sharp object, migration of emboli in circulation etc. the bacteria enter in circulation causing septicemia and necrosis of tissue leading to migration to the area of least resistance to form the abscess and the current case agreed with this phenomena (Sahoo and

Ganguly, 2015). The treatment and management of the current case are identical with that of Thorat *et al.* (2008) in which treatment of abscess was performed by evacuation of pus from the abscess cavity along with antibacterial therapy.

In the present study similar line of treatment was followed and the cow was successfully healed. Domestic animals are also exposed to many of the foreign bodies like sharp stones, nails, wires etc. and similarly in this case the cow exposed to any foreign body as the complains of the owner. Similar findings were also described by Tiwari and Kashyap (2011) in foot abscess of camel. It is therefore advised to begin treatment as soon as possible to reduce the further aggravation of acute case to chronic one. In conclusion, Proper animal handling technique is important in order to prevent traumatic lesions and hence abscess and wound prevention.

3.5. Calf Scour Due to Colibacillosis in Calf

Abstract: Colibacillosis is one of the major causes of mortality among young calves due to severe diarrhea associated with calf scour and septicaemia. A two weeks old male local breed calf weighted about 25 kg was presented to Veterinary teaching hospital on January 10, 2018 with complains of yellowish-watery diarrhea for the past two days, lethargy and inappetance. Based on clinical examination, the calf was dull and depressed, yellowish-watery bloody diarrhea, fever 39.9 °C, 92 beat/min and 30 breath/min was detected. The EDDIE Smart phone application revealed the case as colibacillosis. The case was tentatively diagnosed as colibacillosis and its differential diagnosis are: salmonellosis, coccidiosis, corona virus and rota virus. Based on the history, clinical sign, EDDIE result and bacterial culture the case was finally diagnosed as Colibacillosis. Trimethoprim Sulfadiazine 30 mg/kg (Hebei Yuanheng Pharmaceutical Co., Ltd, China) was given for three days and the calf was healed while being treated. In conclusion; colibacillosis is one of the cause of calf scour; improved sanitation and provision of adequate colostrum to newborn calves have forestalled the occurrence of the disease in the calf.

Keywords: *Calf, Colibacillosis, E.Coli, sulfadiazine*

3.5.1. Introduction on colibacillosis

Calf scour (Diarrhea) during early stage of life in neonates is one of the most severe clinical conditions. In young calves diarrhea is a syndrome of great aetiological complexity that causes economic losses directly through mortality and indirectly from poor growth. In addition to the influence of various environmental, managemental, nutritional and physiological factors, the infectious agents capable of causing diarrhea in the neonatal calf are numerous (esh Kumar *et al.*, 2012; Malik *et al.*, 2012).

Among numerous infectious agent, Colibacillosis is one of the most common calf scour during the first week. Colibacillosis is an infection with *Escherichia coli* (*E. coli*) is a major cause of mortality among young calves (Sharma *et al.*, 2006). *E. Coli* is one of the common resident microbiota of the intestinal tract of calves; however there are certain strains of this organism that are pathogenic (Quinn *et al.*, 2011). These pathogenic strains of *E. Coli* are the cause of severe diarrhoea, dehydration, fever, fatigue, malaise and depression that results in economic losses in both dairy and beef calves production (Jesse *et al.*, 2016). This organism is the most important bacterial cause of diarrhoea in calves during the first few weeks of life. While septicaemia is caused by certain invasive serotypes of enterotoxigenic *E. coli* (ETEC) that possess virulence properties which enables them to cross the mucous membranes of intestines, nasopharynx, crypts of tonsils or umbilical veins . They also have the ability to resist the hosts' defence mechanisms following invasion and produce bacteraemia and septicaemia. *E. coli* is widely distributed in nature; being present in soil, surface water, animal and human faeces. *E. coli* produces septicemia and diarrhea in a wide range of hosts including man, avian and animals (Jesse *et al.*, 2016).

Etiology and its Clinical signs: The disease is caused by certain strains of *E. coli*. Such strains are described as being enteropathogenic *E. coli* (EPEC). Pathogenic *E. coli* are divided into two types: *Enteropathogenic E. coli* and *Uropathogenic E. coli*. Further pathogenic *E. coli* are grouped into *enterotoxigenic E. coli* (ETEC), *enteropathogenic E. coli* (EPEC), *enteroinvasive E. coli* (EIEC) and *enterohemorrhagic E. coli* (EHEC). Calf diarrhoea is being controlled primarily following the maintenance of strict hygienic and sanitary measures. Enterotoxigenic *E. coli* attaches to the wall of the small intestine where it releases toxins that cause the body to excrete

fluids into the intestine. This results in severe diarrhea within the first three days of life. *Septicemic E. coli* invades the blood stream and travels to distant sites in to body including the joints and other organs. *Enterohemorrhagic E. coli* and *verocytotoxic E. coli* produce shiga-like toxin that destroys intestinal microvilli resulting in hemorrhagic diarrhea in calves that are 2-5 weeks' old (Bashahun and Amina, 2017).

The clinical sign of colibacillosis are: diarrhea, a rise in body temperature, general weakness, dehydration, lack of appetite and depression that results in economic losses in both dairy and beef production. The condition is followed by coma and death within a few hours. In older animals are tendency of infection to localize itself in the joints of survivors. Lesions include enlarged, hemorrhagic spleens and the accumulation of synovial fluid and sometimes pus in affected joints (Ahmed *et al.*, 2013).

Enteric colibacillosis is characterized by diarrhea. Defecation is frequent and effortless. The rear quarters are pasted with fluid or semisolid feces. Feces are malodorous, may be fluid, containing chunks of partially digested milk, or semisolid, and may be yellow-white or grey in color. Affected calves rapidly become dehydrated and lose weight. Depression, anorexia, and weakness follow. The rectal temperature is usually normal in the initial stages but becomes subnormal as the disease worsens. Affected calves die or recover in several days depending on the severity of the diarrhea and the therapy they receive. Death usually occurs in 3 to 5 days (Haggard, 1985).

Mild to moderately affected calves may be diarrheic for a few days and recover spontaneously with or without treatment. Those more severely affected become progressively worse over a period of several days, gradually become weaker, completely anorexic, and progressively more clinically dehydrated. The degree of dehydration will vary from 4 to 6 per cent of body weight (when it is just barely detectable clinically) to up to 10 to 16 per cent of body weight. Degree of hydration can be assessed by "tenting" the skin of the neck and measuring the time required for the skin fold to return to normal. In calves with 8 per cent dehydration, it will take 5 to 10 seconds for the skin fold to disappear; in calves with 10 to 12 per cent dehydration, it will take up to 30 seconds (Haggard, 1985).

Diagnosis and differential diagnosis: Diagnosis is based on history and clinical findings, bacterial culture, demonstration of a severe deficiency of circulating IgG, serological test and ultimately, demonstration of the organism in blood or tissues; biochemical analysis is also of good help. The differential diagnosis of colibacillosis are: coccidiosis, Rotavirus ,coronavirus, Cryptosporidia and salmonellosis (Bashahun and Amina, 2017).

Treatment and prevention of Colibacillosis: Calves that acquire adequate concentrations of immunoglobulin from colostrum are resistant to colisepticemia. Therefore, prevention depends primarily on management practices that ensure an adequate and early intake of colostrum. The passive immunity acquired from the colostrum and absorbed into the circulation from the gut is the calf's main defense mechanism against *E. coli* diarrhea. Inadequate amounts of antibodies in the colostrum, inadequate intake of the colostrum and inadequate absorption of antibodies from the gut render very young calves susceptible to infection (Groutides and Michell, 1990). Thus the present case report described Colibacillosis in a calf.

3.5.2. Case description on colibacillosis in calf

A two weeks old male local breed calf weighted about 25kg was presented to Veterinary teaching hospital of Addis Ababa university on January 10, 2018 with complains of diarrhoea for two days and the calf was lethargic and refused to feed and was kept in an isolation in house. Physical examination revealed that the calf had a yellowish mixed with bloody diarrhea which is watery, was dull and depressed, the rectal temperature of the calf was 39.8°C, heart rate 92 beat/minute, respiratory rate was 30 breath/minute and the mucous membranes were pale and dry, with normal capillary refill time of 3 seconds. The case was tentatively diagnosed as colibacillosis and its differential diagnosis are: salmonellosis, corona virus, coccidiosis and rota virus. The smart phone EDDIE was also revealed the case as a collibacillosis.



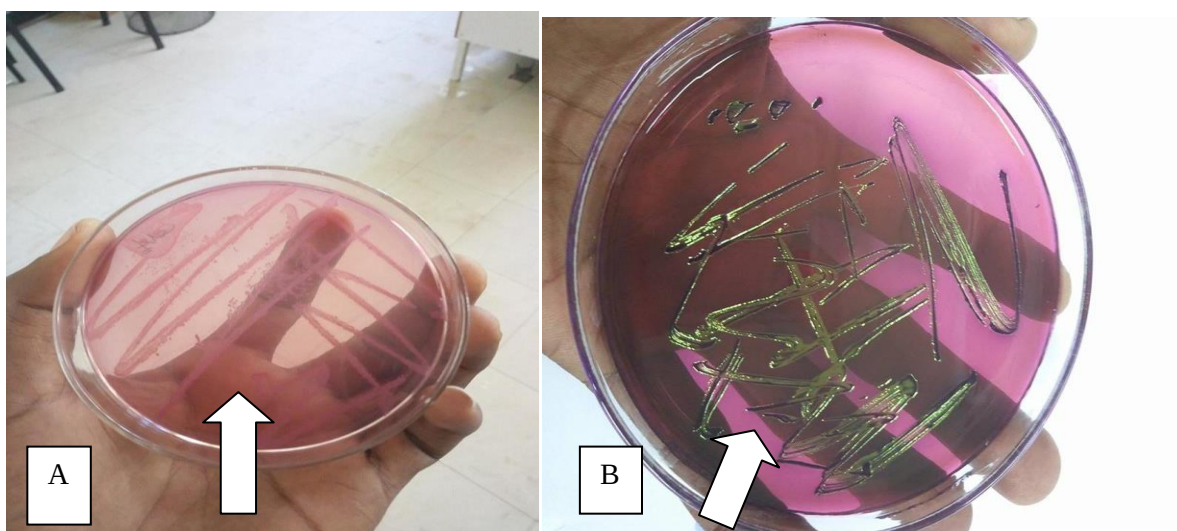
Figure 16: Photograph showing the presentation of the Calf on first (right) and third day (left).

3.5.3. Laboratory finding and its investigation

A fecal sample was collected from the calf and the sample was aseptically collected in a sterile stool pot and sent to biomedical and parasitology laboratory of Addis Ababa University. The fecal sample was checked for Eimeria in the parasitology laboratory and it was negative during floatation technique. Sample was enriched with Enrichment media (*Tryptone soya broth*) as indicated below for 24 hours in biomedical laboratory. *Nutrient broth* (NB) was used for primary culturing of *E. coli* organisms that were present in the collected faecal samples. For the isolation and identification of *E. coli* the sample was cultured on *MacConkey* (MC) agar medium and *Eosin Methylene blue* (EMB) agar medium which was used as a selective medium for *E.coli* and metallic sheath characteristics of *E.coli* was observed on *Eosin Methyelen blue* (EMB) as indicated below in figure.



Figure 17: Fecal sample and Enriched sample in broth.



A) *E.coli* on MacConkey

B) *E.coli* on EMB Agar

Figure 18: Characteristic of *E.coli* on MacConkey (A) and EMB (B).

3.5.4. Colibacillosis management and its treatment outcome in calf

Based on the history obtained, clinical signs observed, EDDIE result and laboratory finding the case was finally diagnosed as colibacillosis. As a treatment antibiotic Trimethoprim Sulfadiazine 30mg/kg (Hebei Yuanheng Pharmaceutical Co., Ltd, China) administered intramuscularly (IM)

for three days and the owner informed to give quantity of colostrums on early stage of calves and keeping the hygiene of calf. The calf was constantly followed during the treatment for three days and responded well to the treatment. The diarrhea stopped and the calf was with full appetite.



Figure 19: Photography of the calf after three days (left) and two months of treatment (right).

3.5.5. Discussion

Various studies showed that different bacterial infections specifically the enterotoxigenic, enteropathogenic, enteroinvasive, and enterohemorrhagic *E. coli* leads to calf colisepticemia and causes neonatal mortalities particularly in non-vaccinated calves and those which are deprived of colostrums. In this case report, based on history, clinical sign and laboratory findings the case was finally diagnosed as colibacillosis which is in line with the case reported by Jesse *et al.* (2016). Bacteria, viral and protozoa are few pathogen agents that may cause calf scour (Kahn, 2005) and the current report agreed with these principle as the cause was bacteria pathogen. The laboratory finding was also agreed with the result obtained by EDDIE smart phone application.

In this case report, the isolated pathogen was bacteria specifically *E. coli* which caused colibacillosis in a calf. Among calf scour, Colibacillosis is a major cause of diarrhea in calf (Jesse *et al.*, 2016) and *Enteropathogenic E. coli* (EPEC), which also known as adhering and effacing *E. coli* is usually the causative agent for severe diarrhea in Calf and small ruminants (Wani *et al.*, 2013). There most common clinical signs that have seen in the present case in calf

such as diarrhea, dehydration, weight loss, systemic reaction, acid-base and electrolyte imbalance are in agreement with Studdert *et al.*(2011).

Inflammation and necrosis of the intestinal wall, efficiency of fluid absorption and excretion in the intestine will be reduced significantly. *E. coli* produces enterotoxins which are virulent factor that adhere to the enterocytes through the use of frimbae and cause severe infection and inflammation in the submucosal layer of the intestine (Kaper *et al.*, 2004). The primary therapeutic plan for animals with colibacillosis is usually vigorous antimicrobial therapy to reduce morbidity and mortality (Wani *et al.*, 2013) and antibiotic was used in the current case report.

In the present case report, sulfadiazine was used as the antibiotic of choice and the calf responded well to the treatment which is in agreement with the treatment given by Jesse *et al.* (2016). In Conclusion Enteric colibacillosis may occur in animals of any age due to *E. coli* infection where common clinical signs such as diarrhea, dehydration, weight loss, and abdominal pain will be observed. The disease can be prevented with proper farm hygiene and can be control by early diagnosis and prompt treatment to prevent great economic losses in the ruminant industry.

3. 6. Babesiosis in Ox

Abstract: Babesiosis is a tick born disease caused by protozoan of the genus *babesia* and it is characterized by haemolytic anemia and fever, with occasional hemoglobinuria and death. A bull weighted 200kg was brought to Veterinary teaching hospital of Addis Ababa University on March 11, 2019 with the complains of inappetance, depressed, bloody urine and tick infestation around the scrotum. Based on physical examination the rectal temperature was 39.8°C, slight pale mucus membrane, presence of ectoparasites (ticks), Supra scapular and pre-femoral lymph nodes were enlarged and palpable, anemia, haemoglobinurea and/or coffee colored urine. Blood sample was taken and blood smear was prepared and examined after staining by Giemsa method. The blood smear prepared and stained with giemsa was a negative for *babesia* or hemoparasite. EDDIE smart app revealed the case as babesiosis. Based on the history, clinical signs and

EDDIE result the case was tentatively diagnosed as Babesiosis. The ox was treated with diminazene aceturate at 3.5mg/kg, IM, Ivermectin at 0.2 mg/kg SC and the ox was also administered with multivitamin 1ml/10kg IM. On follow up, the ox was healed from the disease. In conclusion, *Babesia* produces acute disease by hemolysis and circulatory disturbance mechanism. The rapidly dividing parasites in the red cells produce rapid destruction of the erythrocytes with accompanying haemoglobinaemia, haemoglobinuria and fever. In order to control babesiosis owner was advised to use acaricides on ectoparasite.

Keywords: *Babesiosis, Diminazene aceturate, Ox*

3.6.1. Introduction on babesiosis

Arthropod transmitted hemoparasitic diseases are economically important vector-borne diseases of tropical and subtropical parts of the world including Ethiopia (Abdela and Bekele, 2016). Bovine babesiosis (BB) is an intraerythrocytic tick borne disease of cattle caused by the protozoan parasites of the genus *Babesia* (Ukwueze and Orajaka ,2014). It is a disease with a world-wide distribution affecting many species of mammals with a major impact on cattle (Zintl *et al.*, 2003; Bock *et al.*, 2004). The disease is particularly severe in naive animals introduced into endemic areas and is a considerable constraint on livestock development in many part of the world. The disease is of major economic important and will cost the agricultural sector some colossal amount of money in countries afflicted by this disease; as a result of the infection causing retarded growth in calves, death, increased abortion rate and sterility, reduced milk and meat production and escalated cost of prevention and treatments (Urquhart *et al.*, 2003).

BB is principally maintained by sub-clinically infected cattle that have recovered from the disease. Morbidity and mortality vary greatly and are influenced by prevailing treatments employed in an area, previous exposure to a species/strain of parasite and vaccination status. In endemic areas, cattle become infected at a young age and develop a long-term immunity. However, outbreaks can occur in these endemic areas if exposure to ticks by young animals is interrupted or immune naive cattle are introduced. It also occurs most commonly in exotic crossbred cattle under stress conditions; particularly in tropical and subtropical countries when tick population is very high (Tufani *et al.*, 2015).

Etiology: Bovine babesiosis (BB) is a tick-borne disease of cattle caused by the protozoan parasites of the genus *Babesia*, order *Piroplasmida*, phylum *Apicomplexa*. The principal species of *Babesia* that cause BB are: *Babesia bovis*, *Babesia bigemina* and *Babesia divergens*. Other *Babesia* that can infect cattle includes *B. major*, *B. ovata*, *B. occultans* and *B. jakimovi*. BB is predominantly observed in adult cattle, with *B. bovis* generally being more pathogenic than *B. bigemina* and *B. divergens*. Infected animals develop lifelong immunity against re-infection with the same species and cross-protection is evident in *B. bigemina*- immune animals against subsequent *B. bovis* infections (Spickler and Roth, 2006).

Pathogenesis and clinical signs of babesiosis: The protozoans *Babesia* spp. are generally transmitted by ticks and reach the blood stream while the ticks are feeding. Once inside the host, the parasite attaches to an erythrocyte, is engulfed via endocytosis, matures, and then starts asexual reproduction, producing merozoites. Infected erythrocytes eventually rupture and released merozoites invade other erythrocytes. The main pathogenesis associated with babesiosis is hemolytic anemia. Hemolytic anemia is the result of direct erythrocyte injury caused by the parasites and also by immune-mediated mechanisms. In addition, most dogs with babesiosis have thrombocytopenia. Puppies are generally more susceptible to babesiosis and are at greatest risk of serious illness and death. Low blood oxygen (hypoxaemia) as a result of the anaemia contributes to morbidity and the most pathogenic strains cause kidney and liver injury, and systemic inflammatory disease (Sunitha *et al.*, 2011).



Figure 20: Coffee Coloured Urine in Calf suffered from babesiosis.

Source: (Saini and Sankhala, 2015)

Babesia produces acute disease by hemolysis and circulatory disturbance mechanism. The rapidly dividing parasites in the red cells produce rapid destruction of the erythrocytes with accompanying haemoglobinaemia, haemoglobinuria and fever. Clinical symptoms of babesiosis in neonatal calves were inability to suckling, high fever, coffee colour urine, jaundice and deep shallow respiration (Venu *et al.*, 2015). In endemic areas, cattle become infected at young age and develop a long-term immunity. Infected animals develop a lifelong immunity against re-infection with the same species. However, cross protection is also evident in *Babesia bigemina* (Bal *et al.*, 2016).

Diagnosis and differential diagnosis: Diagnosed of babesiosis mainly based on identification of the parasites in blood or tissues. Diagnosis can also depend on clinical sign and babesiosis should be suspected in cattle with fever, anemia, jaundice and hemoglobinuria. The differential diagnosis of babesiosis are: Anaplasmosis, Trypanosomiasis, Theileriosis, Bacillary haemoglobinuria, Leptospirosis and Chronic copper poisoning (Abdela and Jilo, 2016).

Treatment and its prevention: The treatment of babesiosis in food animals must be advocated after considering the efficacy, potency, withdrawal period, adverse effects and price of the chemotherapeutic agent. Even though, several antihemoproteoal drugs can be used against babesiosis, diminazene aceturate is the drug used worldwide due to its efficacy, availability and cost effectiveness (Taylor *et al.*, 2007). In sheep, diminazene aceturate and imidocarb dipropionate were effective 80% and 100%, respectively in eliminating parasitemia (Rashid *et al.*, 2010). In cattle, sheep and goat, use of combination of diminazene aceturate and oxytetracycline was found to be more effective than either of the drug used alone (Ijaz *et al.*, 2013; Saini and Sankhala, 2015).

Along with proper babesicidal therapy, it is essential to provide supportive therapy in complicated babesiosis for the early recovery of the animals (Jacobson and Swan, 1995). Active prevention and control of babesiosis is achieved by three main methods: immunization, chemoprophylaxis and vector control. Ideally, the three methods should be integrated to make the most cost effective use of each and also to exploit, breed resistance and the development and maintenance of enzootic stability (Demessie and Derso, 2015). Thus the present case report described the case of babesiosis in ox.

3.6.2. Case description on babesiosis

A bull weighted 200kg was brought to Veterinary teaching hospital of Addis Ababa University on March 11, 2019 with the complains of inappetance, depressed, bloody urine and tick infestation around the scrotum and not treated before for the infestation of tick. Based on physical examination the rectal temperature was 39.8°C, heart rate 74 beat/min, respiratory rate 20 breath/min slight pale mucus membranes, presence of ectoparasites (ticks), Supra scapular and pre-femoral lymph nodes were enlarged and palpable, anemia, haemoglobinurea and coffee colored urine. EDDIE smart app revealed the case as babesiosis. Based on the history, clinical signs and EDDIE result the case was tentatively diagnosed as Babesiosis and its differential diagnosis are bacillaryhemoglobiemia, anaplasmosis, theleriosis, trypanosomosis, leptospirosis, copper poisoning and strychnine poisoning.

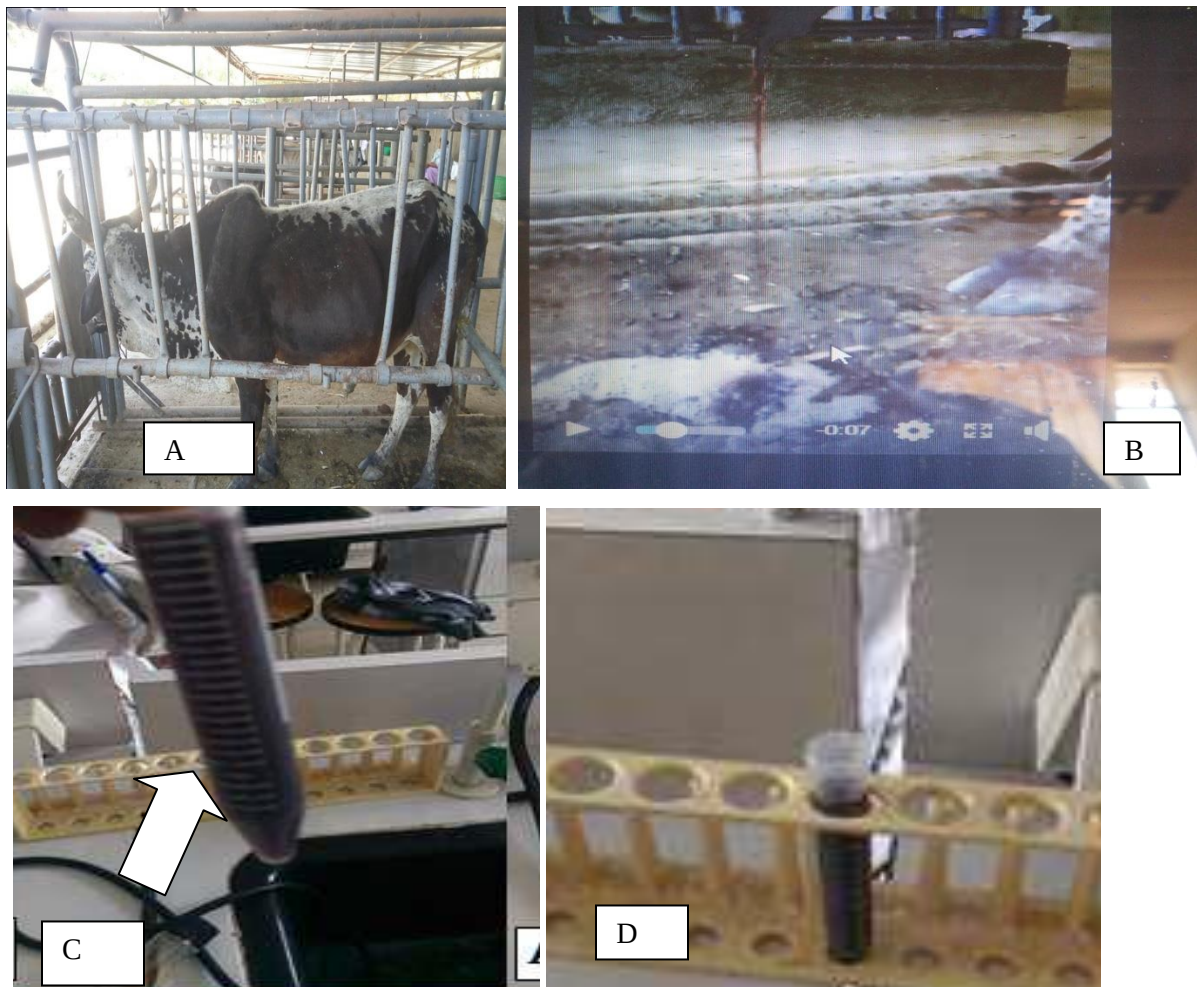


Figure 21: Ox suffered from bloody urine (B) and centrifugation method (C).

3.6.3. Laboratory finding and its investigation

On clinical examination of animals, mucous membrane was pale and animal was voiding red coloured urine. Haemoglobinuria was observed and was differentiated from hematuria by centrifugation method and no sedimentation was observed in the current case report (Ajith *et al.*, 2016). Blood was collected from the jugular vein into EDTA bottle to check for haemoparasites. Blood smear was prepared and examined after staining by Giemsa method. The Blood smear prepared and stained with giemsa was a negative for *babesia* or hemoparasite. Faecal sample was also collected for screening of G.I. parasites. Fecal sample was examined and found to be negative for any parasitic ova and oocysts (Taylor *et al.*, 2007). Based on the history, clinical signs, tick infestation and EDDIE smart app result the case was diagnosed as Babesiosis.

3.6.4. Case management and its treatment outcome

The ox was treated with diminazeneaceturate at 3.5mg/kg, IM and Ivermectin at 0.2 mg/kg SC. The ox was also administered with multivitamin 1ml/10kg IM, as a supplement for iron and vitamin to increase RBC formation. The ox was healed from the disease as indicated in the figure as follow and the owner informed to deworm for parasite like tick which is connect to tick born disease. In the present case report, combination therapy using diminazene aceturate along with supportive care was effective in eliminating parasitemia and early recovery of the ox.



Figure 22: Photograph of ox after three weeks post treatment.

3.1.5. Discussion

Babesiosis is a highly prevalent tick borne disease affecting a wide range of host species worldwide, especially ruminants of tropical and subtropical countries where abundant tick population is present (Demessie and Derso, 2015). It is the most important disease of cattle worldwide and transmitted by blood-sucking ticks of the Ixodidae family (Homer *et al.*, 2000; Hunfeld *et al.*, 2008). Based on the history, clinical signs and EDDIE result the case was finally diagnosed as babesiosis. The predominant symptoms of babesiosis observed in the present case report were pale mucus membranes, anemia, hemoglobinuria/coffee coloured urine and depression were in agreement with published reports of Gohil *et al.*(2013). The laboratory finding was negative for this case and this finding disagree with the result of EDDIE smart phone and the diagnosis of the clinician.

Venu *et al.*, (2013) also diagnosed and reported Babesiosis infection in a 14-day old Jersey female calf showing clinical symptoms of high fever, increased respiratory rate, pale mucous membrane and haemoglobinuria which was in agreement with the current case report as the same clinical signs were observed. Hemoglobinuria, the clinical sign first detected by the owner, occurs at the peak of the hemolytic crisis was in accordance with the present cases report. Detection and treatment of babesiosis are important tools to control babesiosis. Microscopy detection methods are still the cheapest and fastest methods used to identify *Babesia* parasites although their sensitivity and specificity are limited and the current case report was performed by microscopic detection of babeseia parasite, but the result was negative on laboratory finding (Mosqueda *et al.*, 2012).

The ox was treated with *diminazene aceturate* at 3.5mg/kg BW, IM and Ivermectin at 0.2 mg/kg SC. The ox was also administered with multivitamin 1ml/10kg IM, as a supplement for iron and vitamin and this treatment was in agreement with the treatment given by Ajith *et al.*(2016). The current treatment given for the ox was in agreement with Karunakaran *et al.*, (2011) ; and Ukwueze and Orajaka (2014) in which they successfully treated a two months old calf and a twenty days old calf respectively with a single dose of *diminazene aceturate* along with supportive therapy.

In conclusion, Bovine babesiosis is the most important arthropod-borne disease of cattle worldwide that causes significant morbidity and mortality. Control measures that are currently applied are control of ticks by use of acaricides, vaccination and chemoprophylaxis. Live, attenuated strains of *B. bovis*, *B. bigemina* or *B. divergens* are used to vaccinate cattle. The most effective procedure for the control of babesiosis is to control and minimize its vector.

3.7. Contagious Ecthyma/Orf in Doe

Abstract: Contagious ecthyma, also called contagious pustular dermatitis, is a zoonotic disease, with worldwide distribution that affects sheep, goats and man. A two years doe weighed at 20kg was presented to veterinary teaching hospital of Addis Ababa university college of veterinary medicine on February 10, 2019 with the complains of inappetance, persistent scabby rashes on body of the doe particularly on lip, ear, mouth part and there was no previous vaccination history. The owner has noticed vesicular lesions on the body especially around mouth, which developed into scabs over a period of two weeks. According to owner they have lost 2 goats with the same condition before this and there was history of keeping this animal with those that died. On physical examination the goat had depressed and scabby lesions on mouth, nose and ear part. The rectal temperature was at a high 40.6°C, heart rate was 70 beats/minute and respiration 20 breath/minute. After physical examination, based on history, presence of lesion and sign; and symptoms the case was diagnosed Contagious Ecthyma and its differential diagnosis are pox and PPR. EDDIE also revealed the case as Contagious Ecthyma. Oxytetracycline 20%, 20mg/kg, Dexamethasone sodium phosphate (Sokar Healthcare Pvt.Ltd. Gujarat India) 0.2mg/kg/day, and iodine tincture 2% were used in the management of the contagious ecythema. This treatment was aimed at reducing the severity of the lesions and avoiding secondary bacterial complication. As the owner reported the doe was recovered from the disease. In conclusion, contagious ecthyma is one of the most common skin diseases of sheep, goats and other domesticated as well as wild ruminants. Antibiotics and anti-inflammatory drugs are usually having only limited success and the owner was also advised to vaccinate their small ruminants.

Keywords: *Contagious Ecthyma, Doe, Oxytetracycline*

3.7.1. Introduction on contagious ecthyma

Contagious ecthyma, also called contagious pustular dermatitis, ecthyma contagiosum, and scabby mouth, is a zoonotic disease, with worldwide distribution that affects sheep, goats, wild artiodactyls, and man (Nandi *et al.*, 2011). Contagious ecthyma (Orf) virus is a member of the genus *parapoxvirus* in the family of *Poxviridae* (Nadeem *et al.*, 2010; Murphy *et al.*, 2012). It is commonly called “Orf ” which is an acute, contagious, debilitating and important zoonotic skin disease that affects domestic and wild ruminants especially sheep and goat. Contagious ecthyma, contagious pustular dermatitis, sore mouth and scabby mouth is a disease of economic significant among small ruminant industries (Lovatt *et al.*, 2012).

In the face of outbreaks of contagious ecthyma, morbidity can be as high as 100%, whilst mortality is usually less than 1% but increase to 20% – 50% as a result of secondary bacterial complications, stress, immunosuppression or concomitant disease and can exceed up to 90% in the case of ‘malignant Orf ’ (Sadiqma *et al.*, 2017). Contagious ecthyma is a non systemic eruptive skin disease having worldwide distribution. This virus primarily causes acute pustular lesion ,where thesevere oral and facial effects can be seen in goats rather than sheep (Abdullah *et al.*, 2015a).

Orf is zoonotic and infected human ordinarily get ulcerative lesions or nodules particularly on their hand. Direct or indirect contact can transmit the virus through broken, scarified or damaged skin (Frandsen *et al.*, 2011). Risk factors for Orf virus infection include age, congestion due to increased stocking density, increased orphaned lambs, stress, immunosuppressive diseases, prolonged parturition and forage weed (thorny plants) (Onyango *et al.*, 2014). Persistent infections with severe, generalized skin proliferative lesions have been reported. Persistently infected carrier goats and sheep have been demonstrated to be the main source of disease and infection in the farm that can relapse during time of stress. Exposure of animals to stress or infection can accentuate the severity of the disease. Additionally, it was reported that contagious ecthyma is severe enough to create substantial welfare problems and public health issues (Sadiqma *et al.*, 2017).

Etiology and Clinical signs: The causative agent is a double-stranded DNA virus that is a member of the family *Poxviridae*, subfamily *Chordopoxvirinae*, genus *Parapoxvirus*. ORFV gains entry through abraded skin and replicates in epidermal cells (Anderson and Rings, 2002). Infected animals with contagious ecthyma virus typically develop the characteristic lesions in a sequence of papules, vesicles, pustules, scabs around the mucous membranes of their lips, muzzle, and mouth. CE virus is an epitheliotropic virus that commonly produces lesions on the lips, oral and nasal mucosa, skin, and udders. These lesions evolve through different stages such as erythema, macules, vesicles, pustules, and proliferative scabs (Fleming and Mercer, 2007). Interestingly, this virus can also spread to other parts of the body such as the vulva, udder, under the tail and scrotal sac (Kumar *et al.*, 2015).

In more severe cases, the skin of the eyes and feet *also* may be affected. Infection is confined to the squamous epithelium and may involve the oral cavity, eyelids, teats, and coronary band, subsequently predisposing affected animals to secondary infections. Rarely, lesions extend to the squamousepithelium of the esophagus, rumen, and omasum, causing ulcerative gastroenteritis. Residual skin lesions are not infective once the scab falls off, but substantial amounts of infective virus are shed within scabs which can remain infective in the environment for years. The disease has high morbidity and low mortality but can cause significant debilitation due to the inability of affected animals to suckle or graze. Nursing animals often transfer the virus to adults, typically affecting the teats and udder (Haig, 2006).

Diagnosis and differential diagnosis: The diagnosis of contagious ecthyma can be on the basis of examining the clinical signs and characteristic of the lesions, histopathology, and observation of a poxvirus particles by electron microscopy (Nandi *et al.*, 2011). On the other hand, serological tests such as agar gel precipitation test, agglutination test, complement fixation test, enzyme linked immunosorbent assays, serum neutralization test could be employed. The differential diagnosis are: Ulcerative dermatosis, Proliferative dermatitis (strawberry foot rot), Blue tongue, FMD and goat pox (Magaña Ch *et al.*, 2014).

Treatment and control of contagious Ecthyma: In the course of treatment for Orf virus, systemic antibiotics have been recommended since opportunistic infections following the disease could emerge (Nandi *et al.*, 2011). Vaccination remains one of the effective ways to control Orf virus

infection. There are several approved commercial vaccines for ORFV which contain virulent virus. These vaccines are valuable because they limit the severity of disease. The purpose of the vaccine is to produce a lesion at the vaccine site, thus inducing immunity; however, this also causes virus shedding and can contribute to maintenance of infective virus within the environment. Thus, the ORFV vaccine is only recommended for use in endemically infected flock/herds. The affliction had spread all over the world causing outbreak across farms from one area to another (Onyango *et al.*, 2014). Thus the present report described the case of contagious ecthyma in Doe.

3.7.2. Case description on contagious ecthyma in doe

A two years doe weighed at 20kg was presented to veterinary teaching hospital of Addis Ababa university college of veterinary medicine on February 10, 2019 with the complains of inappetance, persistent scabby rashes on body of the doe particularly on lip, ear, mouth part and there was no previous vaccination history. The owner has noticed vesicular lesions on the body especially around mouth, which developed into scabs over a period of two weeks. According to owner they have lost 2 goats with the same condition before this and there was history of keeping this animal with those that died. On physical examination the goat had depressed and scabby lesions on mouth part as indicated below in figure. The rectal temperature was at a high 40.6°C, heart rate was 70 beats/minute and respiration 20 breath/minute. Animal have hemorrhagic papules, vesicles and pustules to multifocal necrotic scabs at commissure of the lip. After physical examination, based on history, presence of lesion and sign and symptoms the case was diagnosed as Contagious Ecthyma and its differential diagnosis are goatpox and PPR. The smart Phone EDDIE also revealed the case as contagious Ecthyma.



Figure 23: Doe infected by contagious ecthyma.

3.7.4. Case management and treatment outcome

There is no specific treatment for contagious ecthyma (ORF) but supportive therapy is proved beneficial. Mortality is increased due to secondary bacterial infections (Abbas and Mughal, 2014). Oxytetracycline 20%, 20mg/kg, Dexamethasone sodium phosphate (Sokar Healthcare Pvt.Ltd. Gujarat India) 0.2mg/kg/day and iodine tincture 2% were used in the management of the contagious ecythema. This treatment was aimed at reducing the severity of the lesions and speed recovery as removal of the scab may delay healing; the owner recommended to vaccinate their animals before they are diseased. The goat was healed from the disease as indicated in figure below.



Figure 24: Doe after four month of treatment.

3.7.5. Discussion

Contagious ecthyma, also called contagious pustular dermatitis, ecthyma contagiosum, and scabby mouth, is a zoonotic disease, called Orf in humans, with worldwide distribution that affects sheep, goats and man (Deane *et al.*, 2000). Ecthyma causes severe economic losses due to young animals loosing condition, slower growth rate, trading restrictions and death of lambs. Contagious ecthyma is not difficult to diagnose clinically or pathologically when the lesions are present in the typical locations such as lips, muzzle and teats; and in the current report also there was lesions on lip and muzzle. The clinical signs observed in the present case report were in agreement with the report of Sadiqma *et al.*(2017).

The report by Abdullah *et al.* (2015) have extensively elucidated the diagnostic approach for case of Orf virus, however, in this case report, diagnosis was made primarily based on the history of previous infection in the flock, prolonged persistence of disease in the flock, clinical signs with the characteristic lesions and clinical diagnosis of severe persistent contagious ecthyma (Orf). The history in the current case report has shown that similar disease has previously been observed in the flock, with the recent case being persistent for the past two weeks. An Orf virus usually presents striking characteristic features that can be easily recognized and identified

resulting in a presumptive and rapid clinical diagnosis (Zamri-Saad *et al.*, 1994; Kumar *et al.*, 2015).

As there is no specific treatment for this case report, the doe was given Oxytetracycline 20% 20mg/kg, dexamethasone and supportive treatment with application of tincture iodine on the scab lesions. This approach of case management was agreed with Radostits *et al.* (2007), Pugh and Baird (2012) and Nandi *et al.* (2011) who reported supportive treatment that includes the topical application with Iodine tincture and systemic antimicrobial administration against secondary bacterial complications may speed recovery (Zamri- Saad *et al.*, 1994).

In conclusion, contagious ecthyma is one of the most common skin diseases of sheep, goats and other domesticated as well as wild ruminants. It is responsible for producing skin lesions at the area of mouth, lips and nose for the incubation period of approximately, one week. Though the disease is self-limiting, secondary bacterial infections lead to complications that may lead to mortality. Antibiotics and anti-inflammatory drugs are usually having only limited success and the owner was also advised to vaccinate their small ruminants.

3.8. Goat Pox in Buck and Doe

Abstract: Goat pox is contagious viral diseases of small ruminants. Sheep pox and goat pox (SGP) viruses are belonging to Poxviridae family and Capripox virus genus. An old buck weighted of 15 kg was brought with doe to Veterinary Teaching Hospital of Addis Ababa University college of veterinary medicine on February 15, 2019 with the complains of loss of appetite, pox lesion all over the body, other two goats was suffered from the same case, but it was a minor, there was no history of vaccination and the flock of the goats were managed extensive farming system in a field. Based on physical observation, there was high temperature 40°C, heart rate 84 beat/min, respiratory rate 26 breath/min, depressed, rough hair coat, and pock lesion in head, neck and under tail region, emaciation, and erosion on the tongue and eye. The pock lesions were also observed on the mouth, fore limb, and hind limb. The EDDIE Smart phone app revealed the case as goat pox. Based on the History, outbreak occurrence, EDDIE smart phone app, clinical signs observed and laboratory finding the case was finally diagnosed as Goat pox. For checking secondary bacterial infection the goat was treated with Oxytetracycline

20%; 20mg/kg; and Dexamethasone sodium phosphate (Sokar Healthcare Pvt.Ltd. Gujarat India) 0.2mg/kg/day as there was no treatment for viral diseases and the buck/doe was washed with antiseptic. On follow up period, five months of post treatment the doe and buck was totally recovered from the disease and the buck was sold, but the doe was indicated in figure. In conclusion; Sheep pox and goat pox are contagious viral diseases of animals which interfere in wool production. Vaccination is used to control sheep pox and goat pox in endemic areas. Outbreaks in non-endemic areas can be controlled with movement controls and depopulation of infected and exposed animals, followed by stringent cleaning and disinfection of farms and equipment. Proper disposal of infected carcasses is important; burning or burial is often used and the owner was advised to vaccinate their small ruminants.

Keywords: *Buck, Doe, Goat pox*

3.8.1. Introduction on goat Pox

Goat pox are contagious viral diseases of small ruminants. Sheep pox and goat pox (SGP) viruses are belonging to *Poxviridae* family, *Chordopoxvirinae* sub-family, and *Capripox* virus genus (Fauquet *et al.*, 2005). These are large (170–260 nm by 300–450 nm), double stranded, DNA, and enveloped viruses (Tulman *et al.*, 2002). The length of genome of SGP viruses is about 150-kbp, and are very similar to each other but by sequencing, researchers have categorized the viruses in *Capripox* virus genus. The genomes of SGP and lumpy skin disease (LSD) viruses have 97% similarity in their nucleotide identity (Bhanuprakash *et al.*, 2006). On the other hand, genomes of SGP viruses include some nucleotide differences, revealing that they are phylogenetically distinct, and probably both of them have derived from an LSDV-like virus. Capripox viruses (CaPVs) contained lipid, and are susceptible to many disinfectants, lipid solvents, and acids (Ben Chehida *et al.*, 2018; Hosamani *et al.*, 2004; Tulman *et al.*, 2002).

Sheep pox virus and *goat pox virus* be unable to differentiate from each other with serological techniques and were once thought to be strains of a single virus. Genetic sequencing has currently revealed that these viruses are distinct; nevertheless recombination can ensue between them. Intermediate host specificity normally found in recombinant strains. *Sheep pox virus* and *goat pox virus* are nearly related to the virus that causes lumpy skin disease in cattle (Mirzaie *et al.*, 2015).

Etiology and clinical sign: Sheep pox and goat pox result from infection by *sheeppox virus* (SPPV) or *goatpox virus* (GTPV), closely related members of the genus *Capripoxvirus* in the family *Poxviridae*. SPPV is mainly thought to affect sheep and GTPV primarily to affect goats, but some isolates can cause mild to serious disease in both species. SPPV and GTPV can be distinguished by a few specialized genetic tests. These tests are not widely available, and isolates are typically assigned to SPPV or GTPV based on the animal species affected during an outbreak. However, some studies suggest that this assumption is not always valid. SPPV and GTPV are closely related to lumpy skin disease virus (LSDV), a *capripoxvirus* that affects cattle. These three viruses cannot be distinguished by many diagnostic tests, including all tests that detect antibodies or viral antigens (Ben Chehida *et al.*, 2018).

The incubation period of SGP ranged from 4-14 days; however, OIE recorded a maximum incubation period of 21 days (OIE, 2010). Usually, the first manifestation of the disease is swelling of nostrils, followed thick discharges from the nose and watery discharges from the eyes. High body temperature (41 to 42°C) is found in infected animals, and keratitis may develop (Daoud, 1997). In lambs, malignant form of SP has been recorded as the most common type. There is prostration, high fever, marked depression, and discharges from the eyes and nose. Lesions occur on unwooled skin and on the buccal, respiratory, digestive, and uro-genital tract mucosa. They commence as papules, then become nodular, occasionally become vesicular, pustular and finally scab. Pox lesions have seen in the heart muscles in this form of the disease, most rarely. In the benign form, more common in adults, only skin lesions occur, particularly under the tail, and there is no systemic reaction and animals recover in 3-4 weeks. Abortion and secondary pneumonia are complications (Radostits *et al.*, 2006).



Figure 25: Thick discharges from the nose and Pox lesions on the face and ears in goat.

Source: (Mirzaie *et al.*, 2015)

Diagnosis and differential diagnosis of goat pox: *Capripoxviruses*, their antigens and nucleic acids can be detected in skin lesions (e.g., biopsies, scrapings, vesicular fluid, scabs); oral, nasal and ocular secretions; blood; lymph node aspirates; and tissue samples from external or internal lesions collected at necropsy. Samples for virus isolation and for some antigen-detection tests should be collected during the first week of illness, before neutralizing antibodies develop. Blood samples should be taken as early as possible; virus isolation is unlikely to be successful after generalized lesions have been present for more than a few days. PCR can identify viral RNA directly in tissue samples, blood and secretions. Most genetic assays can only identify the organism as a *capripoxvirus*; however, some PCR tests can distinguish the small ruminant *capripoxviruses* (SPPV and GTPV) from LSDV. Tests to detect *capripoxvirus* antigens include *enzyme-linked immunosorbent assays*, *immunostaining* methods and *agar gel immunodiffusion* (Ben Chehida *et al.*, 2018).

Electron microscopy can provide a tentative diagnosis, as the morphology of *capripoxviruses* differs from most poxviruses that cause illnesses in small ruminants. The clinical signs of severe sheep pox and goat pox are highly characteristic. However, in their mild form they can be confused with parapoxvirus causing orf or urticaria from multiple insect bites, Bluetongue, pestedespetitsruminants, Photosensitisation, Dermatophilosis and Mange (Radostits *et al.*, 2006)..

Treatment and prevention of goatpox: There is no specific treatment for sheep pox or goat pox, but supportive treatment may reduce morbidity and complications. Prevention *Capripoxviruses* are most likely to be introduced in infected animals, but they may also enter a herd on fomites and animal products such as wool. Newly introduced animals should be quarantined. Other biosecurity measures, such as prevention of contact with other herds and disinfection of fomites, are also helpful. Infected herds and sick animals should be isolated for at least 45 days after they have recovered from clinical signs. Vaccination is used to control sheep pox and goat pox in endemic areas. Outbreaks in non-endemic areas can be controlled with movement controls and depopulation of infected and exposed animals, followed by stringent cleaning and disinfection of farms and equipment. Proper disposal of infected carcasses is important; burning or burial is often used. Insect repellents applied to carcasses might aid in reducing virus transmission before burial, but this has not been evaluated (Mirzaie *et al.*, 2015). Thus the present case report described the case of goatpox in buck and doe.

3.8.2. Case description on goat pox in buck and doe

An old buck weighted of 15 kg was brought with doe to Veterinary Teaching Hospital of Addis Ababa University college of veterinary medicine on February 15, 2019 with the complains of loss of appetite, pox lesion all over the body, other two goats was suffered from the same case, but it was a minor, there was no history of vaccination and the flock of the goats were managed extensive farming system in a field. Based on physical observation, there was high temperature 40°C, heart rate 84 beat/min, respiratory rate 26 breath/min, the goat was also in a dehydrated stage, depressed, rough hair coat, and pock lesion in head, neck and tail region as indicated below in figure, emaciation, and erosion on the tongue and eye. The pock lesions were also observed on the mouth, fore limb, and hind limb. The center of the lesion then became depressed and gray (necrotic) and was surrounded by an area of hyperemia. The EDDIE Smart phone app revealed the case as goat pox. Based on the History, outbreak occurrence, EDDIE smart phone app, clinical signs observed and laboratory finding the case was finally diagnosed as Goat pox.



Figure 26: Goat pox lesion on eye, head, ear and tail parts.

3.8.3. Laboratory finding and its investigation

The goat with typical lesion was selected for taking tissue sample for confirmation of the case. A lesion on the left hind limb was selected and with 25 gauge needle 2% lidocaine was infiltrated around the lesion. Using scalped blade and thumb forceps, the marked papule was surgically removed and the tissue sample was kept in sterile universal bottle that contain Phosphate-buffered saline (PBS). The area where the sample was taken was cleaned with 1% iodine and

covered with gauze for three days. The sample was then transported with cold chain to NVI for molecular identification of antigen. Classical PCR and real time PCR revealed the case was positive for the diagnosed disease goat pox as indicated in annex part (paper of confirmation from the NVI (**Anne 6**)). Based on the history obtained, clinical signs observed and laboratory finding, the case was finally diagnosed as goatpox.

3.8.4. Goat pox management and its treatment outcome

As there was no drug for viral diseases the buck and the doe was washed with antiseptic iodine and for checking secondary bacterial infection the goat was treated with antibiotic Oxytetracycline 20%; 20mg/kg, and Dexamethasone sodium phosphate (Sokar Healthcare Pvt.Ltd. Gujarat India) 0.2mg/kg/day; the owner also advised on vaccination of their animals. On follow up period, five months of post treatment the doe and buck was totally recovered from the disease and the buck was sold, but the doe was indicated in figure as follow.



Figure 27: Doe after five months of treatment.

3.8.5. Discussion

Goat pox is a contagious viral disease, which is common in small ruminants. It causes economic losses resulting from decreased milk production, damage to the quality of hides and wool, and other production (Barua *et al.*, 2017). Based on the history, previous occurrence in the flock, clinical sign and lesions observed, EDDIE result and laboratory finding the case was diagnosed as goatpox. The clinical sign and lesion observed in this case are agreement with the report of Mirzaie *et al.* (2015). In goatpox, the first manifestation of the disease is swelling of nostrils, followed thick discharges from the nose and watery discharges from the eyes and high body temperature (41 to 42°C) is found in infected animals (Daoud, 1997) and the clinical sign observed in the present case report was also agreed with this clinical finding.

Goat pox Viruses are shed in secretions and excretions of infected animals, but it is believed that they are not important sources of transmission during outbreaks, because it is difficult to recover live virus on tissue culture from scabs materials. Movement of infected animals acts as the main cause of spreading SGP viruses (Kitching, 2004) and highest level of shedding of infectious virus and viral DNA in secretions of infected animals occurred between about 1-2 weeks post inoculation, and this secretion continued for up to an additional 3-6 weeks (Bowden *et al.*, 2008) and this principle was also indicated in the present case report as the occurrence of the disease was in the flock as the owner reported it. EDDIE result and laboratory finding was agreed to each other in this case report.

Management strategies should be directed to control secondary bacterial infection as there is no effective treatment for goatpox virus. In the present goat pox case report long acting oxytetracycline was recommended and this agrees with the recommendation given by Barua *et al.* (2017) on management of goatpox. In conclusion, Goatpox cause great economic loss in small ruminant producing enterprises accompanied by higher morbidity and mortality rate. Therefore, to lessen mortality and economic loss once the disease explodes, opportune and thorough management plays enormous role. However, prevention through vaccination and isolation of new arrivals at least for three weeks is mandatory.

3.9. Dystocia Case due to Fetal Mummification in Doe

Abstract: Fetal mummification is important gestational disorders of farm animals in which the exact etiology and time of fetal death are unknown. A four year old goat was presented to Veterinary Teaching Hospital, college of veterinary medicine, Addis Ababa University with the history of full term pregnancy and distention of abdomen ventrally for the past few days. The animal was showing straining intermittently for the past three days. No vaginal discharge was observed and the animal fed well. The animal was active and alert and was showing intermittent straining. On detailed clinical examination temperature 38.6°C, respiration 24 breath/min, conjunctival mucous membrane, and lymph nodes were normal and heart rate 72 beat/min. On pervaginal examination, mummified fetus was palpated in the anterior vagina. The condition was tentatively diagnosed as a case of dystocia due to mummified fetus. It was decided to perform manual removal of the mummified fetus and the fetus was removed; the vagina was washed with saline water and Oxytetracycline 20% with a dose of 20mg/kg was given to avoid complication with bacterial infection.

Key word: Doe, Dystocia, fetal mummification

3.9.1. Introduction on fetal mummification

Failure of pregnancy is usually divided into stages based on the fetus's development and potential viability: embryonic mortality and fetal mortality. The exact outcome of early fetal mortality is unpredictable and influenced by several factors, such as the cause of the fetal mortality, species differences, stage of gestation at fetal death, and number of fetuses. One possible outcome of fetal death is mummification (Lefebvre, 2015). Fetal mummification are important gestational disorders of farm animals in which the exact etiology and time of fetal death are unknown (Dutt *et al.*, 2018). However, fetal mummification has been reported in many domestic species, including the cow, sheep (Alagar *et al.*, 2016) and goat (Anil *et al.*, 2017). The condition is said to be more common in swine, dogs, and cats carrying large litters which results in uterine overcrowding and placental insufficiency (Bisla *et al.*, 2018).

In does and ewes, fetal mummification is uncommon, and affects both single and twin fetuses. It is associated with four major conditions: toxoplasmosis, Chlamydophila, border disease and Coxiella infection. The prevalence of each of these is difficult to estimate, because diagnostic samples are often not submitted for testing, serologic results are not specific, infected females are usually asymptomatic, these diseases are generally sporadic in incidence, and abortion storms are rare. However, goats and sheep seem to present a higher prevalence of fetal mummification than cows (Lefebvre, 2015).



Figure 28: Photograph showing the mummified fetus.

Source: (Gouru Raju and Reddy, 2017)

Etiology: Compared to cows, fetal mummification in does and ewes is most often associated with infectious diseases, in particular *Toxoplasma gondi*, *Chlamydophila*, *Border disease* and *Coxiella infection*. Of these infectious agents, Coxiella infection is at the top of the differential diagnosis list. Energy and protein deficiencies, particularly on days 90–120 of gestation, have also been implicated (Lefebvre, 2015). In most cases, primiparous females are more susceptible than multiparous animals. The transmission route is oronasal contact with the infectious agent in aborted tissue (placenta), vaginal discharge, or a contaminated neonate. With Chlamydophila infection, pigeons and sparrows may serve as the reservoir and researchers have speculated that ticks and insects may also play a role in transmission. For *C. burnetii*, cattle, sheep, goats, dogs,

and birds may serve as carriers. Ticks (multiple species) are the primary natural reservoir for *Coxiella*, and are probably responsible for the disease being transmitted to domestic animals. Unlike the other diseases, *C. burnetii* may cause abortion in successive parturitions. For *T. gondii*, cats are the definitive host for the disease, and small ruminants can be infected by oronasal contact with the urine and feces of infected adults or newborns (Braun JR, 2007).

Clinical signs: Mummified fetuses in small ruminants are spontaneously aborted. Infected females with a *Toxoplasma gondi* or *Coxiella* infection are usually asymptomatic and the diseases are sporadic in occurrence. When first infected, the female sometimes has a short and transient mild fever or malaise that is usually not noticed by the farmer. Spontaneous abortion is observed in about 5% of females in flocks with the endemic form of the disease, and greater than 20% in the epidemic situation (uncommon). Abortion, stillbirth, and fetal maceration and mummification are usually observed when infection occurs at the end of the second trimester and during the third trimester of gestation. Mummified fetuses within the same litter may be affected differently. In an outbreak situation with *C. abortus*, the abortion rate can exceptionally reach 60% in native flocks.⁴⁶ One may assume that in these acute conditions, the number of mummified fetuses is probably much higher than in the endemic situation (Lefebvre, 2015).

Diagnosis: Demonstration of placental lesions and isolation of the infectious agents are the principal requirements for making a definitive diagnosis. *C. abortus*, *C. burnetii*, and *T. gondii* affect mainly the placenta (placentitis), and very few lesions are actually observed on the fetus. *Chlamydophila* and *Coxiella* cause similar macroscopic changes in the cotyledonary areas of the placenta: white areas of necrosis and mineralization on the cotyledons. However, *Coxiella* infection also involves intercotyledonary areas (Moeller Jr, 2001). In border disease, the virus can be isolated from fetal blood (buffy coat). Serology studies and PCR detection of the organism in the placenta may also be used. However, one has to remember that when a female aborts as a result of an infectious agent, it may also shed other organisms at the same time, and that infection may occur without abortion (eg, *C. burnetii*). A *Chlamydophila* infection is suggested when elementary bodies are found in impression smears of trophoblast cells made from cotyledons or uterine discharge using Gimenez or modified Ziehl–Neelsen stains. In the case of *Toxoplasma* infection, the modified agglutination test can be used to detect antibodies in fetal and maternal serum (Dubey, 1990)

Treatment and prevention: There is no effective treatment available for Coxiella infection or border disease. For *C. abortus*, treatment with tetracycline in the last trimester reduces the incidence of abortion. For *T. gondii* infections, monensin throughout gestation may reduce the incidence of abortion. However, it should be remembered that no data are available for the overall incidence of fetal mummification in these diseases, and that such treatments have not yet been evaluated in controlled experiments. In most situations of Toxoplasma, Chlamydia and Coxiella infection, culling does and ewes that have previously aborted is recommended, along with quarantining new animals before introducing them back into the herd. To prevent *C. abortus*, a vaccine can be administered, and animals should not be fed on the ground. To prevent toxoplasmosis, cats should not be allowed near pregnant females, and a vaccine is available in Europe and New Zealand. It is important to maintain good sanitary conditions and a monitoring program (Braun JR, 2007). Thus the present report described the management of dystocia due to fetal mummification.

3.9.2. Case description on dystocia due to fetal mummification in doe

A four year old goat was presented to Veterinary Teaching Hospital, college of veterinary medicine, Addis Ababa University with the history of full term pregnancy and distention of abdomen ventrally for the past few days. The animal was showing straining intermittently for the past three days. No vaginal discharge was observed and the animal was anorexic. The animal was active and alert and was showing intermittent straining. On detailed clinical examination temperature 38.6°C, respiration 24 breath/min, conjunctival mucous membrane, and lymph nodes were normal but were having 72 beat/min. On per vaginal examination, mummified fetus was palpated in the anterior vagina. The condition was tentatively diagnosed as a case of dystocia due to mummified fetus.

3.9.3. Case management and its outcome

It was decided to perform manual removal of the mummified fetus and the mummified fetus was removed; the vagina was washed with saline water and Oxytetracycline 20% with a dose of 20mg/kg was given to avoid complication with bacterial infection; the owner also informed to keep the hygiene and safety of the pregnant animals from external environment.



Figure 29: Photograph showing the mummified fetus.



Figure 30: Goat after the Removal of the mummified fetus.

3.9.4. Discussion

Fetal mummification is diagnosed occasionally in all major domestic species, and occurs most often in multiparous and polytocous animals. It is much less prevalent in monotocous species (Lefebvre, 2015). Fetal mummification in goat can occur due to death of fetus in utero and it is reported to be rare in goats but appears to be more associated with twin pregnancy (Tutt, 1997) . This was found to be true in the present case as the fetus was being having eyeballs and skin, but the fetus was so mummified. The present case was agreed with that of Tutt(1997) which reported

that the foetal mummification in goat. Markendeya *et al.* (1991) and Doijode (1993) reported cases of mummification in goat that was also in line with the present case report.

Ogbu *et al.* (2011) also reported a case of dystocia due to mummification where the fetus was dead that corresponded with the present study. In the present study, the fetus was dead and mummified well as indicated in the case description. In the present case the fetal consistency and configuration along with the presence of dark brownish colored discharge confirmed the hematic type of mummification and fetus was expelled from the uterus, lodged in the anterior vagina and mummified fetus was delivered manually by gentle traction which was agreed with observation made by Lefebvre *et al* (2009).

In conclusion, in the present case the mummified fetus was successfully delivered manually and fetal mummification is very different in terms of etiology, clinical signs, treatment, prognosis, and preventive approaches for monotocous versus polytocous species. More scientific knowledge is needed to increase diagnostic efficiency and precision, and to allow for better treatment and the establishment of preventive programs aimed at preserving overall fertility.

3.10. Coenurosis / Gid in a Kid

Abstract: Coenurosis (Gid, Sturdy) is the disease caused by invasion of central nervous system by the intermediate stage of *Taenia multiceps* a tapeworm that lives in the small intestine of dogs. A 6 month old male local kid was presented to Veterinary Teaching Hospital of Addis Ababa University on October 23/2018 with ataxia, inappetance, circling and regurgitations (moving up of feeds). According to the owner the symptoms appeared before a week, the flock from which the kid originated had a history of such kind of case and the doe was died with similar problem. Based on physical examination the temperature was 38.7 0c, heart rate 68 beat/min, respiratory rate 25 breath/min, normal mucus membrane, depressed, unilateral circling (towards the right) and the kid was unable to carry its head or pressing its head to inanimate objects as indicated in figure below. EDDIE smart phone app revealed the case as coenurosis. Based on history and typical clinical signs observed and EDDIE result the case was finally diagnosed as Coenurosis. Once clinical syndrome of coenurosis is established, the prognosis of case becomes grave and case fatality rate is 100%. Treatment of coenurosis in sheep and goats

ranged from chemotherapy using albendazole, niclosamide and praziquantal showing little or no effect, to successful surgical removal. In this case the anti-inflammatory drugs detamethaxone 0.2mg/kg and anthelmintic praziquantel 56.8mg/ml at a dose of 5mg/kg subcutaneously was tried. But the treatment was not successful and the kid was died after a week as the owner reported it. In conclusion; in the case of coenurosis there is no appropriate treatment and the best strategy to control coenurosis is regular anthelmintic treatment of dogs, correct disposal of sheep and goat brain are the main control method of coenurosis.

Keywords: *Coenurosis, kid*

3.10.1. Introduction on coenurosis

Coenurosis (Gid, Sturdy) is the disease caused by invasion of central nervous system by the intermediate stage of *Taenia multiceps* a tapeworm that lives in the small intestine of dogs and other canids and produce localized, space-occupying lesions of the tissue that is usually seen in small ruminants (Hobbenaghi *et al.*, 2014). *Coenurus cerebralis*, is the metacestode or larval form of the dog tapeworm *Taenia multiceps*, causes *cerebral coenurosis*, also known as gid or stagger. *C. cerebralis* causes a serious problem in small ruminants production. The larval stage (metacestode) of this cestode, known as *C. cerebralis*, affects the CNS, particularly the brain of sheep and gives rise to the neurological signs of coenurosis (gid or stagger) (Tavassoli *et al.*, 2011).

Domestic and wild canids constitute the definitive hosts, while a wide range of herbivores including sheep, goats, cattle, buffaloes, camels and equines are the intermediate hosts. Coenurosis is quite the commonly occurring disease in sheep compared to the other animals (Sharma and Chauhan, 2006). Dog being definitive host of *Taenia multiceps* plays an important role in spreading the disease. Dogs fed on the heads containing cerebral coenuri develops adult tapeworm in the duodenum and jejunum and the life cycle is completed approximately 42-60 days after ingesting the *Coenurus* cysts (Abera *et al.*, 2016).

Clinical Signs and Life cycle of the Cyst: Clinical sign is based on location and size of the *Coenurus* cyst in the brain and spinal cord (Avcioglu *et al.*, 2012). The resulting neurological signs in affected animals are gid or circling, ataxia, head deviation and blindness. *Coenurus* is a

nervous disease and clinical syndrome is based on species of animal, location and size of the *Coenurus* cyst in the brain. In case of cattle, the clinical syndrome of coenurosis is associated with in-coordination and impaired vision (Moghaddar, 2007), more specifically ataxia, uncontrolled movements, paralysis of limbs and occasional circling, exhaustion and death (Dinev *et al.*, 1999). Major clinical signs in goats and sheep include dullness, circling, torticollis, loss of appetite, frequent bleating, pain response on pressure over the cystic area and sometimes unilateral partial blindness (Patro *et al.*, 1997; Tafty *et al.*, 1997).

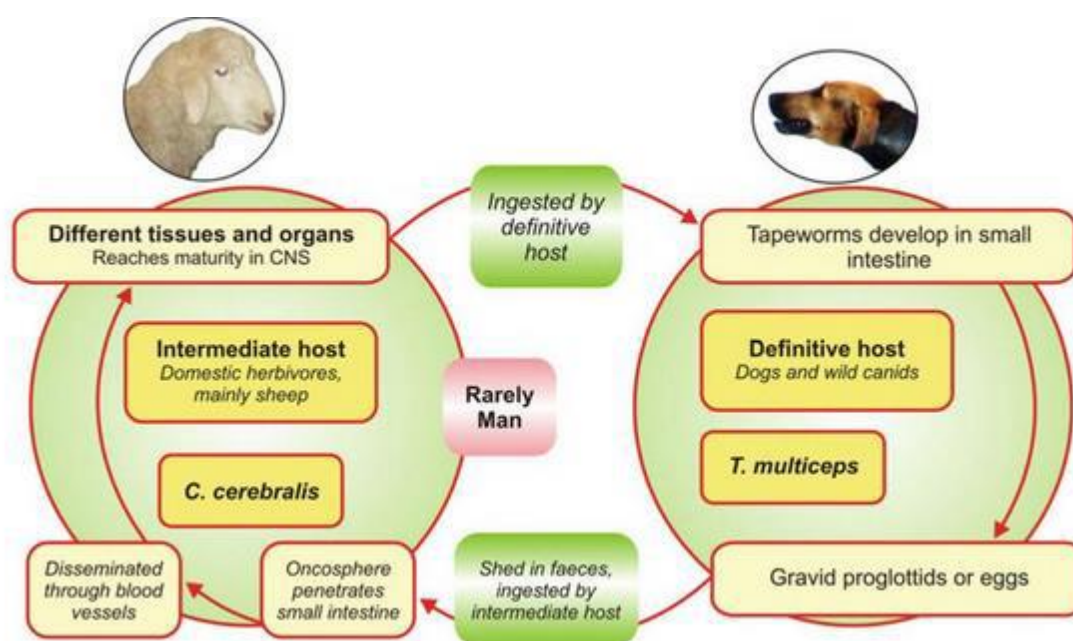


Figure 31: *coenurus cerebralis* life cycle involving intermediate and definite host.

Source: (Abera *et al.*, 2016)

Diagnosis and differential diagnosis: Clinical signs, Necropsy finding of cyst, ultrasound and X-ray are the diagnostic method of coenurosis. The diagnosis of coenurosis is difficult and may be confused with other similar clinical conditions like listeriosis (Soundararajan *et al.*, 2017) and nasal bots syndrome (Sharma and Singh, 1997). Heres *et al.*(1994) reported association of *Oestrus ovis* larvae in surgically treated cases of sheep coenurosis. However, the author perceived that the clinical symptoms were so distinct that the competent staff working in a herd never missed a correct diagnosis. Predilection of locations based on the direction of circling and head deviation had a success rate of 62% (Achenef *et al.*, 1999a).

Listeriosis, louping-ill, sarcocystosis and polioencephalomalacia should be considered when formulating a diagnosis of acute coenurosis. Once clinical syndrome of coenurosis is established, the prognosis of case becomes grave and case fatality rate is almost 100%. Though chemotherapeutic approach using drugs like albendazole, praziquantel, niclosamide and others directly or indirectly (to dogs) have been tried by several workers to control coenurosis with little or no success (Abera *et al.*, 2016). Thus the present report described the case of Coenurosis in kid.

3.10. 2. Case description on coenurosis in kid

A 6 month old male local kid was presented to Veterinary Teaching Hospital of Addis Ababa University on October 23/2018 with ataxia, inappetance, circling and regurgitations (moving up of feeds). According to the owner the symptoms appeared before a week, the flock from which the kid originated had a history of such kind of case and the doe was died with similar problem. Based on physical examination the temperature was 38.7 0c, heart rate 68 beat/min, respiratory rate 25 breath/min, normal mucus membrane, depressed, unilateral circling (towards the right) and the kid was unable to carry its head or pressing its head to inanimate objects as indicated in figure below. EDDIE smart phone app revealed the case as coenurosis. Based on history and typical clinical signs observed and EDDIE result the case was finally diagnosed as Coenurosis and its differential diagnosis is listeriosis.



Figure 32: Kid suffered from coenurosis.

3.10.3. Coenurosis management and its treatment outcome in Kid

Once clinical syndrome of coenurosis is established, the prognosis of case becomes grave and case fatality rate is 100%. Treatment of coenurosis in sheep and goats ranged from chemotherapy using albendazole, niclosamide and praziquintal showing little or no effect, to successful surgical removal (Sharma and Chauhan, 2006). In this case the antiinflammatory drugs 0.2mg/kg dexamethasone and anthelmintic drugs praziquantals 56.8mg/ml at a dose of 5mg/kg subcutaneously was tried; and the owner informed to bury the brain of sheep or goat died to this case. But the treatment was not successful and the kid was died after a week as the owner reported it.

3.10.4. Discussion

Coenurosis (Gid) is a disease caused by, the larval stage of *Taenia multiceps*, particularly affects sheep and goats (Oge *et al.*, 2012). In 80-90% of cases, the cyst is located in one cerebral hemisphere, whilst in 5-10% of cases, it is localized in the cerebellum; rarely it involves two sites in the brain of the affected animal. The clinical signs of the disease develop when the CNS of the sheep/goat is invaded by the cyst (Avcioglu *et al.*, 2012).

In this case report, typical clinical signs of coenurosis were observed. The neurologic signs were unilateral circling to the right direction, head pressing towards inanimate objects and behavioral changes in the affected kid. Based on the history and typical clinical signs observed the case was finally diagnosed as Coenurosis. Abo-Shehada *et al.* (2002) described that circling was the most prominent clinical symptom of coenurosis in naturally infected sheep and in the current case report a variety of clinical signs including ataxia, incoordination, drowsiness, unilateral circling, head pressing and regurgitation have been reported in this case and agreed with the report of Ozmen *et al.* (2005); Ioannidou *et al.* (2015).

In a study about *C. cerebralis* infection of sheep, the cysts were seen in the cerebral hemisphere in 96% of the cases (43% and 57% for left and right, respectively) and 4% being in the cerebellum. The prediction of cyst locations based on the direction of circling and head deviation had a 62% success rate. The present case was also showed unilateral circling toward the right which is in agreement with the report of Achenef *et al.* (1999b) In goats, coenuruses cysts may

also develop in locations outside the CNS, including the abdominal cavity (Sharma *et al.*, 1998), subcutaneous tissue, skeletal muscles, thoracic cavity and lung parenchyma (Gharagozlou *et al.*, 2003). But, the present case report disagree with this report since it was reported coenurosis due to coenuros cyst in brain based on the clinical finding observed. This may reflect a different host response to the parasite in goats or, alternatively, parasitism by larvae of another cestode species, *Taenia gaigeri* (Sharma *et al.*, 1998).sease (Abo-Shehada *et al.*, 2002).

The present case report on coenurosis agreed with Gogoi *et al.* (1992) case report that correlated cystic presence in cerebrum with depression, tilting of the head either towards right or left, head pressing, feet stamping or walking in straight line. The current case report disagreed with that of Bussell *et al.* (1997) that recorded lumbar paralysis in a lamb due to presence of *Coenurus* cyst in lumbar region of a lamb.

In conclusion, Cerebral coenurosis is worldwide in distribution but most common in developing countries of Africa and south eastern Asia region and it is an endemic disease in Ethiopia (Oge *et al.*, 2012; Adane *et al.*, 2015). For the case of coenurosis there is no appropriate treatment and in the current case the kid was died after a week of treatment. The best strategy to control coenurosis is regular anthelmintic treatment of dogs, correct disposal of sheep and goat brain are the main control method of coenurosis. The community should Control dog contact with pasture and have to properly dispose the brain of infected sheep and goats after slaughter; also they should keep their hygiene to prevent ingestion of *T. multiceps* eggs.

3.11. Clinical Mastitis in Goat

Abstract: Mastitis is an inflammation of the mammary tissue and is a common disease in dairy cattle. It is also one of the conditions that is most expensive for the dairy industry. A 30 kg adult doe was presented to veterinary teaching hospital of Addis Ababa University with a complaint of reduced appetite, swelling of udder and redness of udder. Based on the initial physical examination of the doe revealed, rectal temperature 38.8°C, heart rate 84 beat/min, respiratory rate 24 breath/min and slightly pale mucous membranes. The animal was alert and responsive. Swelling of udder on both quarters was observed. Upon palpation udder showed hard to touch,

response to pain and redness of udder was observed. The EDDIE smart phone app had a limitation on mastitis and not included in the list of cases on EDDIE. Based on the history, clinical signs observed, EDDIE result and laboratory finding the case was diagnosed as mastitis. The case was treated by penstrip (Chongqing Fantong Animal Pharmaceutical Co.Ltd, China) for three successive days at 1ml/20kg/day and following treatment the doe responded well to the remedy. In conclusion; Mastitis is one of the most serious economic and health problems of small ruminant flocks worldwide and important thing promising the avoidance of disease at this time are to maintain clean environment, prevent teat injuries and pre and post milking dipping.

Keywords: *Doe, Mastitis, Penstrip*

3.11.1. Introduction on mastitis

Mastitis is an inflammation of the mammary tissue and is a common disease in dairy cattle. It is also one of the conditions that is most expensive for the dairy industry (Kossaibati and Esslemont, 1997). Mastitis is one of the most serious economic and health problems of small ruminant flocks worldwide. Mastitis may be caused by contagious or environmental pathogens. Contagious pathogens live and multiply on and in the cow's mammary gland and are transmitted from cow to cow primarily during the milking process. Major contagious mastitis pathogens include *Staphylococcus aureus* and *Streptococcus agalactiae*. Environmental pathogens reside in the environment where cows live. Major environmental mastitis pathogens include *streptococci* other than *S. agalactiae* and coliforms, or Gram-negative bacteria (Oliver *et al.*, 2004). *Staphylococci* are the most prevalent micro-organisms responsible for mastitis in small ruminants. Mastitis is mostly a bacterial disease that occurs in several different forms. Mastitis can affect one or more of the udder quarters and the disease can be divided into different categories. In general, mastitis is divided into clinical, sub-clinical, and chronic in scientific literature (Bergonier *et al.*, 2003).

Etiology and clinical sign of Mastitis: Several pathogens can cause mastitis, but *Staphylococcus* spp. is the most frequently diagnosed causal microorganisms of intra mammary infection in small ruminants. Other pathogens such as *Streptococcus* spp., *Enterobacteriaceae*, *Pseudomonas aeruginosa*, *Mannheimia haemolytica*, *Corynebacteria* and fungi can produce intra mammary infection in small ruminants, but occurrence rates are lower. In addition, severe cases of mastitis

related to incorrect preventative strategies have been attributed to the pathogens *Aspergillus fumigatus*, *Serratia marcescens*, *P. aeruginosa* or *Burkholderia cepacia* (Contreras *et al.*, 2007).

Subclinical Mastitis: Most prevalent and costly form of mastitis. Animal does not exhibit typical mastitis symptoms, No change in udder appearance, No observable changes in milk, Milk production will be lowered, but likely overlooked and Can only be detected with individual cow somatic cell count (SCC) or microbiological culture. Infected cows serve as reservoirs and can infect other cows (Chassagne *et al.*, 2005).

Clinical mastitis is the term used for bacterial infections of the mammary gland that are present with obvious symptoms. Visible indications of clinical mastitis include swelling, redness or necrosis of one or more half udders and abnormal discharge of milk (presence of clots or serum), as well as other symptoms such as anorexia, fever or agalactia. Usually the consequence of clinical mastitis is toxemia and gangrenous necrosis of the udder. The rate of new clinical cases in lactation is usually below 5% for both milk and meat flocks. Clinical mastitis can lead to mortality or culling of up to 90% of mastitic ewes in the flock. Several pathogens can cause mastitis, but *Staphylococcus* spp. are the most frequently diagnosed causal microorganisms of intramammary infections (IMI) in goats and sheep. Clinical incidence is generally lower in ewes than in cows. Subclinical mastitis is characterized by inflammation of the udder detected by enumeration of inflammatory cells in milk (Olechnowicz and Jakowski, 2014).

Acute Mastitis: Sudden onset of symptoms and its symptoms include: Fever, Off-feed and off-water, Rapid pulse, Weakness, Udder may be red, swollen, hard and/or painful to touch - Grossly abnormal milk - Dramatic drop in milk production and Can be caused by coliforms, pseudomonas and other bacteria. Treatment dependent on type of bacteria, time and duration of treatment (Mastitis, 2004).

Chronic Mastitis: Of long duration (months to years). Symptoms vary depending on phase of infection. Cows may remain subclinically infected indefinitely or Cows may alter between clinical and subclinical mastitis. Multiple infections in the same quarter within a lactation or into the next lactation are a sign of chronic mastitis (Mastitis, 2004)

Diagnosis and Its Differential Diagnosis: Clinical Examination is important part of its diagnosis. Individual udder quarters are examined for abnormal type of size, consistency, symmetry, fibrosis, inflammation signs by thorough inspection & palpation. Milk is examined for the detection of abnormalities such as discoloration, blood ting, wateriness, clots, flakes & pus (Sanchez *et al.*, 2003).

California Mastitis Test (CMT): CMT is simple, inexpensive, rapid screening test for mastitis. This test is based on a gelling reaction between the nucleic acid of the cells & reagent.

Bacteriological of Milk: The laboratory procedure of inoculating standard volume of hygienically collected milk agar culture medium has been the standard diagnostic method for bovine mastitis. The resulting bacterial growth is observed, quantified & tested. In fact use of milk culture is wide spread as a measure of determining udder health status and differentiates it from udder edema. It has become the definitive standard diagnostic test, (Sanchez *et al.*, 2003).

Treatment and prevention: There are several practices that animal producers can implement to successfully manage mastitis in their herd/flock. There are different strategies to manage mastitis: establishment of goals for udder health, maintenance of a clean, dry, comfortable environment, proper milking procedures, proper maintenance and use of milking equipment, good record keeping, appropriate management of clinical mastitis during lactation, effective dry cow treatment, maintenance of biosecurity for contagious pathogens and marketing of chronically infected cows, regular monitoring of udder health status and Comparing management practices of high quality herds to medium or poor quality herds is one way to highlight management practices associated with a high degree of control of clinical and subclinical udder infections (Chassagne *et al.*, 2005). Thus the present case report described the case of mastitis in goat.

3.11.2. Case description on mastitis in doe

A 30 kg adult doe was presented to veterinary teaching hospital of Addis Ababa University with a complaint of reduced appetite, swelling of udder and redness of udder. Based on the initial physical examination of the doe revealed, rectal temperature 38.8°C, heart rate 84 beat/min, respiratory rate 24 breath/min and slightly pale mucous membranes. The animal was alert and responsive. Urination and defecation were within normal limits. Swelling of udder on both

quarters was observed. Upon palpation udder showed hard to touch, response to pain and redness of udder was observed. The EDDIE smart phone app had a limitation on mastitis and not included in the list of cases on EDDIE. Based on the history and clinical signs observed the case was diagnosed as mastitis and its differential diagnosis is mammary edema.



Figure 33: Photograph of doe suffered from mastitis.

3.11.3. Laboratory finding and its investigation

The milk sample was taken and sent to laboratory of biomedical department. The milk sample was enriched with TSB for hours as indicated in figure. After 24 hrs *Mannitol salt agar* was prepared (A) and the sample was cultured on *Mannitol salt* as indicated in photograph (B) as follows. The mannitol agar was a selective media for *Staphylococcus* organism and after 24 hrs incubation at 37°C the organism was grown on MSA media as indicated below. The typical characteristic on culture was yellow colour as indicated as follow (w₃). Based on the history, clinical signs and laboratory finding the case was finally diagnosed as mastitis due to *staphylococcus* organisms.

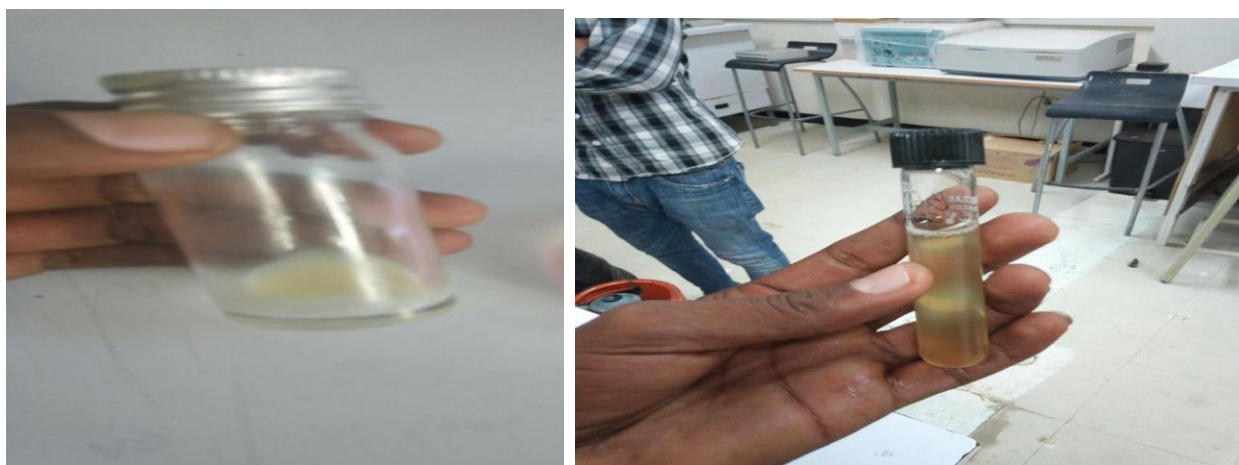
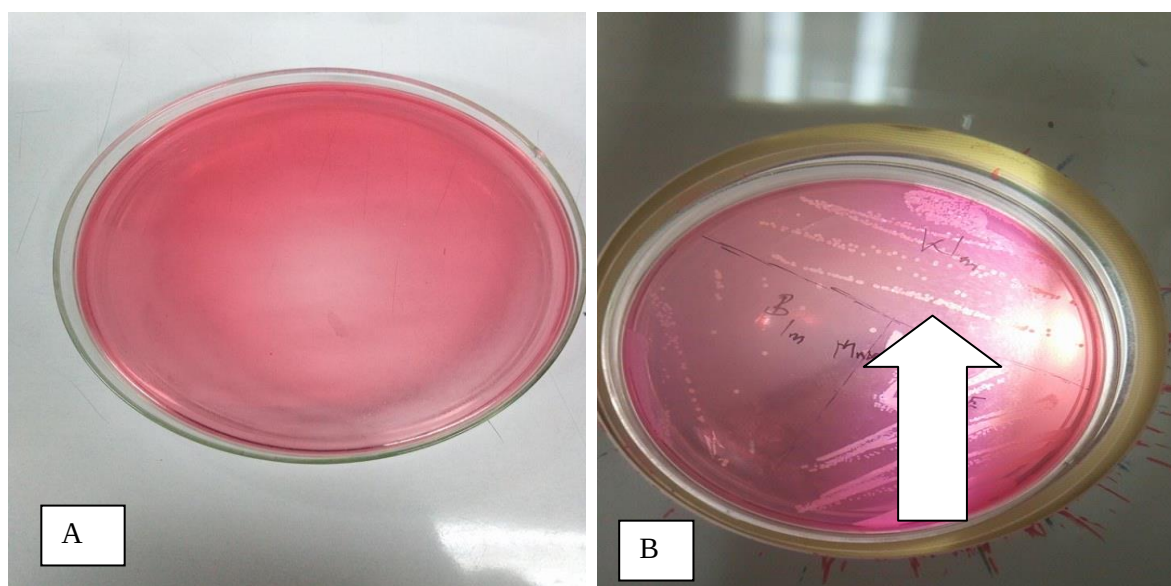


Figure 34: Milk sample and its enrichment in TSB.



A) Mannitol salt agar.

B) *Staphylococcus aureus* on Mannitol salt agar

Figure 35: Mannitol salt agar and *Staphylococcus aureus* on Mannitol salt agar.

3.11.4. Mastitis management and its treatment outcome

The case mastitis was treated with antibiotic and in this case report the doe was treated with penstrip (Chongqing Fantong Animal Pharmaceutical Co.Ltd, China) for three successive days at 1ml/20kg/day for three days; the owner also advised to provide good environment and hygienic

status of their house; and the doe gives a good response to the treatment as indicated in figure as follow



Figure 36: Doe after three weeks of treatment.

3.11.5. Discussion

Mastitis is a complex health issue that continues to affect dairy herds all across the world. Clinically disease is characterized by inflamed udder, reduction and change in appearance and composition of milk; this was in consistent with the current case report. These signs are not seen in sub-clinical infection except increase in SCC and may develop into chronic mastitis. Fortunately, several management practices have a positive influence on the prevention and incidence rate of mastitis caused by both the major and minor contagious and environmental mastitis pathogens (Olechnowicz and Ja+@kowski, 2014).

The present case report was finally diagnosed as Mastitis based on history, clinical findings and laboratory confirmation; but EEDIE was not included mastitis on the recorded data. In present case report, a typical case of mastitis is reported which is caused by *S. aureus* and this report agreed with the result reported by Marogna *et al.*(2012); and White and Hinckley (1999). Infection usually occurs after kidding with development of enlarge pendulous udder. Milk in udder provide site for bacterial multiplication and if remain untreated, may develop into chronic mastitis (Alawa *et al.*, 2000).

Antibiotic therapy is a common practice in mastitis, and treatment can start blindly by means of a broad-spectrum effective therapeutic agent against the major causal agents of the disease

(Sawant *et al.*, 2005). In this case report the doe was treated with parental injections of antibiotic penstrip 1ml/25kg bwt intramuscularly for three days. Administration of the antibiotic in this case depends on the identification of the causal agent. Although; antibiotics are useful to treat the bacterial infection, but they cannot protect the glands from tissue damage. The use of nonsteroidal anti-inflammatory agents as supportive treatment in mastitis has been advocated to alleviate the clinical signs of the disease and to improve the welfare standards of the animals (McKellar, 2006).

In conclusion, In this case clinical mastitis observed is due to a contagious and pathogenic form having a substantial impact on dairying worldwide in livestock production. Although prevention aimed at maintaining a clean and dry environment for dairying is the most importance, vigorous treatment of affected animals with appropriate drugs and making a good environment for the cow/doe/ewe is also essential.

3.12. Retained Fetal Membrane in Doe

Abstract: Retention of fetal membranes is one of the major periparturient complications among the reproductive disorders in dairy goats which negatively influence health, reproductive efficacy and welfare of the animal. A doe aged 2 years old with one parity was presented to VTH of College of veterinary medicine, Addis Ababa University on October 20, 2018 with the history of kidding two days earlier and persistence of fetal membranes hanging from the vulva. The doe had delivered one dead fetus. Further the owner complaint that the doe loss appetite since the day of kidding. The doe was observed to be weak, dull and depressed with abnormal foul vaginal discharge. Clinical examination revealed temperature 38.4 °c, heart rate 76 beat/min and respiration rate 24 beat/min. Fetal membrane was seen hanging from the vulva which diagnosed the case as retention of fetal membranes where the fetal membrane failed to expel within certain period after the parturition of fetus. Perineal region and exposed part of fetal membranes of the doe was cleaned with saline solution and using soft cotton the region was dried off to prevent microbial invasion into the uterus. Then, carefully mild gentle traction was applied on the fetal membrane and the fetal membranes came off easily. Following the removal of the retained fetal membranes, long acting oxytetracycline (20%) was given to avoid secondary bacterial

complication and Dexamethasone sodium phosphate (Sokar Healthcare Pvt.Ltd. Gujarat India) 0.2mg/kg/day was given intramuscularly to provide anti-inflammatory, anti-exudative and anti-pyretic effects. After two weeks of follow up the goat was totally free from the suffering. On conclusion, proper nutrition and management can resolve the problem of retention of fetal membrane in small ruminants, thus saving the economic losses and promoting better health and fertility of the animals.

Keywords: *Doe, Retained fetal membrane*

3.12.1. Introduction on retained fetal membrane

Retention of fetal membranes (RFM) is one of the major periparturient complications among the reproductive disorders in dairy goats which negatively influence health, reproductive efficacy and welfare of the animal (Singh *et al.*, 2018). It causes significant economic losses in the herd due to decreased milk production, treatment cost and decreased market value of the animal if not treated adequately and promptly. In does, RFM is defined as the failure of the fetal membrane expulsion within 6–8 h after kidding (Noakes, 2009).

Normally the fetal membranes are expelled 1–4 hr after kidding. Immediate Veterinary attention is essential if the expulsion is not made within 12 hr as contraction of the uterus and closure of the cervix will soon prevent manual removal of the RFM (Mude *et al.*, 2010). Expulsion of fetal membrane being the third and final stage of parturition depends on various factors mainly the hormonal level. The hormonal processes that lead to the normal placental separation are multifactorial and begun before parturition (Beagley *et al.*, 2010). Collagenases are proteolytic enzymes that have a crucial role in the fetal membrane release, by breaking the peptide bonds in collagen (Noakes *et al.*, 2009).

Causes of retained placenta: The list of potential causes is quite long; however, there are a number of common Causes that affect livestock like: Mechanical Causes of Retained Placenta: (Difficult birth (calf too large for cow, backwards calf, one leg or head backwards), Twins, Fetal monsters or emphysematous fetus (gas-filled fetus). Nutritional Causes of Retained Placenta: Energy or Protein Deficiency during pregnancy, Vitamin A deficiency, Selenium deficiency, Iodine deficiency and Vitamin E deficiency. Management Causes of Retained Placenta: Stress

(Transportation or rough handling, poor feed conditions), Obesity, Heredity and Infectious diseases/Toxins: Brucellosis, Leptospirosis, and BVD virus (Hanafi *et al.*, 2011).

Therapy of retained fetal membrane: Several authors recommended different method of therapies for RFM although the efficacy of many of these treatments is questionable. Current evidence does not support manual removal as an effective treatment for RFM however it is still commonly practiced (Djuricic *et al.*, 2015). Thus the present report described the management of Retention of fetal membranes in a doe.

3.12.2. Case report on retained fetal membrane in doe

A doe aged 2 years old with one parity was presented to VTH of College of veterinary medicine, Addis Ababa University on October 20, 2018 with the history of kidding two days earlier and persistence of fetal membranes hanging from the vulva. The doe had delivered one dead fetus after long labor as the owner revealed the history. Further the owner complaint that the doe loss appetite since the day of kidding. The doe was observed to be weak, dull and depressed with abnormal foul vaginal discharge. Clinical examination revealed temperature 38.4c^o, heart rate 76 beat/min and respiration rate 24 beat/min. Fetal membrane was seen hanging from the vulva which diagnosed the case as retention of fetal membranes where the fetal membrane failed to expel within certain period after the parturition of fetus.



Figure 37: The retained fetal membranes hanging from the vulva of the doe.

3.12.3. Therapeutic management of retained fetal membrane

The perineal region and exposed part of fetal membranes of the doe was cleaned with saline solution and using soft cotton the region was dried off to prevent microbial invasion into the

uterus. The fetal membranes were noticed to be adhered loosely to the uterine portion and slight manual intervention possibly will remove the fetal membrane remnants. So, carefully mild gentle traction was applied on the fetal membrane and the fetal membranes came off easily. Following the removal of the retained fetal membranes, long acting oxytetracycline (20%) was given to avoid secondary bacterial contamination and to eliminate uterine debris which could have lead to metritis affecting the normal health and future fertility of the animal. The doe was further managed with Dexamethasone sodium phosphate (Sokar Healthcare Pvt.Ltd. Gujarat India) 0.2mg/kg/day intramuscularly to provide anti-inflammatory, antiexudative and anti-pyretic effects. The owner also advised to care for their pregnant animals in their feeding and management. The doe regain health and started to consume normal diet and recovered within the following weeks as reported by the owner.



Figure 38: Doe after the removal of the retained placenta.

3.12.4. Discussion

RFM in farm animals is a serious post-parturient disorder which occurs when the final stage of parturition is delayed. The RFM is probably less health problem in does than in cows, inspite of the fact that the RFM prevalence in some cow and goat herds was similar Djuricic *et al.* (2015). RFM have been associated with increased risk for endometritis, metritis, ketosis, and mastitis in such animals where the placenta is not removed (Bruun *et al.*, 2002 ; Melendez *et al.*, 2003).

So, the present case describes about the successfully manual removal of the fetal membranes and other medical therapy thus prevents the secondary complication of pathogen. Manual removal of the fetal membranes remains a common practice despite numerous studies fail to demonstrate a beneficial effect on reproductive performance (Drillich *et al.*, 2006). Similarly manual removal remains method of choice for the present case too. In this case, RFM might be due to lack of

proper nutrition supplement during the dry period and during term which in turn is associated with difficulty in delivery of fetus under normal condition. This case agreed with Hanafi *et al.* (2011) that reported that RFM occur usually following dystocia, maternal hyp immunity, mal and unbalanced nutrition, stress, hereditary predispositions or infections since the handled case was associated with dystocia. In conclusion, proper nutrition and management can resolve the problem of retention of fetal membrane in small ruminants, thus saving the economic losses and promoting better health and fertility of the animals.

3.13. Concurrent Infection of *Haemonchosis* and *Fasciolosis* in Ewe

Abstract: *Haemonchus contortus* commonly known as barber pole worm is a most pathogenic blood sucking gastrointestinal nematode found in the abomasums and economically important nematode of small ruminants. In this report, a severe case of *Haemonchosis* and *fasciolosis* was described. A female sheep aged four years was presented to Veterinary Teaching hospital, college of veterinary Medicine, Addis Ababa university on November 27,2018 with the history of anorexia, ataxia and dark colour firm feces voiding for past a week days and the animal was not treated before. As the owner complained before two weeks there was swelling under the neck and the hind leg was unable to stand for continuous three days. On clinical examination, sheep was found to be very weak, dehydrated, paunches of wool was easily removed; capillary refill time was around four minute, depressed, lateral recumbent position, hypothermia 34.2⁰C, heart rate 96 beat/min, respiratory rate 22 breath/min and pale conjunctival mucous membrane. The sheep was died in VTH while preparing for fluid therapy. Based on the consent of the owner the sheep was sent for Post mortem examination. A well detailed post mortem examination of sheep was conducted to know the cause of the death. First, the animal was examined carefully on the external surface of the body and the internal organs were examined, and the organs showing macroscopic lesions were observed. Based on the history, clinical sign observed, post mortem examination and parasitological finding the case was finally diagnosed as *Haemonchosis* and *fasciolosis*. On conclusion, *Haemonchus contortus* is an important blood-sucking nematode which has produce anemia and hypoproteinaemia in small ruminants that may be fatal particularly to young animals. The major activities for controlling *haemonchosis* infection includes rotational usage of different anthelminthetic drugs, correct identification of parasitic

species, correct usage of drug of choice, appropriate dosage of drug, change the grazing areas frequently to break the life cycle of parasite and rotational grazing methods.

Key words: Ewe, *Fasciolosis*, *Haemonchosis*, *Sheep*

3.13.1. Introduction on *haemonchosis* and *fasciolosis*

Small ruminants plays major role in the maintenance of rural farmer's family stability by providing cash income through milk, meat, skin and wool. *Haemonchus contortus* commonly known as twisted stomach worm or barber pole worm, is a most pathogenic blood- sucking gastrointestinal nematode found in the abomasum of small ruminants (Lateef *et al.*, 2005).

Pathogenicity of *H. contortus* consists of blood loss due to the way of eating of both adults and larvae fourth stage which are obligate hematofagous. Pathogenicity of *H. contortus* consists of blood loss due to the way of eating of both adults and larvae fourth stage which are obligate hematofagous. This leads to decrease the number of red blood cells, hematocrit and hemoglobin levels and quantity of total serum protein and albumin. Hypoproteinaemia and hypoalbuminaemia are an important element for the occurrence of edema. Clinical manifestation of *haemonchosis* is largely dependent on the breed, age, sex and immunological status of the hosts and also the degree of infection dose, stage of disease and diet. The content of protein in the diet significantly affects the pathogenesis of the disease (Iliev *et al.*, 2017).

Clinical signs: The signs most characteristic of *H. contortus* infection relate almost entirely to the blood-feeding activities of adult and late larval stages; include anaemia, reduced exercise tolerance and subcutaneous oedema. In cases of overwhelming infection ('hyperacute *haemonchosis*'), animals are found dead, with signs of severe anaemia in many of the survivors. Usually, *haemonchosis* occurs in an acute form, with varying rates of onset and mortality, depending mostly on the rate of intake of infective larvae of *H. contortus*. The most specific indication is anaemia, seen as pallor of the mucous membranes, especially easily seen in the conjunctivae, and varying from the normal, red-pink color to extreme white in terminal situations (Bowman, 2014).



Figure 39: Buccal and conjunctival mucous membranes pale and anaemic.

Source: (Saminathan *et al.*, 2015)

Affected animals become progressively weaker with increasing blood loss, and are less inclined to move and may spend more time lying down than usual. On driving, some will collapse and may die, particularly if repeatedly forced to move. Without treatment, the hypoproteinaemia due to blood loss may lead to a general, ventral oedema in a proportion of animals. This is especially evident as submandibular oedema ('bottle jaw'), although this is not pathognomonic for *haemonchosis*, as it also occurs on a flock or herd scale in chronic *fasciolosis* outbreaks and with extreme cachexia, and deaths may occur before oedema develops. The faeces are often firm and scant, and may be dark due to an occult blood content. Diarrhoea is not usual, although *haemonchosis* can occur concurrently with infections with other nematodes that cause this clinical sign. Pain is not visually evident, but a break in the wool of sheep occasionally occurs, with the shedding of strands of wool or even the entire fleece (Bowman, 2014).



Figure 40: Pale conjunctiva and Submandibular oedema in a lamb infected with *H. Contortus*.

Source: (Iliev *et al.*, 2017).

Diagnosis and Differential Diagnosis: *Haemonchus contortus* infection is clinically diagnosed by anemia, dehydration, and sub mandibular internal fluid accumulation those results in the formation of a bottle neck, diarrhea and low packed-cell volume (PCV). Infection also results in retarded growth; weakness reduced reproductive performance, general illness and death.

Microscopical techniques: *Haemonchus* eggs were identified on the basis of morphology. Species whose eggs exhibit similar morphological characters and therefore cannot be distinguished from each other can further be subjected to larval culture and identification of the third stage larvae (L3) (Waller *et al.*, 2004). Supplementary diagnosis is achieved through the use of microscopic techniques by the recovery of *H. contortus* eggs from stool samples. Because the eggs of many important genera are morphologically similar and therefore hard to identify to species level, a better way of delineate species is by larval culture and identification of 3rd stage larvae. Demonstration of parasite eggs in faecal material can prove the presence of infection and is the most commonly used diagnostic method. Nevertheless, this method does not always reveal the presence of the parasite during low level of parasitic burden and pre-patent periods requiring repeated examinations. Host resistance to GIT helminthes also delays egg laying and a change in female worm size affects its fecundity. Hence, egg counts do not necessarily reflect the number of worms present. Other methods like measurement of parasite specific antibodies can be used as supplementary diagnostic tools; and *fasciolosis* and other GIT parasite are considered as differential diagnosis (Eysker and Ploeger, 2000).

Treatment and prevention of *Haemonchosis*: In the major endemic zones, control has relied heavily on anthelmintics, with consequent widespread and severe resistance. Sustainable approaches require the effective detection of developing *H. contortus* burdens and the avoidance of excessive larval intake through pasture changes, with the application of refugia-based strategies on either an individual animal or a flock basis. In environments where *haemonchosis* occurs more sporadically, monitoring is particularly important to allow preemptive treatments during potential risk periods. In all situations, appropriate anthelmintic choice is fundamental to the effective management of *H. contortus* (Waller *et al.*, 2004). Thus the present report described the concurrent infection of *Haemonchosis* and *fasciolosis* in ewe.

3.13.2. Case report on concurrent infection of *haemonchosis* and *fasciolosis*

A female sheep aged four years was presented to Veterinary Teaching hospital, college of veterinary Medicine, Addis Ababa university on November 27, 2018 with the history of anorexia, swelling under the neck before two weeks, weight loss, and dark colour firm feces voiding for past a week days and the animal was not treated before. As the owner complained before two weeks there was swelling under the neck and the hind leg was unable to stand for continuous three days. On clinical examination, sheep was found to be very weak, dehydrated, paunches of wool was easily removed; capillary refill time was around four minute, depressed, lateral recumbent position, hypothermia 34.2 °C, heart rate 96 beat/min, respiratory rate 22 breath/min and pale conjunctival mucous membrane. EDDIE revealed the case as *haemonchosis*. Based on the clinical finding, history obtained and EDDIE result the case was tentatively diagnosed as *Haemonchosis* and its differential diagnosis is *fasciolosis*.



Figure 41: Ewe in lateral recumbency.



Figure 42: Pale mucous membrane almost whitish in diseased ewe.

3.13.3. Laboratory finding, postmortem examination and its investigation

The sheep was died in VTH while preparing for fluid therapy. Based on the consent of the owner the sheep was sent for Post mortem examination. A well detailed post mortem examination of sheep was conducted to know the cause of the death. First, the animal was examined carefully on the external surface of the body and the internal organs were examined,

and the organs showing macroscopic lesions were recorded. Hydrothorax, ascite were observed. Liver became swollen and also bile duct, Adult fasciola was observed while the liver opened. Intestine was pale as indicated below in figure. Before the death of sheep the feecal sample was collected and sent to parasitology laboratory of Addis Ababa University. A floatation technique was done and numerous eggs of haemonchus were observed under 40x microscope, but negative on sedimentation technique for *fasciolosis*. Based on the history, clinical signs observed, post mortem examination and parasitological finding the case was finally diagnosed as concurrent infection of *Haemonchosis* and *fasciolosis*.





Figure 43: Post-mortem examination of ewe and major pathological change in internal organs.

3.13.4. Discussion

Haemonchus contortus is a major highly pathogenic and economically important gastrointestinal parasite of sheep and goats (Mortensen *et al.*, 2003) and causes high morbidity, mortality, decreased production and economic loss due to cost of treatment and control measures (Getachew *et al.*, 2007; Qamar and Maqbool, 2012).

Based on history obtained, Clinical examination detected, postmortem examination observed and parasitological finding, the case was finally diagnosed as concurrent infection of *Haemonchosis* and *fasciolosis*. In this study, clinical signs like buccal and conjunctival mucous membranes were pale and anaemic, bottle jaw and paunches of wool was easily removed which was corresponded with the observation of Zacharias *et al.*(2008); Iliev *et al.* (2017).

On post mortem examination, Hydrothorax, hydroperitonuem (Ascites), swollen liver, pale intestine and Enlarged mesenteric lymph node were observed. This finding was agreed with the observation of Saminathan *et al.* (2015) and adult *fasciola* observed in the current case report was disagree with the finding of Saminathan *et al.*(20115). The present study clearly described the clinical signs and gross lesions of *haemonchosis* and *fasciolosis* on postmortem and parasitological examination. In the present study, cause of death was due to concurrent infection of *H. contortus* and *fasciolosis* results in anaemia, hypoproteinemia, ascites and dehydration leads to shock.

Although, fecal flotation examination is an important diagnostic tool to find out gastrointestinal parasitism, but *H. contortus* eggs cannot be distinguished easily from other parasites of strongylids family. In the present study, numerous *H. contortus* eggs were identified on the basis of morphology. These findings were corresponded with the observation of Kumsa *et al.* (2008); Valderr+íbano *et al.* (2002); but it is negative for floatation technique.

In conclusion, *Haemonchus contortus* is an important blood-sucking nematode which has produce anemia and hypoproteinaemia in small ruminants that may be fatal particularly to young animals. The major activities for controlling *haemonchosis* and *fasciolosis* infection includes rotational usage of different anthelmintic drugs, correct identification of parasitic species, correct usage of drug of choice, appropriate dosage of drug, change the grazing areas frequently to break the life cycle of parasite and rotational grazing methods.

3.14. Pneumonic Pastuerellosis in Ewe

Abstract: *Pneumonic pasteurellosis* is one of the most important economically infectious diseases of ruminants with a wide prevalence throughout the world. A female sheep was presented to the Addis Ababa University, College of veterinary medicine Veterinary Teaching Hospital on November 03, 2018 with complains of inappetence, coughing, nasal discharges and weakness. As the owner complained, the sheep was bought from the rural market with the lamb and the lamb was passed away. Close physical examination findings were serous nasal discharge, rough hair coat, pyrexia 40.1 °C, heart rate 76 beat/min, respiratory rate 24 breath/min, and pale mucous membrane. Harsh and crackles lung sound was noticed upon auscultation. EDDIE revealed the case as pneumonic pasteurollosis. Based on the history obtained from the owner, EDDIE result and clinical signs observed the case was tentatively diagnosed as pneumonic pasteurellosis. Bacteriology result also revealed the case as pasteurella organism and finally the case was diagnosed as pneumonic pasteurellosis. As a treatment, Oxytetracycline 10% (Chongqing Fantong Animal Pharmaceutical Co.Ltd, China) for three successive days at 10 mg/kg was given was given for three successive days and the sheep was well responded to and healed. In conclusion, pasteurellosis in this case was occurred due to environmental stress and transportation stress. However, as the case observed, the chances for recovery are high when the

sheep were treated promptly and effectively. This disease can be control effectively with early treatment and proper vaccination program to prevent unnecessary economic losses

Key words: *Sheep, pasteurellosis, Oxytetracycline*

3.14.1. Introduction on pneumonic pasteurellosis

Pneumonic pasteurellosis is one of the most important economically infectious diseases of ruminants with a wide prevalence throughout the world. The disease is characterized by an acute febrile course with severe fibrinous or fibrinopurulent bronchopneumonia, fibrinous pleurisy, and septicaemia (Mohamed and Abdelsalam, 2008). *M. haemolytica*, *P. trehalosi*, and *P. multocida* are common commensal organisms of the tonsils and nasopharynx of healthy sheep and goats. They are non-motile, gram-negative rods that cause cranioventral bronchopneumonia affecting sheep and goats of all ages worldwide (Abdullah *et al.*, 2015b).

Infections from these pathogens are associated with poor management practices and occur as a secondary infection or as a consequence of severe stress. Transportation stress, viral infections, overcrowded pens, poor housing conditions, sudden environmental changes, and other stressful conditions increase goats' susceptibility to *P. multocida* and *M. haemolytica* pneumonias. Drugs such as penicillin, ampicillin, tetracycline, oxytetracycline, tylosin, florfenicol, and ceftiofur have been reported to be effective in the treatment of pneumonia in goats (Abdullah *et al.*, 2015b). Vaccination is the best form of control of the disease. Effective vaccine such as alum precipitated and oil adjuvant vaccines have been developed (Myint and Jones, 2007).

Etiology and Clinical sign of pneumonic pasteurellosis: It is now evident that *M. haemolytica*, which was formerly known as *P. haemolytica*, is the main causative agent of the disease although a number of investigators still believe that *P. multocida* is also involved. However, the pathogenic role of *P. multocida* was more evident in sheep in which it was responsible for many serious outbreaks. It is worth mentioning that *M. haemolytica* and *P. multocida* are commensally present as normal constituents of the nasal and pharyngeal microflora of healthy ruminants. Both organisms were frequently isolated from the nasopharynx and trachea of sick animals and also from apparently healthy ones (Mohamed and Abdelsalam, 2008).

Diagnosis and differential diagnosis of pneumonic pasteurellosis: Diagnosis is depending on the history, recent movement, weaning or housing, isolation and identification of the causative agent is important. Differential Diagnosis is Conditions that may be mistaken for pneumonic pasteurellosis include; respiratory disease, Verminous pneumonia, viral interstitial pneumonia and sporadic conditions, such as lung abscesses and aspiration pneumonia (Frank *et al.*, 2000).

Treatment and prevention of pneumonic pasteurellosis: Early identification of respiratory disease and introduction of effective antibiotic therapy is necessary. Prevention of respiratory viruses by using a vaccination program would be expected to decrease respiratory pasteurellosis by preventing the initial insult that allows colonization. Inclusion of prophylactic antibiotics, mainly tetracycline, in the feed during the months of the year with the highest incidence is a common management practice. Avoidance or reduction of known stressors such as heat, overcrowding, exposure to inclement weather, poor ventilation, handling, and transportation should also be considered (Myint and Jones, 2007). Thus the present case report described the management of pneumonic pasteurellosis in a sheep.

3.14.2. Case description on pneumonic pasteurellosis

A female adult sheep aged four years was presented to the Addis Ababa University, College of veterinary medicine, Veterinary Teaching Hospital on November 03, 2018 with complains of inappetence, coughing, nasal discharges and weakness. As the owner complained, the sheep was bought from the rural market with the lamb and the lamb was passed away. Based on the physical and clinical examination findings there were serous nasal discharge, rough hair coat, fever 40.1⁰C, heart rate 76 beat/min, respiratory rate 24 breath/min and the mucous membrane was pale with capillary refill time and skin tenting of more than 2 seconds. Based on history obtained, clinical signs observed and EDDIE diagnosis a case was tentatively diagnosed as pneumonic pasteurellosis and its differential diagnosis were PPR, Verminous pneumonia and other respiratory disease.



Figure 44: Ewe suffered from pneumonic pasteurellosis.

3.14.3. Laboratory finding and its investigation

The identification of the etiology of the case was performed at the Biomedical Laboratory of Addis Ababa University using techniques recommended by Hardy Diagnostics, Santa Maria, CA, USA. First, the nasal content was taken from the sheep using nasal swab and the sample was put in the pre-enriched in tryptose Soya broth of 10ml. Second, the sample pre-enriched in tryptose Soya broth specimen was incubated for 24 hrs at 37°C. After 24 hrs incubation, a loop full of the broth cultures were taken and streaked over an identified Petri-plate containing blood agar base supplemented with 5% sheep blood and immediately incubated aerobically at 37°C for 24 hours

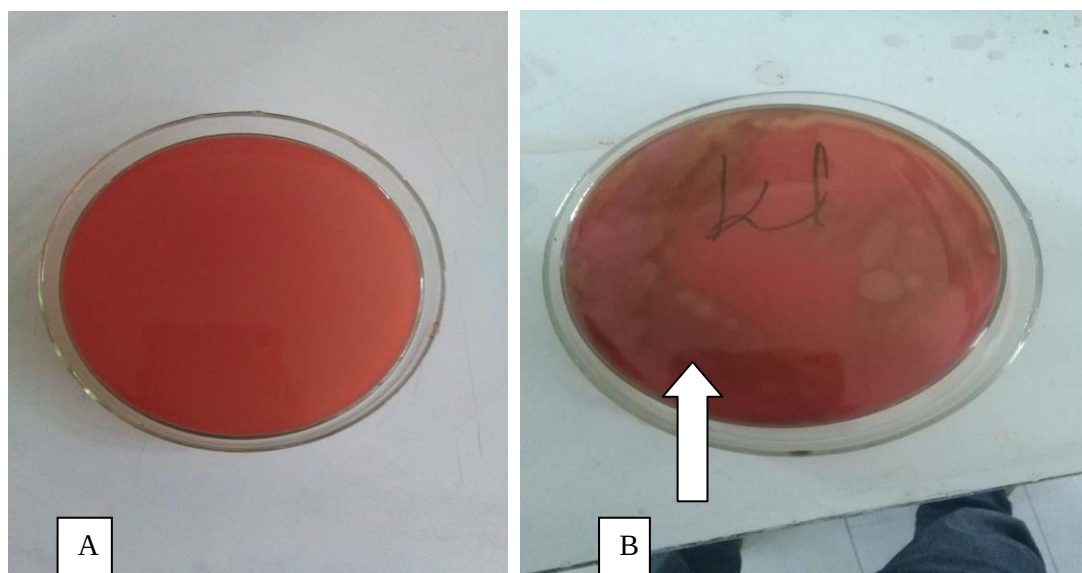


Figure 45: Blood agar prepared (A) and Bacteria grown on blood agar (B).

Thirdly, from culture positive plates, typical colonies were subjected to gram's staining to study staining reactions and cellular morphology under light microscope, at 100x magnification (Oil immersion). Gram-stained of the colonies showed gram-negative (red colour background), ovoid, bipolar staining coccoid forms was observed under oil immersion Microscopy. The sample was taken from the blood agar and again cultured on *MacConkey* agar in order to test whether it is grow or not on *macConkey*. The cultured sample from blood agar didn't grow on *MacConkey* agar and hence it is due to *pastuerella* organism (Figure below).



A)

A) Cultured sample was unable to grow on *MacConkey* agar

Figure 46: Cultured sample on *MacConkey*

Based on the history obtained from the owner, clinical signs observed, EDDIE result and bacteriology result, this case was finally diagnosed as pneumonic pasteurellosis.

3.14.4. Case management and treatment outcome

The treatment of the sheep was aimed at relieving the problem and to heal the sheep. Hence, therapy of Oxytetracycline 10% (Chongqing Fantong Animal Pharmaceutical Co.Ltd, China) for three successive days at 10mg/kg was given. The owner was also advised to separate and nurse the sheep at home for the sake of others and to avoid stress on the diseased one; vaccinating

other groups of flock. A month after recovery, the owner reported that the ewe was healed and sold.

3.14.5. Discussion

Pasteurellosis or commonly known as shipping fever is the most common problem faced by small ruminant holders in Ethiopia. Besides environmental stress, nutritional and poor husbandry stresses also contribute to the development of pasteurellosis in sheep and goats leading to great economic losses (Chung *et al.*, 2015). The present case was diagnosed as pneumonic pasteurellosis based on the history obtained from owner, clinical presentations, EDDIE result and bacterial culture findings. The result of EDDIE diagnosis agreed with the laboratory result. This finding of the case was agreed with the case of Chung *et al.* (2015) in which all clinical signs observed in both cases are identical. The global economic impact of the disease is very well recognized where one billion dollars are annually lost due to pasteurellosis (Mohamed and Abdelsalam, 2008).

The administration of oxytetracycline in the present case is in line with that of Abdullah *et al.* (2015c) who reported that antibiotics oxytetracycline were effective in the treatment of pneumonic pasteurellosis in goats. In this case, the sheep was treated with oxytetracycline a broad spectrum antibiotic which is effective against *M. haemolytica*. In addition to treatment, vaccination is also important in the control of pasteurellosis (Zamri-Saad *et al.*, 1994). Kids that received adequate colostrums from vaccinated does within the first 24 hours of birth will only have passive immunity against pasteurellosis for their first 4 weeks of life. Vaccination of the lamb is necessary to build its own active immunity and continued resistance to the disease (Akan *et al.*, 2006; Tesfaw *et al.*, 2014). Nevertheless, vaccination against pasteurellosis is not vastly practiced in Ethiopia in small ruminants. This is probably due to the unpopularity of the usage of vaccine among farmers or improper vaccination program.

In conclusion, pasteurellosis in this case was occurred due to environmental stress and transportation stress. However, as the case observed, the chances for recovery are high when the sheep were treated promptly and effectively. This disease can be controlled effectively with early treatment and proper vaccination program to prevent unnecessary economic losses.

3.15. Urolithiasis in Ram

Abstract: Urolithiasis is a condition of the urinary tract in which insoluble mineral and salt concretions develop and aggregate around a nidus of proteinaceous material within the Urinary bladder, urethra or urethral process. A matured ram was brought to Addis Ababa university, college of veterinary medicine, veterinary teaching Hospital on November 14, 2018 with the complains of unable to urinate in a normal manner. Based on close physical examination the ram was appeared to strain to urinate and dribble urine. Small “sand-like” materials which are crystals on the hairs at the end of the prepuce were observed, temperature 38°C, 94 beat/min, 24 breath/min and the case was diagnosed as Urolithiasis. The urethral process was examined in the ram as the urolithiasis mostly occurred in the urethral process in small ruminants. The ram was propped up on its rump and grasped the penis through the skin at the base of the scrotum and force the penis cranially. As the glans protrudes from the prepuce and grasped with a dry gauze, and the penis can be exteriorized completely. The urethral process was observed and contains crystals; and it was obstructed; Urethral Process Amputation was performed on the ram as management of the case, near the glans of the penis and the ram urinated immediately after urethral process amputation takes place and 20% oxytetracycline was given to avoid complication of bacterial infection. Urolithiasis is a common problem in male small ruminants and well management of the male animals in their feeding and during castration is paramount.

Keywords: *Ram, Urolithiasis, urethral process amputation*

3.15.1. Introduction on urolithiasis in small ruminant

Urolithiasis is a condition of the urinary tract in which insoluble mineral and salt concretions develop and aggregate around a nidus of proteinaceous material within the bladder or urethra. Urolithiasis refers to the disease conditions resulting in urethral obstruction. It is the most widespread and economically important disease of ruminants, which affects both sexes; however, urinary blockade is a major problem only in males. Male small ruminants are commonly affected because of their particular anatomy, which includes a long, narrow, tortuous urethra with a thin urethral process. It is the second biggest cause of death behind respiratory disease (Sutradhar *et al.*, 2018)

Urolithiasis is commonly reported in young, castrated male small ruminants that associated with some factors including gender, age of castration, diet, urine pH and concentration. The calculi is mostly found in urinary bladder, but can also occur in renal pelvis and urethra. The calculi dislodged from bladder may get trapped in narrow male urethra, sigmoid flexure, urethral process or at preputial opening (Parrah *et al.*, 2011).

Etiology: The etiology is complex and multifactorial. Although urolithiasis is known to have numerous predisposing etiology factors, but exact mechanism of stone formation and growth is not fully known. Urinary calculi formation usually results from a various combination of various physiological, nutritional and management factors. It may occur due to excessive or imbalanced intake of minerals in feedlots while fattening cattle receive rations high in cereal grain and oil meals. These feedstuffs have high levels of phosphorous and magnesium but relatively low level of calcium and potassium predispose to disease condition (Sultan *et al.*, 2017).

A calcium phosphorous imbalance results in high urinary phosphate excretion, which is an important factor in the genesis of phosphate calculi. Numerous additional factors have been incriminated as contributing causes of the development of phosphate calculi with resultant obstructive urolithiasis in cattle. These include heavy concentrate-low roughage diets, limited intake or deprived of water, dehydration, urine alkalinity, mineralized artesian water, alkaline water supplies, excess of sodium bicarbonate in diet, vitamin imbalance e.g. hypovitaminosis and hypervitaminosis and high protein rations (Makhdoomi and Gazi, 2013).

Clinical signs: The clinical manifestations vary depending on the duration and site of obstruction. Obstruction of the urethra causes a characteristic syndrome of abdominal pain manifested by kicking at the belly, repeatedly lying down and rising, rolling, falling and moaning, swishing of the tail, twisting of the penis, strenuous efforts to urinate, treading with rear limbs. A heavy precipitation of crystals is often visible on the preputial hair or on the inside of the thigh. Animals with chronic partial urethral obstruction are termed as “dribblers” because of their characteristic slow or intermittent urine flow during voiding. In case of urethral rupture urine escapes into the tissues surrounding penis and edematous type of swelling occurs on abdominal floor (Singh, 2005).

Diagnosis and its differential diagnosis: Urolithiasis is often difficult to detect until it is in a severe stage because the clinical signs can be quite variable depending upon duration, extent and location of obstructing urolith. The condition is thus diagnosed by history of anuria coupled with other clinical manifestations like urine analysis, abdominocentesis besides to clinical, physical and haematobiochemical examination (Loretti *et al.*, 2003).

Imaging techniques as plain and contrast radiography are usually used in evaluating of the urinary tract lesions in small and large ruminants. Radiography is not consistently successful in diagnosis of urolithiasis in cattle. However, ultrasonography can be successfully used as a diagnostic aid together with radiography in diagnosis of cases of urine retention due to obstructive lesion. Urethral endoscopy has been found useful in evaluating urethral patency, examining urethral mucosa following relief of urethral obstruction to assess the long term prognosis for urethral strictures and helping in conducting laser lithotripsy for the management of urolithiasis by providing a route (Halland *et al.*, 2002).

Differential diagnosis: include pathological perineal, retro flexion and hernia of the urinary bladder, rupture of the urethra and pathological urethral diverticulum or dilatation. The condition is usually associated with urethritis and or cystitis as a result of accumulation of urine in the swelling for a prolonged period. Non obstructive urolithiasis may be confused with pyelonephritis or cystitis, penile hematoma, and differentiation may be possible only by rectal examination in the case of vesical calculi or by aspiration of swelling part (Panigrahi *et al.*, 2016). Thus the present report described the management of urolithiasis in ram.

3.15.2. Case description on urolithiasis in rams

A matured ram was brought to Addis Ababa university, college of veterinary medicine, veterinary teaching Hospital on November 14, 2018 with the complains of unable to urinate in a normal manner. Based on close physical examination the ram was appeared to strain to urinate and dribble urine, Small “sand-like” materials which are crystals on the hairs at the end of the prepuce were observed and temperature 38°C, 94 beat/min, 24 breath/min; the case was finally diagnosed as Urolithiasis.



Figure 47: Rams suffered from Urolithiasis and after amputation of urethral process.

3.15.3. Urolithiasis management and it treatment outcome

Examination of the urethral process should be a routine step in the diagnostic procedure for suspected urolithiasis in small ruminants, because the urethral process is the most common localization of urinary calculi in small ruminants (86% of the uroliths) (K++mper, 1994). The urethral process was examined in the Ram as the urolithiasis mostly occurred in the urethral process in small ruminants. The ram was propped up on its rump and grasped the penis through the skin at the base of the scrotum and force the penis cranially. As the glans protrudes from the prepuce and grasped with adry gauze, and the penis can be exteriorized completely. The urethral process was observed and swollen; and it was obstructed; Urethral Process Amputation was performed on the ram as management of the case, near the glans of the penis. The ram urinated immediately after urethral process amputation takes place and 20% oxytetracycline was given to avoid complication of bacterial infection and owner advised to give quality and quantity of water. Removal of the urethral process has no adverse effect on breeding ability or fertility.

3.15.4. Discussion

The most common sites for urethral obstruction to occur in ruminants are at the distal sigmoid flexure and urethral process. In Small ruminant, sheep, the urethral process has been reported to be the most common site of obstruction. The present case was diagnosed as urolithiasis in urethral process which was agreed with Rakestraw *et al.* (1995) which reported the urethral process was the site of obstruction in 17 of 43 sheep and 22 of 51 goats.

Urethral Process Amputation was performed on the ram as management of the case. Amputation of the obstructed urethral process resulted in free urine flow in a ram. This management of the case was corresponded with that of Van Metre *et al.* (1996) in which amputation of the urethral process was performed in all 15 animals in the report either before admission or on admission; three animals (20%) had temporary relief after urethral process amputation, but all reobstructed.

In the present case study the result of amputation of urethral process was succeeded and the ram was healed from the obstruction. The urethral recess of the caprine and ovine male urethra recess makes retrograde catheterization and flushing difficult. Retrograde catheterization with flushing was not attempted in the present case which is disagree with kumber (1994 in which four animals retrograde catheterization with flushing was attempted and failed to either partially or completely relieve the obstruction in all four animals.

In conclusion, one of the best ways to prevent urolithiasis is to maintain water consumption. The addition of salt in the diet may be needed to stimulate water consumption. Producers should not rely on salt blocks or loose salt to accomplish this. The salt should be slowly blended into the ration up to 4% of the diet. Another preventative measure is the addition of ammonium chloride. Ammonium chloride will acidify the urine which reduces chance of stone formation. Producers should avoid feeding too much protein and be careful when feeding or grazing legumes with wether lambs and goat and the owner also informed to give enough quantity and quality of water to their animals.

3.16. Parturient Paresis in Ewe

Abstract: Parturient paresis is an acute or subacute pathologic condition, which occurs more often shortly before or after parturition. A 3 year local ewe weighing 30kg was presented to Addis Ababa University, college of veterinary medicine, Veterinary Teaching Hospital on January 04, 2019 with a complaint of prolonged weakness, unable to stand especially on the hind legs and inappetance. The sheep had lambed before two days and was managed semi intensively on field. Based on the history, ewe was not vaccinated and also not dewormed. Physical examination showed the vital parameters were temperature 36°C, heart rate 80 beat/min and respiratory rate 22 beat/min. The sheep was on right lateral recumbency with the neck curved towards the left flank (S-shaped). There was dehydration. A tentative diagnosis was made based on the history of early delivery, inappropriate nutritional management and the presented typical clinical features of parturient paresis and also the EDDIE smart phone revealed the case as parturient paresis. The differential diagnoses were; Pregnancy toxemia, hypoglycemia and metabolic acidosis. Management of the case was aimed at restoring blood calcium level and 40% calcium borogluconate was given as a therapeutic measure through intravenously and the ewe was responded rapidly to the therapy and hence it was confirmed as hypocalcemia. In conclusion, hypocalcaemia is the result of a reduction of blood calcium in the early stages of lactation. This is due to the ewe having a sudden, dramatically increased demand for calcium to produce milk. Any preventive measure must be aimed at regulating calcium haemostasis and eliminating the precipitous fall in blood calcium at parturition by considering feeding system of animals.

Keywords: *Calcium borogluconate, Ewe, Parturient paresis,*

3.16.1. Introduction on parturient paresis

Hypocalcemia; parturient paresis or lambing sickness is an acute or subacute pathologic condition, which occurs more often shortly before or after parturition. The salient features of the disorder include reduced serum concentrations of calcium, progressive paralysis of smooth and striated muscles, recumbency, and lack of conscience (Pugh and Baird, 2012). The incidence of the disease is associated with imbalanced nutrition and/or improper handling and housing. In older animals, the ability of absorption and mobilization of stored calcium is reduced; thus, these

animals are more susceptible to the condition (Goff, 2000). It is an acute metabolic disease of sheep, characterised by tetany, incoordination, paralysis and coma is caused by an inadequate supply of metabolisable calcium (Woldemeskel *et al.*, 2000).

In contrast to “milk fever” in cows, this almost occurs at calving, hypocalcemia in ewes and does can develop from several weeks before until the first 2 weeks after parturition when the fetal skeletons are mineralizing. Incidence of the disease is usually less than 5%, only occasionally rising up to 20%. On the other hand, in intensively managed dairy flocks/herds the disease is more frequent after lambing, coinciding with the time of peak milk production. Calcium concentration in ewes’ milk is almost double that in cows’ milk (Moreno-Rojas *et al.*, 1994); because there are individuals producing over 3 L of milk daily, there is a high and prolonged demand of calcium during the first stage of lactation (Brozos *et al.*, 2011a).

At early stages of the disease, animals become isolated from the flock/herd and have a temporary stiff gait, with muscle tremors; potentially, they can become hyperesthetic. Soon afterwards, they become hyposensitive and weak, and remain recumbent. Depleted muscle contractions result in constipation and decreased rumen motility, leading to development of bloat (Care *et al.*, 1999; Cockcroft and Whiteley, 1999). As disease progresses depression can occur, usually ending in coma. Ears are typically cold, although rectal temperature usually remains within the normal range (Brozos *et al.*, 2011a)

Etiology: Parturient paresis is caused by a decrease in calcium intake under conditions of increased calcium requirements, usually during late gestation. This results in a low serum calcium concentration, particularly in animals pregnant with multiple fetuses. Hypocalcemia may coexist with pregnancy toxemia. Differential diagnosis between the two diseases is difficult on a farm level, and can be accurately performed only by measuring concentrations of calcium and b-hydroxybutyrate in the blood of affected animals. Uncomplicated hypocalcaemia responds immediately (within 5 minutes) to intravenous administration of calcium; this can also be used to confirm the diagnosis (Scott, 1995).

Parturient paresis can occur at any time from 6 wk before to 10 wk after parturition; however, the greatest demand for calcium because of mineralization of the fetal skeleton occurs 1–3 wk

prepartum, particularly when multiple fetuses are presented in utero. Whenever an abrupt decrease in calcium intake occurs, the body requires 24–72 hr to activate the metabolic machinery necessary to mobilize stored calcium. Mobilization of stored calcium can be inadequate to meet the animal's needs in older ewes and does, in animals with chronic calcium deficiency, and when diets are calcium deficient (Dickson and Jolly, 2011).

Clinical Findings and Diagnosis: Parturient paresis occurs in outbreaks, with most cases occurring in the last few weeks of gestation, although it is not uncommon for individual animals to be affected. Usually, <5% of animals are affected, but severe outbreaks may involve up to 30% of the flock. The onset is sudden and often follows within 24 hr an abrupt change of feed, a sudden change in weather, or short periods of fasting imposed by circumstances such as shearing or transportation. In early hypocalcemia in sheep, the most commonly noted signs are stiff gait, ataxia, salivation, constipation, and depressed rumen motility, progressing to hyposensitivity, bloat, recumbency, loss of anal reflex and, if untreated, death. Tachycardia may be present; heart sounds are quieter than normal. Often when recumbent, ewes are in a sternal frog-lying position, with the hind legs extended behind. Goats have a similar presentation, although muscle tremors are more commonly seen than in sheep (Asbury, 1992; Silva and Noakes, 1984).

A diagnosis is based on the history and clinical signs. In outbreaks occurring before parturition, pregnancy toxemia is the main differential diagnosis. These diseases also occur concurrently. A tentative diagnosis of acute hypocalcemia is supported by a dramatic and usually lasting response to slow IV administration of calcium. Diagnosis can be confirmed by testing serum calcium levels before treatment. Hypocalcemia is often classified as total serum calcium levels <2 mmol/L or, if expressed as ionized calcium, <1.1 mmol/L. Normal values are reported as 2.8–3.2 mmol/L for sheep and 2.2–3.05 mmol/L for goats. Animals with low serum albumin, such as occurs with Johne's disease and clinical GI parasitism, may have low total serum calcium and normal ionized calcium (Brozos *et al.*, 2011a).

Treatment and Prevention: Intravenous calcium borogluconate is the preferred treatment given slowly to effect (monitor heart rate and intensity). Intravenous administration of 30 to 60 mL of 20% calcium borogluconate solution usually is sufficient. A combination product containing phosphorus, magnesium, and/or potassium with dextrose can also be used and may be

preferred. Calcium solution should be heated to 35 °C to 40 °C before administration. Administration must be performed slowly over 5 to 7 minutes, while the clinician monitors the animal's heart rate and rhythm; administration should be stopped at once if there is evidence of arrhythmia. Subsequently, an additional dose of 60 mL of calcium borogluconate, without dextrose, can be administered subcutaneously to ensure a more prolonged absorption. During subcutaneous administration, and as calcium solutions are irritant, the quantity to be administered should be divided into two equal volumes and injected at two different sites of the body. For grazing animals, attention to calcium content of feeds during diet formulation and avoidance of unnecessary stressors usually suffice to reduce the risk of animals developing the disease (Brozos *et al.*, 2011a).

Although low calcium diets are recommended in cattle in the prepartum period, in sheep these appear to precipitate hypocalcaemic events. As such, it is recommended that high risk groups, such as late pregnant and lactating ewes and weaned lambs are supplemented with calcium carbonate when grazing crops or other diets with low Ca: P. However, their increased inclusion in compound feeds for pregnant or lactating ewes and does should be avoided (Dias *et al.*, 2008). Thus the present case report described parturient paresis in ewe.

3.16.2. Case description on parturient paresis in ewe

A 3 year local ewe weighing 30kg was presented to Addis Ababa University, college of veterinary medicine, Veterinary Teaching Hospital on January 04, 2019 with a complaint of prolonged weakness, unable to stand especially on the hind legs and inappetance. The sheep had lambled before two days and was managed semi intensively on field. Based on the history, ewe was not vaccinated and also not dewormed. Physical examination showed the vital parameters were Physical examination showed the vital parameters were temperature 36°C, heart rate 80 beat/min and respiratory rate 22 beat/min. The sheep was on right lateral recumbency with the neck curved towards the left flank (S-shaped) (as Indicated below on figure). There was dehydration. A tentative diagnosis was made based on the history of early delivery, inappropriate nutritional management and the presented typical clinical features of parturient paresis and also the EDDIE smart phone revealed the case as parturient paresis. The differential diagnoses were; Pregnancy toxemia, hypoglycemia and metabolic acidosis.



Figure 48: Ewe on right lateral recumbency with the neck curved towards the left flank.

3.16.3. Hypocalcaemia management and its treatment outcome

Management of the case involved instituting Calciumborogluconate 40 % containing 400mg/ml calcium borogluconate, 30 ml slowly, intravenously in order to restore blood calcium level and the ewe was rapidly responded to the treatment and hence it is confirmed as hypocalcaemia case. The ewe was well responded to the therapy given as indicated below in figure and the owner informed on feeding system of ewes during dry period and during gestation. Generally based on clinical signs, history and therapeutic diagnosis the case was finally diagnosed as a parturient paresis.



Figure 49: Rapid response of Ewe to the therapy.

3.16.4. Discussion

Nutritional imbalances, deficiencies, or erratic management of feeding programs for dairy cows or small ruminants can create large numbers and various types of health problems generally categorized as metabolic diseases. Among them Milk fever (parturient paresis) is an important metabolic disorder of dairy cattle around the time of calving (Fikadu *et al.*, 2016).

Based on the history, clinical signs observed and therapeutic diagnosis the case was finally diagnosed as parturient paresis. According to Anteneh *et al.*(2012) parturient paresis is caused by a severe deficiency of metabolizable calcium ion in the circulation and the current case also agreed with this principle as the treatment response was rapid. Milk fever (parturient paresis) is an afebrile disease which typically is associated with parturition and beginning lactation. It is characterized by a sudden paralysis, gradual loss of consciousness and, if untreated, usually terminates in death (Hibbs, 1990).

Calcium borogluconate is the appropriate fluid therapy for the management of hypocalcaemia and a therapy of 40% of calcium borogluconate therapy was given which is in agreement with that of Abdullah *et al.* (2014) and the ewe was responded well to the calcium borogluconate

treatment. In the present case report, treatment with intravenous infusion of calcium salt solutions cured the ewe and it was agreed with the treatment given by Curtis *et al.* (1983) for hypocalcemia in an ewe. Ewe after delivery is most susceptible to hypocalcemia and also the current case report was agreed with the report of Charbonneau *et al.* (2006) on the stage of hypocalcemia occurrence in sheep.

In conclusion, hypocalcaemia is the result of a reduction of blood calcium in the early stages of lactation. This is due to the ewe having a sudden, dramatically increased demand for calcium to produce milk. In the newly lambed cow, this sudden need for calcium comes as a bit of a shock for the body and it can take several days for the normal mechanisms required to regulate calcium levels to begin working efficiently. It is during this transition period that ewe is prone to classical parturient paresis. Any preventive measure must be aimed at regulating calcium haemostasis and eliminating the precipitous fall in blood calcium at parturition by considering feeding system of animals.

3.17. Pregnancy Toxemia in Ewe

Abstract: Pregnancy toxemia is a metabolic disease in sheep and goats caused by negative energy balance, is commonly called pregnancy disease or twinning disease. The disease is commonly associated with rapid growth of multiple fetuses during late pregnancy mostly and sometimes after parturition. A two year old female Ewe weighing 20kgs was presented to veterinary Teaching Hospital of Addis Ababa University on October 09, 2018 with the history of delivered two lambs before two days ago and become weak after delivery, some sort of weakness before three days of delivery and inappetence/anorexia. Based on the physical examination depression, sternal recumbency, torticollis, lateral deviation of neck, unable to stand, grinding of teeth and salivation were observed in the case. Clinical examination of ewe revealed hypothermia 36°C, increased heart rate 82 beat/min, pink conjunctival mucus membrane and opisthotonus. EDDIE smart phone app revealed the case as pregnant toxemia. Based on the history of delivery, typical clinical signs and EDDIE result the case was tentatively diagnosed as pregnancy toxemia. The ewe was treated with 5% dextrose solution into jugular vein intravenously and was instituted with an aim to restore blood glucose level and to correct the

dehydration and the ewe was responded to the treatment. On conclusion, early and accurate diagnosis of subclinical metabolic disorders like pregnancy toxemia is important for the dairy sheep industry. An immediate and accurate diagnosis usually increases the possibility for their successive treatment and prevention.

Keywords: *Ewe, Dextrose, Pregnancy toxemia*

3.17.1. Introduction on pregnancy toxemia

Various nutritional, metabolic, genetic, physiologic, environmental, health and/or management factors can influence the development of clinical disease like pregnancy toxemia, and all these should be addressed earlier for the prevention of onset the disease (Fthenakis *et al.*, 2012). Pregnancy toxemia (PT), a metabolic disease in sheep and goats caused by negative energy balance, is commonly called pregnancy disease or twinning disease. The disease is commonly associated with rapid growth of multiple fetuses during late pregnancy (Lima *et al.*, 2012).

Ewe or does that have low energy levels are more susceptible to toxemia. This low energy level is caused by a sudden increase in nutritional demands as a result of rapid fetus development. Under these conditions, the doe's body is depleted of carbohydrates that are used to produce glucose. Nearly 80% of fetal growth occurs during the last six weeks of gestation. During the final month of gestation, the energy requirement of a pregnant doe carrying twins or triplets is 180% or 240% greater, respectively, than that of a doe with a single fetus and obese ewes and does are at greater risk for developing PT (Chandana and Padmaja, 2000).

Pregnancy toxemia follows a period of negative energy balance and impaired gluconeogenesis resulting in hypoglycemia, fat mobilization, ketonemia, and ketonuria. Hypoglycemia, hyperketonemia and metabolic acidosis are the primary blood disturbances in PT. The disease occurs in association with anorexia caused by other diseases or sudden stresses (Rook, 2000). There are two factors involved in the development of hypoglycaemia. One is the glucose requirement of the uterus may increase to more than 40% of the total liver glucose output, Secondly the endocrinological status changes in late pregnancy . Adequate plane of nutrition in the second half of pregnancy and improving glycogenic fatty acid production in the rumen may help in suppression of the problem (Radostits *et al.*, 2007). It is characterized by hypoglycemia,

low concentrations of hepatic glycogen, increased concentrations of ketone bodies in the blood (hyperketonaemia) and elevated plasma concentrations of free fatty acids (Van Saun, 2000).

Clinical sign and its Pathogenesis: There are two major syndromes of the disease: the malnutrition syndrome and the stress syndrome. In the malnutrition syndrome, the disease is produced because of an ongoing lack of glucose precursors in the diet, which results in the above events taking place. In the stress syndrome, the ewes are maintaining a normal glucose metabolism until some stress such as sorting or shearing causes them to go off feed, which reduces the availability of glucose precursors from the diet and shifts the ewe's metabolism to the production of ketone bodies. Clinical signs are subtle in the early stages and may go unnoticed. Initially, affected ewes merely seem sluggish and often lag behind the flock when it moves. Signs gradually progress over the next 2-10 days to include anorexia, incoordination and weakness. In the late stages, severe neurological signs such as blindness, muscle tremors, convulsions and coma progress and eventually cause the death of the ewe (Schulz and Riese, 1983).

Most authors are in agreement that pregnancy toxemia is caused primarily by a reduced food intake during late gestation. This reduced intake may occur in both thin and fat ewes that are being malnourished. However, in fat ewes it may occur as a result of inadequate capacity of the stomachs due to compression by body fat in combination with a large, gravid uterus. It may also occur in both thin and fat ewes that voluntarily reduce their food intake due to some stress such as worming, shearing, transportation, sorting or sickness. Seventy percent of fetal growth occurs during the last six weeks of pregnancy, and this growth causes a large demand for glucose by fetal tissues (Schulz and Riese, 1983).

If the ewe's energy intake is insufficient to supply the fetal demand plus her own needs for glucose, the ewe's tissue stores of glucose are drawn upon to meet these needs. When these tissue stores are used up, hypoglycemia occurs, which in itself causes some central nervous system depression. Also, when there is a hypoglycemic state present, fatty acids begin to be mobilized from fat stores in the body in order to meet the body's energy demands. These fatty acids are oxidized in the liver, which produces acetyl-CoA as one of the metabolites. Normally, acetyl-CoA is utilized in the tricarboxylic acid cycle and forms nontoxic end-products. However, when there is a deficiency of glucose in the body, this acetyl CoA cannot be utilized in the

tricarboxylic acid cycle and is instead used in a biochemical process that produces ketone bodies as its endproduct. The resulting ketosis leads to an acidosis, and this ketoacidosis causes an increase in severity of clinical signs and eventually contributes to the death of the ewe (Schulz and Riese, 1983).

Diagnosis and differential Diagnosis: Pregnancy toxemia is unique in that the symptoms are primarily central nervous system in origin, and that these symptoms develop only during the last 3-6 weeks of gestation. Also, these CNS signs are accompanied by fatty liver, hypoglycemia and ketonuria. When confronted by these typical clinical signs; laboratory findings of glucose blood level is important as a diagnosis of pregnancy toxemia. The major differential diagnosis that must be considered is hypocalcemia. Both disease show CNS signs; however, these signs are usually more pronounced and varied with pregnancy toxemia (Olfati *et al.*, 2013).

In hypocalcemia, nervous signs are usually limited to tremors and dullness which progress to coma and death. The course of the disease is usually much shorter with hypocalcaemia, death occurring within 24 hours in untreated cases. In contrast, death may not occur until 5-7 days after the first appearance of clinical signs in cases of pregnancy toxemia. Also, with hypocalcemia there is a rapid and dramatic response to calcium salts administered intravenously. This treatment is not beneficial in cases of pregnancy toxemia. Other sporadically occurring diseases that may produce nervous signs and occasionally be confused with pregnancy toxemia include listeriosis, cerebral abscesses, infestation with *Coenurus cerebralis*, and louping ill. However, these diseases can usually be differentiated by different factors such as duration and severity of clinical signs and morbidity rates in the flock. Also, many of these diseases show characteristic gross and histological post-mortem lesions and thus should not normally be mistaken for pregnancy toxemia (Olfati *et al.*, 2013).

Treatment and prevention of pregnancy toxemia: In general, treatment of pregnancy toxemia is only moderately successful even if started in the early stages of the disease. If treatment is not initiated until the ewe is comatose, the mortality rate approaches 100% in spite of intensive therapy. One of the earliest treatments for pregnancy toxemia consisted of either oral or intravenous administration of glucose. Although this seems to be a very logical treatment when faced with hypoglycemia, results were not promising. In some trial studies, giving intravenous

glucose as the sole treatment raised the mortality rate above that for untreated control animals (Brozos *et al.*, 2011b). Thus the current case report described the case of pregnancy toxemia in ewe.

3.17.2. Case description on pregnancy toxemia in ewe

A two year old female Ewe weighing 20kgs was presented to veterinary Teaching Hosptital of Addis Ababa University on October 09, 2018 with the history of delivered two lambs before two days ago and become week after delivery, some sort of weakness before three days of delivery and inappetance/anorexia. Based on the physical examination depression, sternal recumbency, torticollis, lateral deviation of neck, unable to stand, grinding of teeth and salivation were observed in the case. Clinical examination of the goat revealed hypothermia 36°C, heart rate 82 beat/min, pink conjunctival mucus membrane and opisthotonus. EDDIE smart phone app revealed the case as pregnant toxemia. Based on the history of delivery, typical clinical signs and EDDIE result the case was tentatively diagnosed as preganancy toxemia and its differential diagnosis are parturient paresis, listeriosis, cerebral abscesses, and Coenurosis.



Figure 50: Ewes suffered from pregnancy toxemia.

3.17.3. Pregnancy toxemia management and its treatment outcome

The ewe was stabilized with intravenous infusion of Dextrose 5% (one bag) as glucose replacement followed by 4 ml of multivitamin at 1 ml/10 kg was administered as vitamin

supplements and the ewe was recovered from the metabolic problem and one of its lambs was passed away; and its figure indicated below after two month of treatment.



Figure 51: Ewe after two months of Treatment.

3.17.4. Discussion

Pregnancy toxemia is a metabolic disorder with high mortality rate and occurs in twin-bearing ewes (does) in late gestation (Schlumbohm and Harmeyer, 2008a). Based on the history of multiple lambing (twin), typical clinical signs and EDDIE result the case was diagnosed as pregnancy toxemia. This case report was in agreement with Schlumbohm and Harmeyer (2008b), where the ewe had two fetuses was suffered from pregnancy toxemia. Based on Tinkler (2014), clinical signs such as anorexia, depression and separation from the herd are the first step in diagnosis of pregnancy toxemia in a pregnant ewe which were agreed with the primary complaint in the present case report. As the disease progressed, animal will start showing neurological signs include depression, tremors, stargazing, ataxia, teeth grinding and blindness due to encephalopathy that result from hypoglycaemia; the current case was agreed with this principle but, there was no problem of blindness (Barbagianni *et al.*, 2015).

According to Edmondson and Roberts (2012) pregnancy toxemia can be divided into four categories. The first category is primary pregnancy toxemia where inadequate nutrition such as poor quality feed or period of fasting that occurs in a doe/ewe. The second category is fat ewe/doe pregnancy toxemia which is due to over-conditioned during early gestation then the animal suffer a nutritional decline during late gestation. Third is severely under-conditioned does due to lack of feed after drought or after heavy flood. Lastly is secondary pregnancy toxemia due

to concurrent disease such as parasites, poor dentition, or lameness. As the owner complains the current case report of pregnancy toxemia was due to inadequate nutrition and ewe was also inappetance for three days.

The main therapeutic plan in pregnancy toxaemia is to restore the glucose metabolism and dehydration status (Ermilio and Smith, 2011). In the present case report, the Ewe was promptly administered dextrose fluid therapy to replace the glucose and electrolyte loss, as well as to rehydrate and at the same time to flush out the ketone bodies. The ewe was stabilized with intravenous infusion of Dextrose 5% as glucose replacement followed by 4 ml of multivitamin at 1 ml/10 kg was administered as vitamin supplements intramuscularly. The treatment strategy was in agreement with the treatment given by (Chandana and Padmaja, 2000).

Brozos *et al.* (2011a) stated that an immediate and accurate diagnosis with successive treatment may increases the survivability. In the present case report was early presentation to the clinic with proper diagnosis ewe was survived. Olfati *et al.*(2013) reported that ewes carrying multiple pregnancies are much more likely to experience ketosis and pregnancy toxemia which is agreement with the current case repot. Further, it can also be observed in poorly nourished sheep with only a large single fetus (Bani Ismail *et al.*, 2008).

The best important points to be noted in the control and prevention of pregnancy toxaemia are high energy supplement feed such cereal grain such as corn, oats, barley or combination should be given during the final months of gestation (Edmondson and Roberts, 2012). Besides that, free choice of trace mineral salt and clean water should always be provided to the animal (Tinkler, 2014). In conclusion, Pregnancy toxemia is a metabolic disorder causing high mortality and economic loss to the farmers. The single most important factor for preventing pregnancy toxemia can be supplying of proper nutrition to the dam. In the present case, the owner also advised to feed his ewes with best nutrition.

3.18. Peste Des Petits Ruminants in Ram

Abstract: *Peste des Petits Ruminants* (PPR) is an infectious, highly contagious viral disease affecting sheep, goats and wild ruminants with high mortality rate. A 3 years old ram local breed weighted about 27 kg was presented to veterinary teaching hospital of Addis Ababa university on March 19, 2019 with complaint of the ram was suffering from depression, diarrhea (watery), anorexia from last 3 days, Ocular and nasal discharge have seen. Vaccination and treatment history against any disease was not found and by investigation from owner it was found recently more rams were bought and introduce into the flock of ram showing the similar signs and symptoms. Based on physical examination, the ram showed very high fever 40.6°C, Respiration rate about 38 breath /min, pulse rate was 92 beat/min and CRT was more than 2 means the ram was dehydrated with sunken eye. Nasal discharge was muco-purulent in nature and because of watery diarrhea the hind quarter was soiled with feces. Feces were check for parasitic ova but result was negative. The EDDIE was revelead the case as peste des petites ruminants. On the basis of history, clinical signs and EDDIE result the disease was diagnosed as PPR. On therapeutic management Oxytetracycline 20%, 20mg/kg, Dexamethasone (Sokar Healthcare Pvt.Ltd. Gujarat India) 0.2mg/kg/day were managed and multivitamin 1ml/10kg were given and the ram recovered from the problem and sold as the owner reported through phone calling. In conclusion, PPR leads to heavy economic setbacks to the farmers. Isolation of sick animals and constitution of supportive therapy plan, following the quarantine measures of the newly purchased animals before mixing with rest of the herd members and adopting routine vaccination protocols are highly warranted.

Keywords: *Oxytetracycline, PPR, Ram*

3.18.1. Introduction on peste des petits ruminants

PPR is a common viral disease of small ruminants, widespread in distribution and is closely related to the Rinderpest virus, a devastating disease of cattle (Bello *et al.*, 2016). *Peste des Petits Ruminants* (PPR) is an infectious, highly contagious viral disease affecting sheep, goats and wild ruminants with high mortality rate. The ailment is transboundary animal disease and is one of the top ten diseases of small ruminants (Zahur *et al.*, 2014).

PPR also named as “Kata”, “pseudo rinderpest”, “syndrome of stomatitis pneumoenteritis” and “pneumoenteritis complex” (Parida *et al.*, 2015). Clinically, the disease is characterized by fever, mucopurulent ocular and nasal discharges, necrotizing and erosive stomatitis, severe enteritis and pneumonia leading to death (Diallo, 2006). The disease is of heavy economic significance in small ruminant industry and ranks among the top ten diseases affecting small ruminants. Economic setbacks in terms of high morbidity, high mortality, dropped production, abortion and trade barrier makes PPR as a disease of global concerns (Alvi *et al.*, 2017). The incubation period of the disease is 3-6 days, and is characterized by high fever, oculonasal discharges, pneumonia, stomatitis, and inflammation of gastrointestinal tract leading to severe diarrhoea followed by death or recovery (Balamurugan *et al.*, 2014).

Etiology and clinical signs: The etiological agent is a negative sense single stranded enveloped RNA virus belonging to genus Morbillivirus of family *Paramyxoviridae*. *Peste des Petits Ruminants virus (PPRV)* is closely related to human measles virus, Rinderpestvirus, canine distemper virus and dolphin distemper virus (Abubakar *et al.*, 2012). There are three proteins associated with the host cell membrane –derived viral envelope viz. matrix protein, fusion protein and HN protein. The pathogen is sensitive to environmental changes and rapid inactivation occurs when exposed to unfavorable conditions outside the host, therefore, close contact is required for the virus to be transmitted from infected to susceptible animal (Singh *et al.*, 2004).

Primary hosts of the virus are sheep, goats and wild ungulates irrespective of age and sex. However, the disease in cattle and buffalo with poor body condition and stress has also been reported with the signs resembling with that of rinderpest (Abraham *et al.*, 2005). The disease mainly effects sheep and goats but it is more severe in goats where it causes heavy losses (Abbas *et al.*, 2012). PPRV is shed in all of the body secretions and excretions travel a short distance through aerosol infecting the healthy animals. However, close contact with the infected animal is the most frequent a usual route of transmission. Contamination of feeding and water trough can also serve as additional sources of viral particle transmission (Alvi *et al.*, 2017).

The clinical signs in ruminants include pyrexia up to 41°C, anorexia, dry muzzle, serous ocular and nasal discharges which becomes progressively mucopurulent. Respiratory distress, necrosis

and ulceration of buccal mucosa, dehydration and diarrhea due to gastroenteritis appear in advanced stages of the disease. Pregnant female animals may abort. The severity of clinical signs depends upon the age, breed, body condition and innate immunity of the host and virulence of the virus. Concurrent bacterial and parasitic infection can further aggravate the condition (Munir, 2013). Out breaks of the disease are characterized by fever, erosive stomatitis, nasal and ocular discharges, pneumonia, diarrhea and death. These signs may not all be exhibited by infected animals during an outbreak, as symptomless infections have been reported (Couacy-Hymann *et al.*, 2007; Diop *et al.*, 2005a).

Diagnosis and its differential diagnosis: Diagnosis of the disease is generally based on clinical signs and symptoms. Virus can also be detected through a number of diagnostic techniques including ELISA, virus neutralization test, Agar gel immunodiffusion test, haemagglutination test. The competitive ELISA is the most suitable choice due to high diagnostic sensitivity and, specificity and reliability (Osman *et al.*, 2008). The disease needs to be differentially diagnosed from Orf, pox, foot and mouth disease and blue tongue disease due to similarities in clinical signs, therefore, it is necessary to confirm clinical diagnosis through laboratory testing (Alvi *et al.*, 2017).

Treatment and its control: Symptomatic and supportive treatment was done because there is no specific treatment. Vaccination of susceptible animals is the best option to minimize the risk of occurrence in animal population. Live attenuated vaccine is used to immunize the animals against PPR virus. A number of different vaccines like heterologous vaccines, homologous vaccines, recombinant marker vaccines, subunit vaccines, multivalent vaccines are available commercially to immunize the susceptible animals. Isolation and quarantine measures, slaughtering of positive animals, proper disposal of infected materials, proper disinfection of utensils and other items of flock are crucial for control of PPR (Alvi *et al.*, 2017). Thus the present case report described the case of Peste Des Petits ruminants in ram.

3.18.2. Case description on peste des petites ruminants in ram

A 3 years old ram local breed weighted about 27 kg was presented to veterinary teaching hospital of Addis Ababa university on March 19, 2019 with complaint of the ram was suffering from

depression, diarrhea (watery) (as indicated in figure as follow), anorexia from last 3 days, Ocular and nasal discharge have seen. Vaccination and treatment history against any disease was not found and by investigation from owner it was found recently more rams were bought and introduce into the flock of ram showing the similar signs and symptoms. Based on physical examination, the ram showed very high fever 40.6°C , Respiration rate about 38 breath /min, pulse rate was 92 beat/min and CRT was more than 2 means the ram was dehydrated with sunken eye. Nasal discharge was muco–purulent in nature and because of watery diarrhea the hind quarter was soiled with feces. Feces were check for parasitic ova but result was negative. The EDDIE was revealed the case as peste des petites ruminants. On the basis of history, clinical signs and EDDIE result the disease was diagnosed as PPR.



Figure 52: Photograph of depressed and diarrheic ram with nasal and ocular discharge.

3.18.3. PPR management and its treatment outcome

On therapeutic management Oxytetracycline 20%, 20mg/kg, Dexamethasone (Sokar Healthcare Pvt.Ltd. Gujarat India) 0.2mg/kg/day and multivitamin 1ml/10kg were given and the owner also informed to vaccinate their flocks. The ram recovered from the problem and sold as the owner reported through phone calling.

3.18.4. Discussion

A Peste des petits ruminant is an acute or subacute viral disease of goats and sheep characterized by fever, watery diarrhea, necrotic stomatitis, gastroenteritis, and sometimes death. In this case

report the clinical signs of pyrexia, depression, anorexia, nasal and ocular discharges, crust on the lips and watery diarrhea which are consistent with PPR infection were observed. These observations are similar to those reported by Roeder *et al.* (1994) among Ethiopian goats. The occurrence of a fatal fast spreading disease characterized by stomatitis, diarrhea and pneumonia affecting mainly small ruminants should arouse suspicion of PPR (El-Yuguda *et al.*, 2009). In the current case report the clinical signs like watery diarrhea, depression, nasal and ocular discharge observed are in agreement with the case report reported by Arslan Tariq (2014).

PPR may be observed with a history of recent movement or gathering of sheep/goats for housing and feeding, introduction of recently purchased animals, contact in a flock that had been sent to market but returned unsold, contact with trade or nomadic animals through shared grazing, water and/or housing or changes in weather conditions such as the onset of the rainy season (Abubakar *et al.*, 2012) and also in the current case report on there was purchased rams to the group. In the present case report, a recent history of congregation of some sheep without following quarantine periods for housing and feeding had occurred and such phenomena was occurred with the case reported by Diop *et al.* (2005b) and the aim of treatment in this case report was to prevent of secondary bacterial complication.

In conclusion, PPR leads to heavy economic setbacks to the farmers. With the aims and objectives to flourish small ruminant farming and maximizing profit, a few key points should be rigorously adopted. Of them, isolation of sick animals and constitution of supportive therapy plan, following the quarantine measures of the newly purchased animals before mixing with rest of the herd members and adopting routine vaccination protocols are highly warranted,

3.19. Flea Allergy Dermatitis in Dog

Abstract: Flea allergy dermatitis or flea bite hypersensitivity is the most common dermatologic disease of domestic dogs. A local old dog breed was brought to Veterinary Teaching Hospital of Addis Ababa University College of Veterinary Medicine on November 09, 2018, with history of pruritis lasting for several months, worsening during day time even while eating the feed. According to the owner`s complaints, the dog bite his back and scratching it to inanimate objects and the dog was kept in the house and the house was infested with a flea. Upon physical

examinations, close examination of the skin and hair coat of the dog revealed the presence of adult fleas around dorsolumbar area, tail and the ventral part of the abdomen. Alopecia and scaling in the dorsolumbar area was observed on the dog as indicated in Figure below and the dog was biting his back and febrile with the rectal body temperature of 40.4 °C and 90 beats/min and 22 breaths/min heart and respiratory rates, respectively. The EDDIE smart phone app was not incorporated pet animals. Based on history taken, clinical signs observed (Dorsolumbar pruritus and lesions) and presence of fleas on the body of the dog, it is finally diagnosed as Flea Allergy Dermatitis and its differential diagnosis are food hypersensitivity, scabies, pediculosis and demodicosis. Penstrip 1ml/20kg, Dexamethasone (Sokar Healthcare Pvt.Ltd. Gujarat India) 0.25 mg/kg/day and Ivermectin 0.2mg/k were managed and the dog was died after two weeks as owner informed through phone calling. In conclusion, Flea allergy dermatitis is a skin condition that arises from a hypersensitivity to saliva from the flea. Avoidance of flea bites remains the best long term solution to flea allergy dermatitis, which is accomplished by implementing an aggressive flea control program that may also include environmental controls.

Keywords: *Dog, Dermatitis, Flea allergy*

3.19.1. Introduction on flea allergy dermatitis

Flea allergy dermatitis (FAD) or flea bite hypersensitivity is the most common dermatologic disease of domestic dogs. FAD is most prevalent in the summer, although in warm climates flea infestations may persist throughout the year. In north temperate regions, the close association of pets and their fleas with human dwellings creates conditions that permit a year-round problem. Temperature extremes and low humidity tend to inhibit flea development (Wilkerson *et al.*, 2004).

When feeding, fleas inject saliva that contains a variety of histamine-like compounds, enzymes, polypeptides, and amino acids that span a wide range of sizes (40–60 kD) and induce Type I, Type IV, and basophil hypersensitivity. Flea-naïve dogs exposed intermittently to flea bites develop either immediate (15 min) or delayed (24–48 hr) reactions, or both, and detectable levels of both circulating IgE and IgG antiflea antibodies. Dogs exposed continuously to flea bites have low levels of these circulating antibodies and either do not develop skin reactions or develop them later and to a considerably reduced degree. This could indicate that immunologic tolerance

may develop naturally in dogs continually exposed to flea bites. Although the pathophysiology of FAD in cats is poorly understood, similar mechanisms may exist (Laffort-Dassot, 2009a).

Cause and clinical findings: The flea found most commonly on both dogs and cats with a flea infestation is the cat flea, *Ctenocephalides felis*. Pets that develop FAD have an allergic response to flea saliva injected during flea feeding. The itch associated with just one flea bite persists long after that flea is gone and leads to significant self-traum (Bourguignon *et al.*, 2013).



Figure 53: Photograph of Flea allergy dermatitis in dog.

Clinical signs associated with FAD are variable and depend on frequency of flea exposure, duration of disease, presence of secondary or other concurrent skin disease, degree of hypersensitivity, and effects of previous or current treatment. Non allergic animals may have few clinical signs other than occasional scratching due to annoyance of flea bites. Those that are allergic will typically have a dermatitis characterized by pruritus (Wilkerson *et al.*, 2004).

In dogs, the pruritus associated with FAD can be intense and may manifest over the entire body. Classic clinical signs are papulocrustous lesions distributed on the lower back, tail head, and posterior and inner thighs. Dogs may be particularly sensitive in the flanks, caudal and medial thighs, ventral abdomen, lower back, neck, and ears. Affected dogs are likely to be restless and uncomfortable, spending much time scratching, licking, rubbing, chewing, and even nibbling at

the skin. Hair may be stained brown from the licking and is often broken off. Common secondary lesions include areas of alopecia, erythema, hyperpigmented skin, scaling, papules, and broken papules covered with reddish brown crusts. The rump and tail head areas are typically the first, most evident, areas affected. As FAD progresses and becomes chronic, the areas become alopecic, lichenified, and hyperpigmented, and the dog develops secondary bacterial and yeast infections (Laffort-Dassot, 2009a).

Diagnosis and differential diagnosis: A number of factors must be considered in the diagnosis of FAD, including history, clinical signs, presence of fleas or flea excrement, results of intradermal testing, and exclusion of other causes of dermatologic disease. Most cases are seen in the late summer, corresponding to the peak of flea populations. In these cases, history can be highly suggestive. Age of onset is also important, because FAD does not ordinarily occur before 1 yr of age. Usually, diagnosis is made by visual observation of fleas on the infested pet. Demonstration to the owner of the presence of fleas or flea excrement is helpful. Slowly parting the hair against the normal lay often reveals flea excrement or the rapidly moving fleas. Flea excrement is reddish black, cylindrical, and pellet- or comma-shaped. Placed in water or on a damp paper towel and crushed, the excrement dissolves, producing a reddish brown color (Laffort-Dassot, 2009a).

FAD must be differentiated from other causes of dermatologic disease. The presence of fleas or a positive reaction to an intradermal test does not exclude the presence of another dermatologic disease responsible for the clinical signs. In dogs, differential diagnoses include atopic dermatitis, food allergy dermatitis, sarcoptic or demodectic mange, other ectoparasites, and bacterial folliculitis (McCall *et al.*, 1997).

Treatment and Control: Flea control measures have changed dramatically over the years. The development of insecticides and insect growth regulators (IGRs) with convenient dosage formulations and prolonged residual activity has dramatically improved owner compliance and helped eliminate recurrent infestations. The goals of flea control are elimination of fleas on pet(s), elimination of existing environmental infestation, and prevention of subsequent reinfestation. The first step is still the elimination of existing pet flea infestations. Elimination of those fleas currently established on the dog or cat is necessary to eliminate pet discomfort.

However, it is important to differentiate between speed of elimination of established infestations and speed of elimination of newly acquired fleas after a product has been applied. When treating a dog or cat with a topically applied formulation, it could take several hours (12–36 hr) until the compound has spread sufficiently or reached sufficient systemic concentrations to eliminate all existing flea (Carlotti and Jacobs, 2000). Thus the present case report described the Flea allergy dermatitis in dog.

3.19.2. Case description on flea allergy dermatitis

A local old dog breed was brought to Veterinary Teaching Hospital of Addis Ababa University College of Veterinary Medicine on November 09, 2018, with history of pruritis lasting for several months, worsening during day time even while eating the feed. According to the owner's complaints, the dog bite his back and scratching it to inanimate objects and the dog was kept in the house and the house was infested with a flea. Upon physical examinations, close examination of the skin and hair coat of the dog revealed the presence of adult fleas around dorsolumbar area, tail and the ventral part of the abdomen. Alopecia and scaling in the dorsolumbar area was observed on the dog as indicated in Figure below and the dog was biting his back and febrile with the rectal body temperature of 40.4 °C and 90 beats/min and 22 breaths/min heart and respiratory rates, respectively. The EDDIE smart phone app was not incorporated pet animals. Based on history taken, clinical signs observed (Dorsolumbar pruritus and lesions) and presence of fleas on the body of the dog, it is finally diagnosed as Flea Allergy Dermatitis and its differential diagnosis are food hypersensitivity, scabies, pediculosis and demodicosis.



Figure 54: Photograph of dog infested by flea.



Figure 55: Alopecia in the dorsolumbar area and flea in the bottle.

3.19.3. Case management and treatment outcome

In this case report the dog was treated by Penstrip 1ml/20kg, Dexamethasone (Sokar Healthcare Pvt.Ltd. Gujarat India) 0.25 mg/kg/day and Ivermectin 0.2mg/kg were managed; the owner also informed to spray their house and the housing of dogs; but the dog was not responded to the treatment and died as the owner informed during the follow up period. As the owner said the dog suffered from bloody diarrhea and Vomition after two weeks of post treatment; it was died and the case of disease may be due to complication created by flea allergy dermatitis

3.19.4. Discussion

Flea allergy is a very common pruritic dermatological condition in the dog. This dermatitis occurs in young adult dogs of any sex. Clinical signs are usually more severe during the warm season. They are characterized by a pruritic erythematous papular eruption affecting the caudal aspect of the dog like dorsolumbar pruritus and lesions are characteristic diagnostic criteria. Diagnosis of canine flea allergy dermatitis relies on history of housing, physical examination and lesions and presence of flea is pathognomonic sign for flea allergy dermatitis. Clinical signs and lesion distribution are strongly suggestive of the diagnosis; Dorsolumbar lesions and pruritus

have been found, in many cases of flea allergy dermatitis which is agreed with the current clinical finding observed in the reported case (Laffort-Dassot, 2009b). In this case report the dog was treated by Penstrip 1ml/20kg, Dexamethasone (Sokar Healthcare Pvt.Ltd. Gujarat India) 0.2 mg/kg/day and Ivermectin 0.2mg/k were managed; but the dog was not responded to the treatment and as the owner said the dog suffered from bloody diarrhea and Vomition after two weeks of post treatment; it was died and the case of disease may be due to complication created by flea allergy dermatitis.

In conclusion, Flea allergy dermatitis is a skin condition that arises from a hypersensitivity to saliva from the flea. Dogs that suffer from flea allergy dermatitis typically suffer from severe pruritus and often secondary infections as well. Avoidance of flea bites remains the best long term solution to flea allergy dermatitis, which is accomplished by implementing an aggressive flea control program that may also include environmental controls.

3.20. African Horse Sickness in Stallion

Abstract: Africa horse sickness (AHS) is a non contagious, infectious, insect borne disease of equids caused by Africa horse sickness virus. A stallion horse was weighted around 250kg was brought to Spana of Addis ababa university college of veterinary medicine on October 12, 2018 with the complains of inappettance, depressed, swelling around the head, kept with other horse within neighbor and others were passed away due to this case from neighbor. Based on physical examination the horse was depressed, fever 40°C, respiratory rate 22 breath/min , heart rate 72 beat/min, swelling of supra orbital fossa. EDDIE smart phone result also revealed the case as Africa horse sickness virus. Based on history, outbreak occurrence, pathognomonic clinical sign (Swelling of supra orbital fossa), EDDIE result and laboratory finding the case was tentatively diagnosed as Africa horse sickness. Cotrimoxazole 480mg tablet was given for five days two tablets 960mg in the morning with feed for the purpose of avoiding the secundary bacterial complication. The stallion was recovered from the viral disease on follow up period. In conclusion Africa horse sickness virus is a vector born disease and controlling the vectors and vaccination of the equine are the best important principle in its control in endemic area.

Keywords: *AHS, Cotrimoxazole, Stallion, Spana*

3.20.1. Introduction on Africa horse sickness

Africa horse sickness (AHS) is a non contagious, infectious, insect borne disease of equids caused by a virus of the same name (AHSV). Although zebra and donkeys rarely exhibit clinical signs, the effects of the disease, particularly in susceptible populations of horses can be devastating and mortality rates for this species may exceed 90%. AHS has been allocated OIE (Office International des Epizooties) List A status (Mellor and Hamblin, 2004).

AHS is characterized by clinical signs, which develop as a result of damage to the circulatory and respiratory systems giving rise to serous effusion and haemorrhage in various organs and tissues. The extent and severity of the clinico-pathological findings have been used to classify the disease into different forms. In ascending order of severity these are horse sickness fever, the subacute or cardiac form, the cardio-pulmonary or mixed form and the peracute or pulmonary form. All forms of disease can occur in any one outbreak but in susceptible populations of horses the mixed and pulmonary forms tend to predominate so mortality rates in these animals will be very high (Mellor and Hamblin, 2004). Although vaccines are available, cross-protection between serotypes is limited, and the introduction of a new serotype into an area may result in outbreak (Equorum and Equina, 2006).

Etiology and pathogenesis: African horse sickness results from infection with the African horse sickness virus (AHSV), a member of the genus *Orbivirus* in the family *Reoviridae*. There are nine serotypes of this virus, and while some serotypes are cross-protective (e.g., serotypes 6 and 9), others are not. Despite the distinct differences in the clinical severity of AHS infection in different equids, the typical pattern of pathogenesis is similar. Following exposure through the bite of an infected vector, the virus initially replicates in an adjacent lymph node before disseminating throughout the entire body via the circulatory system. This is the primary viraemia which leads to infection of the lungs and lymphoid tissues. The virus then undergoes a further replication cycle in these target organs which in turn gives rise to a secondary viraemia. The virus has a predilection for the vascular endothelial cells throughout the body, causing extensive damage including effusions into body cavities and tissues, and widespread haemorrhages. The

duration of this process from initial infection to secondary viraemia can vary between 2–21 days, although it usually takes less than nine (Tkubet *et al.*, 2016).

In horses, the period of viraemia usually lasts between 4–8 days, whereas in donkeys, it may persist for up to four weeks. In zebra, this period may be extended to approximately 40 days post-infection. In common with BTV, AHSV is often associated with red blood cells of the infected animal throughout both primary and secondary viraemia. In ruminants infected with BTV, this often leads to an extended period of viraemia, although this does not appear to be the case with AHS (Carrasco *et al.*, 1999).

Clinical signs: Four different forms of African horse sickness exist. The per acute (pulmonary) form, the subacute edematous (cardiac) form, the acute (mixed) form, and horsesickness fever. Sudden death can also occur without preceding signs. Symptomatic infections are seen most often in horses and mules, with the pulmonary and mixed forms usually predominating in susceptible populations of horses. Zebras and donkeys rarely develop serious clinical signs. The mildest form, horse sickness fever: tends to develop in resistant species such as donkeys or in horses with partial immunity. This form can also occur in zebras, although most infections in this species are asymptomatic (Tkubet *et al.*, 2016).

The per acute or pulmonary form: The pulmonary form of African horse sickness usually begins with an acute fever, followed within a day or two by the sudden onset of severe respiratory distress. Animals with this form often stand with forelegs spread, head extended, and nostrils fully dilated. Other clinical signs may include tachypnea, forced expiration, profuse sweating, spasmodic coughing, and a frothy serofibrinous nasal exudate. Dyspnea usually progresses rapidly, and the animal often dies within a few hours after the respiratory signs appear (Tkubet *et al.*, 2016).



Figure 56: Froth nasal discharge in pulmonary form of AHS.

Source: (Thompson *et al.*, 2012)

The subacute edematous or cardiac form: The cardiac form of African horse sickness usually begins with a fever that lasts less than a week. Shortly before the fever starts to subside, edematous swellings appear in the supraorbital fossae and eyelids. These swellings later spread to involve the face, tongue, intermandibular space, laryngeal region, and sometimes the neck, shoulders and chest. Edema of the lower legs is absent. Other clinical signs, usually seen in the terminal stages of the disease, can include severe depression, colic, petechiae or ecchymoses on the ventral surface of the tongue, and petechiae in the conjunctivae. Death often occurs from cardiac failure. If the animal recovers, the swellings gradually subside over a few days to a week.



Figure 57: Supraorbital swelling in cardiac form of AHS

Source: (Thompson *et al.*, 2012).

The acute or mixed form Clinical signs of both the pulmonary and cardiac forms are seen in the mixed form. In most cases, the cardiac form is subclinical and is followed by severe respiratory distress. Occasionally, mild respiratory signs may be followed by edema and death from cardiac failure. Although the mixed form is common, it may not be recognized except at necropsy (Equorum and Equina, 2006).

AHSV is transmitted by the midges *Culicoides imicola* and *C. bolitinos* in Africa. Additional species of *Culicoides* might also be able to act as vectors. Wind has been implicated in the dispersal of infected vectors during some epidemics. AHSV is capable of overwintering, at least in milder climates where *Culicoides* adults can survive. Other arthropods might also be capable of transmitting AHSV, but are thought to be, at most, only minor sources of infection. Mosquitoes have been implicated as possible biological vectors, and biting flies in the genera *Stomoxys* and *Tabanus* may be able to transmit the virus mechanically (Tkubet *et al.*, 2016).

Diagnosis and Differential Diagnosis: The diagnosis of AHS disease are Clinical signs and lesions in association with previous epidemiological information may be sufficient for clinical diagnoses, however because most of the clinical signs and macroscopic lesions are not pathognomonic AHS must be confirmed by Virus isolation. The differential diagnosis are: Equine infectious anemia, Equine viral arteritis, Trypanosomosis, Equine encephalosis, Piroplasmosis and Purpura haemorrhagica (Mellor and Hamblin, 2004).

Treatment and control of Africa horse sickness: There is no specific treatment for animals suffering from AHS apart from rest and good husbandry. The treatment is only symptomatic and targeted at preventing secondary bacterial complications using combination of antibiotic and anti-inflammatory drug (Mellor and Hamblin, 2004). Thus the present case report described the of Africa horse sickness in Stallion.

3.20.2. Case description on African horse sickness

A stallion horse was weighted around 250kg was brought to Spana of Addis ababa university college of veterinary medicine on October 12, 2018 with the complains of inappettance, depressed, swelling around the head, kept with other horse within neighbor and others were passed away due to this case from neighbor. Based on physical examination the horse was depressed, fever 40°C, respiratory rate 22 breath/min, heart rate 72 beat/min, swelling of supra orbital fossa. EDDIE smart phone result also revealed the case as Africa horse sickness virus. Based on history, outbreak occurrence, pathognomonic clinical sign (Swelling of supra orbital fossa) and EDDIE result the case was tentatively diagnosed as Africa horse sickness. The

laboratory result from national veterinary institute also indicated as the case was Africa horse sickness virus (**Annex 7**).



Figure 58: Photograph of horse showing swelling of supra orbital fossa.

3.20.3. Laboratory investigation and findings

A whole blood sample was taken from jugular vein of the horse into heparinized vacutainer tube and sent to national veterinary institute of Ethiopia. Virus isolation test was done and the result obtained from national veterinary institute revealed the case as African horse sickness virus and the result was attached in the Annex part (**Annex 5**) paper of confirmation from NVI.

3.20.4. Case management and treatment outcome

Cotrimoxazole 480mg tablet was given for five days two tablets 960mg in the morning with feed for the purpose of avoiding the secondary bacterial complication and the owner also advised to rest horse until recovery; vaccinating the horse for other time and the horse was totally recovered from the disease as indicated in figure below after eight months of treatment.



Figure 59: Horse after eight months of treatment.

3.20.5. Discussion

African horse sickness is an infectious and non contagious arthropod born viral disease affecting all species of equidae. It is an OIE listed disease and has been classified as a notifiable disease worldwide and it is endemic to sub-Saharan, Central and East Africa (Tkubet *et al.*, 2016). In the current case report, Africa horse sickness was diagnosed based on the history of outbreak occurrence, typical clinical signs, EDDIE result and laboratory confirmation of the case through virus isolation test. In this case report the laboratory finding was in agreement with the result of Smart phone application as the EDDIE revealed it as Africa horse sickness.

In enzootic areas in Africa, annual vaccination against AHSV is a very practical means of control (Horst, 1992). Although this cannot be relied upon fully, and only horses which have received three or more courses of AHS vaccine are usually well protected, vaccination still remains a viable tool for AHS control in Africa (MacLachlan *et al.*, (2007). Although this vaccine has greatly reduced the impact of AHS, outbreaks of the disease continue to occur, even in well-vaccinated horses, and the vaccine virus itself has on occasion caused disease in inoculated horses (Coetzer and Guthrie, 2004; Gilfoyle, 2006).

In the current case report; the horse was vaccinated before as the owner said but suffered from the Africa horse sickness. This may be due to inappropriate administration of vaccine or due to the failure of vaccine in its efficacy. There are major factors that have been responsible for

polyvalent AHS vaccine failure. For example; one, failure to exercise appropriate procedures in the care, preservation and administration of the vaccines, secondly, the stress factor, i.e. failure to rest the horse, and thirdly, improper timing for vaccination (Wilson *et al.*, 1995) and this may in agreement with the current case report as the horse was used for cart purpose.

Africa horse sickness is a viral disease which has no treatment; in the current case report the cotrimoxazole was administered orally for the purposes of prevention of secondary bacterial complication and the horse was fully recovered from the Africa horse sickness. In conclusion Africa horse sickness virus is a vector born disease and controlling the vectors and vaccination of the equine are the best important principle in its control in endemic area.

3.21. Case of Strangle In Horse

Abstract: Strangles is an infectious and highly contagious respiratory bacterial disease of equine caused by *Streptococcus equi subspp.equi*. A horse weighted 250kg was brought to Spana of Addis Ababa university on March 7, 2019 with the complains of nasal discharge for consecutive three days, inappettance/unable to feed, some sort of swelling retropharyngeal lymph node and the horse was used for cart purpose. Based on physical examination the horse was depressed, fever 40°C, heart rate 74 beat/min, and respiratory rate 26 breath/min and also nasal discharge almost serous to mucoid discharge was observed when horse arrived at Spana of Addis Ababa University. The EDDIE smart phone revealed the disease as upper respiratory infection. Based on the history, clinical signs, and laboratory finding the case was diagnosed as strangle and its differential diagnosis are upper respiratory infection and respiratory form of Africa horse sickness virus. As the case was in its early stage, Procaine Penicillin G 22,000IU/ kg was given for three days intramuscularly as a therapeutic measures and the horse was healed from the case. In conclusion, Strangles has a very contagious nature, which makes the control of spread among horses on farms very difficult. Horses with strangles as well as their environment should be isolated. Owners and caretakers must be very careful not to spread the bacteria to other horses.

Keywords: Stallion, Strangle, Spana

3.21.1. Introduction on Strangle

Respiratory tract infections are considered the major problem of equine worldwide. Strangles is an infectious and highly contagious respiratory bacterial disease of equine caused by *Streptococcus equi* (Neamat-Allah and El Damaty, 2016). The respiratory disease of equine animals can be classified into contagious upper respiratory tract disease (viral and bacterial); non contagious respiratory tract disease (functional abnormalities of larynx); Infectious lower respiratory tract disease (bacterial pneumonia) and noninfectious lower respiratory tract disease (Rush and Mair, 2008). Upper respiratory tract infection in horses is common and can be caused by viral, fungal, and bacterial pathogens. These include equine influenza virus, equine herpes viruses, *Aspergillus* species, and Lancefield group C *Streptococcus* species (Wood *et al.*, 2005).

Out of different disease of upper respiratory tract infection, strangle is the most common upper respiratory disease which effect on health of Equine animals. Strangles is an infectious, contagious disease of Equidae characterized by abscessation of the lymphoid tissue of the upper respiratory tract. The bacterium *Streptococcus equi* subsp. *equi* (*S. equi*) is the causative agent of the important and highly contagious upper respiratory disease “strangles” in horses and other equids (Paillot *et al.*, 2010). Historically, strangles got its name because affected horse was sometimes suffocated from large infected lymph nodes that obstructed their upper airway. The name strangle was named by Bourgelat in 1791 (Sweeney *et al.*, 2005).

Strangle disease is very contagious which have high morbidity and low mortality rate. Severity of clinical disease varies with classical clinical manifestation of an upper respiratory tract infection which includes acute dyspnea, dysphasia, internal lymph node abscessation and immune mediated responses (Whelchel and Chaffin, 2009). After incubation period ranged from 3 days to 2 weeks from exposure to causative agent, then infective organisms shed in nasal discharges and pus from opened lymph nodes (Higgins and Snyder, 2006).

The occurrence of strangle disease was recorded in young foals compared to adult one. The *S. equi* var *equi* easily spreads from infected to susceptible horses through contaminated water and other fomites (Mallicote, 2015). The diagnosis of strangle in horse can be undergone by different methods, bacteriological culture of nasal swabs, nasal washes and aspirated pus from abscesses

remains gold standard for *S. equi* (Khoo *et al.*, 2011). In the recent time, serological test has been developed to identify equine animals that exposed to strangle disease (Robinson *et al.*, 2013). The major significances importance of strangle disease in equine animals are death of animals, disruption of the management of commercial horse establishments, the time to treat affected horse and esthetic unpleasantness of running nose and draining abscesses (Pritchard *et al.*, 2005). Control and prevention of strangle disease can be achieved by keeping animals in hygienic condition and vaccination (Corinne, 2010).

Etiology and Clinical signs of strangle: Strangles is a highly contagious and serious infection of horses and other equids caused by a gram positive, hemolytic, pyogenic and lancefield group C bacterium, *Streptococcus equi* subsp. *equi* from genus streptococcus. It is characterized by severe inflammation of the mucosa of upper respiratory tract with extensive swelling of retropharyngeal and submandibular lymph nodes and often ruptures of lymph nodes produces large amount of thick creamy pus (Pritchard *et al.*, 2005).

The main characteristic of streptococcus bacteria are facultative anaerobic catalase negative, oxidase negative, non-motile and hemolytic (Quinn *et al.*, 2011). The colony of streptococcus bacteria after culture looks like honey colored, mucoid colonies on blood agar, it makes wide zone of hemolysis (beta hemolysis) on blood agar (Taylor and Wilson, 2006a). *S. equi* is belongs to group of pyogenic streptococci and it is biochemically differentiated from other beta hemolytic group of streptococcus Lancefield C by its inability to ferment sorbitol, lactose and trehalose. *S. equi* is highly resistant to phagocytosis due to the presence of hyaluronic acid capsule (Lewis *et al.*, 2008).

Clinical Findings: Horses affected by strangles develop a clinical sign varying from acute form to a complicated form depending on the immune status of the horse, virulence of the agent and the environmental factors facilitating the disease process (Boyle *et al.*, 2018).

Acute Form: In acute form strangles is characterized by sudden onset of fever followed by mucopurulent (Copious) nasal discharges and acute swelling in the submandibular and retropharyngeal lymph nodes, depression, lethargy and loss of appetite within an incubation period of 3-14 days (Pritchard *et al.*, 2005). Pharyngitis and lymphadenopathy may develop

which makes swallowing difficult and affected horses become anorexic or reluctant to eat and stand with neck extended. A soft cough and slight but painful swelling between the mandibles occurs. With the progression of the disease, abscesses develop in the submandibular (Between the jaw bones) and/or retropharyngeal (At the back of the throat) lymph nodes. The lymph nodes become hard and very painful and may obstruct breathing (Strangles). The lymph node abscesses will burst in 7–14 days releasing thick pus heavily contaminated with *S. equi*. The horse will usually rapidly recover once abscesses have ruptured (Welch and Chaffin, 2009). Chronic Form: Classic strangles is a severe infection that can be fatal usually because of a variety of complications that occur. Strangles in about 20% of the cases is complicated which significantly increase the mortality rate (Corinne, 2010).

Diagnosis and Differential Diagnosis of strangle: The diagnosis of strangles based on the history and clinical signs, diagnostic should be confirmed by culture of nasal swabs, washes, or lymph nodes aspirates and PCR for the identification of the bacterium (Laus *et al.*, 2007). The culture of nasal swabs, nasal washes and aspirated pus from abscesses are remains gold standard. Nasal washes are more effective than swabs in detection of small numbers of bacteria. The washes can take sample from a greater surface area. Polymerase chain reaction (PCR) is a method to detect DNA sequence of *SeM* of bacteria. Strangles should be differentiated clinically from other upper respiratory tract diseases of horses. Chronic weight loss due to metastatic infection should be differentiated from equine infectious anemia, parasitism, inadequate nutrition, and neoplastic (Sweeney *et al.*, 2005).

Control and management of strangle: Treatment of an animal in the early stages of the disease is usually effective and is not associated with side effects (Davidson *et al.*, 2008). The use of antimicrobials is also controversial. *S. equi* is highly susceptible to penicillin G, which is recommended at 22,000 IU/kg in early stages (Taylor and Wilson, 2006a). The application of penicillin after abscesses draining speed the recovery and prevents complications. The organism is also susceptible to ampicillin, ceftiofur, erythromycin, rifampicin, tetracycline; all of them are effective in treating field cases (Dixon, 2008). For horses that have developed lymph node abscessation antibiotic therapy is probably contraindicated. Treatment only prolongs the enlargement and eventual rupture of lymph node abscesses (Timoney, 1993).

Strangle outbreaks are more frequently when new animals, incubating the disease or recovering and still shedding the organism, is introduced. The best way to prevent an outbreak of strangles is keeping animals in hygienic and isolating infected animals. The horse should be isolated for 3 weeks. The younger horses should be kept separately from older horses, where the most important thing is to keep horses in competition away from younger horses. The stable should be supplied with good equipment for hand washing with clean warm water, soap and a clean towel (Abdisa, 2017a). Thus the present case report described the case of strangle in Horse.

3.21.2. Case description on strangle

A horse weighted 250kg was brought to Spana of Addis Ababa university on March 7, 2019 with the complains of nasal discharge for consecutive three days, inappettance/unable to feed, some sort of swelling submandibular lymph node and the horse was used for cart purpose. Based on physical examination the horse was depressed, fever 40°C, heart rate 74 beat/min, and respiratory rate 26 breath/min; and also nasal discharge almost serous to mucoid discharge was observed when horse arrived at Spana of Addis Ababa University. The EDDIE smart phone revealed the disease as upper respiratory infection. Based on the history, clinical signs, and laboratory finding the case was diagnosed as strangle and its differential diagnosis are upper respiratory infection and respiratory form of Africa horse sickness virus.

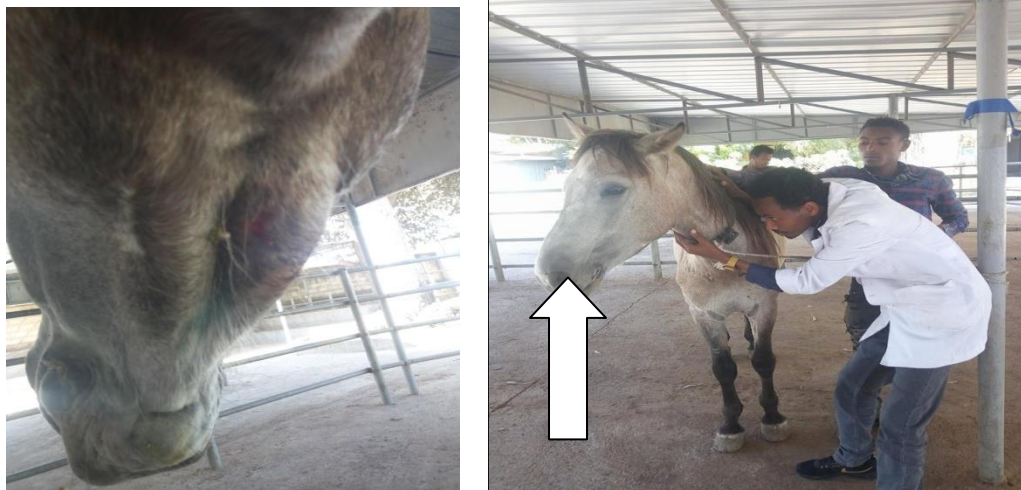
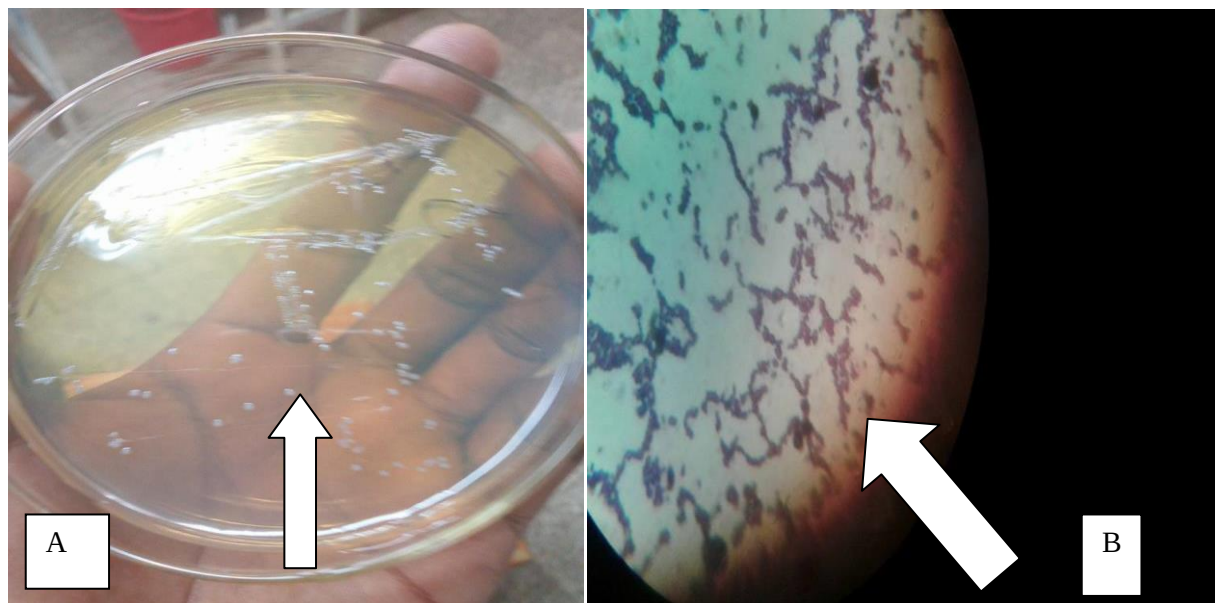


Figure 60: Photograph of horse suffered from strangle.

3.21.3. Laboratory finding and its investigation

The nasal swab was taken for two purposes; gram staining and bacterial culture. Nasal swabs materials from the stallion was immediately transported to the laboratory in an ice-cooled container for bacteriological examination at biomedical and microbiology laboratory for the purpose of diagnosis. Samples were cultured on selective Edward media for *Streptococcus* and incubated at 37°C for 24 h under complete aerobic conditions. *Streptococcus equi* on Edward media showing beta-hemolytic dew-drop like colonies and Microscopical examination of *Streptococcus equi* stained with Gram-stain showing Gram-positive cocci arranged in pairs and chains (Oil, 100×) as indicated below in figure. Based on the history, clinical finding observed and laboratory result the case was finally diagnosed as strangle.



A) *Streptococcus equi* on Edward media showing beta-hemolytic dew-drop like colonies

B) Microscopical examination of *Streptococcus equi* stained with Gram-stain showing Gram-positive cocci arranged in pairs and chains (Oil, 100×).

Figure 61: *Streptococcus equi* on media and its Microscopical examination with Gram-staining

3.21.4. Strangle management and its treatment outcome

Since the case is in its early stage; Procaine Penicillin G 22,000IU/KG was given for three days intramuscularly as a therapeutic measures and the owner recommended to rest the stallion until

recovery; and after three months treatment the horse was totally healed from the case and the owner was using it for carting purpose as indicated in figure below.



Figure 62: Horse after three months of treatment.

3.21.5. Discussion

Strangles is a highly contagious disease in horses. It is caused by the bacteria *Streptococcus equi* subsp. *Equi* and said to be the most frequently diagnosed infectious disease of horses worldwide with Common clinical signs like fever, nasal discharge (24-48 h after onset of fever), swollen lymph nodes and problems of swallowing (Waller *et al.*, 2011). The current case report was diagnosed based on history, clinical signs, laboratory confirmation and the smart phone application EDDIE revealed the case as a strangle. The most common clinical symptoms appeared on the infected horses are fever, nasal discharge for two days and some sort of swallowing problem which is in agreement with the case reported by Sjoblom (2014)

Bacterial culture and gram staining of the nasal discharge were done. *Streptococcus equi* on Edward media showing beta-hemolytic dew-drop like colonies and the gram staining through

Microscopical examination of *Streptococcus equi* stained with Gram-stain showing Gram-positive cocci arranged in pairs and chains under Oil immersion (100×) and the result of laboratory finding observed in the current case report of both bacterial culture and gram staining were in agreement with the result obtained by Neamat-Allah *et al.*(2016) in stallion suffered from strangle.

Treatment of an animal in the early stages of the disease is usually effective and is not associated with side effects and some times the use of antimicrobials is also controversial. *S. equi equi* is highly susceptible to penicillin G, which is recommended at 22,000IU/kg in early stages (Taylor and Wilson, 2006). In the present case report since the disease is on its early stage, the penicillin G 22,000IU/kg was administered for three days.

In conclusion, Strangles has a very contagious nature, which makes the control of spread among horses on farms very difficult. Horses with strangles as well as their environment should be isolated. Owners and caretakers must be very careful not to spread the bacteria to other horses (Taylor and Wilson, 2006b) and also the owner advised to isolate and serve his stallion in a house.

3.22. *Epizootic Lymphangitis* Management in Stallion

Abstract: *Epizootic lymphangitis* is a chronic disease of equids caused by *Histoplasma capsulatum* var. *farciminosum* (HCF), and is characterized by lymphangitis and lymphadenitis. A stallion weighted around 210kg was presented and examined in Spana of Addis Ababa university college of veterinary medicine on February 13,2019 with the complains of wounds on its body especially on chest part and the horse was used for cart purpose. The main complaint according to the owner was some sort of wound on the skin of the fore limbs, chest, and neck which had not treated before. Based on physical examination the horse was depressed, cutaneous nodules around the chest and fore limb. The parameters of horse like heart rate 72 beat/min, the respiratory rate was 20 breath/min and rectal temperature after a min was 38.4 °C was almost in the normal range. The result of EDDIE smart phone application revealed the case as epizootic lymphangitis. Based on clinical examination (affected area and clinical signs including cutaneous nodule) and EDDIE result the case was tentatively diagnosed as Epizootic lymphangitis and its differential diagnosis were ulcerative lymphangitis, glanders and and Strangle. The current case report was managed with antiseptic by incision of wounds with 7% iodine tincture for five days and also Infusion of the perforated nodules with tincture iodine and also topical ointmen to apply on the wound until healing occurs; the owner also advised to give a rest for horse from using cart purpose; and after five months the status of horse was good. In conclusion, Epizootic lymphangitis is a chronic disease of equines. Strict hygienic precautions are essential to prevent spread of epizootic lymphangitis and Moreover great care should be taken to prevent spread by grooming or harness equipment, as contaminated bedding should be burned, since the organism may persist in the environment for long time.

Keywords: *Epizootic lymphangitis, stallion,spana*

3.22.1. *Introduction Epizootic lymphangitis*

Epizootic lymphangitis is a chronic disease of equids caused by *Histoplasma capsulatum* var. *farciminosum* (HCF), and is characterized by lymphangitis and lymphadenitis. HCF is a dimorphic fungal soil saprophyte; the mycelial form is present in the soil and the yeast form is most commonly found in lesions. Fungal spores are carried from infected animals by direct

contact or on inanimate objects such as grooming equipment, bedding, saddlery etc., and gain entry through cutaneous abrasions. The organism has also been isolated from the alimentary tract of biting flies, suggesting a role in the transmission of the disease (Ameni, 2006a). The disease is characterised by a cord-like appearance of the subcutaneous lymphatic vessels, especially of the limbs, neck and chest, and the development of a series of pyogranulomas, the discharge from which contains yeast-like cells of the pathogen. Rarely, infection may lead to pneumonia and conjunctivitis (Al-Ani, 1999).

A significant association has been reported between tick infestations and EL lesions in mules and ticks may serve as a mechanical vector or most probably as a facilitator for entry through the skin barrier. The form that the disease takes seems to depend primarily on the route of entry. The skin form of EL occurs following contact between contaminated soil and traumatized skin whereas the conjunctival form is believed to spread by biting flies of the genera *Musca* or *Stomoxys*. The pulmonary form of the disease is infrequent and occurs after inhalation of the organism. In all cases, the result and lesions are nodular and granulomatous in character, and the organism, once established, spreads locally by invasion, and then via the lymphatics. There is often thickening of lymphatics with the formation of purulent nodules, and regional lymph nodes may be enlarged and inflamed (Ameni and Terefe, 2004).

The incidence of the disease increases when large numbers of animals are assembled together. It affects mainly horses, mules, and donkeys. EL has also been reproduced experimentally in mice and rabbits. Rare cases of human infections have been reported (Guerin *et al.*, 1992), but identification of the causative organism has not been substantiated. One variety of HCF, *Histoplasma capsulatum* var. *capsulatum* (HCC), causes histoplasmosis in man. Antigenically, HCF and HCC are indistinguishable, but HCC primarily infects the lungs and occasionally other organs. In the latter case, the disease is termed as disseminated histoplasmosis, and can be fatal if untreated. In Africa, a third variety, which is known as *Histoplasma capsulatum* var. *duboisii* (HCD), is the cause of human histoplasmosis (Cano and Hajjeh, 2001).

Etiology and its clinical sign: *Histoplasma farciminosum* (synonyms: *Cryptococcus farciminosum*, *Zymonema farciminosum*, *Histoplasma capsulatum* var. *farciminosum*) is the cause of epizootic lymphangitis. *Histoplasma farciminosum* will be used to name the agent,

although according to Ajello the organism does not belong to the genus *Histoplasma*. The organism was first demonstrated in pus by Rivolta in 1873, but was not successfully cultivated until 1896 when the first pure cultures were obtained by Tokishiga in Japan. The yeast form of the organism appears in pus as a double-contoured oval or ovoid body, measuring 2.5- 3.5 μm by 3-4 μm . The saprophytic stage is mycelial and both forms can be cultivated if suitable media, temperature of incubation and carbon dioxide tension are provided. The organism is highly resistant to the effects of physical and chemical agents and can survive for at least a month in the dust of stables or kraals. Bardelli and Ademollo found the pathogen to be viable and virulent after desiccation in the laboratory for 25 months. *H. farciminosum* may survive for up to ten weeks in non-sterile water at 26°C (Al-Ani, 1999).

Clinical signs of Epizootic lymphangitis are described based on the pathological lesions; otherwise the body temperature and general character of the animals are not changed. On the other hand, most of the animals will lose their body condition (Abutarbush, 2010; Ameni, 2006b). There are three clinical form of epizootic lymphangitis in horse as cutaneous, ocular and pulmonary form. The cutaneous form of the disease, after which the disease was named, is the most common. Clinical signs are observed several weeks to 6 months after infection. The initial lesion is an open granulomatous wound along the course of a lymphatic vessel, which has a tendency to ulcerate, or to undergo alternating periods of discharge and closure for some weeks before healing with residual scar formation (Abutarbush, 2010).

Lesions are most common in the forelimbs, the chest wall, and the neck. In severe cases, skin over the entire body may be affected; Initial nodules appear anywhere on the body but commonly on lower limbs, chest, and neck. Nodules rupture, discharging thick pus, and the ulcerated lesions subsequently scar and heal. Lesions progress locally along lymphatics, which become beaded and rope-like with enlarged regional lymph nodes. Repeated cycles of ulcerating and healing nodules occur (Abutarbush, 2010).

The ophthalmic form of the disease is less frequent. Infection may occur as conjunctivitis or a naso-lachrymal infection. Initial infection is characterized by a watery discharge from one or both eyes and some swelling of the eyelids, followed by the development of papules and ulcerating button-like growths on the conjunctiva and/or on the nictitating membrane. The pul-

monary form of the disease is infrequent, which usually occurs as a late development in the cutaneous form of the disease (Chapter, 2008). The nasal lesions are characterized by serous secretion, multiple small gray nodules, and or ulcers. They are mostly confined to the upper respiratory tract. They usually found near the external nares and they may extend to the muzzle, or they may be found deep in the nasal cavity and in the pharynx, nasal sinuses, the larynx and the bronchi (Abdisa, 2017a).

Some horses are asymptomatic carriers of HCF and they do not show clinical signs. They can be identified clinically by the identification of fibro-calcification of skin lesions at previous sites of infection, or based on serologic evidence of antibodies, and positive reactions to intra dermal tests. These methods do not distinguish exposure from chronic infection. Such horses will give a positive result to an intra dermal sensitivity test and positive reactions to serological tests. Six bacterial contaminant genera are isolated from lesions of epizootic lymphangitis and some of them are frequently found that they potentially contribute to the clinical signs, pathogenesis and to the severity of the disease, leading sometimes to death in severely infected horses (Hadush *et al.*, 2014).

Diagnosis and differential diagnosis of Epizootic lymphangitis: Diagnosis of epizootic lymphangitis depends on the clinical sign, history of animals and laboratory confirmation. The clinical signs of Epizootic lymphangitis in horses in endemic regions are often the basis of diagnosis; however confirmatory tests should be followed. Several confirmatory tests have been described. Laboratory diagnosis of epizootic lymphangitis usually is by stained smears of the cutaneous exudate based upon demonstration of the typical yeast-like, double-contoured cells in pus collected aseptically from the lesion and confirmed by culturing the pathogen (Al-Ani *et al.*, 1998a).

Microscopic examination of Giemsa or Gram-stained smears of pus/ swabs aspirated from a nodule reveal Gram-positive yeast forms with a halo (unstained capsule-like) structure(Asfaw *et al.*, 2012). According to Ameni (Ameni, 2007), it reveals hyaline septated and branched hyphae. The yeast form of the organism appears in pus as a double-contoured oval or ovoid body, measuring 2.5-3.5 μm by 3-4 μm . Culture of HCF from body fluids or tissues is the “gold standard” for confirming the diagnosis but it may be impractical since it may be difficult and

time-consuming to grow from body fluids and tissues. Moreover false-negative results are likely to occur. The fungus HCF can be cultured or isolated on special media such as Sabouraud dextrose agar but it dies quickly in specimens, unless these are collected in antibiotic solutions, refrigerated and cultured promptly (Asfaw *et al.*, 2012).

Serologic tests for the presence of antibodies in the blood are also the possible options, but they may not have a high degree of specificity for active disease. It may reflect past exposure or asymptomatic infection. Tube agglutination and passive hemagglutination tests have been reported to identify increased titers in horses with epizootic lymphangitis, which can be used as a practical screening test. A serum agglutination titer of 1: 80 or higher is reported to be positive (Gabal and Khalifa, 1983).

Differential diagnosis: includes glanders, strangles and ulcerative lymphangitis especially when these diseases occur under the same environmental conditions. Histofarcin test could play a significant role in detecting early infection and in differential diagnosis (Ameni, 2006a). The organisms are pleomorphic, often described as slightly lemon-shaped basophilic masses, varying from 2 to 5 μm in diameter, that are surrounded by a 'halo' when stained with H&E or Gram's stain and Electron microscopy has been applied to skin biopsy samples of 1.5–2.0 mm immediately prefixed in phosphate buffered 2% glutaraldehyde solution at 4°C and post-fixed in 1% osmium tetroxide. Ultra-thin sections were cut and stained with uranyl acetate and lead citrate. Examination demonstrated the fine internal structure of the organism, *H.capsulatum* var. *farciminosum*, including the cell envelope, plasma membrane, cell wall, capsule and inner cell structures. The skin form of the disease may be confused with the skin form of glanders, which is caused by *Burkholderia mallei*, ulcerative lymphangitis, which is caused by *Corynebacterium pseudotuberculosis*, indolent ulcers caused by *Rhodococcus equi*, strangles and cutaneous lymphosarcomas (Abutarbush, 2010).



Figure 63: Gram-stain of *Histoplasma farciminosum*: Note oval bodies with unstained capsule.

Source: (Al-Ani, 1999).

Treatment and control of epizootic lymphangitis: Treatment of epizootic lymphangitis is mandatory to prevent spreading of the infection, whereas for disease control, culling infected horses and adoption of hygiene measures (e.g., cleaning and disinfection) and insects control are required. In recent years, the use of vaccines (i.e., a killed formalized vaccine, attenuated vaccine, and live vaccine) have been proposed as a strategy to eradicate the infection in endemic areas; the administration of the attenuate vaccine (i.e., vaccine developed by exposure of the causative agent to high temperatures) has resulted in a protection rate of 75.5% over >31 months (Al-Ani, 1999).

Intravenous dosing of iodide may be used particularly in endemic areas. The intravenous injection of 100 ml of sodium iodide of a 10% solution, repeated weekly for four weeks is recommended. Different antifungal drugs have also been used and successful treatment with amphotericin B has been reported (Gabal, 1984). Many treatment types have been tried, but it was without success. Parenteral amphotericin B and iodides have been reported as effective. Even though Epizootic lymphangitis is highly prevalent and economically important in Ethiopia, the treatment options have not been employed because of the cost of the drugs and their absence in the market (Ameni, 2006b). Thus the present case report described the case of Epizootic lymphangitis in stallion.

3.22.2. .Case description of epizootic lymphangitis

A stallion weighted around 210kg was presented and examined in Spana of Addis Ababa university college of veterinary medicine on February 13,2019 with the complains of wounds on its body especially on chest part and the horse was used for cart purpose. The main complaint according to the owner was some sort of wound on the skin of the fore limbs, chest, and neck which had not treated before. Based on physical examination the horse was depressed, cutaneous nodules around the chest and fore limb. The parameters of horse like heart rate 72 beat/min, the respiratory rate was 28 breath/min, and rectal temperature after was 38.4 °C was almost in the normal range. The result of EDDIE smart phone application revealed the case as epizootic lymphangitis. Based on clinical examination (affected area and clinical signs including cutaneous nodule) and EDDIE result the case was tentatively diagnosed as Epizootic lymphangitis and its differential diagnosis were ulcerative lymphangitis, glanders and and strangles.



Figure 64: Horse suffered from epizootic lymphangitis.

3.22.3. Laboratory finding and its investigation

A sample of pus were collected from one of the nodules on the chest area under sterile conditions and sent veterinary pathology laboratory of Addis Ababa University. Giemsa staining technique was performed as indicated below and the characteristic of the giemsa staining was revealed Gram-positive yeast forms with a halo (unstained capsule-like) structure and it reveals hyaline

septated and branched hyphae. The yeast form of the organism appears in pus as a double-contoured oval or ovoid body. Parallel to giemsa staining the pus sample was enriched in trypton soya broth 10ml and culture on mannitol salt agar; and no growth of bacteria was observed on MSA. Based on the clinical sign observed, EDDIE result and laboratory finding the case was finally diagnosed as Epizootic lymphangitis.

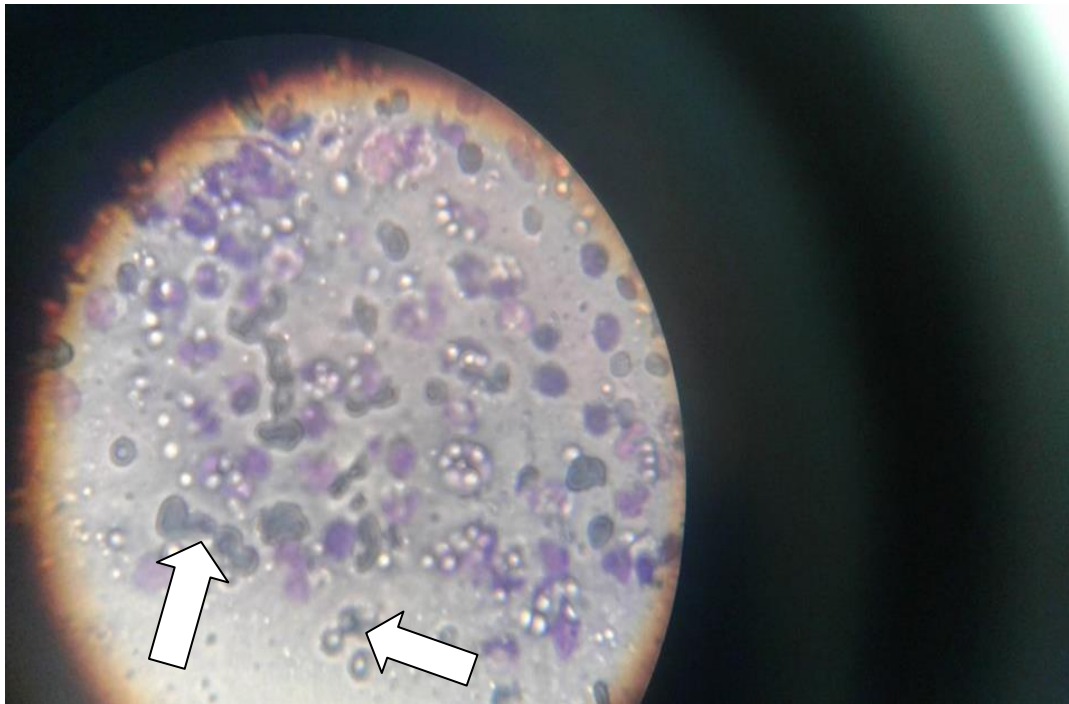


Figure 65: Giemsa staining of pus swab.

3.22.4. Epizootic lymphangitis management and its treatment outcome

The current case report was treated with antiseptic by surgical incision of wounds with 7% iodine tincture for five days and the owner advised to give a rest for horse from using cart purpose and also Infusion of the perforated nodules with tincture iodine and also topical ointment. 600ml of the iodine was given to the owner to apply on the wound until healing occurs and after a week of treatment nodules and other lesions become reduced and lesions became dried. After five months of therapeutic management the status of horse was recovered and started for cart purpose as indicated in figure below.



Figure 66: A diseased horse on a week days of treatment (A) and five months (B) of post treatment.

3.22.5. Discussion

Epizootic lymphangitis is one of the major chronic contagious disease of equine which cause pyogenic, ulcerative, and generalized spreading pyogranulomatous, multifocal dermatitis with lymphadenitis, and a cord like appearance of the subcutaneous lymphatic vessels (Abdisa, 2017a). Based on the clinical finding, outbreak occurrence, EDDIE result and laboratory finding the current case report was diagnosed as epizootic lymphangitis. The finding obtained in both EDDIE and laboratory finding was in agreement in each other. The clinical findings and laboratory result by gram stainig observed in this case was in agreement with the clinical signs and laboratory result observed in the case reported by AL and Muhsen (2016).

The skin form of the disease may be confused with the skin form of glanders, which is caused by *Burkholderia mallei*, ulcerative lymphangitis, which is caused by *Corynebacterium pseudotuberculosis*, indolent ulcers a caused by *Rhodococcus equi*, sporotrichosis caused by *Sporothrix schenckii*, strangles and cutaneous lymphosarcomas. Successful treatment with intravenous administration of sodium iodide, oral administration of potassium iodide and

surgical excision of lesions are limited, since recurrences of clinical signs months later is possible. However, In most areas, Epizootic Lymphangitis is a notifiable disease, and treatment is not as much effective, but in the current case report the case was treated with antiseptic by surgical incision of wounds with 7% iodine tincture for five days and agreed with the report of Al-Ani *et al.* (1998b; Ameni and Terefe (2004).

In conclusion, Epizootic lymphangitis is a chronic disease of equines and so prophylactic measure is better than therapeutic measures for the prevention and control of it. Strict hygienic precautions are essential to prevent spread of epizootic lymphangitis, Moreover great care should be taken to prevent spread by grooming or harness equipment, as contaminated bedding should be burned, since the organism may persist in the environment for long time.

3.23. Newcastle Disease in Hens and its Postmortem Examination

Abstract: Newcastle disease is one of the most devastating diseases that considerably cripple the global poultry industry. Two hens were brought to veterinary teaching hospital of Addis Ababa University on February 02, 2019 with the complains of outbreaks in bishoftu poultry farm, sudden death and unable to feed, abnormal positioning. Based on physical examination there were depression, weakness, lying down, green diarrhea, swelling of the face, twisting of the neck, paralysis of legs and arched position of the body were observed. The EDDIE Smart phone app was not accessed for poultry. Other hen was taken to national veterinary institute for confirmation. Based on history, outbreak occurrence, and typical clinical sign the case was tentatively diagnosed as Newcastle disease and its differential diagnosis are Marek's disease, avian influenza and Gumboro disease. Based on the consent of the owner the hen was taken for postmortem examination. Based on postmortem examination the case revealed out the Pinpoint haemorrhages on the tips of glands in the proventriculus, Enlarged and haemorrhagic caecal tonsils, Haemorrhagic lesions in the intestinal wall and marked congestion of trachea, with haemorrhages were also observed. The air sacs appeared inflamed cloudy and congested. The postmortem finding revealed the pathological indications of Newcastle disease. Based on the history, outbreak occurrence, typical clinical signs and postmortem examination the case was finally diagnosed as new castle disease. In conclusion, Because of its enormous socioeconomic

importance and potential to rapidly spread to naive birds in the vicinity, ND is included among the list of avian diseases that must be notified to the responsible institution immediately upon recognition and the owner was advised to vaccinate their chickens starting from day olds.

Keywords: *Hen. Newcastle, postmortem examination*

3.23.1. Introduction on newcastle disease

Newcastle disease (ND) is one of the most devastating diseases that considerably cripple the global poultry industry. Because of its enormous socioeconomic importance and potential to rapidly spread to naive birds in the vicinity, ND is included among the list of avian diseases that must be notified to the OIE immediately upon recognition. It remains a constant threat to the poultry industry and is a limiting disease for poultry producers worldwide. The variety of clinical presentations and the emergence and spread of new genetic variants make recognition and diagnosis challenging (Bello *et al.*, 2018).

Etiology: Newcastle disease (ND) is a viral disease of poultry caused by a single-strand, nonsegmented, negative-sense RNA virus known as *Avian paramyxovirus 1* (APMV-1). All *avian paramyxoviruses* (APMV) are part of the genus *Avulavirus*, subfamily *Paramyxovirinae*, family *Paramyxoviridae*. There are 9 serotypes of APMV, but all isolates of Newcastle disease virus (NDV) belong to serotype 1 (APMV-1), therefore NDV is synonymous with APMV-1. The APMV-1 viral genome of approximately 15 kb is composed of 6 genes encoding 6 structural proteins fusion, nucleoprotein (NP), matrix, phosphoprotein, RNA polymerase, and hemagglutinin- neuraminidase (HN). Two additional proteins are encoded by RNA editing of the P protein, namely proteins V and W. The cleavability of protein F is the main determinant for viral virulence, but other proteins such as HN and V are also believed to influence pathogenicity. Although all NDV isolates belong to a single serotype (APMV-1), there is great genetic variability among different strains. Based upon phylogenetic reconstruction, NDV can be divided into 2 classes (I and II), each of those respectively subdivided into 9 and 10 genotypes (Miller *et al.*, 2010).

Pathogenesis: A sequence of events following introduction of NDV into chickens is initiated by multiplication of the virus at the site of introduction. Initially the virus replicates in the mucosal

epithelium of the upper respiratory and intestinal tracts. Then follows release of the virus into the bloodstream, a second cycle of multiplication occurs in visceral organs producing a secondary viremia. This leads to infection of other target organs such as lungs, intestine and central nervous system. Signs of the disease and liberation of the virus into the environment are associated with the second release of the virus into the bloodstream. An exception occurs with large airborne exposures where the virus replicates in and is disseminated from the epithelium of the respiratory tract (Murphy *et al.*, 1999).

Clinical signs: The clinical signs reported in birds infected with NDV vary widely but mainly depend on virulence of the virus. Other factors determine the outcome of the disease such as the host species, age, immune status, infection with other organisms and environmental stress. In some circumstances, with extremely virulent viruses the disease may result in sudden death (Brown *et al.*, 1999a).

Strains of NDV are distinguished into five pathotypes. Velogenic viruses (vvND): responsible for disease characterized by acute lethal infection showing frequently haemorrhagic lesions of the digestive tract of dead birds; Neurotropic velogenic viruses (nvND): causing disease characterized by acute neurological signs and often-high mortality which follows respiratory distress; Lesogenic viruses: moderate respiratory disease often seen with high mortality only in young birds; Lentogenic viruses: causing mild infections of the respiratory tract and asymptomatic enteric viruses: mainly gut infections causing no apparent disease. Although these classifications are useful for descriptive purposes, some overlap does occur even in experimental infection of specific-pathogen-free chickens and some strains are difficult to place. In addition, in the field, aggravating factors such as concurrent infections, and immune suppression may result in clinical signs induced by milder strains to resemble those of more virulent strains. Generally, ND may involve signs of depression, diarrhoea, prostration, oedema of the head and wattles. In the vvND, clinical signs often begin with listlessness, increased respiration ending with death. Diarrhoea is frequently seen. Surviving birds may develop nervous signs such as muscular tremors, paralysis and torticollis (Bhaiyat *et al.*, 1994).

In nvND, the clinical signs are marked by severe respiratory disease shortly followed by neurological signs. With all pathotypes of ND, egg production falls dramatically sometimes leading to complete cessation of egg laying and death. Virulent ND strains may replicate in vaccinated birds, but the clinical signs will be greatly diminished depending on the antibody level (Hamid *et al.*, 1990).

Diagnosis and differential diagnosis: Avian paramyxovirus- 1 infections are usually diagnosed by virus isolation. Serology can be used only in non-vaccinating countries (OIE, 1996). NDV can most easily be isolated from tissue samples or faecal or tracheal swabs from infected birds by inoculation of eight- to ten-day-old embryonated chicken eggs via the allantoic cavity (Alexander, 1997). Confirmation of the virus as belonging to the APMV-1 serotype, can be performed by haemagglutination inhibition (HI) tests using a panel of specific antisera. Differential diagnosis of ND is extremely important in case of acute diseases and sudden death. The prompt recognition of highly contagious OIE notifiable diseases such as ND or AI and differentiation from other viral infections of poultry causing similar clinical signs, such as Gumboro disease (infectious bursal disease) is essential for the implementation of appropriate control measures and to limit economic losses (Al-Garib *et al.*, 2003)

Treatment and Control: There is no treatment for Newcastle disease. Timely vaccination with live and/or inactivated (killed) vaccine is the only reliable control method. However, under field conditions vaccination alone is not sufficient to control Newcastle disease. It must therefore be accompanied by good hygiene, good management and good biosecurity practices (Bhaiyat *et al.*, 1994). Thus the current case report described the case of Newcastle disease in the hen.

3.23.2. Case description on newcastle disease

Two hens were brought to veterinary teaching hospital of Addis Ababa University on February 02, 2019 with the complains of outbreaks in bishoftu poultry farm, sudden death and unable to fed, abnormal positioning. Based on physical examination depression, weakness, lying down, green diarrhea, swelling of the face, twisting of the neck (as indicated in figure below), paralysis of legs and arched position of the body were observed. The EDDIE Smart phone app was not accessed for poultry. Other hen was taken to national veterinary institute for confirmation. Based

on history, outbreak occurrence, and typical clinical sign the case was tentatively diagnosed as Newcastle disease and its differential diagnosis are Marek's disease, avian influenza and Gumboro disease.



Figure 67: Torticollis due to Newcastle in hen.

3.23.3. Postmortem examination of the hen

Based on the consent of the owner the hen was taken for postmortem examination and the owner advised early vaccination of their poultry. Based on postmortem examination the case revealed out the Pinpoint haemorrhages on the tips of glands in the proventriculus, Enlarged and haemorrhagic caecal tonsils, Haemorrhagic lesions in the intestinal wall (in the lymphoid aggregates) (as indicated in figure as follow) and Marked congestion of trachea, with haemorrhages were also observed. The air sacs appeared inflamed cloudy and congested. Air sacs contain cheesy (caseous) material. The postmortem finding revealed the pathological indications of Newcastle disease. Based on the history, outbreak occurrence, typical clinical signs and postmortem examination the case was finally diagnosed as new castle disease.

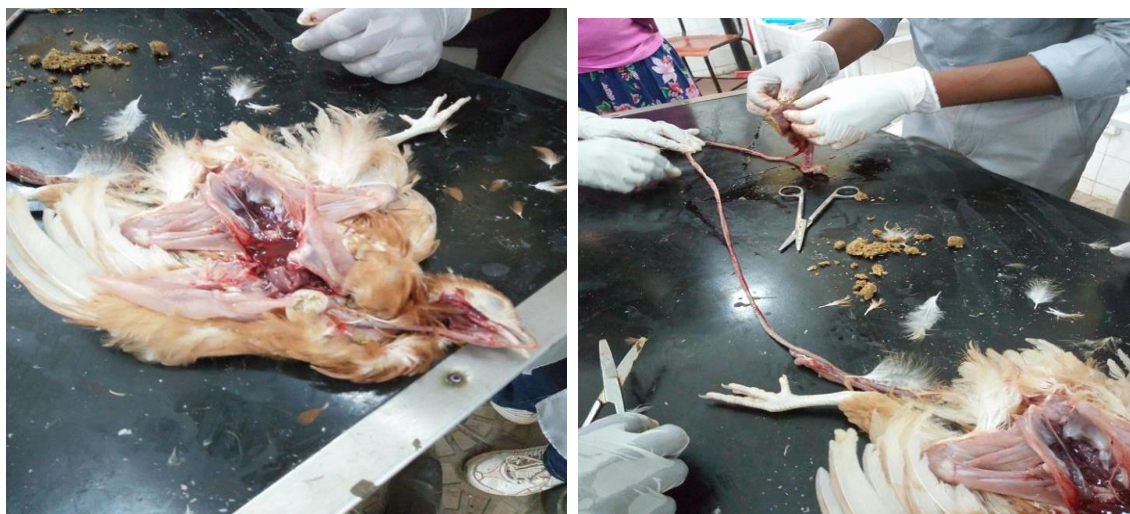


Figure 68: Pathological finding during post-mortem examination.

3.23.4. Discussion

Newcastle disease has been classified as a notifiable diseases list of terrestrial animals (April 2013). In this case report based on the clinical signs observed, outbreak occurrence of the disease and typical postmortem examination revealed the case as Newcastle disease, but the smart phone app was not assessed for poultry. The clinical signs obtained in the current case report were in agreement with the review published by Abdisa and Tagesu (2017) and based on the consent of the owner the hen was passed for more detail postmortem examination as a diagnostic tool for more accuracy.

The postmortem finding observed in the current case report like the Pinpoint haemorrhages on the tips of glands in the proventriculus, Enlarged and haemorrhagic caecal tonsils, Haemorrhagic lesions in the intestinal wall, Marked congestion of trachea with haemorrhages and the air sacs appeared inflamed cloudy/congested were in agreement with Etriwati *et al.* (2017) in which the postmortem examination revealed the case as the Newcastle disease. In conclusion, Newcastle disease is one of the most important animal diseases in the world, both for the number of animals affected every year and for the severe economic impact on the poultry industry. Rapid and reliable detection and confirmation of ND is important to limit economic losses and to handle the disease on time. The general approaches to the control of Newcastle disease are hygiene and vaccination.

4. OVER ALL RESULTS AND DESCRIPTION OF THE CURRENT STUDY

A total of 23 different cases comprised of 25 total animals were examined in these case reports through clinician examination, EDDIE smart phone application and its laboratory confirmation. The over all result of the current case study was summarized as follow in tables along with its description.

Table 1: Total number of animals examined and treatment outcome

Animals	Total	Recovered	Died	Passed for postmortem exam.
Ruminants	19	17	2	0
Equine	3	3	0	0
Canine	1	0	1	0
Poultry	2	0	0	2
Total (in percentage)	25	20 (80%)	3 (12%)	2 (8%)

From a total of 25 animals, majority of the diseased animals 20 (80%) were recovered from the disease, 3 (12%) animals were died and 2 (8%) were passed for postmortem examination based on the consent of the owner in this case report. A major challenge that observed during the study was the owner not brought on the early stage of the disease, and they brought after the animal became dehydrated and emaciated; and another important point revealed was the owner tried to treat their animals through indigenous knowledge which was another challenge that we suffered from. From the dead animals one sheep was taken for postmortem examination to know more detail of the cause of the death and the hens was taken for more detail examination of pathological lesions based on the consent of the owner. Generally if the disease of animals are managed and treated early, there is high chance of recovery of the diseased animals as observed in the current case reports.

Table 2: Diseases encountered during the study in their causative agent in percentage

Diseases	Number of affected animals	Percentages (%)
Bacteria	6	24%
Virus	8	32%
Parasites	4	16%
Protozoal	1	4%
Metabolic	2	8%
Fungal cases	1	4%
Others	3	12%
Total	25	100%

From the total cases the most responsible pathogens in the etiology was virus. From a total of 25 animals 32% was suffered from viral disease and the second pathogen responsible for more occurrence of the disease was bacteria and 24% out of the diseased animals was suffered from bacterial disease; parasitic (16), metabolic disease (4%) and others (4%) are also observed in the present case reports respectively.

Table 3: Evaluation of smart phone EDDIE diagnosis with clinican diagnosis and laboratory confirmation.

Animals	No,	Clinician diagnosis with EDDIE		EDDIE with laboratory confirmation	
		Matched	Not matched	Matched	Not Matched
Bovine	6	4	2	3	3
Small ruminant	13	9	4	6	4
Equine	3	3	0	3	0
Total	22	16 (72.7%)	6 (27.3%)	12 (54.5%)	7 (31.8%)

*Some disease/disorders are not confirmed due to lack of facility in three small ruminants (3 animals). In this case study, smart phone have been used as an input to improve cattle disease diagnosis through the use of relatively inexpensive and increasingly ubiquitous smartphone technology. Due to the real-time reporting opportunities that smartphone-based reporting and

diagnosis systems provide, their importance for early detection of diseases is clear (Shears, 2000). Smartphone based systems can also provide details about the demography of the sick entity and clinical signs of the disease, which enhances the opportunity for early detection of unusual syndromes in the area which help in the early diagnosis of the disease (Halliday *et al.*, 2012) and in the current case report, Livestock diseases that have the highest importance from an economic or trade perspective were included in the EDDIE smart phone app, based on the diseases targeted for control by the veterinary services of Ethiopia and their diagnosis were done parallel to the clinician diagnosis in the present case study.

Approaches that demonstrated by EDDIE offer opportunities for improvements in disease diagnosis and reporting within developing countries and can facilitate the early detection of the diseases. While such smartphone-assisted diagnosis and reporting can present considerable start-up challenges in terms of financial resources and sporadic mobile network coverage; in the long run, they offer clear benefits in terms of timeliness, improved data integrity, and ultimately a reduction in operating costs.

In this case study, the disease diagnosed by EDDIE smart phone was compared and evaluated with the clinician diagnosis and laboratory confirmation of the case. From a total of 23 different case which included 25 numbers of animals, 3 (two hens and one dog) of them were excluded from EDDIE diagnosis because EDDIE was not accessed for poultry and pets in this case study. From a total of 22 animals, in 16 (72.7%) animals the diagnosis of the clinician was matched with the EDDIE diagnosis and in 6 (27.3%) animals EDDIE diagnosis was not matched with clinician diagnosis. From a total 22 animals, in 12 (54.5%) animals the EDDIE diagnosis was matched with the laboratory confirmation of the case, but not in 7 (31.8%) of animals. In three diseased animals confirmation was not done due to lack of facility and due to difficulty in its confirmation. In the current study, The EDDIE smart phone played a key role in disease diagnosis, listing differential diagnosis and appropriate drugs were listed as a treatment lines. Generally a smartphone-based application improves the accuracy, Completeness, and Timeliness of livestock Disease diagnosis and Reporting; forwarding best option of treatment and applying this technology in disease diagnosis is recommended in future perspective.

5. CONCLUSION AND RECOMMENDATIONS

The existence of a wide range of infectious disease and parasites in all agro ecological zones of Ethiopia causes direct and indirect economic losses through high morbidity and mortality of animals and contributes to the poor reproductive performance of the animals. Therefore; accurate disease diagnosis is a prerequisite to observe disease outbreaks and implementing appropriate measures for their control and prevention. In the current case study; a number of disease according to their etiology bacterial, viral, metabolic, fungal, parasitic and others forms of disease were included in the study. Different species of animals with different sex and age were presented and examined in Veterinary teaching hospital and SPANA of College of veterinary medicine and agriculture, Addis Ababa University. In these study; the important point included was application of clinical case handling protocols during disease diagnosis, correct and best treatment with appropriate dose of drugs; and thorough follow-up of the patient which has a great role in reducing the impact of diseases on the animals, and economic loss due to mortality and reduction in productivity. Parallel to clinician diagnosis; a smart phone EDDIE was used as a diagnostic tool and the smart phone is very important for diagnosis purposes as it was observed well and in the future perspective it is better if applied in the field. However this smart phone has its limitation on the species of animals and recorded data of the disease. Parallel to antimicrobial therapy, supportive therapy was used and could minimize the animal suffering and hence facilitate the healing of the diseased animals. As a challenge the owner brought his diseased animals after the animal become weakened/emaciated, lack of some fluid therapy during treatment and lack of laboratory facilities, follow up during treatment are problems that detected during the study period in the study area. Based on the above conclusions; the following recommendations are forwarded;

- Awareness creation on early treatment of diseased animals for farmers.
- Veterinary teaching hospital need Inpatient care facilities and it should be constructed
- Animal health workers and farmers must get training on handling and management of diseased animals and avoiding cultural treatment of disease by farmers;
- The smartphone should include all species of animal and additional research should be needed in the future perspective.
- The laboratory should be fully accessed and other diagnostic tool should be installed.

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7 ANNEXES

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 & prevention: control methods prescribed, prevention and corrective management measures recommended _____

Annex 2: Clinical Examination Protocols, adapted 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.

Animal	$^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$
Horse	38
Cow	38.5
Sheep	39.5
Goat	39
Pig	39
Dog	39
Cat	38.5
Rabbit	39.3

Recording of Pulse Rate:

Usually the pulse rate is equal to the rhythmic contraction and expansion of heart. Increased pulse rate is common and occurs in most cases of septicaemia, toxæmia, circulatory failure, excitement and in pain stricken condition. Marked slowing of heart beat (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.

- * Normal pulse rate in a Horse is 28-45 beats per minute.
- * Normal pulse rate in a Dog is 80–120 beats per minute.
- * Normal pulse rate in a Cow is 55–100 beats per minute.
- * Normal pulse rate in a Sheep/Goat is 60-110 beats per minute.
- * Normal pulse rate in a Rabbit is 20–150 beats per minute.
- * Normal pulse rate in a Cat is 100–140 beats per minute.
- * Normal pulse rate in a Swine is 60-120 beats per minute

Recording of Respiration Rate

In cattle average respiration rate per minute is 12-30. Sometimes it goes from 15-30. 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.

- * Normal respiration rate in a Dog is 15–30 per minute.
- * Normal respiration rate in a Cow is 10–40 per minute.
- * Normal respiration rate in a Sheep/Goat is 10–30 per minute.
- * Normal respiration rate in a Rabbit is 50–60 per minute.
- * Normal respiration rate in a Cat is 20–30 per minute.
- * Normal respiration rate in a Swine is 8–18 per minute

Examination of Visible Mucous Membrane

This includes the examination of conjunctiva, buccal, nasal, vulval, vaginal and rectal mucosae. In normal and healthy condition of animals, the mucous membrane is moist and rosy in colouration. 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 discolouration: Signs of ecterus and hepatic disorder, jaundice.
- ☐ Pin point/Petechial haemorrhages: Indicates septicaemia, surra, phosphorus and arsenic poisoning.
- ☐ Cyanotic changes: Bluish discolouration owing to dyspnoea, hypoxia, venous stasis, congestive cardiac failure, pleurisy and nitrate poisoning.
- ☐ Ulcerations: Typical ulcers on oral mucous membrane seen in FMD, PPR and RP.
- ☐ Pinkish: Equine infectious anaemia.

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 toxæmia 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 Colour of Conjunctiva of Various Animals

Cattle and Buffalo	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 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 amount 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: Ways in which EDDIE works

The image displays two side-by-side screenshots of the EDDIE application interface. Both screens have a blue header with the text "EDDIE" in white. The left screen is titled "Animal Details for new Case" and shows a date field set to "30/06/2019", input fields for "Owner Name/ID" and "Animal ID", and a "Select Region" section with radio buttons for Addis_ababa (selected), Affar, Amhara, Benshangul, Gambela, Harer, Oromia, and Somalia. The right screen is also titled "Animal Details for new Case..." and shows a "Species" section with radio buttons for Cattle (selected), Camel, Sheep, Goats, Horse/Mule, and Donkey. Below this is an "Age" section with radio buttons for 0 - 6 months (selected), 7 - 12 months, 13 - 24 months, 2 - 4 years, and Older than 4 years. At the bottom is a "Breed" section with radio buttons for Cross (selected) and Exotic.

EDDIE

Select Symptoms

Anaemia/Pallor

☒ Unknown
☐ Present
☐ Absent

Anoroxia/Loss of appetite

☒ Unknown
☐ Present
☐ Absent

Ataxia/ Incoordination of movement

☒ Unknown
☐ Present
☐ Absent

EDDIE

Most likely Diagnosis.

☒ Anthrax : 6.25%
☐ Babesiosis : 6.25%
☐ Blackleg : 6.25%
☐ CBPP : 6.25%
☐ Colibacillosis : 6.25%
☐ Cowdriosis : 6.25%
☐ FMD : 6.25%
☐ Fasciolosis : 6.25%
☐ LSD : 6.25%
☐ Lungworm : 6.25%
☐ Pasteurellosis : 6.25%
☐ GI parasites : 6.25%
☐ Rabies : 6.25%
☐ Trypanosomosis : 6.25%
☐ Tuberculosis : 6.25%

EDDIE

Select Treatment.

☐ Penstrep (1ml/25 kg bw , 3 days, IM)
 * Shake well before use. Do not administer
 >20ml in cattle, >10ml in swine & >5ml in calves,
 sheep and goats per injection site. WP: Meat 10
 days & Milk 3 days

☐ Penstrep (1ml/20kg bw , 5 days, IM)
 * Shake well before use. Do not administer
 >20ml in cattle, >10ml in swine & >5ml in calves,
 sheep and goats per injection site

☐ Procaine penicillin G (22,000IU/kg bw, 3 days, IM
 or SC)
 * Allergic reactions might occur.

☐ Procaine penicillin G (22,000IU/kg bw, 5 days,
 IM)
 * Allergic reactions might occur.

Treatment Comment

Enter Your comment here..

Annex 4: Ethical clearance paper

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ADDIS ABABA UNIVERSITY
College of Veterinary Medicine
and Agriculture
Bishoftu/Debre Zeit

Animal Research Ethical Review Committee

Ethical clearance certificate

Certificate Ref. No: VM/ERC/32/07/09/2017

Name of Applicant: Tariku Jibat (DVM, MSc, PhD fellow)

Address: College of Veterinary Medicine and Agriculture, Addis Ababa University

Title of the project: Improving livestock disease diagnosis, treatment and surveillance in Ethiopia through development and evaluation of smart-phone based application

Date of application: 24/07/2017
Nature of the project: Mildly invasive
Target animal species: all livestock species
Number of animals involved: depends on case availability
Study area: Ethiopia

Minutes No. and date of review: VM/ERC/07/09/017, 15/08/2017

The above indicated research project is acceptable from ethical perspective, relevance, originality and technical competence points of view. Hence the project is allowed to be executed provided that:

1. All procedures and conditions stipulated in the proposal are respected and any deviation or changes be reported to the committee
2. The project activities be open for occasional supervision by the committee whenever this is deemed necessary

Dr Getachew Terefe
Chairman

Signature

Dr. Dinku Ayana
Dean

College of Veterinary Medicine
and Agriculture

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Please quote Our Ref. No. When replying

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Tel. +251 114338450

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Bishoftu/Debre Zeit, Ethiopia

Annex 5: Laboratory result from NVI for Lumpy skin disease

	NATIONAL VETERINARY INSTITUTE	Document No. NVI-QMS-QF-158		
		Effective Date 19/09/2014	Issue No. 4	Page No. 1 of 1
Title: - Laboratory Result Report Form				

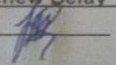
Client Name and Address: Addis ababa university, college of veterinary medicine and Agriculture

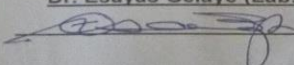
Sample History	Animal species	Sample type	Number of Samples	Origin of animals	Lab. Ref. No.
-	Bovine	Nodule suspension	1 (one)	-	MB 78/19

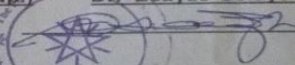
Date of Submission: - 04/04/2019
 Samples Collected By: - Customer
 Date of Examination: - 10/04/2019
 Date of Report: - 10/04/2019
 Report No: - MO-26/19
 Disease to Diagnose: - LSD antigen detection.
 Test Method/s Recommended: -
 Classical PCR & real time PCR
 Purpose: - LSD antigen detection.
 Type of test under taken: - Classical PCR & real time PCR
 Criteria for Positive Result: - Positive sample has around 172bp, 50.00°C /73.50°C

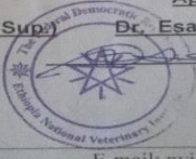
Number of positive samples	Number of negative samples	Total number tested
-	1 (one)	1(one)

ID of positive sample: - none

Tested By:
 Name: - Alebachew Belay
 Signatures: - 

Checked By:
Dr. Esayas Gelaye (Lab. Supv)


Approved By:
Dr. Esayas Gelaye (TM)




Tel: +251-11-433-8411/16
 Website: <https://www.nvi.com.et>

Fax: +251-11-433-9300
 P.O.Box:19, Debre-Zeit, Ethiopia

E-mail: nvi-rt@ethionet.et

Annex 6: Paper of confirmation for goat pox from NVI

	NATIONAL VETERINARY INSTITUTE	Document No. NVI -QMS - QF - 158		
Title: - Laboratory Result Report Form		Effective Date 19/09/2014	Issue No. 4	Page No. 1 of 1

Client Name and Address: Addis ababa university, college of veterinary medicine and Agriculture

Sample History	Animal species	Sample type	Number of Samples	Origin of animals	Lab. Ref. No.
-	Caprine	Nodule suspension	1 (one)	-	MB 79/19

Date of Submission: - 04/04/2019
 Samples Collected By: - Customer
 Date of Examination: - 10/04/2019
 Date of Report: - 10/04/2019
 Report No: - MO-27/19
 Disease to Diagnose: - GTP antigen detection.
 Test Method/s Recommended: -
 Classical PCR & real time PCR

Purpose: - GTP antigen detection.

Type of test under taken: - Classical PCR & real time PCR

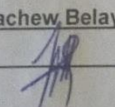
Criteria for Positive Result: - Positive sample has around 172bp, 56.00°C /72.50°C

Number of positive samples	Number of negative samples	Total number tested
1 (one)	-	1(one)

ID of positive sample: -01

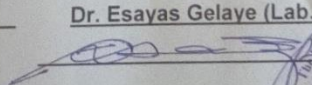
Tested By:

Name: - Alebachew Belay

Signatures: - 

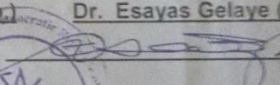
Checked By:

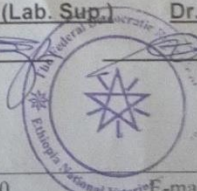
Dr. Esayas Gelaye (Lab. Sup.)



Approved By:

Dr. Esayas Gelaye (TM)





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P.O.Box:19, Debre-Zeit, Ethiopia

E-mail: nvi-rt@ethionet.et

Annex 7: Laboratory confirmation of Africa horse sickness from NVI

 NATIONAL VETERINARY INSTITUTE	Document No. NVI-QMS-QF-158		
	Title Laboratory Result Report Form	Effective Date 19/09/2014	Issue No. 4

Client Name: **welkite furgasa** Tel: **0921165829**
 Client address: **Debre Zeit** Test Report No: **VR12/19**

Sample History	Animal species	Sample type	Number of Samples	Origin of animals	Sample. Ref. No.
	Equine (Horse)	Whole blood	1	Debre zeit	VR240/18

Samples Collected By: **customer**
 Date of sample collection; 27/11/2018
 Date of Sample Submission to lab: 27/11/2018
 Date of Test Conducted: 17/04/2019
 Date of Test Report: 21/05/2019
 Test Method used

Virus Isolation on vero cell

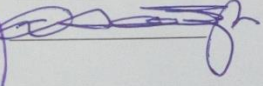
Purpose: To isolate Africa horse sickness (AHS) virus on vero cell
 Criteria for positive result: cytopathic effect (CPE) above 60%
 Test result:

Number of Positive Samples	Number of Negative Samples	Total Number Tested
1	0	1

ID of Positive samples:
 Opinion and Interpretation:
**This test result is related only to sample Reference Number mention on this Laboratory test result report form*

Tested By:
 Name: Hawa Mohammed (Lab technologist)
 Signature: 

Checked By:
 Name: Dr Teferi Degefa (Lab Sup)
 Signature: 

Approved By:
 Name: Dr Esayas Gelaye (TM)
 Signature: 



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<https://www.nvi.com.et> P.O.Box: 19, Debre-Zeit, Ethiopia

Annex 8: Recommended Gauge of needle for different animals

Recommended Needle Sizes			
	Subcutaneous (SQ)	Intramuscular (IM)	Intravenous (IV)
Dog & Cat	3/4" x 22 ga	1" x 22 ga	***
Horse	1" x 18 ga	1½" x 18 ga	1½" x 18 ga
Colt	3/4" x 20 ga	1" x 20 ga	1" x 20 ga
Cow	1" x 16 ga	1" x 16 ga	1½" x 16 ga
Calf	3/4" x 16 ga	1" x 16 ga	1" x 18 ga
Goat	3/4" x 22 ga	1" x 18 ga	***
Sheep	3/4" x 18 ga	1" x 18 ga	1" x 18 ga
Hog	3/4" x 18 ga	1" x 18 ga	2" x 18 ga
Sow	1" x 18 ga	1" x 18 ga	4" x 18 ga
Pig	½" x 20 ga	1" x 18 ga	1" – 1½" x 20 ga
Poultry	5/8" x 25 ga	3/4" x 22 ga	***