World Journal of Veterinary Science

ISSN: 2689-5951

Review Article

A Review on Ovine Pasteurellosis

*Yohannes Mekonnen**

College of Health Sciences, Mekelle University College, Mekelle, Ethiopia

Abstract

Ovine Pasteurellosis is one of the important infectious and a devastating condition affecting sheep of all age group that causes significant economic losses in Ethiopia. It is one of the most common causes of mortality in all age of sheep and most often associated with stress. Mannheimia haemolytica, Bibersteinia trehalosi and *Pasteurella multocida* are involved as etiological agents of the disease, which are commensally resident in the upper respiratory tract of healthy sheep and are capable of causing infection in animals with compromised pulmonary defense system. Ovine Pasteurellosis occurs worldwide but it is a particular problem in the tropics especially the hot, humid tropics where environmental stress is an important trigger mechanism of the disease complex. A wide variety of clinical signs, ranging from sudden death to occasional coughing, may occur in sheep affected with pneumonic pasteurellosis and it is frequently fatal. Field diagnosis can be made on the bases of the history, clinical signs, post-mortem gross pathological findings and epidemiological features, including species, age group season associated with management factors. Pasteurellosis represents diseases, amongst which is influenced by a wide variety of environmental and management risk factors. Chemoprophylactic measures for preventing Pneumonic Pasteurellosis are useful for preventing the outbreak of the disease, especially when disease provoking stress is consciously put up with. Application of long acting oxtetracycline before shipping animals over a long distance will protect the animals effectively against shipping fever. Management factors such as avoiding crowding, mixing of different flocks, and deprivation of feed and water, exposure to aerosol infection from other sheep and providing shelter especially during extreme weather condition reduce the outbreaks of the disease. Vaccines for M. haemolytica A2 have been against both septicemic and pneumonic forms of pasteurellosis gamma-irradiated *M. haemolytica* vaccine showed better protective efficacy than the commonly used formalin killed vaccine in laboratory animals as well as in sheep and hence could be potential alternative method of vaccine production against ovine pasteurellosis.

Keywords: Ovine; Pasteurellosis; Review; Risk factors

Abbreviations

CSA: Central Statics Agency; DNA: Deoxyribonucleic Acid; FAO: Food and Agriculture Organization; GDP: Gross Domestic Production; LPS: Lipopolysaccharide; OIE: World Animal Health Organization; OMP: Outer Membrane Protein; PCR: Polymerase Chain Reaction; RNA: Ribonucleic Acid; SPP: Species; URT: Upper Respiratory Tract

Introduction

Background

Having approximately 43.1 million cattle, 23.6 million sheep, and 18.4 million goats, Ethiopia has the largest number of livestock in Africa. Ethiopia's agricultural sector, of which livestock is a crucial component, is a major part of its economy [1]. And 17% of the National Gross Domestic Product and 39% of the Agricultural Gross Domestic Product (GDP) is directly contributed by the livestock sector [2].

The second largest group of livestock in Ethiopia is sheep, who are also very important to the country's economy. The two main protein sources are meat and milk, and a sizable number of exports are made up of hides, live animals, and carcasses. Their significance in the nation has grown due to the rising need for sheep meat, monetary income, and food security. Ethiopia has a significant population of livestock, but the economic benefits are still negligible because of a number of common diseases, inadequate nutrition, subpar animal production techniques, ineffective reproduction, management restrictions, and a general lack of veterinary care [3]. Among several diseases, ovine pasteurellosis is an important disease of sheep.

Ovine pasteurellosis is a respiratory disease that affects sheep and results in significant economic losses not only in Ethiopia but also globally. It is caused by *Pasteurella multocida*, *Mannheimia hemolytica*, and Bibersteinia trehalosi, which belong to the family *Pasteurellaceae* and genus *Pasteurella* [4]. Acute febrile incidents, severe fibrinous or fibrinopurulent bronchopneumonia, fibrinous pleurisy, and septicemia can all result from ovine pasteurellosis. Animals with the infection may pass away in a matter of days after exhibiting symptoms. Acute assault survivors may develop a persistent infection. Sheep and goats that are infected experience a high fever along with clinical signs of severe respiratory impairment, such as runny nose, coughing, dyspnea, and froth in the mouth. Adolescent animals are more vulnerable than mature ones, and they often experience more severe infections that can cause [5].

Small, gram-negative coccobacilli or rods belonging to the *Pasteurellaceae* family may exhibit bipolar staining. With very few exceptions, it is non-motile, non-spore-forming, and fermentative. Most of them create acid from ordinary sugar but not hydrogen sulfide gas. They ferment sugars like glucose, sucrose, and maltose. It grows quickly and can be facultatively anaerobic or aerobic [4]. It is oxidase and catalase positive, reduces nitrate to nitrite and urease negative. Its growth on artificial media is enhanced by the addition of serum or blood on which they appear after 24 hours of incubation as round, smooth, greyish colonies of moderate size (1 mm-2 mm in diameter). Although non-enriched media will support their growth, these organisms grow best on media supplemented with blood or serum [5].

Citation: Yohannes M. A Review on Yersiniosis. World J Vet Sci. 2024; 4(1): 1022.

Publisher Name: Medtext Publications LLC

Manuscript compiled: Jun 04th, 2024

***Corresponding author:** Yohannes Mekonnen, College of Health Sciences, Mekelle University College, Mekelle, Ethiopia

Infected animals and the environment are the source of infection and transmission of bovine pasteurellosis occurs by inhalation of infected droplet, coughed up or exhaled from infected animals which may be clinical case or recovered carriers in which the infection persist in the upper respiratory tract [6]. *Pasteurella multocida* and *Mannheimia haemolytica* are highly susceptible to environmental influences and it is unlikely that mediated contagion is an important factor in the spread of the disease. When conditions are optimal, particularly when sheep are closely confined in inadequately ventilated or held for long periods in holding pens and feed lots, the disease may spread very quickly and affect high proportion of the herd within short period of time because of the activation (virulence) of bacteria in favorable conditions [6].

The virulence of *M. haemolytica* and *P. multocida* is mediated by the action of several factors, including endotoxin, leukotoxin and capsular polysaccharide that afford the bacteria advantages over host immunity. The leukotoxin is particularly important in the pathogenesis, because it is specifically toxic to ruminant leukocytes, resulting in fibrin deposition in lungs and on pleural surfaces [7]. The lipopolysaccharide endotoxin contributes to adverse reactions in the lungs and also leads to systemic circulatory failure and shock. The capsular polysaccharide prevents the phagocytosis of the bacteria and assists in (pathogenesis) attachment to the alveolar epithelial surface [8]. Sheep that recover may have chronic respiratory problems, including reduced lung capacity and weight gain efficiency if greater than 20% of the lung was damaged [9].

A wide variety of clinical signs, ranging from sudden death to occasional coughing, may occur in sheep affected with ovine pasteurellosis. Clinical manifestations of acute respiratory distress usually develop within 10-14 days in adult animals after being exposed to stress but a much earlier onset is more typical. In acute outbreaks, the clinical course of the disease is relatively short (2-3 days) terminating in death or recovery in either treated or non-treated animals [5]. Infected animals appear extremely dull with reduced appetite and remarkable depression, weight loss, high fever (40°C-42°C (>104°F) range, coughing, dyspnoea, mucopurulent nasal discharge and anorexia that commonly develops when the immune system of the animal is compromised by stressor factors [5]. Clinical signs are very significant in the diagnosis of pasteurellosis.

The primary diagnostic criteria for pasteurellosis include post mortem findings, laboratory results, and clinical signs and symptoms. The process of isolating and identifying the causal agent yields a confirmatory diagnosis. Over time, numerous laboratory diagnostic methods for pasteurellosis have been developed and are frequently employed in the laboratory. The diagnosis is simple if bacteriology is done correctly. It is feasible to identify the pasteurellosis-causing agent from a clinical specimen utilizing culture techniques, serological testing, Polymerase Chain Reaction (PCR), and other non-traditional techniques [10].

Broad-spectrum antibiotics are used in the antimicrobial medication therapy of O. pasteurellosis, which will aid in the bacteria's eradication. Animals should get them systemically, usually *via* injections. The inoculation region should be well disinfected in addition to this basic therapy [11]. Antimicrobial drugs represent the most powerful tools to control such infections. However, increasing rates of antimicrobial resistance may markedly reduce the efficacy of the antimicrobial agents used to control *Pasteurella* and *Mannheimia* infections [12]. Management control factors such as avoiding crowding, mixing of different flocks, and deprivation of feed and water, exposure to aerosol infection from other sheep and providing shelter especially during extreme weather conditions reduce the occurrence of the outbreaks of disease [13].

Vaccination is the best alternative practical control and prevention strategy to reduce the incidence and burden of the disease and to minimize antimicrobial use [14]. Currently, several vaccine types exist against pasteurellosis globally. Problems with vaccination arise where there is more than one serotype circulating, due to the lack of cross-protection [15]. At present, only a monovalent P. multocida serotype A vaccine is commercially available in Ethiopia [16]. Although *P. multocida* serotypes A and D [14] and 11 serotypes belonging to M. haemolytica have long been detected. Consequently, repeated outbreaks are reported in Ethiopia [15,17]. even among vaccinated sheep and goats, which practitioners and communities ascribe to vaccine failure.

Ethiopia recorded the highest number of outbreaks, cases and death in Africa according to AU-IBAR 2011 reports. Also, some different studies conducted in Ethiopia indicated that pasteurellosis is a major threat to sheep production. The different studies conducted in Ethiopia indicated that pasteurellosis is a major threat to sheep production. Some of these studies were those in Amhara Regional State particularly Debre Birhan [18]. West Amhara [14] and South Wollo [19]. Haramaya District of Eastern Hararghe [17] and Oromia Regional State particularly selected sites of Arsi Zone [20] and East Shewa Zone [21] but there is no study conducted in selected districts of Wolaita Zone Southern, Ethiopia.

The economy of Ethiopia depends heavily on sheep, which make up the second-largest animal group in the nation. Meat and milk are the two main sources of protein, and a significant portion of exports include hides, live animals, and corpses. Their significance in the nation has grown as a result of rising demand for sheep meat, cash income, and food security. However, ovine pasteurellosis is a common respiratory disease with economic consequences that can lead to animal mortality and induce acute pneumonia outbreaks in sheep of all ages. The disease will eventually spread among animals when they are exposed to environmental stressors such as extreme heat or cold, poor ventilation, transportation, a shortage of food or water, or a concurrent infection. Thus, ovine pasteurollosis is a top concern at the national level due to the significant economic losses through morbidity, mortality and high cost of treatment.

The livestock production system, especially the sheep production, is the most important issue in Sodo Zuriya District of Wolaita zone, where sheep are the main sources of income and food. Sodo Zuriya is a large, place in the Zone and majority of the people live concentrated. The district is also a highly populated area in the Zone. The demand of sheep and their product is coming greater and greater. But Production constraints, mainly respiratory problems, make a bottle neck in its Productivity. Ovine Pasteurollosis is very important disease to farmers and affects the production and productivity of sheep. It increases cost of production, lowers production level, reduces the quality and quantity of animal products and generally causes great loss to the farmers in the study area. These indicate the presence of complexity and dynamic epidemiological situation of the disease in the study area. There is no information concerning the cost-effective prevention and control methods, prevalence of bovine pasteurellosis and associated risk factors to the prevalence in the study district. Therefore, it is important to generate useful information on the prevalence of ovine

Pasteurollosis and determinants in the study area and to assess the knowledge of farmers in the district. Moreover, no investigation has been done on the prevalence and risk factors of ovine Pasteurollosis in the present study area, which gave impetus to the initiation of this study. Thus, the objective of this study is to identify etiology, epidemiological, pathogenesis, clinical signs, treatment, and control and prevention of ovine pasteurellosis and associated risk factories.

Objectives

General objectives:

- To carry out etiology, epidemiological, pathogenesis, clinical signs, treatment, and control and prevention of bovine pasteurellosis and associated risk factories

Specific objectives

- To identify etiology, epidemiological, pathogenesis, clinical signs, treatment, and control and prevention
- To identify associated risk factors

Ovine Pasteurellosis

Etiology

In healthy sheep and goats, *M. haemolytica*, *B. trehalosi*, and *P. multocida* are prevalent commensals of the tonsils and nasopharyngeal microbiota. Their pleomorphic nature results in small (0.2 × 1 μm-2 μm) non-motile, nonsporing, fermentative, Gram-negative rod and *coccobacilli* that cause cranioventral bronchopneumonia in sheep and goats of all ages across the world. The majority of the species are catalase-positive, and they are oxidase-positive [22]. These organisms grow best on media supplemented with blood or serum, yet non-enriched media will sustain their growth as well. Pasteurella, named for Louis Pasteur, was the previous genus under which they were categorized. However, the majority of the previously described species underwent extensive revision and reclassification as a result of more recent advances in molecular biology, including DNA hybridization and the sequencing of 16S rRNA. Regarding this, *P. hemolytica*, biotype A was allocated to a new genus and renamed Mannheimia. On the other hand, *P. haemolytica* biotype T was first reclassified as *P. trehalosi* (Bibersteinia). All serotypes of *M. hemolytica* and *P. multocida* can be involved in pneumonic pasteurellosis (Figure 1) [5].

Epidemiology

Geographic distribution and occurrence: Although ovine pasteurellosis is a global issue, it is particularly problematic in the tropics, particularly the hot and humid ones where environmental stress plays a significant role in the disease complex's trigger mechanism. The microorganism is most commonly found in countries in Asia and Africa where sheep or goat breeding is common. In Europe, pasteurellosis is prevalent in many regions with a high concentration of sheep and cattle, including the Netherlands, Germany, Italy, and France [23]. Pneumonic pasteurellosis is common in highlands and also in lowland hot and humid areas with high morbidity and mortality, *P. multocida* has a wide host range whereas *M. haemolytica* is largely restricted to ruminants and *B. trehalosi* to sheep [5].

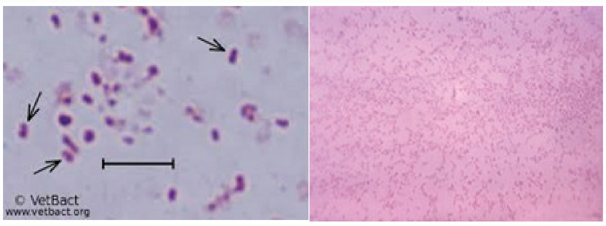

Figure 1: *M. hemolytica* and *P. multocida*.

Ovine pasteurellosis is frequently referred to as a complicated disease and is believed to be caused by Pasteurellaceae invading the lung once the respiratory tract's defensive mechanisms are compromised. Common commensal organisms found in the tonsils and nasopharynx of healthy sheep is *M. haemolytica* and *P. multocida*. Under some conditions, the bacteria can proliferate rapidly, invading the lungs or erupting from the tonsils to become systemic and cause a variety of pasteurellosis forms [24]. The trigger factors causing pneumonic pasteurellosis are stress (e.g., dipping, castration, clipping, docking…etc.), climate (e.g., warm and cold, wet and windy weather) and other infectious diseases. It is believed that these factors seem to alter the Upper Respiratory Tract (URT) epithelium allowing the sequential down-regulation of local pulmonary defense mechanisms such as ciliation and mucous production, resulting in the agent colonizing, escaping clearance in the nasopharynx, and moving to the lungs by gravitational drainage [17].

When lambs and kids are at danger and sheep and goats exhibit clear signs of respiratory disease, an acute epidemic of pneumonic pasteurellosis in their flock typically starts with one or more fatal cases. These latter suffer greatly from dyspnea and high temperatures (over 40°C), and if you look at the rest of the flock, you'll see that they have a mild respiratory illness that manifests as coughing and oculonasal discharges [25].

Source of infection and modes of transmission: The source of the infection is diseased animals and their surroundings. Pasteurella are most likely spread by inhaled droplets, coughed up by infected animals, or exhaled by carriers who have recovered but still have the virus in their upper respiratory tract. Remarkably, serotyping is most frequently isolated from the tonsils and nasopharynx of seemingly healthy animals, which are home to *M. haemolytica* [24].

Pasteurella multocida and *Mannheimia haemolytica* are highly susceptible to environmental influence and it is unlikely that mediated contagion is an important factor in the spread of the disease. When conditions are optimal, particularly when animals are closely confined in inadequately ventilated trains or held for long periods in holding pens and feedlots, the disease may spread very quickly and affect a high proportion of the herd within 48 hours [15].

Risk factors contributing to the epidemiology:

Agent risk factors contributing to the epidemiology: Several virulence factors have been identified both for *P. multocida* and *M. haemolytica* and these virulence factors influence the outcome of bacteria-host interactions. Among the major virulence components of *M. haemolytica* and *P. multocida* are the polysaccharide capsule, OMP, LPS, fimbriae, adhesions, extracellular enzymes and other factors that are still to be investigated and elucidated [6].

The severity of lesions, however, depends on the rate and extent of bacterial proliferation and the amount of endotoxin released, which in turn depends on the virulence of the bacterial strain and the degree to which the defenses of the host are impaired [26]. The cell capsule constitutes an important virulence factor which plays vital roles in the pathogenicity of pathogenic bacteria and establishment of infection. The virulence mechanism of the cell capsule is mostly attributed to its ability to protect the invading organism against cellular and humoral defense mechanisms of the host [26]. The capsular materials of *M. haemolytica* and other Pasteurella species were identified as polysaccharide basic structures produced during the logarithmic phase of growth of the bacteria. Each serotype of *M. haemolytica* produces a characteristic polysaccharide capsule in order to avoid phagocytosis by macrophages and polymorphonuclear leukocytes and to protect the organism against complement-mediated destruction of the outer membrane in serum

Many Gram-negative bacteria have tiny appendages on their surface called fimbriae. These are particular bacterial cell wall surface features that facilitate or improve adhesion to and colonization of the target epithelium in the susceptible animals. Different strains of *Pasteurella* and *Mannheimia* species contain fimbriae. Like all other Gram-negative bacteria, *M. haemolytica* has an endotoxin called Lipopolysaccharide (LPS) in its cell wall. One of the most significant virulence factors in the pathophysiology of pneumonic pasteurellosis is this endotoxin [26].

Host risk factors contributing to the epidemiology: Disease progression is thought to depend on a complex interaction of host factors including species, age, breed and immune status, and strain-dependent virulence factors of the agent such as production of toxins, adhesins and mechanisms for acquiring nutrients from the host [6]. Bronchopneumonia caused by *P. multocida* or *M. haemolytica* has a cranioventral lung distribution and affects sheep of all ages worldwide. It can be particularly devastating in young animals. It is a common cause of morbidity and mortality in lambs, especially in those that have not received adequate colostrum or in which passive colostral immunity is waning. Affected animals often die if not treated [6].

Bronchopneumonia caused by *P. multocida* or *M. haemolytica* has a cranioventral lung distribution and affects all ages of animals worldwide. It can be particularly devastating in young animals. It is a common cause of morbidity and mortality in young, especially in those that have not received adequate colostrum or in which passive colostral immunity is waning. The reasons for increased susceptibility to *M. haemolytica* infection in stressed animals are primarily attributed to the breakdown of innate pulmonary immune barriers by stress [6].

Environmental risk factors contributing to the epidemiology: *Mannheimia haemolytica* and *P. multocida* occur as commensals in the upper respiratory and alimentary tracts of their various hosts. Although varieties of some species cause primary disease, many of the infections are secondary to other infections or result from various environmental stresses. The effects of different environmental stressors are believed to be important components of risk factors for pasteurellosis in many domestic ruminants. Although the effects of stressors are difficult to measure, some indicators including increased body temperature, heart rate, respiratory rate and plasma cortisol have been correlated with disease. The disease appears to occur most often in animals that have undergone recent stresses such as transportation, weaning, or commingling with animals from unrelated farms [6].

Physiological reactions to stress (referred to as the "system"); as a result, extended stress may make a person more vulnerable to infections, illness, and death. Pneumonic pasteurellosis in livestock is most frequently linked to environmental stressors such as heat, cold, wind, chill, humidity, crowding, and mixing with new animals. Other environmental stressors include inadequate ventilation in barns, handling, transporting, and deprivation of feed and water. Immunity may potentially be further weakened by other predisposing factors, such as insufficient protein or energy, insufficient ingestion of colostrum, certain vitamins, or certain minerals [6].

Clinical signs/symptoms

A wide variety of clinical signs, ranging from sudden death to occasional coughing, may occur in sheep affected with pneumonic pasteurellosis and it is frequently fatal [6]. Acute pneumonia caused by *M. haemolytica* is uncommon in adult sheep, unless there is a predisposing problem such as ovine pulmonary adenocarcinoma or other viral infection. Affected sheep often appear depressed, lethargy with a nasal discharge, exhibit inappetance and weight loss, have high temperatures (40.4°C-42°C) and are consistent with profound endotoxemia. Most cases occur during the first two weeks after transportation and the course of disease can be rapid with death occurring before the above clinical signs of disease are observed (Figure 2) [6].

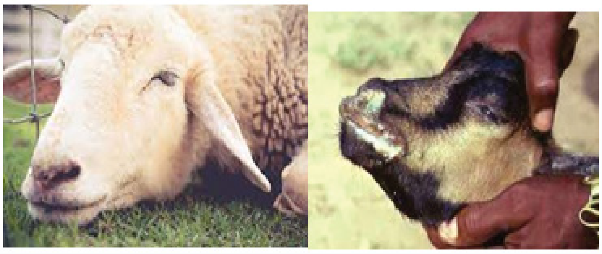

Figure 2: Pneumonic pasteurellosis in sheep and goats.

Diagnosis

Field diagnosis: Field diagnosis can be made on the bases of the history, clinical signs, post-mortem gross pathological findings and epidemiological features, including species, age group season associated with management factors. Clinical symptoms including dyspnea, frothing in the mouth, occulonasal discharge, cough and fever ranging from 40.6°C-42.6°C are the most prominent symptoms [27].

Bacteriological diagnosis: By culturing lung or nasal swap specimens that have been pre-enriched in tryptose-Soya broth for 24 hours at 37°C, pasteurella can be isolated. After the culture is gathered, it is streaked onto blood agar (which contains 5% sheep blood) and incubated aerobically for 24 hours at 37°C [23]. Then typical colonies subjected to gram' s staining and cellular morphology under light microscope mixed and gram negative, *coccobacilli* bacteria will further sub cultured on both blood agar containing 5% sheep blood and MacConkey agar for isolation and characterization. Presence of haemolysis, the type of haemolysis, the general appearance of colonies will be analyzed and followed by biochemical and molecular tests for identification and characterization [28].

Serological techniques: Serotype differentiation is based on sugar composition of the capsule as well as the composition of LPS component of the cell membrane [27]. Indirect Hemagglutinin on test (IHA), Rapid slide/plate agglutination test and agar gel immuno diffusion test are common serological tests applied in diagnosis [23].

Molecular identification: Conventional Polymerase Chain Reaction (PCR) has been proved valuable to overcoming some limitations of the conventional biochemical and serological methods and better sensitivity and rapidity [23].

Post mortem changes and histopathological lesions: Among infected small ruminants with bovine pasteurellosis, the most noticeable gross lesions that can be found are the marbling of the lung, presence of excess straw-coloured fluid in the thoracic cavity, as well as the appearance of frothy exudates in the trachea, bronchi and damaged lungs surface [29]. Pulmonary lesions are always bilateral with the distribution of cranioventral, while the most affected portions are below the horizontal line generally by the trachea bifurcation, apical and the cardiac lobes. Infections affecting large parts of the diaphragmatic lobe may be more common in severe cases [26]. Furthermore, fibrin and oedema fluid accumulation areas in interlobular septa and alveoli are the most evident lesions. The lesions consisted of congestion, consolidation, hardness, raised red to bronze areas up to 1 cm in diameter and fibrinous pleuritis [30]. Acute fibrinous haemorrhagic pneumonia with pleurisy adhesions, however, is the basic post mortem lesions. Besides, numerous areas of coagulative necrosis are commonly found within the portions of the pneumonic lung parenchyma appearing in irregular shape and clearly demarcated with white borders that are thick and have deep red central zone (Figure 3) [26].

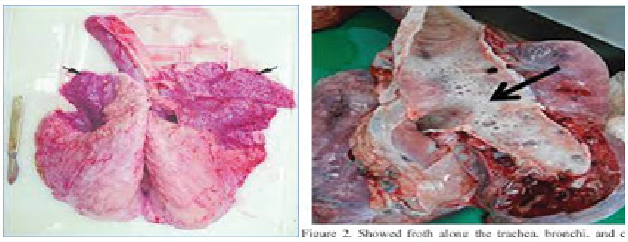

Figure 3: Showed Pneumonic lungs and Trachea.

Prevention and control approaches

Management: Pasteurellosis is an example of a disease that is impacted by numerous environmental and managerial risk factors. Thus, it is crucial to lessen or perhaps completely eradicate these risk factors. Disease outbreaks are decreased by management practices include preventing crowding, mixing flocks, depriving sheep of grain and water, exposing them to other sheep's aerosol infections, and offering shelter, particularly during severe weather [13].

Chemotherapy: Chemoprophylactic therapies against Pneumonic Pasteurellosis are effective in stopping the disease's spread, particularly when illness-inducing stress is voluntarily tolerated. In order to effectively prevent shipping fever in animals, long-acting oxtetracycline should be used prior to long-distance shipping. During an unexpected outbreak, the only method to quickly treat the infection and stop it from spreading to other animals or the herd is to provide the antibiotic chemoprophylaxis of pasteurellosis. In these situations, the previously administered hyperimmune serum is replaced with chemoprophylaxis [31].

Vaccination/immunoprophylaxis: Experimental study indicated that vaccine against *M. haemolytica* A1 provides little or no cross-protection against *M. haemolytica* A2. Vaccines for *M. haemolytica* A2 have been against both septicemic and pneumonic forms of pasteurellosis gamma-irradiated *M. haemolytica* vaccine showed better protective efficacy than the commonly used formalin killed vaccine in laboratory animals as well as in sheep and hence could be potential alternative method of vaccine production against ovine pasteurellosis [13]. Gamma irradiated vaccines appear to be more effective than formalin killed vaccines against disease, and has the added advantage of a longer storage life than "live" vaccines [13]. In Ethiopia, recent studies indicated that most cases of ruminant pasteurellosis are caused by *M. haemolytica* and a monovalent vaccine inactivated *P. multocida* biotype B in bovine and inactivated *P. multocida* biotype A in ovine is being used for vaccination against pasteurellosis which cannot match to the actual causative agent [23].

Status of Ovine Pneumonic Pasteurellosis in Ethiopia

Several studies have been conducted in Ethiopia to determine the extent of the problem and the relative distribution of different biotypes and serotypes of *pasteurella* species [31,32]. The prevalence of pneumonic pasteurellosis in ruminants is found to be high and 11 of the known 17 serotypes of *M. haemolytica*, *M. glucosida* and *B. trehalosi* has so far been isolated and identified in ovine in central, northeastern and southeastern high lands of Ethiopia [31].

In the Milae district of the Afar region, there has been an outbreak of infectious acute respiratory illness in sheep and goats. The morbidity and death rates of 750 goats and 722 sheep, respectively, were 22% and 32% and 57% and 53%, respectively, out of four flocks. In the sheep population, the case fatality rate had reached 38%, while in the goat population, it had reached 59%. Sheep and goat nasal swabs, lung, and pleural fluid were used to isolate *M. haemolytica* biotype T. The most prevalent serotypes of *M. haemolytica* in the nation are A1 and A2. The studies indicated that pneumonic pasteurellosis is a major threat in the highlands and in the lowland hot and humid areas with high death and illness to domestic ruminant production [31].

Conclusion and Recommendations

Bovine Pasteurellosis is one of the important infectious and a devastating condition affecting sheep of all age group that causes significant economic losses in Ethiopia. It is one of the most common causes of mortality in all age of sheep and most often associated with stress. *Mannheimia haemolytica*, *Bibersteinia trehalosi* and *Pasteurella multocida* are involved as etiological agents of the disease, which are commensally resident in the upper respiratory tract of healthy sheep and are capable of causing infection in animals with compromised pulmonary defense system. Bovine Pasteurellosis occurs worldwide but it is a particular problem in the tropics especially the hot, humid tropics where environmental stress is an important trigger mechanism of the disease complex. A wide variety of clinical signs, ranging from sudden death to occasional coughing, may occur in sheep affected with pneumonic pasteurellosis and it is frequently fatal. Field diagnosis can be made on the bases of the history, clinical signs, post-mortem gross pathological findings and epidemiological features, including species, age group season associated with management factors. Based on the above conclusion the following recommendations are made:

- Awareness creation should be made for owners about treatment, and control and prevention mechanisms
- Proper management systems such as feeding, should be made
- Vaccination of animals should be made

References

1. Ayelet G, Gelaye E, Negussie H, Asmare, K. Study on the epidemiology of foot and mouth disease in Ethiopia. Rev Sci Tech. 2012;31(3):789-98.

2. Mohammed Z, Aliy A, Jibril Y, Negussie H. Epidemiological and clinical characteristics of the foot and mouth disease outbreaks in cattle in central. Ethiopian

Vet J. 2022;26(1):105-21.

3. Mengstie F, Gizaw H, Tesfaye D. Prevalence of Ovine Pasturellosis and In-Vivo Evaluation of the Level of Protective Antibody Titer before and after Ovine Pasteurollosis Vaccination in Bonga Sheep. Global J Sci Front Res: D Agri Vet. 2016;16(7):2249-4626.

4. Abdu F, Yune N, Ahimad M, Edao A, Hailu T, Aliyi M, et al. A Study on Ovine Pneumonic Pasteurellosis : Isolation and Identification of Pasteurellae and Their Antibiotic Susceptibility Test in Bishoftu District , Elfora Abattoir, Ethiopia. Res Rev J Vet Sci. 2022;6(4):1-13.

5. Abera D, Mossie T. A review on pneumonic pasteurellosis in small ruminants. J Appl Animal Res. 2023;51(1):1-10.

6. Taye M, Asefa M, Mohammed N, Desa G. Ovine Pneumonic Pasteurellosis. American-Eurasian J Sci Res. 2019;14(4):64-76.

7. Legesse A, Abayneh T, Mamo G, Gelaye E, Tesfaw L, Yami M, et al. Molecular characterization of Mannheimia haemolytica isolates associated with pneumonic cases of sheep in selected areas of Central Ethiopia. BMC Microbiol. 2018;18:1-10.

8. Babetsa M, Sandalakis V, Vougidou C, Sivropoulou A, Psaroulaki A, Ekateriniadou LV. Tetracycline resistance genes in Pasteurella multocida isolates from bovine, ovine, caprine and swine pneumonic lungs originated from different Greek prefectures. Afr J Pig Farm. 2020;8(3):1-7.

9. Scott P. Antibiotic Treatment Response of Chronic Lung Diseases of Adult Sheep in the United Kingdom Based upon Ultrasonographic Findings. Vet Med Int. 2014:2014:537501.

10. Sebbar G, Zro K, Kichou F, Maltouf AF, Belkadi B. Isolation and Identification of. J Agri Sci Technol. 2018;8(6):398-405.

11. Kebkiba B. Epidemiology of Pasteurellosis in Small Ruminants. Acta Sci Microbiol. 2021;4(12):46-51.

12. Berhe K, Weldeselassie G, Bettridge J, Christley RM, Abdi RD. Small ruminant pasteurellosis in Tigray region, Ethiopia: marked serotype diversity may affect vaccine efficacy. Epidemiol Infect. 2017;145(7):1326-38.

13. Nuvey FS, Arkoazi J, Hattendorf, Mensah GI, Addo KK, Fink G, et al. Effectiveness and profitability of preventive veterinary interventions in controlling infectious diseases of ruminant livestock in sub-Saharan Africa : a scoping review. BMC Vet Res. 2022;18(1):332.

14. Asfaw M, Senbit M, Yesuf M, Dagnaw M, Abat AS, Ibrahim SM, et al. A Preliminary Investigation on a Commercial Ovine Pasteurellosis Vaccine Using Clinical and Pathological Endpoints. Infect Drug Resist. 2022:15:2937-48.

15. Kahsay YT. Review on the Pneumonic Pasteurellosis of Cattle in. Int J Adv Res Bio Sci. 2022;9(5-2022):39-50.

16. Ferede Y, Mekuriaw S, Mazengia H, Amane A. Sero-typing and evaluation of the level of protective antibody titer in northwest ethiopian sheep before and after ovine pasteurollosis vaccination. Int J Pharm Med & Bio. Sc. 2013;2(4):57-64.

17. Marru HD, Anijajo TT, Hassen AA. A study on Ovine pneumonic pasteurellosis : Isolation and Identification of Pasteurellae and their antibiogram susceptibility pattern in Haramaya District, Eastern Hararghe, Ethiopia. BMC Vet Res. 2013:9:239.

18. Abera D, Sisay T, Birhanu T. Isolation and identification of Mannhemia and Pasturella species from pneumonic and apparently healthy cattle and their antibiogram susceptibility pattern in Bedelle District , Western Ethiopia. J Bacteriol Res. 2014;6(5):32-41.

19. Alemneh T, Tewodros A. Sheep and goats pasteurellosis : Isolation, identification, biochemical characterization and prevalence determination in Fogera Woreda, Ethiopia. J Cell Animal Biol. 2016;10(4):22-9.

20. Getnet K, Abera B, Getie H, Molla W, Mekonnen SA, Megistu BA, et al. Serotyping and Seroprevalence of Mannheimia haemolytica, Pasteurella multocida, and Bibersteinia trehalosi and Assessment of Determinants of Ovine Pasteurellosis in West Amhara Sub-region, Ethiopia. Front Vet Sci. 2022:9:866206.

21. Haji S, Abunna F. Epidemiology of Ovine Pasteurollosis in Lume District , East Shewa Zone of Oromiya Region , Ethiopia. J Biol Agri Healthcare. 2016;6(15):12-20.

22. Carter GR, Cole JR. Diagnostic Procedure in Veterinary Bacteriology and Mycology. 1990.

23. Jilo K, Belachew T, Birhanu W, Habte D, Yadeta W, Giro A. Pasteurellosis Status in Ethiopia: A Comprehensive Review. J Trop Dis Public Health. 2020;8(4):1-5.

24. Disasa WK, Beyene DM, Gamtessa AA, Gamtessa AY, Akasa TU. Review on pneumonic pasteurellosis in cattle. Global Sci J. 2020;8(9):1694-708.

25. Jesse FFA, Boorei MA, Chung ELT, Won-Nor F, Lila MAM, Norsidin MJ, et al. A Review on the Potential Effects of Mannheimia haemolytica and its Immunogens on the Female Reproductive Physiology and Performance of Small Ruminants. J Animal Health Prod. 2020;8(3):101-12.

26. Mohamed RA, Abdelsalam EB. A Review On Pneumonic Pasteurellosis (Respiratory Mannheimiosis) With Emphasis On Pathogenesis , Virulence Mechanisms And Predisposing Factors. Bulgarian J Vet Med. 2008;11(3):139-60.

27. Ahmed WA, Mohammed RJ, Khalaf IA. Molecular and Phenotypical Characterization of Mannheimia haemolytica Isolated from Goats in Baghdad Province. Adv Micobiol. 2017;7(4):304-14.

28. Akane AE, Alemu G, Tesfaye K, Ali DA, Abayneh T, Kenubih A, et al. Isolation and Molecular Detection of Pasteurellosis from Pneumonic Sheep in Selected Areas of Amhara Region, Ethiopia: An Implication for Designing Effective Ovine Pasteurellosis Vaccine. Vet Med (Auckl). 2022:13:75-83.

29. Firdaus F, Jesse A, Amira NA, Isa KM, Maqbool A, Ali NM, Chung ELT, et al. Association between Mannheimia haemolytica infection with reproductive physiology and performance in small ruminants : A review. Vet World. 2019;12(7):978-83.

30. Firdaus F, Jesse A, Lim E, Chung T, Abba Y, Bitrus AA, et al. Clinical management of stage I pinkeye with concurrent pneumonic pasteurellosis in a goat : A case report. J Adv Vet Animal Res. 2017;4(4):390-3.

31. Kabeta T, Zenebe T, Kebede G, Fikadu T. Review on the Pneumonic Pasteurellosis of Cattle. Acad J Animal Dis. 2015;4(3):177-84.

32. Zuriaworeda S, Zone W. Determinants of Saving in Rural Saving and credit. Int J Sci Res Pub. 2022;12(7):86-91.