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Research article

Evaluation of Management Strategies for Reducing Pasteurellosis Burden in Lambs in Southern Libya

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Abstract
In this study, 342 imported male lambs were investigated for pasteurellosis. The lambs' ages ranged from 5 to 7 months. Before exportation, lambs were reared on dry pastures and there were no vaccination records for the animals. Lambs were classified into 4 groups (A, B, C and D) according to the management and medications received. The number of animals allocated in the four groups was 150, 13, 79 and100 respectively. Group A received multivitamins intramuscularly after transportation, and was treated with 3% oxytetracycline (90mg/10kg body weight (BW)) intramuscularly for seven days from outbreak occurrence. Group B was treated with 33% sulphadimidine (1130mg/10kg BW) intramuscularly for three days as a first treatment, followed by 20% tylosin (200g/10kg BW) intramuscularly for two days. Group C was treated randomly with one dose of 3% oxytetracycline (90mg/10kg BW) intramuscularly, one dose of 33% sulphadimidine (1130mg/10kg BW) intramuscularly and one dose of tylosin (200mg/10kg BW) intramuscularly followed by two injections of 20% oxytetracycline (200mg/10kg BW intramuscularly). Group D was treated with three doses of oxytetracycline (200mg/10kg BW intramuscularly) for 5 days. Diarrhea was observed in all groups. In addition, bloody diarrhea was also noted in group A. The 3% oxytetracycline was administered orally to the diarrheic animals and the highest mortality rate was seen in the group which did not receive any dose of oxytetracycline. The group of animals which shown bloody diarrhea and was treated orally with 3% oxytetracycline and with oxytetracycline intramuscularly showed health improvement. Good management including good shelter and nutritional supplements containing multivitamins and minerals are beneficial for feedlot lambs. Systemic administration of 2 to 3 prophylactic doses of oxytetracycline (90mg/10kg BW) within 7 to 10 days after transportation along with oral administration of 3% oxytetracycline for diarrheic lambs could decrease the incidence of pasteurellosis and reduce the mortality rate.

Keywords: Ruminants, *Pasteurella*, pneumonia, Septicemia, Multivitamins, Al-Gatroun

Introduction

Pasteurellosis is a serious devastating infectious disease of ruminants causing high economic losses worldwide (Mohamed & Abdelsalam, 2008), due to high morbidity and mortality rates (Alemneh & Tewodros, 2016) and high treatment cost (Hussain, Mahmood, Ali, & Siddique, 2017).The disease is caused by anaerobic, gram-negative, nonmotile coccobacillus known as *Pasteurella* (Mohamed & Abdelsalam, 2008). The micro-organism is a normal habitant of the upper respiratory tract of mammals (Gilmour *et al.*, 1974). Stresses brought by factors such as overcrowding, heat, poor ventilation, exposure to inclement weather, handling and transport predispose to pneumonic pasteurellosis (Brogden *et al.*, 1998). Different serotypes of *Pasteurella* including *Pasteurella haemolytica* are implicated in pathogenesis of respiratory tract infection. *Pasteurella multocida* and *Pasteurella haemolytica* work as secondary invader to earlier viral infections (Mohamed & Abdelsalam, 2008), producing fibrinous pneumonia (Ribble *et al.*, 1995) associated with high fever, dullness, anorexia, rapid respiration, nasal and ocular mucopurulent discharge (Mohamed & Abdelsalam, 2008). This illness appears in both septicemic form in young animal and pneumonic form in adults (Abera & Mossie, 2023). Several virulence factor such as capsule, leukotoxin, outer membrane protein, adhesion and lipopolysaccharide and various proteases are involved in pathogenesis of the disease through invasion of the immune system. For instance; leukotoxin targets ruminant leucocytes and induces leucocyte death (Clinkenbeard *et al.*, 1989).

To avoid losses due to pneumonic pasteurellosis, it is recommended to reduce stresses up on animals during transportation and after arriving to their destination; avoiding hard driving and overcrowding during transportation and direct access to water at their destination should be considered. Feeding of animals with dry hay followed by watering after few hours is also recommended (Abdulkadir *et al.*, 2024).

The aim of the present study was to assess the effect of different treatment regimens and management strategies in alleviating stress of Pasteurellosis in terms of

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incidence and mortality rate in feedlot lambs in the absence of vaccination.

Materials and Methods

In this study, number of 342 of male lambs were investigated. The lambs' ages ranged from 5 to 7 months. The animals were imported in December 2018 from the Republic of Niger to the town of Al-Gatroun in the Southern-west Libya (24°55'48"N 14°34'35"E). Prior to exportation, animals were reared on dry pastures, and there are no vaccination records for the animals. Sudden change of food from dry to green food was reported after arriving of the animals to their destination. The weather was cold and the temperature reached up to -4˚C at night. Animals in this study were classified into 4 groups (A, B, C and D) according to the management and the received medications as shown in table 1.

Table 1: Classification of animal according to management regimens.

Group	No of Animals	Multivitamin before outbreak (Oligovit, Vetos Farma Ltd, Bielawa, Poland)	Oxytetracycline (3%, Pfizer) during outbreak	Sulphadimidine (33%, Saudi Pharmaceutical Industries) and tylosin (20%, Elanco) during outbreak	Oxytetracycline (20%, KELA N.V. Hoogstraten, Belgium) during outbreak
A	150	+	For 7 days	-	-
B	13	-	-	Sulphadimidine for 3 days first then tylosin for 2 days as a second treatment	-
C	79	-	One dose (90mg/10kg BW)	One dose	Two doses (200mg/10kg BW)
D	100	-	-	-	Three doses (200mg/10kg BW)

Animals of the group A were injected intramuscularly with multivitamins (Oligovit, Vetos Farma Ltd, Bielawa, Poland) after transportation. No multivitamins were administered to the other groups. Few hours after administration of the multivitamins to the animals in group A, the animals were walked in cold weather at a temperature of about 2˚C to their new pens at approximately 3 kilometers distance. Diarrhea was observed in animals of the all groups; bloody diarrhea was also observed in the diarrheic lambs of the group A. A 3% oxytetracycline was administered orally to the diarrheic animals. The dead animals were necropsied for gross pathological examination. Blood from jugular and ear veins was collected for microbiological examination. Ocular discharges, nasal discharges, and fecal samples were also collected for microbiological examination. Giemsa stain was used for bacterial morphology investigation.

Ethical approval

The study did not comprise any special materials or protocols but routine diagnostic and therapeutic procedures. All interventions were made according to animal welfare standards.

Results

According to our investigation, animals were in good health condition on the day of arrival. Few days after, some animals were found dead, other animals showed elevated temperature (>41˚C) and respiratory distress associated with frothy mouth at the end stage of the disease. *Pasteurella* outbreaks in the Southern-west Libya has a seasonal pattern and occur mainly in December. Up to 30% of the infected animals in group A have demonstrated diarrhea and 10% (5/50) of the diarrheic lambs have bloody diarrhea. Postmortem examination showed hepatization of the cranial ventral lobes of the lungs (Figure 1. A). Hydropericardium was also observed (Figure1. B) and the hepatized areas of the lung were fissured and giving marbling appearance to the lung and flabby consistency of the heart in few cases was observed (Figure1. C). Multiple areas of necrosis were also observed in the affected parts of the lung (Figure 1. D). Fibrinous pneumonia with adhesion of lung to the thoracic wall was observed (Figure 2, blue box). Grossly, the viscera were normal. However, hyperemia was clear in serous membranes (Figure2 white boxes). A bloody fluid accumulation was observed in the thoracic cavity (Figure3). The intestinal mucosa was normal. Microbiological screening of the blood, ocular and nasal discharges demonstrated the presence of coccobacilli. However, fecal examination revealed different types of microorganism including *Pasteurella*.

The mortality rate in multivitamin treated group was low compared to the untreated group. The mortality rate in multivitamins and 20% oxytetracycline treated animals was 29% while it was 92% in 33% sulphadimidine and 20% tylosin treated lambs without multivitamins. The mortality rate in animals treated with one dose of 3% oxytetracycline, 33% sulphadimidine, 20% tylosin and 20% oxytetracycline without multivitamins was 60.7%. However, animals treated with 20% oxytetracycline without multivitamins showed a mortality rate of 47%. The animals which showed bloody diarrhea and treated

with 3% oxytetracyline orally and 20% oxytetracycline intramuscularly showed health improvement.

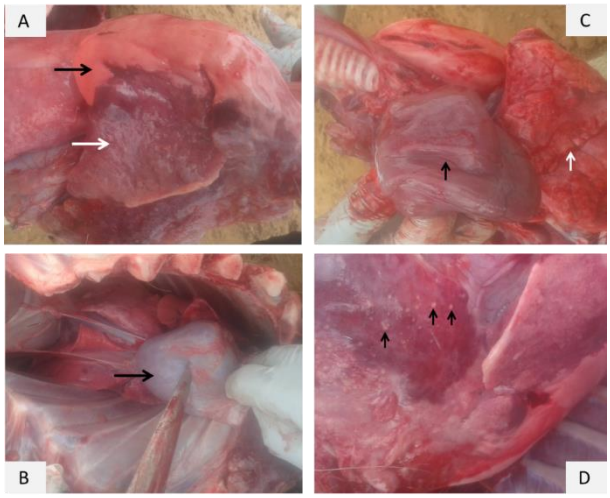

Figure 1. A. Hepatization of the lung (white arrow) comparing to the normal part of the lung (black arrow). **B.** Hydropericardium (black arrow). **C.** Flabby consistency of the heart (black arrow) and marbling appearance of the lung (white arrow). **D.** Areas of necrosis on the affected lung (black arrows).

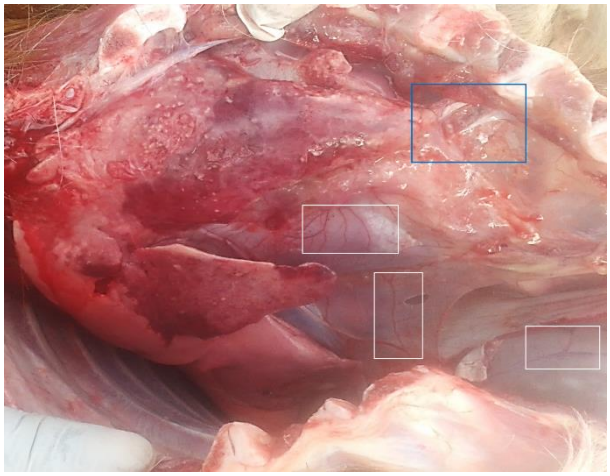

Figure 2. Engorgement of small capillaries of serous membranes with blood in a lamb with pneumonic pasteurellosis (white boxes). Pleurisy and adhesion between the costal bones and pleura (blue box).

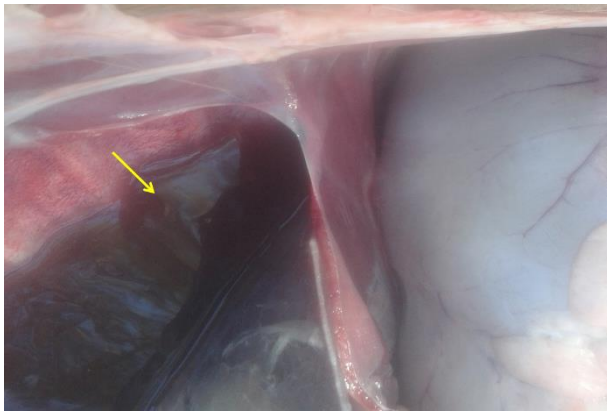

Figure 3. Accumulation of bloody fluid in the thoracic cavity of an animal with *Pasteurella* infection (yellow arrow).

Discussion

Literatures have demonstrated that stresses such as transportation, climate and food changes predispose to pneumonic pasteurellosis (Abdulkadir *et al.*, 2024; Saharia *et al.*, 2024).

According to our investigation, we noticed that animals were alert and bright on the day of arrival. However few days later, a group of animals were found dead indicating the presence of a challenging serious illness within flocks. Urgent clinical and postmortem examinations were performed and the results demonstrated feverish animals (>41˚C) with respiratory distress and frothy mouth at the terminal stage of the disease (Mohamed & Abdelsalam, 2008). *Pasteurella* outbreaks in the Southern-west Libya is mainly seen in imported animals and in cold seasons (Abbas *et al.*, 2023). Enteric diseases such as bloody diarrhea is one of complications of pneumonic pasteurellosis which exacerbate the respiratory form. In this study, postmortem examination showed hepatization of the cranial ventral lobes of the lungs, multiple areas of necrosis, fibrinous pleurisy, adhesion of lung to the thoracic wall and hydropericardium. These finding were also demonstrated by Wood *et al.* (2017), Jilo et al. (2020) and Brogden *et al.* (1998). Moreover, certain areas of the infected lung were hard and fissured with marbling appearance. This finding was also reported by previous study done by Singh *et al.* (2011). The accumulated bloody fluid in thoracic cavity was a marker for a septicemic disease which interferes with endothelial integrity leading to hemorrhagic disease which was also previously repored by Hasani *et al.* (2024). Septicemia was a common event in pneumonic pasteurellosis (Gilmour, 1980). In accordance with that, microbiological screening on blood, ocular and nasal discharges have shown presence of coccobacilli. This microorganism has also a great effect on cardiac muscle, as a loose consistency of the heart was prominent.

It was very difficult to control this challenging disease, so it is highly recommended to implement a prophylactic strategy for this severe illness.

A superiority of oxytratracycline was shawn among the antibiotics used in this study, as the oxytetracycline-treated group showed low mortality rate. This could be attributed to the sensitivity of *Pasteurella* to this drug (Gilmour, 1980). Low sensitivity to tylosin and sulphadimidine was also observed which is previously reported by Tefera & Smola (2001). All of the adopted treatment regimes in this study were approximately invaluable compared to vaccination regime. Benefits of vaccination program was illustrated by Hadush *et al.* (2024). Based on our results, we would recommend to use prophylactic long acting oxytetracycline as an alternative strategy for areas which lack vaccination programs. Moreover, in this study, we addressed the beneficial effect of multivitamins in boosting animal immunity. So, depending on our observations, we can highlight the potential of multivitamins in boosting animals' immunity and decreasing mortality rates.

Conclusion

This study investigated the beneficial effect of multivitamins in reducing transportation stress and

improving animals' immunity. The study also demonstrated the most powerful antimicrobial agent against *Pasteurella spp.* These strategies could be adopted for reducing incidence of *Pasteurella* outbreak in unvaccinated animals. This study indicated that administration of multivitamins and 20% oxytetracycline after transportation can reduce mortality rate of pasteurellosis. Although lambs of the group A have had exposed to high stress conditions, as compared to the other groups, the mortality rate of this group was low compared to the other groups, indicating that multivitamins can act as anti-stress and immunity enhancing agent. The results also showed that the causative agent of pneumonic pasteurellosis was more sensitive to oxytetracycline as compared to tylosin and sulphadimidine. Pasteurellosis treatment and control by antibiotics after appearance of clinical signs is a real challenge and is usually hopeless, therefore, it is highly recommended to supervise animals before, during and after transportation. Reducing stress, good feeding management, multivitamins administration before and after transportation are also recommended. Vaccination still considered the main option for controlling this challenging disease.

Conflict of interest

The authors declare no conflict of interest.

Authors' contribution

All authors contributed equally in the study design, data collection and interpretation and manuscript writing.

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References

Abbas, A., Khan, R. T. H., Asghar, A. Y., Shafeeq, M., & Rahim, A. (2023). Pneumonic Pasteurellosis: Role of Pasteurella multocida and Mannheimia haemolytica in respiratory disease of cattle. *Research Journal of Agricultural Sciences* 2(1): 94-110.

Abdulkadir, M., Nigussie, T., and Kebede, I. A. (2024). Isolation & Identification of Pasteurella multocida and Mannheimia haemolytica from Pneumonic Small Ruminants and Their Antibiotic Susceptibility in Haramaya District, Eastern Ethiopia. *The Scientific World Journal*, 2024(1), 5605552.

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

Alemneh, T., & Tewodros, A. (2016). Sheep and goats pasteurellosis: Isolation, identification, biochemical characterization and prevalence determination in Fogera Woreda, Ethiopia. *Journal of Cell and Animal Biology*, 10(4), 22-29.

Brogden, K. A., Lehmkuhl, H. D., & Cutlip, R. C. (1998). Pasteurella haemolytica complicated respiratory infections in sheep and goats. *Veterinary Research*, 29(3-4), 233-254.

Clinkenbeard, K. D., Mosier, D. A., & Confer, A. W. (1989). Effects of Pasteurella haemolytica leukotoxin on isolated bovine neutrophils. *Toxicon*, 27(7), 797-804.

Gilmour, N. (1980). Pasteurella haemolytica infections in sheep. *Veterinary Quarterly*, 2(4), 191-198.

Gilmour, N., Thompson, D., & Fraser, J. (1974). The recovery of Pasteurella haemolytica from the tonsils of adult sheep. *Research in Veterinary Science*, 17(3):413-4.

Hadush, B., Baraki, A., Abera, D., Bari, F. D., Mohamed, M., Maru, Y., Gugsa, G. (2024). Isolation and Characterization of Pasteurella spps from Pneumonic Cases of Livestock in Three Regional States of Ethiopia: Evidence of Differences between Field and Vaccine Biotypes. *Momona Ethiopian Journal of Science*, 16(1), 60-75.

Hasani, S. J., Enferadi, A., Sarani, S., & Nofouzi, K. (2024). A review of pasteurellosis in humans and animals. *Journal of Zoonotic Disease*, in press.

Hussain, R., Mahmood, F., Ali, H. M., & Siddique, A. B. (2017). Bacterial, PCR and clinico-pathological diagnosis of naturally occurring pneumonic pasturellosis (mannheimiosis) during subtropical climate in sheep. *Microbial pathogenesis*, 112, 176-181.

Jilo, K., Belachew, T., Birhanu, W., Habte, D., Yadete, W., & Giro, A. (2020). Pasteurellosis status in Ethiopia: a comprehensive review. *Journal of Tropical Diseases*, 8(351), 10-35248.

Mohamed, R., & Abdelsalam, E. (2008). A review on pneumonic pasteurellosis (respiratory mannheimiosis) with emphasis on pathogenesis, virulence mechanisms and predisposing factors. *Bulgarian Journal of Veterinary Medicine*, 11(3), 139−160.

Ribble, C. S., Meek, A. H., Janzen, E. D., Guichon, P. T., & Jim, G. K. (1995). Effect of time of year, weather, and the pattern of auction market sales on fatal fibrinous pneumonia (shipping fever) in calves in a large feedlot in Alberta (1985-1988). *Canadian Journal of Veterinary Research*, 59(3), 167.

Saharia, D., Deka, A., Phangcho, C. V., & Namasudra, M. Pathomorphological and Microbiological Diagnosis of Pneumonic Pasteurellosis in Goats of Assam, India. *Indian Journal of Animal Research*, 1, 7.

Singh, K., Ritchey, J., & Confer, A. (2011). Mannheimia haemolytica: bacterial–host interactions in bovine pneumonia. *Veterinary Pathology*, 48(2), 338-348.

Tefera, G., & Smola, J. (2001). Pasteurella haemolytica complex of Pasteurella sensu stricto as new genus Mannheimia: changes in taxonomy. *Veterinarni Medicina*, 46(4), 119-124. DOI: 10.17221/7864-VETMED

Wood, M. E., Fox, K. A., Jennings-Gaines, J., Killion, H. J., Amundson, S., Miller, M. W., & Edwards, W. H. (2017). How respiratory pathogens contribute to lamb mortality in a poorly performing bighorn sheep (Ovis canadensis) herd. *Journal of wildlife diseases*, 53(1), 126-130.