ETIOPATHOLOGICAL INVESTIGATIONS OF RESPIRATORY AFFECTIONS IN GOATS WITH SPECIAL REFERENCE TO BACTERIAL INFECTIONS

THESIS

Submitted
in partial fulfillment of the requirements for the Degree of

MASTER OF VETERINARY SCIENCE
IN
VETERINARY PATHOLOGY

BY
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Enrollment No: V/09/073

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(INDIA)
2017
DECLARATION OF STUDENT

I hereby declare that the experimental research work and interpretation of the thesis entitled “ETIOPATHOLOGICAL INVESTIGATIONS OF RESPIRATORY AFFECTIONS IN GOATS WITH SPECIAL REFERENCE TO BACTERIAL INFECTIONS” or part thereof has not been submitted for any other degree or diploma of any University, nor the data have been derived from any thesis / publication of any University or scientific organization. The sources of materials used and all assistance received during the course of investigation have been duly acknowledged.

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Mr. AULWAR BAJRANG SAYLU has satisfactorily prosecuted his course of research for a period of not less than one semester and that the thesis entitled “ETIOPATHOLOGICAL INVESTIGATIONS OF RESPIRATORY AFFECTIONS IN GOATS WITH SPECIAL REFERENCE TO BACTERIAL INFECTIONS” submitted by him is the result of original research work is sufficient to warrant its presentation to the examination in the subject of VETERINARY PATHOLOGY for the award of MASTER OF VETERINARY SCIENCE degree by the Maharashtra Animal and Fishery Sciences University, Nagpur.

We also certify that the thesis or part thereof has not been previously submitted by him for a degree of any other University.

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This is to certify that the thesis entitled “ETIOPATHOLOGICAL INVESTIGATIONS OF RESPIRATORY AFFECTIONS IN GOATS WITH SPECIAL REFERENCE TO BACTERIAL INFECTIONS” submitted by Mr. AULWAR BAJRANG SAYLU to the Maharashtra Animal and Fishery Sciences University in partial fulfilment of the requirement for the degree of MASTER OF VETERINARY SCIENCE has been approved by the Student’s Advisory Committee after oral examination in collaboration with the External Examiner.

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Chapter – 1

INTRODUCTION

Livestock plays an important role in Indian economy. India has vast livestock resources. Livestock is very important both for the subsistence and economic development in India. About 20.5 million people depend upon livestock for their livelihood. Livestock contributed 16% to the income of small farm households as against an average of 14% for all rural households and it provides livelihood to two-third of rural community. It also provides employment to 8.8 % of the population in India. Livestock sector contributes 4.11% GDP and 25.6% of total Agriculture GDP.

India ranks second in goat population having 135.2 million goats (2012 Livestock census). Small ruminants assumes a uniquely important position in livestock production. Unlike cattle, small ruminants are capable of remarkable adaptability to diverse environmental conditions and are amenable ease of management (Amaravathi et al., 2016). Small ruminants particularly sheep and goats contribute significantly to the economy of farmers in Mediterranean as well as African and Southeast Asian countries. These small ruminants are valuable assets because of their significant contribution to meat, milk, and wool production, and potential to replicate and grow rapidly.

The great Indian leader and freedom fighter M. K. Gandhi “father of the nation” designated goat as “poor man’s cow,” emphasizing the importance of small ruminants in poor countries. In India sheep and goats play a vital role in the economy of poor, deprived, backward classes, and landless labours (Chakraborty et al., 2014).

The goat is an important commodity in many areas of the world, where it is kept as a source of meat, milk, and fiber. Often described as the “poor man’s cow,” the goat can survive in areas where a cow cannot and, therefore,
replaces the cow in importance for a large segment of the world’s population. Improved goat husbandry will help to maximize human food supplies from marginal agricultural lands under restrictive climatologic circumstances (Da Massa et al., 1992).

Rearing of goats is an easy, less laborious, less expensive and highly profitable in developing country like India. In India, goat diseases constitute a major limiting factor in small ruminant production (Doley and Nekibuddin 2017).

Women rear only few goats that are grazed usually on free pastures. These pastures are usually found to be contaminated with various infectious agents that can get access through inhalation and thus they cause pneumonia (Rashid et al., 2013).

The indiscriminate slaughtering is done in market, streets, open fields and viscera, blood, bones etc. are found here and there. For this reason different diseases can be transmitted to other animals, even some zoonotic diseases like tuberculosis may be transmitted to human being which is a serious threat to human health and environment.

Respiratory diseases are common in all species of domestic animals, and they appears due to the interaction of many of infectious agents like (bacteria, mycoplasma, viruses, fungi, parasite etc.). The host defense and environmental factors are responsible for causing high mortality rate and economic losses having association with respiratory diseases in sheep and goats (Mahdi et al., 2015). In addition, there are several bacteria that targets respiratory tract due to its vulnerability to infections.

Respiratory diseases of small ruminants are multifactorial and there are multiple etiological agents responsible for the respiratory disease complex. Out of them, bacterial diseases have drawn attention due to variable clinical manifestations, severity of diseases, and reemergence of strains resistant to a
number of chemotherapeutic agents. The respiratory diseases represent 5.6 per cent of all diseases in small ruminants (Chakraborty et al., 2014).

The main respiratory disease occurs usually due to inflammation of the lung tissues called pneumonia, is a wide spread disease among sheep and goat all over the world and is considered to be one of the most important causes of losses in the small ruminants (Mahdi et al., 2015).

Respiratory system is vulnerable to many infectious and non-infectious agents causing various pathological conditions in farm animals. Among the inflammatory and non-inflammatory disease conditions, pneumonia either acute or chronic causes debility and death leading to great economic loss to the farmers (Ferdausi et al., 2008). Respiratory diseases are the major disease crisis in small ruminants. A number of pathogenic microorganisms have been implicated in the development of respiratory disease but the importance of environmental factors in the initiation and progress of disease can never be over emphasized. They irritate the respiratory tree producing stress in the microenvironment causing a decline in the immune status of the small ruminants and thereby assisting bacterial, viral and parasitic infections to break down the tissue defense barriers (Rahal et al., 2014).

Respiratory infections which commonly occur in sheep and goats often results from adverse physical and physiological stress combined with bacterial infections (Brogden et al., 1998). Bacterial infection of the respiratory tract may be primary, occurring in healthy individuals or secondary to a large number of conditions which depress resistance. Secondary bacterial infection occur especially when the local resistance of the respiratory mucosa is lowered and bacteria growing in the nose and throat extends downwards, usually giving a mixed infection (Megra et al., 2006 and Yesuf et al., 2012). Investigation of microorganisms that affect the respiratory system of goats is very important as it enables us to evaluate the role played by different organisms in respiratory disease and to show the most important microorganism causing respiratory tract infections.

*Mannheimia (Pasteurella) haemolytica* is one of the most important respiratory pathogens of domestic ruminants and causes serious outbreak of acute pneumonia in neonatal, weaned and growing lambs, calves, and goats (Ackermann
and Brogden, 2000). Pneumonic Pasteurellosis is important to sheep and goats throughout the world. Flocks and herds of small ranches, dairy operations or large feedlots are all affected (Brogden et al., 1998).

During monsoon season 2016 there were heavy and sudden rains after consistent draught. There were heavy deaths in goats and those were caused due to respiratory affections in general and fibrinous pneumopathy in particular. The laboratory investigations of those died goats suggested that bacterial infections could be major causation resulting into pneumopathies terminating it into death.

Considering the high prevalence of respiratory affections in general and bacterial infections in particular the present study was conducted with the following objectives.

11. Objectives:

1. To determine the prevalence of respiratory affections in goats with special reference to bacterial infection
2. To isolate and identify the bacteria from goats having respiratory infection
3. To note gross and histopathological changes in affected respiratory organs of screened goats
Chapter – 2

REVIEW OF LITERATURE

Goat farming is one of the profitable sectors for alleviating poverty all over India as well as world. But the low production and mortality due to wide range of respiratory diseases are the crucial impediments for profitable goat farming in so many parts of world including India. Goat carcass with major lung lesions may drastically hamper the economic progress due to elimination of either affected organ or whole carcass. Besides economic losses, the bottom line is that the harmful impact of such defects in goat lungs is spreading of communicable diseases to man. Important studies conducted in India and abroad related to respiratory affections in goats are summarized here:

2.1 Prevalence of respiratory affections in goats with special reference to bacterial infection:

Akbor et al. (2007) screened trachea and lungs of 80 slaughtered buffaloes at slaughterhouses of Barisal sadar, Barisal, Bangladesh during July 2006 to March 2007. Amongst them, 9 trachea (11.25%) and 30 lungs (37.5%) found to be abnormal when examined grossly. Tracheal lesions noted petechial haemorrhages whereas, lungs were with haemorrhages and congestion (16.25%), emphysema (5%), hard nodule (7.5%), cyst (6.25%) and thickened pleura (2.5%).

Ferdausi et al. (2008) examined 60 goats individually at Department of Pathology, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensigh, Bangladesh and recorded 58.3% (n=35) prevalence of lung diseases. The lung diseases noted were grossly categorized into: (a) haemorrhage and congestion in 15 (25%), (b) emphysema in 13 (21.7%), (c) hepatization in 2 (3.3%) and (d) granulomatous nodules about 1 mm diameter in 5 (8.3%).

Rashid et al. (2013) grossly examined 75 lungs from four slaughter houses/ places of Mymensingh Sadar, Bangladesh during January to May 2013 and
recorded lung lesions in 40% in goats (30 out of 75 lungs). These were categorized into (a) hemorrhages 35%, (b) congestion 25%, (c) hemorrhage and congestion 15% (d) emphysematous lung 15% and (e) hepatization 10% respectively.

Belkhiri et al. (2009) screened 870 bovine lungs for about two years at Tiaret slaughterhouse (west of Algeria) and three years at Batna slaughterhouse (east of Algeria) for studying frequency of pathological lesions. Amongst them, 744 lungs appeared to be with various types of pulmonary lesions. The same were recorded as pulmonary emphysema in 111 (14.35%) and pulmonary congestion in 61 (7.89%) and hydatid cyst in 330 (42.64%) cases. Also, right lung were affected in (92.60%) whereas, cranial lobe appeared to be affected more in (76.90%) than caudal in (71.45%).

Latief et al. (2013) recorded 24.18% overall prevalence of lung affections in Sheep after screening 1385 slaughtered Sheep at different abattoirs at Kashmir Valley, India. Amongst 335 lung lesions congestion in 27 (8.05%), red hepatization in 133 (39.70%), grey hepatization in 69 (20.59%), lung abscess in 27 (8.05%), parasitic lesions in 14 (4.17%), pock lesions in 18 (5.37%), froth/exudates in 17 (5.07%), emphysema and atelectasis in 19 (5.67%) and haemorrages in 11 cases (3.28%) was noted.

Shimelis et al. (2017) examined 2400 goats, amongst those, 960 (40%) goats showed different abnormal respiratory affections. Based on postmortem findings, 16.21% lungs were found as pneumonic, of which 78.38% were found to be associated with Pasteurella organisms. In this study, younger and goats with medium body condition score had greater probability to be infected by bacteria.

Sharma et al. (1991) screened 572 lungs of goats slaughtered at the advance base supply Depot Butchery, Narengi, Guwahati and examined 105 lung samples for bacterial incidence. The study revealed 98 (93.33%) samples positive for bacterial infection and recorded 173 different bacterial isolates. Amongst those E. coli was most predominant in 25 isolates (14.45%); followed by Bacillus spp. in 23 (13.29%); Pasteurella multocida in 21 (12.14%); Klebsiella pneumoniae in 21 (12.14%); Enterobacter agglomerans in 18 (10.40%); Hafnia alvei in 17 (9.83 %);
Pasturella hemolytica in 15 (8.67%); Pneumococcus pneumoniae in 12 (6.14%); Citrobacter diversus in 12 (6.14%); Staphylococcus aureus in 6 (3.47%); and Proteus spp. in 3 (1.74%) respectively.

Barbour et al. (1997) determined prevalence of different bacterial species in the upper and lower respiratory tract of healthy and unhealthy Najdi sheep, Somali sheep and Holstein calves. The characteristics of isolated Pasteurella spp. the biotype of Pasteurella haemolytica isolated from healthy and unhealthy animals were studied. In this study, 18 out of 28 (64.3%) of the identified bacterial species in the upper respiratory tract were more prevalent in the nasal cavities of unhealthy Najdi and Somali sheep and Holstein calves having respiratory affections.

Ackermann and Brodgon (2000) reported Mannheimia (Pasteurella) haemolytica as one of the most important respiratory pathogens of domestic ruminants causing serious outbreaks of acute pneumonia in neonatal, weaned and growing lambs, calves, and goats. M. haemolytica is also an important cause of pneumonia in adult animals.

Al-Tarazi et al. (2001) examined 284 lungs of slaughtered Camels (6 months to 10 years age) from northern Jorden and recorded 10.20% prevalence of pneumonia. The lesions noted were chronic proliferative bronchopneumonia (20.69%), lung abscess (10.34%), and chronic pleuropneumonia (6.9%).

Megra et al. (2006) examined total 200 specimens, collected for bacteriological isolation from trachea and the lung amongst those 154 (77%) contained bacteria.

Yimer and Asseged (2007) studied 192 specimens (48 from each anatomical sites) and of which 160 (83.3%) samples contained bacteria with 100% infection rate. Moreover, tissue infection rates were 79.2% and 62.5%, respectively for the trachea and lungs indicating a general decrease in the carrier state down the respiratory passage.

Momin et al. (2011) studied prevalence of pneumonia in Black Bengal goats based on the bacteriological findings at Ullaparasadar upazilla, Sirajgang;
Bangladesh Agricultural University (BAU) goat farm and BAU Veterinary clinic. *Pasteurella multocida* and *Staphylococcus aureus* were isolated from nasal swabs (n = 50) which was considered as evidence of Pneumonia.

Tijjani *et al.* (2012) examined 500 pneumonic lung samples from goats slaughtered at Maiduguri Municipal abattoir, Nigeria. The results showed *Escherichia coli* infection in 433 (86.6%) goats as highly prevalent bacteria amongst isolated.

Nigusu *et al.* (2012) noted 40.6% prevalence of respiratory infections in indigenous Gumuz sheep in Metema district, northwest Ethiopia. The prevalence study was conducted by examining collected nasal swabs, serum sample and feacal samples from 384 sheep of both sex and all age groups.

Momin *et al.* (2014) collected 247 nasal swabs from clinically sick goats at Mymensingh Sadar (District Headquarter) and Ullahpara Upazilla (Sub-District), Sirajgonj in Bangladesh. The examined samples showed 20% prevalence of Pneumonia in Black Bengal goats.

Belkhiri *et al.* (2014) carried out two years study at Batna and Tiaret slaughter house (west of Algeria). The results of study showed pulmonary lesions in 2863 Ovine lungs. The pulmonary congestion was most frequently observed lesion in 209 cases (7.50%). According to the localization of these lesions noted, the right lung was appeared to be most affected than the left one, and the cranial lobes were more invaded than the caudal ones.

Barde *et al.* (2016) examined aseptically total 170 tissue samples of respiratory tract of goats for bacterial isolation at College of Veterinary Science and Animal Husbandry, Mhow (M.P.). Amongst those 36 samples (21.17) were collected from clinically ill animals or morbid tissue with respiratory tract infection. They isolated *Pasteurella multocida* and *E.coli* from 7 (19.44%) and 11 samples (30.55%) respectively, out of 36 samples.
2.2 Bacterial infections affecting respiratory tract:

Al-tarazi et al. (2001) isolated total 75 bacteria from 29 pneunonic lungs of Camel in Jorden. The *E.Coli* in 20 (26.66%), *Klebsiella Spp.* in 11 (14.66%), *Staphylococcus aureus* in 8 (10.66%), other *Staphylococcus spp.* in 3 (4.00%), *Pseudomonas aeruginosa* in 9 (12.00%), *Actinomyces pyogenes* in 5 (6.66%), *Mannheimia haemolytica* in 5 (6.66%), *Hemolytic Streptococci* in 4 (5.33%), *Citrobacter Spp.* in 2 (2.66%), *Enterobacter aerogenes* in 2 (2.66%), *Proteus Spp.* in 2 (2.66%) and *Bacillus Spp.* in 4 (5.33%) were isolated from examined samples. *Klebsiella ozaenae* were the most frequent among the *Klebsiella* Species identified.

Megra et al. (2006) collected sterile cotton tipped swab for bacteriological examination from nasal cavity, tonsils, trachea, and lungs (50 each) of slaughtered goats at Dire Dawa Abattoir, eastern Ethiopia and identified 77.00% (154 specimens amongst 200) incidence of bacterial infection in them. The bacteria wise prevalence showed *Staphylococcus* in 22.8%, *Mannheimia (Pasteurella) haemolytica* in 18.2%, *Staphylococcus aureus* in 17.2%, *Pasteurella multocida* in 11.9%, *Corynebacterium pseudotuberculosis* in 8.8%, *Bacillus* species in 7.4%, *Actinomyces pyogenes* in 6.7%, *E. coli* 6.0% and *Micrococcus* species in 1.0% examined specimens.

Yimer and Asseged (2007) investigated aerobic bacterial flora of the respiratory tract using samples from nasal cavity, tonsil, trachea and lung of 48 healthy sheep slaughtered at Dessie Municipal Abattoir, Northeastern Ethiopia. Total 192 specimens (48 from each anatomical sites), 160 (83.3%) contained bacteria; however, animal infection rate was 100%. On the other hand tissue infection rates were 97.9%, 93.8%, 79.2% and 62.5%, respectively for the nasal cavity, tonsil, trachea and lungs, indicating a general decrease in the carrier state down the respiratory passage ways. The investigation revealed that *E. coli* (14.2%) as a predominant species followed by Coagulase negative *Staphylococcus* (10.7%), *Corynebacterium pseudotuberculosis*, *Bacillus* species (9.9% each), *Citrobacter* (2.6%) and *Klebsiella* (1.3%) among the least encountered bacterial genera.
Ferdausi et al. (2008) examined sixty lung samples of goats. Out of 60 lungs examined 35 found affected. The study was conducted through assessment of collected 35 swabs aseptically from inner core of lungs of goats from four abattoirs in Mymensingh sadar upazila (sub-district), Bangladesh. The percent bacterial prevalence revealed *Pasteurella* sp. in 7 (11.7%); *E. coli* in 4 (6.7%); *Staphylococcus* sp. in 22 (36.7%) and *Bacillus* sp. in 2 (3.3%).

Azizollah et al. (2009) collected 120 swabs aseptically from the nasal cavity, tonsils, trachea, and the lungs of goats for bacteriological examination. The result showed 313 isolates of various bacteria representing different genera. Identified bacteria were *staphylococci* (52.7%), *Neisseria* spp (20.4%), *Bacillus* spp (16.6%), *streptococci* (4.5%) and *Escherichia coli* (2.2%).

Tijjani et al. (2012) collected 500 Caprine pneumonic lung samples for bacteriological examination and isolated *Escherichia coli* in 433 (86.6%), followed by *Pasteurella haemolytica* in 272 (54.4%), *Klebsiella pneumonia* in 264 (52.8%), *Streptococcus pyogenes* in 98 (19.6%) and *Staphylococcus aureus* in 88 (17.6%) samples. Most of the samples examined revealed mixed infection.

Mohammed et al. (2012) collected 72 pneumonic lungs and 24 tracheal swabs for bacteriological examination and isolated bacteria *Pasteurella species* (48.28%), *Staphylococcus species* (17.24%), *Streptococcus species* (13.79%) and other bacteria (20.69%) from tracheal swabs, however, *Pasteurella* species was predominant organism isolated from swab of pneumonic lungs followed by *Staphylococcus spp.* and *Streptococcus spp.*

Hanan and Hassan (2012) studied 200 pneumonic lesions of goats for determination of its bacterial etiology. During this study it was observed that 51% (102/200) of pneumonic lesions yielded different bacterial isolates. The study revealed *Mannheimia (Pasteurella) haemolytica* (83.3%; 85/102), as predominantly targeting bacteria followed by *Corynebacterium pseudotuberculosis* (6.9%; 7/102) and α-haemolytic *Streptococci* (4.9%; 5/102). In addition *Pasteurella multocida*, *Staphylococcus hyicus*, *S. caseolyticus*, *S. saccharolyticus* and *Actiomyces (Corynebacterium) pyogenes* were represented 0.98% (1/102) cases.
Rashid et al. (2013) examined 75 goats for bacteriological and pathological conditions of lungs of slaughtered goats from four different slaughter houses/ places, Mymensingh, Bangladesh. Amongst those, 20 lungs showed different lung affections of whom swabs were collected for further studies. On its laboratory investigations, *Staphylococcus sp.* was recovered from 40% samples followed by *E. coli.* (25%), *Pasteurella sp.* (15%) and mixed infection (*Staphylococcus sp.* and *E. coli*) from 20% cases.

Zafer et al. (2013) screened 110 suspected lung tissues of between March 2010 to March 2011 for bacteriological examination and detected *Pasteurella multocida* as a cause of pneumonia in 38 cases.

Momin et al. (2014) collected lungs and nasal swabs from 250 Black Bengal goats for bacteriological examination. Prevalence of pneumonia was recorded on the basis of bacteriological findings. The bacteriological assessment recovered *Pasteurella multocida* and *Staphylococcus aureus* from nasal swabs or lung tissue.

Merbatu et al. (2015) examined lung tissues and tracheal swabs from sheep, goat & cattle slaughtered at Elphora Abattoir, Gondar University, Ethiopia and isolated total 170 bacteria from lung tissue and trachea of sheep. They found 10.6% *Bacillus* species, 14.7 % *Mannheimia haemolytica* and 42.4 % *staphylococcus* from lung and 5.8 % *Enterobacter* species, 13 % *Bibersteinia trehalosi* and 66.7% *M. haemolytica* from total 69 aerobic cultures. Out of 192 bacteria isolated from goat lungs the percent prevalence of bacteria were 6.3% *M. haemolytica*, *Micrococcus* species 12.5%, *bacillus* species 19.8% and *staphylococcus* 45.3%. The tracheal culture of goat showed *bacillus* species 26.5%, *M. haemolytica* 27.7% and *enterobacter* species 30.1%. Eight *M. haemolytica* species were noted among 93 bacterial isolates of aerobic culture from cattle lung followed by bacillus species 17, *staphylococcus* species 29, while, *M. haemolytica*, *B. trehalosi* and *staphylococcus* accounted for 8, 14, and 18 out of total 57 tracheal cultures, respectively. A total 522 bacterial isolates were detected via anaerobic culture in which 6.2% of the 131 isolates from sheep lung were *bacillus* species, 25.4% were *M. haemolytica* and 40% were *Staphylococcus species*, while, *B. trehalosi* and *micrococcus* species
took 5.4 % each from total isolates, whereas, 12.7% Enterobacter, 19.7% B. trehalosi and 60.6% M. haemolytica species were isolated from a total of 71 sheep trachea culture isolates. Among anaerobic cultures of goat lung tissue, M. haemolytica sp. accounts for 11.2% by Bacillus species, 25.6% and Staphylococcus 36.00% out of the total 125 bacterial species. In the tracheal culture for 7 followed by Bacillus species, 14 and M. haemolytica, 33 from 61 isolates, 7.8% B. trehalosi, 23.4% Bacillus species and 42.9% Staphylococcus species were isolated species from lung of cattle, while from trachea 25.0% M. haemolytica and Staphylococci each were isolated anaerobically.

Hailu et al. (2015) collected aseptically the lung lesions of 384 Goat and by following standard microbiological techniques the bacterial isolation and identification was attempted. The bacteriological evaluation recovered Pasteurella species from 301 samples. Out of total 301, Pasteurella species recovered 274 and 27 of them were Manhemia hemolytica and Pasteurella multocida, respectively. The isolation rates of Manhemia hemolytica was 74.4% and Pasteurella multocida was 7%.

Haji et al. (2016) collected 384 nasal swabs from apparently healthy and clinically sick sheep. In addition, 145 samples from lungs possessing lesions from slaughtered sheep were also collected for bacteriological examination. The samples were collected from Lume districts, East Shoa Zone of Oromia region, Ethiopia. After thorough bacteriological examination, a total of 115 isolates of M. haemolytica, P. trehalosi and P. multocida were recovered from nasal swabs of apparently healthy and clinically sick sheep and from pneumonic lungs. From 145 lung samples collected and cultured, Pasteurella was isolated successfully in 35 (24.1%) sheep. The study revealed that M. haemolytica, P. trehalosi and Pasteurella multocida was isolated from the nasal swabs (11.2%), (7.6%) and (2.1%), whereas M. haemolytica isolates from pneumonic lungs (11.7 %), P. trehalosi (10.3%) whereas Pasteurella multocida was the lowest among species isolated (2.1 %). The overall isolation rate of M. haemolytica and P. trehalosi and Pasteurella multocida was 15.7%, 11.5% and 2.9% respectively. On the basis of these results M.
haemolytica and P. trehalose was the most common cause of Pasteurellosis in sheep.

Ugochukwu et al. (2017) examined 342 and 40 Lung samples from goats and sheep slaughtered at Nsukka abattoir, Enugu State, Nigeria. The study revealed that total 116(30.36 %) lungs had various types of pneumonias. Out of 116 pneumonic lungs collected over a six months period, 98 were of Caprine lungs and 18 were of Ovine lungs. The Escherichia coli, Klebsiella pneumoniae, Mannheimia haemolytica, Streptococcus pyogenes, Staphylococcus aureus and Pasteurella multocida were isolated from pneumonic lungs.

Addis et al. (2017) attempted to isolate and identify the diverse bacteria localizing pneumonic lungs and the associated tracheas of 50 slaughtered cattle at Addis Ababa Abattoirs enterprise, central Ethiopia, in both aerobic and anaerobic environments. Out of these 158 and 135 bacterial isolates were found in aerobic and anaerobic state, respectively using primary and secondary microbiological tests. Gram positive bacteria were the dominant bacteria in both conditions. The frequency of isolation increased from trachea down to lungs in both state indicating the bacterial role in the progress of bovine pneumonia. Most prevalently isolated bacteria from both aerobic and anaerobic conditions were Staphylococcus species, Bacillus species, Mannheimia haemolytica and Pasteurella multocida. In addition, Streptococcus species, E.coli, Klebsiella pneumoniae, Actinobacillus species, Micrococcus species, Arcanobacterium species, Neisseria species, Acinetobacter species, Corynebacterium species, Bordetella species, Pseudomonas species, and Rhodococcus equispecies were also isolated from processed samples.

2.3 Identification of bacteria by Matrix-assisted laser desorption ionization-time of flight mass spectrometry (MALDI-TOF MS):

Ronald et al. (2004) identified disease markers by directly profiling and quantifying the peptide/proteins in biological samples under different physiological or experimental conditions by using MALDI-TOF as an advanced tool.
The information of reproducibility of such quantitative profiling method has not been available. It is important to evaluate and reduce error from technical variation. In this study, an unbiased signal acquisition strategy was used to evaluate the effects of three sample-matrix spotting methods and two matrix chemicals, α-cyano4-hydroxycinnamic acid (CHCA) and sinapinic acid, on the reproducibility of the peptide/protein signal intensities. The sandwich spotting method using 0.1% nitrocellulose coating film and CHCA gave the best quantitative results for the standard peptides and proteins with mass<66.5kDa. The normalized signal intensities of the standard peptides and proteins were directly proportional to their concentrations with intra-assay (within-day) coefficient of variations (CVs) ranging from 6.5% to 17%.

Deborah et al. (2011) concluded that MALDI-TOF MS can be implemented easily for routine identification of bacteria and yeasts in a clinical microbiological laboratory.

De Carolis et al. (2014) stated that Matrix-assisted laser desorption/ionization-time of flight mass spectrometry (MALDI-TOF MS) has recently emerged as a powerful technique for identification of microorganisms, changing the workflow of well-established laboratories so that its impact on microbiological diagnostics has been unparalleled. In comparison with conventional identification methods that rely on biochemical tests and require long incubation procedures, MALDI-TOF MS has the advantage of identifying bacteria and fungi directly from colonies grown on culture plates in a few minutes and with simple procedures. Numerous studies on different systems available demonstrate the reliability and accuracy of the method, and new frontiers have been explored besides microbial species level identification, such as direct identification of pathogens from positive blood cultures, subtyping, and drug susceptibility detection.

Singhal et al. (2015) identified microorganisms with the help of MALDE-TOF by using 16S rRNA and 18S rRNA gene sequencing. However, in recent years matrix assisted laser desorption ionization-time of flight mass spectrometry (MALDI-TOF MS) has emerged as a potential tool for microbial identification and diagnosis. During the MALDI-TOF MS process, microbes are
identified using either intact cells or cell extracts. The process is rapid, sensitive, and economical in terms of both labor and costs involved. The technology has been readily imbibed by microbiologists who have reported usage of MALDI-TOF MS for a number of purposes like, microbial identification and strain typing, epidemiological studies, detection of biological warfare agents, detection of water- and food-borne pathogens, detection of antibiotic resistance and detection of blood and urinary tract pathogens etc.

Riech et al. (2017) studied the species identification of cultured bacteria and fungi within the past years by using MALDI-TOF mass spectrometry and opined that its use has become a powerful tool for the species identification. In the present study, the implementation of MALDI-TOF mass spectrometry in commercial higher laboratories is described. The impact of different growth conditions on the identification results was evaluated in this study. Although slight differences in MALDI-TOF spectra of *E. coli* and *S. aureus* strains cultured on blood agar for various periods (5, 18, 24 and 48 hours) were noticed, however, reliable species identification was obtained for all periods. The same was true when *E. coli* and *S. aureus* strains were cultured for 18 hours on various solid media. Reliable identification was also achieved when fungi were cultured on solid and in liquid media (Sabouraud bouillon). Moreover, growth of fungi in bouillon resulted in accelerated identification. MALDI-TOF mass spectrometry also allowed reliable identification of microorganisms from positive blood culture samples. In toto, 2,900 specimens (234 different species) predominantly derived from clinical samples were examined. Microorganisms were cultured on solid media, in blood culture bottles and in liquid Sabouraud bouillon. 98.6% (n=2,860) of the MALDI-TOF identification results matched those of conventional methods (e.g. Gram staining, carbohydrate degradation ability, Phoenix system) and 16S rDNA PCR product sequencing.

2.4 Gross and histopathological findings:

Sharma et al. (1991) screened 572 lungs of goats slaughtered at advance base supply Depot Butchery, Narengi, Guwahati. Amongst those, 105
(18.36%) showed various types of pneumonia. Grossly, the right lungs were more frequently affected (29.52%) than the left lung (9.53%). Both the lungs (bilateral affection) were affected in 60.95% cases. The apical lobe was affected most frequently in 85.71%, followed by middle lobe 58.09%, diaphragmatic lobe 52.38% and accessory lobe 8.57%.

Oros et al. (1997) screened goats for pulmonary lesions and reported its prevalence as 82% (27/33) in kids and 36% (18/50) in adult goats. The pulmonary lesions noted were characteristic of enzootic pneumonia: with the form of bronchointerstitial pneumonia with peribronchial and peribronchiolar proliferation of lymphocytes.

Brogden et al. (1998) studied Pasteurella haemolytica complicated respiratory infections in sheep and goats at Respiratory and Neurologic Disease Research unit, National Animal Disease Center, Agricultural Service, U.S. Department of Agriculture, Ames, USA. The study revealed that the lesions of spontaneous and experimental pneumonic Pasteurellosis in sheep and goats could be characterized by the deposition of fibrin in the lungs and on the thoracic pleura also, excessive deposition of fluid in the pleural and peritoneal cavity. Microscopically, changes consisted of pneumonitis with multifocal areas of acute fibrinopurulent bronchopneumonia, coagulative necrosis and fibrinous pleuritis. Necrotic centers in groups of alveoli are outlined with congested capillaries and filled with fibrin, proteinaceous material, bacterial colonies, erythrocytes, neutrophiles and macrophages.

Al-Tarazi et al. (2001) examined 284 lungs of slaughtered Camels (6 months to 10 years age) from northern Jorden and recorded 10.20% prevalence of pneumonia. Gross lesions noted were chronic proliferative bronchopneumonia (20.69%), lung abscess (10.34%), and chronic pleuropneumonia (6.9%) and microscopically the lesions were characterized by interstitial pneumonia (58.6%).

Akbor et al. (2007) screened trachea and lungs of 80 slaughtered buffaloes at slaughterhouses of Barisal sadar, Barisal, Bangladesh during July 2006 to March 2007. Amongst them, 9 trachea (11.25%) and 30 lungs (37.5%) found to be
abnormal when examined grossly. Tracheal lesions noted petechial haemorrhages whereas, lungs were with haemorrhages and congestion (16.25%), emphysema (5%), hard nodule (7.5%), cyst (6.25%) and thickened pleura (2.5%). Microscopically, congestion (5%), pneumonia-congested stage (8.75%), fibrinous pneumonia (3.75%), purulent broncho-pneumonia (1.25%), fibrino-purulent pneumonia (1.25%), subacute fibrinous pneumonia (1.25%), chronic interstitial pneumonia (3.75%), broncho-pneumonia (3.75%), bronchitis (2.5%), bronchiolitis (2.5%) and mild tracheitis (8.75%) were noticed.

Ferdausi et al. (2008) examined 60 goats individually at Department of Pathology, Faculty of Veterinary Science, Bangladesh Agricultural University, Mymensigh, Bangladesh and recorded 58.3% (n=35) prevalence of lung diseases. The lung diseases noted were grossly categorized into: (a) haemorrhage and congestion in 15 (25%), (b) emphysema in 13 (21.7%), (c) hepatization in 2 (3.3%) and (d) granulomatous nodules about 1 mm diameter in 5 (8.3%). Histopathologically, the lungs revealed bronchitis in 4 (6.67%), small cell anaplastic carcinoma in 2 (3.3%), pneumonia in 4 (6.67%), interstitial pneumonia in 9 (15%), Emphysema in 4 (6.7%), bronchopneumonia in 2 (3.33%), purulent pneumonia in 3 (5%), hemorrhagic pneumonia in 2 (3.33%), and pulmonary adenomatosis in 1 (1.67%). Apparently, 4 (6.67%) goat lungs did not revealed any appreciable histomorphological change.

Belkhiri et al. (2009) screened 870 bovine lungs for about two years at Tiaret slaughterhouse (west of Algeria) and three years at Batna slaughterhouse (east of Algeria) for studying frequency of pathological lesions. Amongst them, 744 lungs appeared to be with various types of pulmonary lesions. The same were recorded as pulmonary emphysema in 111 (14.35%) and pulmonary congestion in 61 (7.89%) and hydatid cyst in 330 (42.64%) cases. Also, right lung were affected in (92.60%) whereas, cranial lobe appeared to be affected more in (76.90%) cases than caudal in (71.45%) cases. Microscopically it was characterized by interstitial pneumonia (2.32%), fibrinous pneumonia (4.52%), pleuropneumonia (2.85%), suppurative pneumonia (3.61%), hemorrhagical pneumonia (2.32%), hepatisation (2.32%), vascular alteration (4.27%), atelectasia (5.03%) and tuberculosis (0.45%).
Zaghawa et al. (2010) studied respiratory affections in 542 sheep at Faculty of Veterinary Medicine-Sadat city -Menoufia University. The sheep having respiratory affections grossly showed sever congestion all over with bright purplish solid areas. Also the lungs were heavy, edematous and with petechial hemorrhages. The trachea and heart showed mild petechial haemorrhages. Some cases with respiratory affections showed hepatization of the ventral part of diaphragmatic lobe, sever hyperemia and edema, marked emphysema and ecchymotic haemorrhages in lung of sheep.

Tijjani et al. (2012) conducted a study at Maiduguri, North - Eastern Nigeria to assess the bacterial flora, gross and histopathological lesions of Caprine pneumonic lungs. A total of 500 Caprine pneumonic lung samples from goats slaughtered at the Maiduguri municipal abattoir were collected and examined. The study revealed that grossly, lungs showed congestion, consolidation and exudation. However, on histopathological examination revealed bronchopneumonia in 12 (48%), interstitial pneumonia in 8 (32%) and cuffing pneumonia in 5 (20%) samples.

Mohammed et al. (2012) attempted a study to identify the bacteria involved and histopathological changes in pneumonic lungs of small ruminants slaughtered at Gondar town and Elfora abattoir from October, 2009 to January, 2010. They examined total 72 pneumonic lungs and 24 tracheal swabs for bacteriological and histopathological examination and found grossly colour, consistency changes, adhesions, hemorrhages and emphysema in lungs. Histopathologically, bronchopneumonia, interstitial pneumonia and combination of both was recorded to a extent of 56.93%, 23.61% and 16.67%, respectively.

Zafer et al. (2013) screened 110 suspected lung tissues of sheep between March 2010 to March 2011 for bacteriological and histopathological examination. Macroscopical examinations revealed that the most frequently affected lobe was right cranial lobe. Consolidated areas of the lungs were swollen and dark red in color. Affected lung tissues were mostly palped as liver and crusty in consistence. At cross-section of the lungs; fine foamy fluid or creamy suppuration yellowish, gray in color were detected in some bronchus and bronchiole lumen. Microscopically, catarrhal-purulent and fibrinous broncho-pneumonia characterized
by neutrophils and mono-nuclear cell infiltration with fibrin were seen in the bronchi, bronchiole, alveolar lumen and pleura. Multinucleated syncytial cell formations with presence of spindle-shaped oat cells were observed in the alveolar lumen. In some sections widespread neutrophilic infiltration, coagulation necrosis with purulent-necrotic bronchopneumonia were observed in and around of the bronchus and bronchioles, Interstitial pneumonia was characterized as mononuclear cell infiltration in interstitial areas. The lung tissue sections also showed pulmonary adenomatosis.

Rashid et al. (2013) studied the lung lesions in grossly affected goats and found hemorrhages (35%), congestion (25%), hemorrhage and congestion (15%) emphysematous lung (15%) and hepatization (10%). Histopathologically, lung lesions were categorized as bronchopneumonia (30%), pneumonia (25%), hemorrhagic pneumonia (20%), emphysema (15%), and purulent pneumonia (10%).

Azizi et al. (2013) studied 1,000 lungs of sheep carcasses subjected to gross examination. Those carcasses which were suspected to be infected with pneumonia were further subjected for histopathological and bacteriological examination. Pneumonia was detected as predominant lesion in studied sheep. Based on histopathological lesions, the percent presence of various lesions appeared to be 45.24% as suppurative bronchopneumonia, 20.93% with interstitial pneumonia, 11.9% as bronchointerstitial pneumonia, 7.14% with fibrinous bronchopneumonia and 2.38% with embolic pneumonia. In addition, 11.9% of the lungs showed lung abscesses and 2.33% were affected with pleuritis without involving pulmonary parenchyma.

Abdullah et al. (2014) recorded consolidations of the left and right cranio-lateral lung lobes, frothy exudates in trachea, bronchi and the cut surface of the lungs and presence of straw-colored pericardial fluid in goat lungs as gross pathological findings.

Nahed and Allam (2014) conducted bacteriological and clinicopathological studies to know the causation and lesions of pneumonia in sheep. The main histopathological alterations induced by respiratory infections were
bronchitis, bronchiolitis, alveolar emphysema, inflammatory and non-inflammatory edema, serous bronchopneumonia and interstitial pneumonia.

Dar et al. (2014) studied pneumonic lungs of Sheep in Kashmir Valley, India. They collected 257 lungs for routine histopathological examination and found acute bronchopneumonia, chronic bronchopneumonia, fibrinous bronchopneumonia, suppurative bronchopneumonia, and interstitial bronchopneumonia.

Mahdi et al. (2015) screened 21854 sheep and 3659 goats slaughtered in Duhok abattoir to determine the prevalence of disease conditions affecting the lungs. Recorded gross lesions were inflammation in sheep and goat lungs. Microscopically different types of pneumonia such as suppurative bronchopneumonia, fibrinous bronchopneumonia and granulomatous pneumonia were noted during this study.

Amaravathi et al. (2016) noticed interstitial pneumonia with an incidence of 2.67%. Grossly, the lungs were pale to red, heavy and firm. The lungs showed rib impressions on the surface. Cut sections revealed slightly meaty appearance. Microscopically, the alveoli were distorted in shape. The alveolar septae were congested and thickened with infiltration of mononuclear cells, and macrophages. Hyperplasia of bronchial and bronchiolar epithelium into the lumen was observed along with lymphoid hyperplasia in the peribronchiolar region.

Al-Sadrani et al. (2016) studied one hundred and nineteen grossly affected ovine lungs and recorded various types of gross lesions such as fibrinous bronchopneumonia and fibrinous pleuritis. Microscopically, congestion and serofibrinous exudate within the alveoli were noticed. Other cases exhibited only fibrinous exudates associated with thrombosis. The inflammatory cells in both were almost exclusively neutrophils. Furthermore, the alveolar septa were considerably widened by fibrinous exudate. In all cases, the bronchial epithelium appeared necrotic and desquamated with impaction of the bronchial lumen with inflammatory cells, primarily neutrophils. Macroscopically, affected lungs showed dark red consolidated patches from which pus was oozed out through the cut-surface.
Microscopically, severe hyperemia as well as severe infiltration of polymorphs within the alveoli and bronchioles was observed. Grossly lungs appeared to be pale, enlarged and rubbery or meaty and microscopic examination of them revealed marked broadness of interstitium at the alveolar spaces. Alveoli free of exudate; however, the interstitium extensively infiltrated with mononuclears, primarily lymphocytes and macrophages. Also, proliferation of fibroblasts and collagen fibers was seen. Additionally, peribronchial lymphoid tissue hyperplasia was noticed. Furthermore, formation of intrabronchial corpora amylacea was noticed with incidence of 10.08%. In cases with fibrinopurulent bronchopneumonia little amount of pus oozing from cut-surface after squeezing was noticed. Histopathologically, features detected besides abundant neutrophils in both alveoli and bronchioles with incidence of 7.56%. Grossly granulomatous pneumonia grossly showed white firm variable sized nodules. Microscopically the granulomatous pneumonia revealed presence of granulomas lesions characterized by caseated center surrounded by a dense layer of mononuclear cells, primarily epitheloid cells with few lymphocytes and Langhan's giant cells with an incidence of 6.72%.

Ugochukwu et al. (2017) examined lung samples from 342 goats and 40 sheep. Two major types of pneumonia observed during histopathological examination were bronchopneumonia 64 (55.17%) and interstitial pneumonia 52 (44.82%).
Chapter – 3

MATERIALS AND METHODS

3.1 Programme of research work:

The goats slaughtered at local slaughter places in and around Parbhani were examined systematically and scientifically to record pathological alteration in tissue in general and respiratory tract in particular. The tracheal, lung swabs of goats having respiratory affections were collected aseptically for knowing bacterial infection.

Also, the goats died of respiratory affections and presented to Department of Veterinary Pathology, College of Veterinary and Animal Sciences, MAFSU, Parbhani for conduct of post mortem examination were examined critically for noting gross changes in respiratory tract and swabs from trachea and lungs of these affected goats were also collected for further bacteriological studies. The affected respiratory organs were collected for further histopathological studies.

3.2 Materials used:

3.3 Cleaning and sterilization of required glassware and plasticware:

Previously used glass-wares and plastic-wares were kept in liquid detergent solution for overnight soaking and cleaned by brushing then washed thoroughly in running tap water and rinsed in distilled water. The cleaned glass-ware were then dried on a table at room temperature or in Hot air-oven at 160°C for 1 hrs. The petridishes were wrapped with paper. However, the ependrop tubes, plastic tips were sterilized by autoclaving for 15 minutes at 121°C under 15 lbs pressure per sq. inch. All sterile glass-ware and plastic-ware were kept in a dust free place for further use.
3.4 Culture media:

3.5 Bacteriological reagents used:

i. Crystal violet
ii. Gram's or lugols iodine
iii. Ethyl alcohol
iv. Safranine solution or dilute Carbon Fuchsin Gram's
v. Peptone water culture (both positive and negative)
vi. Glucose phosphate peptone water
vii. Methyl red indicator
viii. Alcoholic alpha naphthol 5%
ix. Aq.KOH 40%
x. Phenol red (0.2%)

3.6 Sugars:

i. Glucose
ii. Sucrose
iii. Lactose
iv. Maltose
v. Mannitol
vi. Glycerol medium

3.7 Bacteriological media preparation:

i. Nutrient Broth:

Ingredients used:

i. Peptone 5.00 g/litre
ii. Beef extract 1.50 g/litre
iii. Nacl 5.00 g/litre
iv. Yeast extract 1.50 g/litre
   (Final pH at 7.4 and autoclave)
Procedure of preparation:

13.0 grams nutrient broth was suspended in 1000 ml distilled water. It was boiled to dissolve the medium completely tightly wrapped with paper and tied with rope, kept in cooker up to three bell. Sterilized test tubes in autoclaved at 15 lbs pressure at 121°C for 15 minutes. After preparation of Nutrient Broth 5 ml poured in test tubes used for primary culture of bacteria.

ii. Nutrient agar medium:

Ingredients used:

i. Peptone 10.00 g/litre
ii. NaCl 5.00 g/litre
iii. Beef extract 10.00 g/litre
iv. Agar powder 12.0 g/litre

(Final pH to 7.4 autoclave and pour plates)

Procedure of preparation:

37 grams nutrient agar medium was suspended in 1000 ml of distilled water. It was boiled to dissolve the medium completely and sterilized by autoclaving at 15 lbs pounds pressure at 121°C for 15 minutes. Finally it was mixed well and poured to the Petri dishes.

iii. Brain Heart Infusion Agar:

Ingredients used:

i. Meat infusion powder 12.50 g/litre
ii. BHI Powder 5.0 g/litre
iii. Proteose peptone 10.0 g/litre
iv. Dextrose 2.00 g/litre
v. Sodium Chloride 5.0 g/litre
vi. Disodium phosphate 2.50 g/litre
vii. Agar 15.00 g/litre

(Final pH (at 25°C) 7.2 ± 0.2)
Procedure of preparation:

52.0 grams BHI agar was suspended in 1000 ml distilled water. It was heated to boiling temperature to dissolve the medium completely. Then it was sterilized by autoclaving at 15 lbs pressure at 121°C for 15 minutes and poured into sterile Petri dishes.

**iv. MacConkey Agar:**

*Ingredients used:*

i. Peptone 20.00 g/litre  
ii. Lactose 10.00 g/litre  
iii. Sodium taurocholate 5.00 g/litre  
iv. Neutral red 0.04 g/litre  
Agar 20.00 g/litre  
(Final pH (at 25°C) 7.2 ± 0.2)

**Procedure of preparation:**

55.04 grams BHI agar was suspended in 1000 ml distilled water. It was heated to boiling temperature to dissolve the medium completely. Then it was sterilized by autoclaving at 15 lbs pressure at 121°C for 15 minutes and poured into sterile Petri dishes.

**v. EMB agar medium:**

*Ingredients used:*

i. Peptone 10.00 g/litre  
ii. Lactose 10.00 g/litre  
iii. Saccharose 0.5 g/litre  
iv. Di-potassium phosphate 2.00 g/litre  
v. Eosin 40.00 g/litre  
vi. Methylene blue 0.065 g/litre  
vii. Agar 1.4 g  
(Final pH (at 25°C) 7.2 ± 0.2)
Procedure of preparation:

37.5 grams EMB agar was suspended in 1000ml distilled water. It was then heated to the boiling temperature to dissolve the medium completely and sterilized by autoclaving at 15 lbs pressure at 121°C for 15 minutes. Finally it was poured into sterile Petri dishes.

vi. Bacterial peptone:

Ingredients used:

i. (% w/v) (g /l) Total nitrogen 14.0
ii. Amino nitrogen 2.6
iii. Sodium chloride 1.6
Final pH (at 25°C) 7.2 ± 0.2

Procedure of preparation:

10 gm bacteriological peptone was dissolved in 1000 ml of distilled water and 5 gm of sodium chloride was added to the solution. Then 50ml of 0.2% phenol red and 10% sugar were mixed for the sugar fermentation test. The mixture was sterilized in the autoclave under 15 lbs pressure at 121°C for 15 minutes and poured into sterile conical flasks. It was used as an ingredient of media, for the investigation of numerous organisms through various biochemical tests.

3.8 Methodology:

The present research work was divided into three parts:

1. Screening of slaughtered and died goat carcasses for noting gross respiratory affections
2. Collection of samples (trachea and lungs of goats)
3. Isolation and identification of bacterial organisms associated with respiratory affections
4. Gross and histopathological evaluation of trachea and lung lesions
3.8.1 Screening of goat carcasses:

Goats slaughtered at local slaughter houses in and around Parbhani and those goats died and presented to Department of Veterinary Pathology were Screened during study period for noting respiratory affections.

3.8.2 Collection of samples:

The tracheal, lung swabs from goats suspected for respiratory affections were collected from carcasses of died and slaughtered goats in and around Parbhani. Also, from same goat carcasses the tissue samples of respiratory tract showing gross lesions were collected and subjected for histopathological studies.

3.8.3 Isolation and identification of bacteria

A total of 192 swabs were collected from trachea and inner core of lung aseptically. All the samples were transferred to bacteriology laboratory of the Department of Veterinary Microbiology, College of Veterinary and Animal Sciences, Parbhani for isolation and identification of bacteria and for further bacterial genes, species confirmation subjected at (Rapid Diseases Diagnostic Centre For Small Ruminants, College of Veterinary and Animal Sciences, MAFSU, Udgir, Dist Latur/MS). The broth cultured samples were incubated aerobically agitated thoroughly and mixed before overnight incubation. A loopful of broth culture was taken for streaking over an identified petridish plates containing nutrient agar and brain heart infusion agar. The remaining samples in the test tube were put as sample pool source inside a refrigerator at 4 °c till complete investigation process. From culture positive plates, representative colonies were further streaked on MacConkey agar. Isolation and identification of bacteria was done based on staining, colony characteristic, biochemical tests & Matrix-assisted laser desorption ionization-time of flight mass spectrometry (MALDI-TOF MS)(Quinn, 2006).

3.9 Work diagram for isolation and identification of bacteria:

1. Collection of deep swab from lung / trachea of goats having respiratory affections
2. Swabs were incubated in nutrient broth at 37°C for 24 hours for primary isolation

3. Subculturing was attempted on nutrient agar/ brain heart infusion agar and MacConkey agar using streak plate

4. Individual colonies were collected as pure culture on slants

5. Each of the pure culture was further subjected to Grams staining

6. Morphology based differentiated of bacteria as in to Gram positive/ Gram negative method

7. Biochemical testing for further confirmation of bacteria

3.10 Staining methods:

i. Modified Gram's methods

ii. Leishman's staining

3.11 Biochemical tests:

The representative samples for Staphylococci sp. and of E. coli were further subjected for biochemical tests using sugars.

Sugars: • Glucose • Sucrose • Maltose • Lactose • Mannitol

4.1 Bacterial confirmation through Matrix-Assisted Laser Desorption Ionization-Time of Flight Mass Spectrometry (Maldi-Tof Ms):

Matrix-assisted laser desorption ionization-time of flight mass spectrometry (MALDI-TOF MS) has been suggested as a reliable method for bacterial identification from cultures. The first descriptions of matrix-assisted laser desorption/ ionization time of flight mass spectrometry (MALDI-TOF MS) for bacterial identification were published more than 15 years ago (Anhalt and fenselau, 1975).
4.2 Materials & Methods:

4.2.1 Bacterial Isolation:

Swabs of trachea (10) and lung (07) were collected from goats after necropsy and subjected to bacterial isolation and identification at RDDCSR (Rapid Diseases Diagnostic Centre For Small Ruminants, College of Veterinary and Animal Sciences, MAFSU, Udgir, Dist Latur/MS) for further investigation of goat respiratory affections. The samples were analysed as per procedure described by Bruker Daltronics.

4.2.2 Bacterial confirmation through MALDI-TOF MS:

i. A small amount of bacteria was applied to the MALDI plate in a thin film as a direct method.

ii. Ethanol Formic Acid Extraction:

A colony of bacteria was resuspended in 300 μl (Microliter) of water. Then, 900 μl of absolute ethanol was added to it. The mixture was centrifuged at 15,500 × g for 2 min, and the supernatant was discarded. Subsequently, 50 μl of formic acid (70% [vol/vol]) was added to the colony and mixed thoroughly by pipetting before the addition of 50 μl acetonitrile to the mixture. The mixture was centrifuged again at 15,500 × g for 2 min. One microliter of the supernatant was placed onto a spot of the steel target and air dried at room temperature.

Both the positive standard and the test supernatant were overlaid with 1 μl of matrix solution (saturated solution of HCCA [α-cyano-4-hydroxy cinnamic acid] in organic solvent [50% acetonitrile and 2.5% trifluoroacetic acid]) and air dried.

iii. MALDI-TOF mass spectrometry:

Measurements were performed on an Microflex LT MALDI-TOF/TOF mass spectrometer (Bruker Daltonics, Leipzig, Germany) equipped with a Smart beam laser. Spectra were recorded in the linear, positive mode at a laser frequency of 200 Hz (Hertz) within a mass range from 2,000 to 20,000 Da (Dalton). The IS1 (ionic state), IS2 and lens voltage were maintained at 20 kV (kilovolt), 18.6
kv and 6 kV, respectively whereas the extraction delay time was 40 ns (nanosecond).

For each spectrum, 40 laser shots were collected and analyzed (10 × 50 laser shots from different positions of the target spot). The spectra were calibrated externally using the standard calibrant mixture (Escherichia coli extracts including the additional proteins RNase A and myoglobin; Bruker Daltonics). The calibration masses were as follows: RL36, 4,364.3 Da; RS22, 5,095.8 Da; RL34, 5,380.4 Da; RL33meth, 6,254.4 Da; RL32, 6,315 Da; RL29, 7,273.5 Da; RS19, 10,299.1 Da; RNase A, 13,682.2 Da; and myoglobin, 16,952.5 Da.

iv. Data analysis:

For automated data analysis, raw spectra were processed using the MALDI Biotyper OC 3.1.66 software (Bruker Daltonics, Leipzig, Germany) at default settings. The software performed normalization, smoothing, baseline subtraction, and peak picking and created a list of the most significant peaks of the spectrum (m/z values with a given intensity, with the threshold set to a minimum of 1% of the highest peak and a maximum of 100 peaks). To identify unknown bacteria, each peak list generated was matched directly against reference libraries (4,623 species) using the integrated pattern-matching algorithm of the Biotyper OC 3.1.66 software (Bruker Daltonics, GmbH, Germany). The unknown spectra were compared with a library of reference spectra based on a pattern recognition algorithm using peak position, peak intensity distributions, and peak frequencies. A comparison between Klebsiella Pneumonia isolated from pneumonic cases in bovines and Klebsiella profile included in the Biotyper database for comparison purposes. Once a spectrum was generated and captured by the software, the whole identification process was performed automatically, without any user intervention.

5.1 Pathological studies:

5.1.1 Gross pathology:

A total of 214 goats samples were examined & suspected for died of respiratory affections as well presented to Department of Veterinary Pathology for
conducted post mortem examined critically for noting gross lesions in the respiratory tract. The gross lesions noted in respiratory organs were recorded and representative tissue samples of affected organ were collected in 10% buffer formalin for further histopathological studies. Also, while screening the slaughtered goats, the affected organs of respiratory system observed critically for gross changes and representative samples were collected for further histopathological studies.

5.1.2 **Histopathology:**

The formalin-fixed affected respiratory organs were trimmed, processed, sectioned and stained as per standard procedure (Luna, 1968) for noting histopathological changes.

5.2 **Statistical analysis:**

The data generated during present study was analysed by employing chi-square test by Snedecor and Cochran (1982).
Chapter – 4

RESULTS AND DISCUSSION

The study on respiratory affections with special reference to bacterial infections in goats was conducted. For this study, the goats slaughtered at local slaughter places in and around Parbhani and also died goats presented to Department of Veterinary Pathology, College of Veterinary and Animal Sciences, Parbhani for conduct of post mortem examination were used. During current study, all the carcasses were systematically examined for noting gross lesions in the organs of respiratory tract.

The organs having either of respiratory affections was studied and swabs were collected for knowing the bacterial infection if any. The data generated in respect of respiratory affections was categorized dependent of gross and histopathological lesions, bacterial isolates and age of the goats.

In general, grossly, the affections of lungs were found to be comparatively more than the other respiratory organs. The Staphylococci species as compared to the other species of bacteria found to be more prevalent than the other species. The data generated during present study were analyzed by employing Chi-square analysis and results obtained are narrated and discussed in this chapter.

4.1 Overall prevalence of respiratory affections:

During study period, 214 carcasses of varying aged goats were screened. Amongst those, 154 goat carcasses were screened from different local slaughter places available in and around Parbhani and 60 goat carcasses which were presented to Department of Veterinary Pathology, COVAS, Parbhani for conduct of post mortem examination during study period were examined.
After thorough post mortem examination of screened carcasses of goats, 192 amongst 214 were with either or mixed type of gross lesion targeting either or multiple organs of respiratory system. The overall prevalence of respiratory affections in screened goats was found to be 89.72%.

Belkhirī et al. (2009) reported 85.52% of prevalence of pulmonary lesions in bovines. In addition, Akbor et al. (2007) and Rashid et al. (2013) also noted similar pattern of prevalence of respiratory affections in their respective studies.

The respiratory system is consistently injured due to constant exposure to microbes particle fibers, pollutant, toxic gasses, vapors etc. present in the air. Also, the immune compromization due to managemental, productive and reproductive stress might be making the animal susceptible to injuries. This all could be making the respiratory system very much vulnerable to pathogens leading to high prevalence of respiratory affections.

4.2 Age wise prevalence of respiratory affections in goats:

Table no.1 and 2 shows age wise prevalence of respiratory affections in goats. The data generated in respect of respiratory affections in goats was subjected to analyze it for age wise prevalence. This data was basically pertaining to 60 died goats and 154 slaughtered goats which were screened during present study.

Amongst 60 goats, which were died and presented to Department of Veterinary Pathology, COVAS, Parbhani, 35 carcasses were of goats aging up to 1 year and 25 were of more than 1 year age. These carcasses were when screened for noting the gross respiratory affections revealed 97.14% prevalence in goats aging up to 1 year and this percent prevalence of respiratory affections in goats aging more than 1 year was 92.00%.

The age wise prevalence of respiratory affections in slaughtered as well died goats didn’t showed significant variation on its statistical analysis.
Table No. 1 Age wise prevalence of respiratory affections in slaughtered goats:

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Category</th>
<th>No of goats screened</th>
<th>Positive</th>
<th>Percentage</th>
<th>$X^2$ Table</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Goats up to 1 year</td>
<td>97</td>
<td>94</td>
<td>96.91</td>
<td>0.9462</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Goats above 1 year</td>
<td>57</td>
<td>41</td>
<td>71.92</td>
<td>1.6069</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>154</td>
<td>135</td>
<td>87.66</td>
<td>2.5531</td>
<td>Non-significant</td>
</tr>
</tbody>
</table>

Table No.2 Age wise prevalence of respiratory affections in died goats:

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Category</th>
<th>No of goats screened</th>
<th>Positive</th>
<th>Percentage</th>
<th>$X^2$ Table</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Goats up to 1 year</td>
<td>35</td>
<td>34</td>
<td>97.14</td>
<td>0.0169</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Goats above 1 year</td>
<td>25</td>
<td>23</td>
<td>92.00</td>
<td>0.023</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>60</td>
<td>57</td>
<td>95.00</td>
<td>0.0399</td>
<td>Non-significant</td>
</tr>
</tbody>
</table>
In toto, 154 goats slaughtered at local slaughter houses in and around Parbhani were screened during present study. Amongst those, 97 goats were aging up to 1 year and 57 were of more than 1 year age. The goats aging 1 year showed 96.91% prevalence and goats above 1 year of age were with 71.92% prevalence of respiratory affections. Statistically this age wise prevalence didn’t showed significant difference.

4.3 Prevalence of bacterial infections in lungs of goats:

4.3.1 Isolation and identification of bacteria through bacteriological techniques:

Table no 3 and 4 shows prevalence of bacteria isolated from lungs and trachea of screened goats. These bacteria were isolated by standard bacteriological technique. Amongst 214 goats screened, 192 goats were with either or mixed gross lesions. To know the prevalence of bacteria, 144 swabs from lungs and 48 swabs from trachea were collected and subjected to bacterial isolation and identification by following standard bacteriological techniques. Amongst 144 swabs collected from lungs, 137 swabs were examined through standard bacteriological techniques; however, 7 representative lung swabs were subjected to the MALDI-TOF-MS for confirmative diagnosis.

On bacteriological studies of 137 lung swabs, *staphylococcus* species was isolated from 42 swabs showing 29.16% prevalence which was highest amongst all bacteria species isolated. It was followed by *E. coli* (22.22%), *Bacillus* species (22.22%) and *Proteus* species (21.52%). *Staphylococcus* species and *E. coli* were confirmed biochemically by employing Catalase test and MR-VP test respectively.
Table no. 3 Prevalence of bacteria isolated from lungs of screened goats:

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Isolated bacteria</th>
<th>No. of goats with gross lesion in lung</th>
<th>Positive</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Staphylococci</em></td>
<td></td>
<td>42</td>
<td>29.16</td>
</tr>
<tr>
<td>2</td>
<td><em>E. coli</em></td>
<td>144</td>
<td>32</td>
<td>22.22</td>
</tr>
<tr>
<td>3</td>
<td><em>Bacilli</em></td>
<td></td>
<td>32</td>
<td>22.22</td>
</tr>
<tr>
<td>4</td>
<td><em>Proteus</em></td>
<td></td>
<td>31</td>
<td>21.52</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>144</strong></td>
<td><strong>137</strong></td>
<td><strong>95.12</strong></td>
</tr>
</tbody>
</table>

Table No. 4 Prevalence of bacteria isolated from trachea of screened goats:

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Isolated bacteria</th>
<th>No. of goats with gross lesion in trachea</th>
<th>Positive</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Staphylococci</em></td>
<td></td>
<td>10</td>
<td>20.83</td>
</tr>
<tr>
<td>2</td>
<td><em>E. coli</em></td>
<td>48</td>
<td>08</td>
<td>16.66</td>
</tr>
<tr>
<td>3</td>
<td><em>Bacilli</em></td>
<td></td>
<td>10</td>
<td>20.83</td>
</tr>
<tr>
<td>4</td>
<td><em>Proteus</em></td>
<td></td>
<td>10</td>
<td>20.83</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>48</strong></td>
<td><strong>38</strong></td>
<td><strong>79.15</strong></td>
</tr>
</tbody>
</table>
The forty eight tracheal swabs were collected from slaughtered and died goats which were with either or mixed type of gross lesions in respiratory tract. These were further subjected for isolation and identification of bacteria. The isolation and identification studies of bacteria recovered 20.83% prevalence of *staphylococci* species, followed by *Bacillus* species and *Proteus* species 20.83% each. However, *E. coli* were recovered from 16.66% tracheal swabs.

The findings noted in respect of prevalence of bacteria in respiratory affections in goats goes in line with the earlier reports of Megra et al. (2006), Rashid et al. (2013), Ferdausi et al. (2008) and Azizollah et al. (2009). These researchers recorded variable percent prevalence of bacterial infections.

4.3.2 **Isolation and identification of bacteria through MALDI-TOF-MS:**

Table no. 5 indicates details of bacterial isolates recovered from tracheal and lung swabs of goats.

**Table no. 5: Bacteria isolated from lungs and trachea of goats by MALDI-TOF-MS:**

<table>
<thead>
<tr>
<th>Analyte name</th>
<th>Analyte ID</th>
<th>Organism (Best match)</th>
<th>Score Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2 (+) (B)</td>
<td>1</td>
<td>Staphylococcus chromogenes</td>
<td>1.7</td>
</tr>
<tr>
<td>C3 (+) (B)</td>
<td>2</td>
<td>Corynebacterium efficiens</td>
<td>1.7</td>
</tr>
<tr>
<td>C4 (+++) (A)</td>
<td>3</td>
<td>Acinetobacter pittii</td>
<td>2.053</td>
</tr>
<tr>
<td>C5 (+++)(A)</td>
<td>4</td>
<td><em>Escherichia coli</em></td>
<td>2.381</td>
</tr>
<tr>
<td>C6 (+) (B)</td>
<td>5</td>
<td>Alcaligenes faecalis</td>
<td>1.743</td>
</tr>
<tr>
<td>C7 (+) (B)</td>
<td>6</td>
<td><em>Bacillus clausi</em></td>
<td>1.72</td>
</tr>
<tr>
<td>C8 (+++) (A)</td>
<td>7</td>
<td><em>Escherichia coli</em></td>
<td>2.243</td>
</tr>
<tr>
<td>C9 (+) (B)</td>
<td>8</td>
<td>Corynebacterium efficiens</td>
<td>1.7</td>
</tr>
<tr>
<td>C10 (+) (B)</td>
<td>9</td>
<td><em>Proteus hauseri</em></td>
<td>1.991</td>
</tr>
<tr>
<td>C11 (+) (B)</td>
<td>10</td>
<td><em>Bacillus cereus</em></td>
<td>1.806</td>
</tr>
<tr>
<td>C12 (+) (B)</td>
<td>11</td>
<td>Enterobacter cloacae and Enterobacter ludwigii</td>
<td>1.999</td>
</tr>
<tr>
<td>C13 (+) (B)</td>
<td>12</td>
<td><em>Staphylococcus aureus</em></td>
<td>1.7</td>
</tr>
<tr>
<td>C14 (+++) (A)</td>
<td>13</td>
<td>Comamonas kerstersii</td>
<td>2.119</td>
</tr>
<tr>
<td>C15 (+) (B)</td>
<td>14</td>
<td>Enterobacter cloacae</td>
<td>1.94</td>
</tr>
<tr>
<td>C16 (+) (B)</td>
<td>15</td>
<td><em>Staphylococcus sciuri</em></td>
<td>1.7</td>
</tr>
<tr>
<td>C17 (+++) (A)</td>
<td>16</td>
<td><em>Enterococcus casseliflavus</em></td>
<td>2.097</td>
</tr>
<tr>
<td>C18 (+) (A)</td>
<td>17</td>
<td>Lysinibacillus fusiformis</td>
<td>1.99</td>
</tr>
</tbody>
</table>
Note: Meaning of Score Values:

<table>
<thead>
<tr>
<th>Range</th>
<th>Description</th>
<th>Symbols</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.300 ... 3.000</td>
<td>Highly probable species identification</td>
<td>(+++ )</td>
<td>Green</td>
</tr>
<tr>
<td>2.000 ... 2.299</td>
<td>Secure genus identification, probable species identification</td>
<td>(++ )</td>
<td>Green</td>
</tr>
<tr>
<td>1.700 ... 1.999</td>
<td>Probable genus identification</td>
<td>( + )</td>
<td>Yellow</td>
</tr>
<tr>
<td>0.000 ... 1.699</td>
<td>Not reliable identification</td>
<td>( - )</td>
<td>Red</td>
</tr>
</tbody>
</table>

Note: Meaning of Consistency Categories (A - C):

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td><strong>Species Consistency:</strong> The best match was classified as 'green'. Further 'green' matches are of the same species as the first one. Further 'yellow' matches are at least of the same genus as the first one.</td>
</tr>
<tr>
<td>B</td>
<td><strong>Genus Consistency:</strong> The best match was classified as 'green' or 'yellow'. Further, 'green' or 'yellow' matches have at least the same genus as the first one. The conditions of species consistency are not fulfilled.</td>
</tr>
<tr>
<td>C</td>
<td><strong>No Consistency:</strong> Neither species nor genus consistency (Please check for synonyms of names or microbial mixture).</td>
</tr>
</tbody>
</table>

In toto, 17 representative swabs (10 tracheal and 07 lung swabs) were subjected to MALDI-TOF-MS analysis for confirmation. Amongst those, 1 tracheal swabs showed mixed type of bacterial infection and rest 9 samples showed individual bacteria as mentioned in the table no. 5. However, 7 lung swabs on its screening through MALDI-TOF-MS revealed two mixed type of bacterial infections and rest 5 samples showed prevalence of individual bacteria as shown in table no 5.

The findings noted in respect of isolation and identification of bacteria by MALDI-TOF-MS are in consonance with the earlier reports of Ronald et al. (2004), Deborah et al. (2011) and De Carolis et al. (2014). These
researchers recorded variable percent prevalence of bacteria isolated by the using MALDI-TOF-MS.

Ronald et al. (2004) reported Klebsiella pneumoniae as major isolate followed by Mannheimia haemolytica, Escherichia coli, Enterobacter aerogenes and Streptococcus species from Bovine Respiratory Diseases. MALDI-TOF MS has successfully been used for the identification of a wide array of bacterial and fungal species Kumar et al.(2004).

Earlier studies have recorded the use of MALDI TOF MS as a useful and rapid tool for identification of bacteria from the cultures especially when a good protein profile database allows a comparison of the profiles obtained with a large number of bacterial species and strains. Other studies have described an excellent correlation between MALDI-TOF MS identification and conventional microbiological identification in clinical bacterial isolates.

In some cases, there are discrepancies between MALDI-TOF MS and conventional identification, as sometimes happens for the bacterial isolates specifically for Streptococcus species. MALDI-TOF MS seems to require high bacterial counts to be able to provide reliable scores. The result agrees with the results for the clinical samples, since only one out of thirty samples with bacterial count less than $5 \times 10^5$ CFU/ml, could not form the peaks and reliable MALDI-TOF profiles within the specified incubation period.

4.4 Prevalence of gross lesions in the respiratory organs:

The gross lesions noted in respiratory organs in slaughtered and died goats are shown in table 6, 7, 8 and 9.
### Table No. 6 Prevalence of gross lesions noted in respiratory organs of slaughtered goats:

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Category</th>
<th>Number of goats screened</th>
<th>Positive</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gross lesions in lungs</td>
<td>154</td>
<td>101</td>
<td>65.58</td>
</tr>
<tr>
<td>2</td>
<td>Gross lesions of trachea</td>
<td>34</td>
<td>34</td>
<td>22.07</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>154</td>
<td>135</td>
<td>87.66</td>
</tr>
</tbody>
</table>

### Table No. 7 Prevalence of gross lesions noted in respiratory organs of died goats:

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Category</th>
<th>Number of goats screened</th>
<th>Positive</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gross lesions in lungs</td>
<td>60</td>
<td>43</td>
<td>71.67</td>
</tr>
<tr>
<td>2</td>
<td>Gross lesions of trachea</td>
<td>14</td>
<td>14</td>
<td>23.33</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>60</td>
<td>57</td>
<td>95.00</td>
</tr>
</tbody>
</table>
Fig No. 1 *Escherichia coli*

Fig No. 2 *Acinetobacter pittii*
Fig No. 3 *Enterobacter cloacae* + *Enterobacter ludwigii*

Fig No. 4 *Corynebacterium efficiens*
Fig No. 5 *Escherichia coli*

Fig No. 6 *Alcaligenes faecalis*
Fig No. 9 *Bacillus cereus*

Fig No. 10 *Staphylococcus aureus*
Table No. 8 Prevalence of gross lesions noted in respiratory organs of slaughtered goats:

<table>
<thead>
<tr>
<th>Gross lesions</th>
<th>Number of goats with lung affections</th>
<th>Percentage</th>
<th>No. of goats with Tracheal affections</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congestion</td>
<td>37</td>
<td>36.63%</td>
<td>20</td>
<td>58.82</td>
</tr>
<tr>
<td>Hepatization</td>
<td>17</td>
<td>16.83%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Consolidation</td>
<td>13</td>
<td>12.87%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Marbling</td>
<td>13</td>
<td>12.87%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Fibrinous pneumonia</td>
<td>09</td>
<td>8.91%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Emphysema</td>
<td>05</td>
<td>4.95%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Suppuration</td>
<td>04</td>
<td>3.96%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Haemorrhages</td>
<td>03</td>
<td>2.97%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Froth</td>
<td>-</td>
<td>-</td>
<td>14</td>
<td>41.17%</td>
</tr>
<tr>
<td>Total</td>
<td>101</td>
<td>-</td>
<td>34</td>
<td>-</td>
</tr>
</tbody>
</table>

Amongst 101 lungs of slaughtered goats which were with various types of gross lesions, congestion appeared to be highly prevalent gross lesion having 36.63% prevalence followed by hepatization (16.63%), consolidation (12.87%), marbling (12.87%), fibrinous pneumonia (8.91%), emphysema (4.95%), suppuration (3.96%) and haemorrhage (2.97%).

Table No. 9 Prevalence of gross lesions noted in respiratory organs of died goats:

<table>
<thead>
<tr>
<th>Gross lesions</th>
<th>Number of goats with lung affections</th>
<th>Percentage</th>
<th>No. of goats with Tracheal affections</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fibrinous pneumonia</td>
<td>35</td>
<td>81.39%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Froth</td>
<td>-</td>
<td>-</td>
<td>10</td>
<td>71.42%</td>
</tr>
<tr>
<td>Marbling</td>
<td>04</td>
<td>9.30%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haemorrhage</td>
<td>02</td>
<td>4.65%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consolidation</td>
<td>02</td>
<td>4.65%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Congestion</td>
<td>-</td>
<td>-</td>
<td>04</td>
<td>28.57%</td>
</tr>
<tr>
<td>Total</td>
<td>43</td>
<td>-</td>
<td>14</td>
<td>-</td>
</tr>
</tbody>
</table>

Amongst 101 lungs of slaughtered goats which were with various types of gross lesions, congestion appeared to be highly prevalent gross lesion having 36.63% prevalence followed by hepatization (16.63%), consolidation (12.87%), marbling (12.87%), fibrinous pneumonia (8.91%), emphysema (4.95%), suppuration (3.96%) and haemorrhage (2.97%).
The trachea when studied for gross pathological changes revealed 58.82% prevalence of congestion as a top followed by presence of froth to an extent of 41.17%.

The goats died of respiratory affections when subjected for studying its prevalence revealed 81.39% prevalence of fibrinous pneumonia occupying first position followed by marbling (9.30%), hemorrhage (4.65%) and consolidation (4.65%). However, in case of trachea, presence of froth was observed in 71.42% goats followed by congestion to an extent of 28.57%.

The observations of Sharma et al. (1991), Akbor et al. (2007), Tijjani et al. (2012) supports the present findings recorded in respect to the prevalence of gross lesion in the respiratory organs.

The fibrinous pneumonic conditions observed in the present study in the died goats might be due to presentation of more number of carcasses of died goats to the Department for conduct of post mortem during monsoon season.

4.5 Gross pathological studies:

During systematic post mortem examination of slaughtered and died goats various types of gross lesions noted in trachea and lungs are described as under:

4.5.1 Gross lesions in trachea:

The congestion, a nonspecific lesion was noted in trachea characterized by minimal to mild, focal to multifocal reddening. Mostly the goats died of respiratory affections were with mild to severe, localized to diffused and clear to exudatory froth in trachea (Plate no.1).

4.5.2 Gross lesions in lungs:

During systemic post mortem examination of died and slaughtered goats, died goats were with extensive gross lesions in lungs, whereas, the severity
Plate 1: Note tracheal froth and white fibrinous coating over the lung surface

Plate 2: Note areas of consolidation and focal fibrin over the lung surface
and extent of gross lesions in respiratory organs of slaughter goats appeared to be comparatively of less significance.

During present study, fibrinous pneumopathy was found to be of greater significance in terms of its prevalence in goats. It was characterized by presence of fibrinous exudation over the lung lobes may or might not having adhesions. The fibrin found to be accumulated on the lung surface forming variable sized smooth to hard, loose to tight, whitish to yellowish plaque over the lungs.

The affected lungs appeared to be reddened. In these conditions, there was presence of yellowish, whitish, creamy and red tinged fluid in thoracic cavity (Plate no.2). On section, grossly the lungs showed thin clear edematous fluid.

The lungs with firm consistency were categorized under consolidation condition which usually might be resulted due to loss of air spaces due to exudation. The lungs having localized to diffuse, reddish to grey coloration, softer to harder in its consistency were described under hepatization condition.

The lungs with thickened inter alveolar septa visualized grossly resulting in to slightly firm texture were referred as marbled lungs (Plate no.3). The area of marbling was with deep white coloration.

The lungs with suppuration were characterized by presence of thin watery to thick, clear whitish to creamy, localized to diffused presence of pus. The affected portion of lungs appeared to be whitish to reddish in colour and fragile in its consistency (Plate no 4 and 5).

The lungs with minimal to severe, focal to diffused, reddish discoloration was described as hemorrhagic lung (Plate no.6).

On gross examination, the lungs with emphysema appeared pale and showed enlargement. Occasionally, the impression of ribs over the exposed part was noted in emphysematous lungs.
Plate 3: Note areas of consolidation and marbling in lung

Plate 4: Showing swollen suppuration in left side of lung
Plate 5: Exposed lung showing suppuration

Plate 6: Note multifocal haemorrhages in lungs and froth in trachea
Plate 7: Note multifocal areas of consolidation in lungs

Plate 8: Lungs with meaty appearance
Plate 9: Note petechial haemorrhges over the lung surface

Plate 10: Note adherence of thick fibrin over the lung with pyothorax
Plate 11: Note adherence of fibrin over the lung surface

Plate 12: Plate showing growth of bacterial colonies on Brain heart infusion agar
Plate 13: Plate showing wavy colony of *Proteus* on Brain heart infusion
4.6 Histopathological studies:

The tissue samples from the trachea and lungs having gross lesions were collected and subjected for histopathological studies. The histopathological observations recorded during present study are described and illustrated through plates.

4.6.1 Tracheitis:

The portion of trachea having gross lesions when subjected for histo architectural studied noted acute inflammatory changes characterized by mild to moderate infiltration of inflammatory cells (Plate no.14 and 15) and presence of catarrhal exudate in the lumen.

The tracheal epithelium showed mild hyperplasia at places. Also, engorged venules indicating congestion were noted in few sections of trachea.

4.6.2 Circulatory disturbances in lungs:

The sections of lung showed increased accumulation of blood within the venules characterizing congestion. There was infiltration of inflammatory cells in congested portions of lungs. Also, sections of lungs were with presence of minimal to mild, focal to multifocal and petechial to ecchymotic haemorrhages. Occasionally, the vasculature showed thrombus (Plate no.16).

Many sections of lungs revealed mild to moderate, focal to diffused edema along with infiltration of inflammatory cells (Plate no.18).

4.6.3 Emphysema :

The histopathological studies of lungs showed distension and rupture of alveolar walls forming variable sized clear spaces indicating emphysematous changes (17).
Plate 14: A section of trachea with severe inflammatory cell infiltration (H & E ×100)

Plate 15: A section of trachea with severe inflammatory cell infiltration (H & E ×100)
Plate 16: Note thrombus with edema, congestion and inflammatory cell infiltration in lung (H & E ×100)

Plate 17: Note moderate emphysematous changes with inflammatory cell infiltration in lung (H& E ×100)
Plate 18: Note moderate multifocal edema with inflammatory cell infiltration in lung (H & E ×100)

Plate 19: A section of lung with suppurative bronchopneumonic changes and marked inflammatory cell infiltration and fibrous tissue proliferation (H & E ×100)
Plate 20: A section of lung with hyperplasia of bronchiolar epithelium and marked inflammatory cell infiltration and fibrous tissue proliferation (H & E ×100)

Plate 21: A section of lung with hyperplasia of bronchiolar epithelium and marked inflammatory cell infiltration and fibrous tissue proliferation (H & E ×400)
Plate 22: Note focal areas of necrosis having sever inflammatory cells infiltrations, thickening of interstitium and bronchopneumonic changes (H & E ×100x)

Plate 23: A section of lung with marked deposition of fibrin in alveolar spaces with infiltration of inflammatory cells and moderate thickening of interlobar septa (H & E ×100)
Plate 24: Note moderate hyperplasia of bronchiolar epithelium multifocal edema and moderate inflammatory cell infiltration (H & E ×400)

Plate 25: A section of lung with sever hyperplasia of bronchiolar epithelium with presence of inflammatory exudation in lumen (H & E ×400)
Plate 26: Note severe inflammatory cell infiltration along with thickening of Interstitium (H & E ×100)

Plate 27: A section of lung with suppurative and fibrinous bronchopneumonic changes (H & E ×400)
Plate 28: A section of lung with broncho, suppurative and interstitial pneumonic changes (H & E×100)

Plate 29: A section of lung with thickened inter alveolar septa and marked infiltration of inflammatory cells (H & E ×100)
Plate 30: A section showing adhesion of fibropurulent wall on the lung evidenced by inflammatory cell infiltration (H & E ×100)

Plate 31: Lung showing adhesion of fibropurulent wall on surface with inflammatory cell infiltration (H & E ×100)
Plate 32: Note adhesions of fibrinous coating over the lung surface with proliferative pneumatic changes (H & E ×100)

Plate 33: Note a fibroelastic layer over the lung surface having severe inflammatory cell infiltration (H & E ×100)
Plate 34: Note extensive deposition of fibrin in alveoli of lung with periarterial fibrous tissue proliferation and inflammatory cell infiltration (H & E $\times$100)

Plate 35: Note suppuration characterized by severe infiltration of inflammatory cells (H & E $\times$100)
These changes were mostly noticed in goats having other pulmonary lesions. Occasionally, the sections showed moderate distension of interstitial septa of lungs.

4.6.4 Inflammation:

The sections of lungs studied for histopathological assessment revealed acute to chronic inflammatory changes characterized by minimal to severe, focal to diffused inflammatory cell infiltration, catarrhal, suppurative and fibrinous exudation thickening of inter alveolar septa, fibrous tissue proliferation and coating over lung surface.

4.6.4.1 Bronchopneumonia:

The sections of lungs revealed minimal to marked hyperplasia of bronchiolar epithelium, peribronchiolar inflammatory cell infiltration, presence of inflammatory cells in the alveolar spaces, peribronchiolar lymphoid aggregation, presence of debris in bronchus and bronchioles. The hyperplastic and hypertrophid epithelium in few sections found to be projected into lumen giving adenoid, polypoid appearance. There was thickening of interalveolar septa along with mild to moderate emphysematous changes.

The sections of lungs having suppurative bronchopneumonia showed infiltration of inflammatory cells along with suppurative exudation in bronchiolar and alveolar spaces. The sections with abscession were characterized by localized suppuration encircled with fibrinous tissue proliferation and inflammatory cell infiltration. In few sections of lungs, there was extensive proliferation of fibrous connective tissue proliferating it into inter alveolar spaces leading to proliferative pneumonic changes.

The lungs with fibrinous bronchopneumonia were characterized by deposition of fibrin in inter alveolar spaces, thickening of interstitium along with inflammatory cell infiltration and emphysema. Many sections of lungs prevailing bronchopneumonic changes were with adherence of fibrinous, fibropurulent layer over lung surface which was evidenced by place of adherence with presence inflammatory cells, fibrous tissue proliferation, fibrin deposition, exudation and neovascularization. The fibropurulent layer appeared to be invaded extensively
within the lungs separating alveoli and even compressing them resulting into chronic proliferative pneumonic condition.

4.6.4.2 Interstitial pneumonia:

The sections of lungs revealed hyalised content within alveoli along with thickened interalveolar septa and accumulation of inflammatory cells in alveolar interstitium.

The sections of lungs also showed alveolar fibrosis along with accumulation of mononuclear cells in the interstitium.

Being a major organ of respiratory system, lung involves in effective and speedy removal of pathogens and for which inflammatory reaction takes place. In addition, varieties of pathogens, immunocompromization, long term exposure, environmental stressors could be causing the wide ranged acute to chronic histoarchitecteral changes in the lungs.

The observations of present study are in close approximations with earlier reports of Rashid et al. (2013), Mahdi et al. (2015), Amaravathi et al. (2016), Dar et al. (2014).
The study on respiratory affections with special reference to bacterial infections in goats was conducted. During present study, the goats slaughtered at local slaughter house in and around Parbhani and also died goats presented to Department of Veterinary Pathology, College of Veterinary and Animal Sciences, Parbhani for conduct of post mortem examination were used. All the carcasses were systematically examined for noting gross lesions in the organs of respiratory tract.

The organs having either of respiratory affection were studied and swabs from those goats were collected for knowing the bacterial infection if any. The data generated in respect of respiratory affections was categorized dependent of age of goats, bacterial isolates and gross and histopathological lesions.

Grossly, the affections of lungs as compared to other organs were found to be comparatively more. The *Staphylococci* species as compared to the other species of bacteria found to be more prevalent in the respiratory affections.

During study period, 214 carcasses of varying aged goats were screened. Amongst those, 154 goat carcasses were screened from different local slaughter places available in and around Parbhani and 60 goat carcasses presented to Department of Veterinary Pathology, College of Veterinary and Animal Sciences, Parbhani for conduct of post mortem examination were examined.

After thorough post mortem examination of screened carcasses of goats, 192 amongst 214 were with either or mixed type of gross lesion targeting either or multiple organs of respiratory system.
The overall prevalence of respiratory affections in screened goats was found to be 89.72%.

Amongst 60 goats, which were died and presented to Department of Veterinary Pathology, 35 carcasses were of goats aging up to 1 year and 25 were of more than 1 year age. These carcasses when screened for noting the gross respiratory affections revealed 97.14% prevalence in goats aging up to 1 year and this percent prevalence of respiratory affections in goats aging more than 1 year was 92.00%.

The goats (154) slaughtered at local slaughter places, in and around Parbhani were screened during present study. Amongst those, 97 goats were aging up to 1 year and 57 were of more than 1 year age. The goats aging 1 year showed 96.91% prevalence and goats above 1 year of age were with 71.92% prevalence of respiratory affections.

During present study, the prevalence of bacteria in lungs and trachea was also studied. These bacteria were isolated by standard bacteriological technique. Amongst 214 screened goats, 192 goats were with either or mixed gross lesions. To know the prevalence of bacteria, 144 swabs from lungs and 48 swabs from trachea were collected and subjected to further bacterial isolation and identification by following standard bacteriological techniques. Amongst 144 swabs collected from lungs, 137 swabs were examined through standard bacteriological techniques; however, 7 representative lung swabs were subjected to MALDI-TOF-MS for confirmative diagnosis.

On bacteriological studies of 137 lung swabs Staphylococci species was isolated from 42 swabs showing 29.16% prevalence which was highest amongst all bacterial species. This percent prevalence was followed by E. coli (22.22%), Bacillus species (22.22%) and Proteus species (21.52%).

The isolation and identification studies of 48 tracheal swabs on its thorough bacteriological investigations revealed 20.83% prevalence of staphylococci species, followed by Bacillus species and Proteus species to an extent of 20.83% each. However, E. coli were recovered from 16.66% tracheal swabs.
In toto, 17 representative swabs (10 trachea and 07 lung swabs) were subjected to MALDI-TOF-MS analysis for confirmation. Amongst those, one tracheal swab showed mixed type of bacterial infection and rest 9 samples showed individual bacteria. However, 7 lung swabs on its screening through MALDI-TOF-MS revealed two mixed type of bacterial infections and rest 5 samples showed prevalence of individual.

The gross pathological examination of 101 lungs of slaughtered goats showed congestion as highly prevalent gross lesion having 36.63% prevalence followed by hepatization (16.63%), consolidation (12.87%), marbling (12.87%), fibrinous pneumonia (8.91%), emphysema (4.95%), suppuration (3.96%) and haemorrhage (2.97%).

The trachea when studied for gross pathological changes revealed 58.82% prevalence of congestion followed by presence of froth (41.17%).

The goats died of respiratory affections when subjected for studying its prevalence revealed 81.39% prevalence of fibrinous pneumonia as highest prevalence followed by marbling (9.30%), hemorrhage (4.65%) and consolidation (4.65%). However, in case of trachea, presence of froth was observed in 71.42% goats followed by congestion (28.57%).

During present study, fibrinous pneumopathy was found to be of greater significance in terms of its prevalence in goats. It was characterized by presence of fibrinous coating over the lung surface with or without adhesions. The fibrin found to be accumulated on the lung surface forming variable sized smooth to hard, loose to tight, whitish to yellowish plaque over the lungs.

To know extent of damage being caused in trachea and lungs, its histopathological examinations were carried out. The histopathological studies of trachea revealed tracheitis, congestion and occasional haemorrhages. The lungs on its histoarchitectural studies showed congestion, haemorrhages, oedema, emphysema and bronchopneumonia in affected portions of lungs.

The sections of lungs revealed minimal to marked hyperplasia of bronchiolar epithelium, peribronchiolar inflammatory cell infiltration, presence of inflammatory cells in the alveolar spaces, peribronchiolar lymphoid aggregation,
presence of debris in bronchus and bronchioles. There was thickening of inter alveolar septa along with mild to moderate emphysematous changes.

The sections of lungs having suppurative bronchopneumonia showed infiltration of inflammatory cells along with suppurative exudation in bronchiolar and alveolar spaces. The sections with abscession were characterized by localized suppuration encircled with fibrinous tissue proliferation and inflammatory cell infiltration. In few sections of lungs, there was extensive proliferation of fibrous connective tissue proliferating it into inter alveolar spaces leading to proliferative pneumonic changes.

The lungs with fibrinous bronchopneumonia were characterized by deposition of fibrin in interalveolar spaces, thickening of interstitium along with inflammatory cell infiltration and emphysema. Many sections of lungs prevailing bronchopneumonic changes were with adherence of fibrinous, fibropurulent layer over lung surface which was evidenced by place of adherence with presence inflammatory cells, fibrous tissue proliferation, fibrin deposition, exudation and neovascularization.

The sections of lungs revealed hyalinised content within alveoli along with thickened inter alveolar septa and accumulation of inflammatory cells in alveolar interstitium.

Following conclusions were drawn based on results of present studies:

1. The overall prevalence of respiratory affections in screened goats was found to be 89.72%
2. The goats aging 1 year showed 96.91% prevalence and goats ageing more than 1 year were with 71.92% prevalence of respiratory affections
3. *Staphylococcus* species found to be highly prevalent than other bacterial species
4. Fibrinouspneumopathy was found to be of highly prevalent condition in goats died of respiratory affection
5. MALDI-TOF MS is quick and reliable method for the identification of bacteria

6. Histopathologically, bronchopneumonia found to be highly prevalent condition in goats
BIBLIOGRAPHY


Ugochukwu, Iniobong Chukwuebuka, Aneke, Chioma Inyang, Ezeasor, Chukwunonso Kenchukwu, Msheila, Wayuta Philip, Idoko, S. I.,


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In the year 2015, the author joined Master's degree in the Veterinary Pathology discipline and completed the necessary credits for postgraduate studies in first class. He has participated in various activities apart from study in both undergraduate and post graduate level. He also actively participated in university cultural competition “Indradhanushay” in 2012, 2013. He had one popular article as an author on his credit.
THESIS ABSTRACT

a) Title of the thesis : “ETIOPATHOLOGICAL INVESTIGATIONS OF RESPIRATORY AFFECTIONS IN GOATS WITH SPECIAL REFERENCE TO BACTERIAL INFECTIONS.”

b) Full name of student : Mr. Aulwar Bajrang Saylu

c) Name and address of Major Advisor : (Dr. G. R. Gangane)
Advisor/Guide
Associate Professor,
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College of Veterinary and Animal Sciences,
MAFSU, Parbhani.

d) Degree to be awarded : M.V.Sc.

e) Year of award of degree : 2017

f) Major subject : VETERINARY PATHOLOGY

g) Total number of pages in the thesis : 51

h) Number of words in the abstract : 623

i) Signature of Student :

j) Signature, Name and address of forwarding authority (HOD/SH) :

Dr. S. D. Moregaonkar
Associate Professor and Head
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COVAS, MAFSU, Parbhani.
ABSTRACT

The study on respiratory affections with special reference to bacterial infections in goats was conducted by screening goats slaughtered of local slaughter places in and around Parbhani and also died goats presented to Department of Veterinary Pathology, College of Veterinary and Animal Sciences, Parbhani.

Grossly, the affections of lungs as compared to other organs were found to be comparatively more. The *Staphylococci* species as compared to the other species of bacteria found to be prevalent in the respiratory affections. During study period, 214 carcasses of varying aged goats were screened. Amongst those, 154 goat carcasses were screened from different local slaughter places in and around Parbhani and 60 goat carcasses presented to Department of Veterinary Pathology, College of Veterinary and Animal Sciences, Parbhani were also examined during present study. After thorough post mortem examination of screened carcasses of goats, 192 amongst 214 were with either or mixed type of gross lesion targeting either or multiple organs of respiratory system. The overall prevalence of respiratory affections in screened goats was found to be 89.72%.

Amongst 60 goats, which were died and presented to Department of Veterinary Pathology, 35 carcasses were of goats aging up to 1 year and 25 were of more than 1 year age. These carcasses when screened for noting the gross respiratory affections revealed 97.14% prevalence in goats aging up to 1 year and this percent prevalence of respiratory affections was 92.00%, in goats aging more than 1 year.

The goats (154) slaughtered at local slaughter house, in and around Parbhani were screened during present study. Amongst those, 97 goats were aging up to 1 year and 57 were of more than 1 year age. The goats aging 1 year showed 96.91% prevalence and goats above 1 year of age were with 71.92% prevalence of either or mixed type of respiratory affections.

The prevalence of bacteria in lungs and trachea was also studied. To know the prevalence bacterial, 144 swabs from lungs and 48 swabs from trachea were collected and subjected for bacterial isolation and identification
by following standard bacteriological techniques. Amongst 144 swabs collected from lungs, 137 swabs were examined through standard bacteriological techniques; however, 7 representative lung swabs were subjected to the MALDI-TOF-MS for confirmative diagnosis.

On bacteriological studies of 137 lung swabs *Staphylococci* species was isolated from 42 swabs showing 29.16% prevalence which was highest amongst all bacterial species followed by *E. coli* (22.22%), *Bacillus* species (22.22%) and *Proteus* species (21.52%) respectively. Also 48 tracheal swabs revealed 20.83% prevalence of *staphylococci* species, followed by *Bacillus* species (20.83%) and *Proteus* species (20.83%). However, *E. coli* were recovered from 16.66% tracheal swabs.

In seventeen representative swabs (10 trachea and 07 lung swabs) were subjected to MALDI-TOF-MS analysis for confirmation. Amongst those, 1 tracheal swab showed mixed type of bacterial infection and rest 9 samples showed individual bacteria. However, 7 lung swabs on its screening revealed two mixed type of bacterial infections and rest 5 samples showed individual bacteria.

Grossly, 101 lungs of slaughtered goats showed congestion as highly prevalent gross lesion having 36.63% prevalence followed by hepatization (16.63%), consolidation (12.87%), marbling (12.87%), fibrinous pneumonia (8.91%), emphysema (4.95%), suppuration (3.96%) and haemorrhage (2.97%). Whereas, trachea revealed 58.82% prevalence of congestion followed by presence of froth (41.17%). The died goats on gross examination revealed 81.39% prevalence of fibrinous pneumonia as a highest prevalence followed by marbling (9.30%), hemorrhage (4.65%) and consolidation (4.65%). However, in case of trachea, presence of froth was noted in 71.42% goats followed by congestion (28.57%).

During present study, fibrinous pneumopathy was found to be of greater significance in terms of its prevalence in goats. The histopathological studies of trachea revealed tracheitis, congestion and occasional haemorrhages. The lungs on its histoarchitecteral studies showed congestion, haemorrhages, oedema, emphysema and bronchopneumonia.
प्रवंच सारांश

प्रवंचाचे शीर्षक : "शोध्यातील स्वस्थसंस्थेचा जीवाणुबाधित विकृतीच्या कारण मीमांसेचा अभ्यास"

विद्यार्थीनाचे नाव : आऊळवार बनरंग सायलू

माध्यमात्र : डॉ.गो.र.गंगने

सहयोगी प्राध्यापक,

पशु विकृतीशास्त्र विभाग,

पशुवैद्यक व पशुविज्ञान महाविद्यालय, परमणी

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मुख्य विषय : पशु विकृतीशास्त्र

प्रवंचातील एकूण पृष्ठेचे : ५१

सारांशातील एकूण शब्द : ५५३

विद्यार्थीची स्वाक्षरी

विभाग प्रमुखाची स्वाक्षरी

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प्रस्तुत शोध, शेवटनांतर श्वसनसंस्थेच्या जीवाणु बाधीत विकृतीचा अभ्यास परस्परी परस्परी कल्ततरकाण्यात कल्तत केल्या व मृत शेवट घटून विकृतीशास्त्र विभागात शाविविच्छेदनासाठी सादर करण्यात आलेल्या शेवटांचा अभ्यास करण्यात आला आहे.

एकूण २२४ कत्तल केलेल्या व मृत शेवटांच्या वयोमानाप्रमाणे प्रारंभावाचा अभ्यास करण्यात आला. त्यामध्ये १५४ शेवटांची पद्धतील घटक घटक ६० मृत शेवट हा परामर्श विभागात, पररामर्श घटक शाविविच्छेदनासाठी सादर झाले होते.

डोक्यामध्ये, श्वसनसंस्थेच्या अभ्यासानंतर महत्त्वाची विकृती आढळून आली. जीवाणुपमेशे स्टफिलोकोकाय व जीवाणुचा प्रारंभ स्वस्थ उल्लेखित प्रमाणात आहे.

एकूण २२४ शेवट शाविविच्छेदनाचे परीक्षण करण्यात आले त्यामध्ये १९२ शेवटांमध्ये श्वसनसंस्थेच्या अभ्यासाला रुप मिश्र प्रकाराचे दृष्ट किल्ले आढळून आले. त्यामध्ये एकतरीत ८९.३२% विकृती अभ्यासात्मक स्वस्थ श्वसन संस्थेच्या अभ्यासामध्ये आढळून आले.

ज्या शेवट मृत होत्या व परामर्श विभागात विभागात सादर झाले होते, त्यामध्ये भू मृत शेवटांचे घटक १ मृत होते व २५ शेवटें घटक १ मृत होते घटक २ मृत होते घटक २ मृत होते घटक २ मृत होते. भू मृत शेवटांच्या श्वसनसंस्थेच्या पद्धतील ७५.१२% एवढा प्रभाव आढळला व ९२.००% एवढा प्रभाव हा एक वर्षापेक्षा मोठया शेवटांचे आढळा.

स्थानिक कत्तलखानामध्ये १५४ कत्तल केलेल्या शेवटांच्या पद्धतील घटक १७ शेवट हा १ वर्ष वयाचे होते व ५७ शेवटांचे घटक १ वर्ष वयाचे जास्त वयाचे होते. १ वर्ष वयाचे पर्यावरण शेवटांमध्ये ६५.१२% एवढा प्रभाव आढळला व ७९.६२% प्रभाव हा १ वर्षापेक्षा जास्त वर्याच्या शेवटांच्या स्वस्थ संस्थेच्या आढळा.

प्रस्तुत अभ्यासात्त्वांनी फुस्फुसी व श्वसन नलिकाच्या जीवाणुचा प्रभावाचा अभ्यास करण्यात आला. एकूण २२४ शेवटांच्या पद्धतील घटक १९२ शेवटांमध्ये मिश्र प्रकार आढळले. जीवाणुच्या प्रभावाच्या तयारीची गरजेची विशेषता १४५ नमुने हे फुस्फुसांचे व ४८ नमुने हे श्वसननलिकाचे घटक आले. जीवाणुच्या दृष्टीने करण्यात व आठखंडाच्या मानक जीवाणु चाच्या दृष्ट करण्यात आले. १४४ फुस्फुसीच्या नमुने १३७ नमुने विशेषी घटक हे मानक जीवाणु तंत्राच्या करण्यात आले. तत्काल निर्देशक फुस्फुसांचे नमुने हे पुष्टी स्वस्थ नलिकाची माल-डा-टफ वा विश्वसनीय आधुनिक तंत्राच्या करण्यात आले.

१३७ फुस्फुसीच्या नमुने मालकाच्या स्टफिलोकोक्स प्रजातीचे जीवाणु हे ४२ नमुने मालकाच्या आढळला. सर्व जीवाणुच्या प्रजातीच्या स्टफिलोकोक्स प्रजातीचा जीवाणु प्रभाव २९.५६% स्वस्थ आढळला. त्यामध्ये इ.कोलाय प्रजातीचा (२२.२२%), बर्डलेस प्रजातीचा (२२.२२%) व प्रॉडिजियम प्रजातीचा (२५.२२%) आढळला. तत्काल ४७ श्वसननलिकाच्या नमुनेच्या २०.८७% प्रभाव स्टफिलोकोक्स प्रजातीचा आढळला तत्काळ बर्डलेस प्रजातीचा व प्रॉडिजियम प्रजातीचा २०.८५% प्रत्येक आढळून आला. तथापि, इ.कोलाय वा प्रजातीचा १६.५६% श्वसननलिकाच्या नमुने मालकाचे पुन: प्राप्त दिसून आला.
17 निदर्शक मूल्यांकने १० श्वसननिलकेच व ७ फूफुकसांचे मूल्ये हे माल-डिट-डाफ वा खिच्चशांगण तंत्रज्ञा विलेखशांगणाच्या पुनरुक्तकरणासाठी अंतिम करण्यात आले.

1०९ फूफुकसांच्या कत्तल केलेल्या सेंट्रोल्हिटीची प्रभाव हा सर्वोच्च दृष्टी ३५.६३% आढळला. त्यानंतर हिप्पोटायडोशन (१६.३३%), कोन्सुल्डिंग (१२.८३%), मार्सिंग (१२.८३%), फायर्स्ट्रीस न्युमॉनिया (८.८१%), एमफायरसेमा (४.९९%), सापरेसन (३.९६%) व हिमोसेसन (२.५७%), श्वसननिलकेच ५८.२२% प्रभाव कंडेस्कनचा आढळला. त्यानंतर न्रोळ (४२.१२%) मृत शेड्डोम्याचे ८२.३९% प्रभाव हा फायर्स्ट्रीस न्युमॉनिया मध्ये सर्वोच्च दिसून आला तसेच मार्सिंग (३.८०%), हिमोसेसन (४.६५%) व कोन्सुल्डिंग (४.६५%) तथा पर्यंत श्वसननिलकेच प्रदर्शन ७३.४२% त्यानंतर कंडेस्कनचा (६८.५७%) एवढा आढळला.

या अभ्यासाच्या, फायर्स्ट्रीस न्युमॉनिया हा महत्त्वाच्या विकुटीचा प्रभाव आढळून आला. ज्या विकुटी अभ्यासाच्या श्वसननिलकेच दृष्टी, कंडेस्कन व हिमोसेसन आढळला. श्वसननिलकेच अतिसुध्धा अभ्यासातील कंडेस्कन, हिमोसेसन, इंजेक्शन, एमफायरसेमा व द्रोणक हूंमॉनिया आढळला.