

# THE EFFECTS OF CLIMATIC FACTORS ON THE OCCURRENCE AND GROSS PATHOLOGICAL LESIONS IN BACTERIAL PNEUMONIA OF OVINE AND CAPRINE HOSTS IN ZARIA, NIGERIA

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## ABSTRACT

The bacterial agents of ovine and caprine pneumonia and associated gross pathologic lesions were studied for a period of ten years (1985-1995). Bacteriological data were obtained from the necropsy report books of the Microbiology and Pathology Diagnostic units of the Department of Veterinary Pathology and Microbiology, Ahmadu Bello University, Zaria, on 283 Pathologic lung samples. The major bacterial agents isolated from affected ovine lungs were *E. coli* 24.7%; *Pasteurella multocida* 17.3%; *Arcanobacterium pyogenes* 14.9%; *Streptococcus pyogenes* 6.9%; and *Neisseria catarrhalis* 5.7% and from caprine lungs were *E. coli* 26.6%; *Pasteurella multocida* 13.8%; *Staphylococcus aureus* 16.5%; *Arcanobacterium pyogenes* 11.9%; *Streptococcus pyogenes* 8.2%; and *Proteus vulgaris* 5.5%. There were more cases of ovine pneumonia (61.5%) than caprine (38.5%). In both sheep and goat, more cases of pneumonia were recorded during the dry season, with the highest monthly average value for both occurring in January. Annual distribution of ovine Pneumonia was highest in 1990 (24.7%), followed by 1987 (21.8%), while caprine pneumonia was highest in 1990 (22.9%) followed by 1988 (21.1%). The finding of this study, suggest a high susceptibility of small ruminants in Zaria to bacterial pneumonia during the early dry season and early rainy season. It is recommended that adequate management measures should be instituted to protect stock during these periods of high vulnerability.

KEY WORDS: Seasons, small ruminants, bacterial pneumonia.

## INTRODUCTION

Small ruminants (sheep and goat) production is essential for meeting protein requirement in the developing nations of the world. In Nigeria, small ruminants are estimated to contribute about 35% of the country's meat supply (ILCA, 1993). Population estimates suggest that there are about 24 million goats and 8.8 million sheep, which gives a goat: sheep ratio of about 3:1. This has been attributed to the fact that goats are more resistant to infectious diseases than sheep (Sumberge and Cassaday, 1985).

It has been suggested that the country may be losing close to 20% of her small ruminant population annually to infectious diseases (Dipeolu, 1996). Pneumonia, which is an inflammation of the lung (Anon, 1986) is the major respiratory condition of domestic animals worldwide, especially in countries where livestock management and husbandry practices are not well developed (Osinowo and Adu, 1985).

Pneumonia occurs in sheep and goats of all ages and has a variety of causes. These include viruses, chlamydia, fungi, parasites, dust particles and other foreign matter. The initial problem in all cases of bacterial pneumonia is a sudden dramatic increase in one or more species of bacteria (Anon, 1986), which may elicit respiratory systemic pathology. Bacterial Pneumonia may also possibly occur as a complication of primary viral pneumonia (Hulet, *et al*; 1985; Buxton and Frazer, 1997). It was imagined that small ruminant farmers in Nigeria would benefit immensely from studies on the aetiological agents of bacterial pneumonia. The results of such studies would be a useful tool in the design of preventive measures and also in the management of disease outbreaks.

## MATERIAL AND METHODS

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Zaria is located in the Guinea Savannah zone of Nigeria, where the rainy season runs from May to October, with a peak in the month of August, while the dry season is the period from November to April.

Information in this paper was based on sheep and goat pneumonia cases documented in the necropsy report books of the Microbiology and Pathology units of the Department of Veterinary Pathology and Microbiology, Ahmadu Bello University, Zaria, from January 1986 to December, 1995. The animals were brought in for post mortem examination at the Veterinary Teaching Hospital, ABU by livestock owners from within Zaria. They were examined for gross lesions in the lungs and appropriate lung samples were taken aseptically for bacterial isolation.

Bacteriological data were obtained from 283 pathologic lung samples from sheep and goats. Samples were inoculated onto blood, Mac-Conkey and nutrient agar plates, and then incubated aerobically at 37°C for 24h. Routine biochemical tests were performed to characterize the bacterial isolates as described by Cowan and Steel (1994) and Cottral (1995). Data on gross pathologic lesions associated with each case of pneumonia were also obtained from the pathology section of the same department. The prevalence rate of bacterial agents and pathologic lesions of ovine and caprine pneumonia were estimated as percent.

## RESULTS AND DISCUSSION

A total of 174 cases of pneumonia in sheep and 109 in goats were recorded. The major bacterial agents found present in the lung samples of sheep and goats in order of prominence were *E. coli* (25.4%), *Pasteurella multocida* (15.9%), *Staphylococcus aureus* (12.7%), *Arcanobacterium pyogenes* (13.8%) and *Streptococcus pyogenes* (4.4%) (Table 1). Similar observations had been made by Abubakar *et al* (1981) in Sudan and Adekeye (1984) in Zaria, Nigeria. The isolation of more *E. coli*, *Staphylococcus aureus*, *Arcanobacterium pyogenes* and *Pasteurella multocida* in this study than in previous studies seemed to suggest a greater involvement of these organisms. It was formerly believed that these organisms invade from outside the animal body; however recent studies indicate that they inhabit the upper respiratory tract and that they invade the lungs and

Table 1: Bacterial isolates and gross pathologic lesions of bacterial pneumonia of ruminants in Zaria (1986-1995).

Bacterial agent and lesions	No. (%) of specific Bacterial pneumonia in host		
	Ovine	Caprine	Total
<i>Escherichia coli</i>	43(24.7)	29(26.8%)	72(28.4)
<i>Pasteurella multocida</i>	30(17.2)	15(13.8)	45(15.9)
<i>Staphylococcus aureus</i>	18(10.3)	18(16.5)	36(12.7)
<i>Streptococcus pyogenes</i>	12(6.9)	9(8.2)	21(7.4)
<i>Pseudomonas aeruginosa</i>	3(1.7)	2(1.8)	5(1.8)
<i>Klebsiella pneumoniae</i>	4(2.3)	1(0.9)	5(1.8)
<i>Arcanobacterium pyogenes</i>	26(14.9)	13(11.9)	39(13.8)
<i>Neisseria catarrhalis</i>	10(5.7)	4(3.7)	14(4.9)
<i>Proteus vulgaris</i>	7(4.0)	6(5.5)	13(4.6)
<i>Bacillus spp</i>	5(2.9)	3(2.8)	8(2.8)
<i>Moraxella spp</i>	6(3.5)	6(5.5)	12(4.2)
<i>Micrococcus spp</i>	4(2.3)	1(0.9)	5(1.2)
<i>Acinetobacter spp</i>	5(2.9)	2(1.8)	7(2.5)
<i>Haemophilus spp</i>	1(0.8)	0(0.0)	1(0.4)
Pathologic lesions:			
Congested lungs	58(33.0)	27(25.0)	85(30.0)
Consolidated lungs	46(27.0)	25(23.0)	71(25.0)
Hepatalized lungs	35(20.0)	22(20.0)	57(20.0)
Frothy exudate /lungs	23(13.0)	19(17.0)	42(15.0)
Emphysematous lungs	12(7.0)	16(15.0)	28(10.0)

Table 2: Monthly distribution of bacterial pneumonia of ovine and caprine in Zaria. (1986 - 1995)

Month	No. (%) of specific Bacterial pneumonia in host		
	OVINE	CAPRINE	TOTAL
January	32(18.4)	25(22.9)	57(20.0)
February	18(10.3)	8(7.3)	26(9.2)
March	10(5.7)	4(3.7)	14(5.0)
April	17(9.8)	13(11.8)	30(11.0)
May	14(8.0)	6(5.5)	20(7.0)
June	5(2.9)	6(5.5)	11(3.9)
July	3(1.8)	9(8.3)	12(4.2)
August	7(4.0)	15(13.8)	22(7.8)
September	10(5.8)	9(8.3)	19(6.7)
October	18(10.3)	0(0)	18(6.2)
November	28(16.1)	9(8.3)	37(13.0)
December	12(6.9)	5(4.6)	17(6.0)
Total	174(100)	109(100)	283(100)

Table 3: Annual distribution of climatic data in Zaria (1986-1995)

Year	Rainfall (mm)	Sunshine hr	Maximal	Minimal	Relative
			temperature °C	temperature °C	
1986	81.7	8.9	31.4	18.7	50.7
1987	80.7	7.9	31.4	18.7	51.7
1988	81.0	8.0	32.1	17.7	45.6
1989	96.4	6.8	28.8	16.7	46.6
1990	74.4	7.1	31.9	18.3	48.7
1991	85.1	7.5	31.3	18.4	52.0
1992	85.0	6.6	30.7	18.0	49.9
1993	88.5	5.1	32.0	18.1	48.8
1994	74.1	6.1	31.0	18.1	54.7
1995	74.0	7.2	31.0	17.9	48.2

SOURCE: NAERLS, ABU ZARIA

the blood stream when the body defense mechanism break down. (Anon, 1986). The importance of viruses in predisposing ruminants to bacterial infection has also been documented (Hulet *et al*, 1985). Peste des Petits Ruminants (PPR), in

Table iv: Annual distribution of bacterial pneumonia of ovine and caprine host in Zaria (1986-1995).

Year	No (%) of bacterial Pneumonia in hosts		
	OVINE	CAPRINE	TOTAL
1986	12(6.9)	6(5.5)	18(6.4)
1987	38(21.8)	17(15.6)	55(19.4)
1988	28(16.1)	25(22.9)	53(18.7)
1989	25(14.4)	6(5.5)	31(11.0)
1990	43(24.7)	23(21.2)	66(23.3)
1991	8(4.6)	15(13.8)	23(8.1)
1992	5(2.9)	7(6.4)	12(5.2)
1993	3(1.6)	8(7.3)	11(5.7)
1994	2(1.1)	2(1.8)	4(1.4)
1995	5(2.9)	0(0)	5(1.8)
Total	174(100)	109(100)	283(100)

particular have been reported as the leading cause of pneumonia in small ruminants (Sackey *et al*, 1992).

The gross pathologic lesions associated with ovine and caprine pneumonia is also shown in table I. Congestion of the lungs was observed most frequently, 58 cases occurring in sheep (33.0%) and 27 cases in goats (25.0%). The occurrence of different bacterial agents in pneumonia cases and their associated pathological lesions were similar in sheep and goats, except that emphysematous lungs were seen more in goats (15%) than sheep (7%).

Table II shows the monthly distribution of pneumonia cases. Ovine pneumonia cases were least in July (1.8%) and highest in January (18.4%). Caprine pneumonia was highest in January (22.9%), while no case was recorded in October. In both sheep and goats, more cases were recorded during

## CONCLUSION

This study has shown that bacterial pneumonia and the associated pathologic lesions are likely to be of great importance in Zaria and its environs. Losses due to the disease can be greatly reduced if early diagnosis is made, and appropriate treatment instituted. During the dry season, the animals should be provided with adequate feed to obviate nutritional stress. More importantly, adequate housing should be provided to protect the animals from inclement weather condition.

During the dry season (117 cases and 64 cases respectively), while the rainy season recorded 57 cases for sheep and 48 cases for goats. More cases of pneumonia were recorded in both species during the early dry season (November and December) and early rainy season (April and May). The increased incidence of pneumonia during the dry season, especially the early dry season in Zaria might be explained on the basis of severe

cold, dry and dusty environment. This harsh weather may also increase insults to the epithelial lining of the respiratory tract resulting into infection. Ojo (1971) reported peak incidence during the rainy season in Southern Nigeria. This corresponds with the period of high PPR incidence (Durojaiye, 1983), which may predispose to bacterial infection. Increased confinement of stock during the rains to prevent damage to crop plants also enhances spread by contact.

The fact that total pneumonia cases in sheep (174) was higher than in goats (109), may suggest an increased resistance to bacterial pneumonia in goats.

Table III shows the annual distribution of pneumonia cases. Peak numbers were recorded in 1990 (23%) and 1987 (19.4%), and lowest in 1994 (1.4%) and 1995 (1.7%). These changes in annual incidence of pneumonia cases could not however be reconciled with the average annual changes in climatic factors (Table IV), which showed no meaningful change in values during those periods.

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