CLINICAL INVESTIGATIONS ON THE SEASONALLY OCCURRING RESPIRATORY DISEASE IN GOATS

BY

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THESIS

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DECLARATION

I hereby declare that this thesis entitled "CLINICAL INVESTIGATIONS ON THE SEASONALLY OCCURRING RESPIRATORY DISEASE IN GOATS" is a bonafide record of research work done by me during the course of research and that the thesis has not previously formed the basis for the award to me of any degree, diploma, associateship, fellowship or other similar title, of any other University or Society.

C. Joseph 28/7/79

Mannuthy,
28-7-1979.

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CERTIFICATE

Certified that this thesis entitled "CLINICAL INVESTIGATIONS ON THE SEASONALLY OCCURRING RESPIRATORY DISEASE IN GOATS" is a record of research work done independently by Sri. C.R. Joseph under my guidance and supervision and that it has not previously formed the basis for the award of any degree, fellowship or associateship to him.

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DEDICATED TO MY PARENTS

C O N T E N T S

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INTRODUCTION

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Goats suffer from many infectious diseases. The chances for such infections are more under farm conditions and intensive rearing systems. Among the diseases affecting goats respiratory diseases account for heavy economic loss to farmers by causing high morbidity and mortality in severely affected ones.

Incidence of a seasonally occurring respiratory tract disease among goats is on an increase in recent times in Kerala. The prevalence of this disease is often associated with the change over in climatic conditions and a poor state of health and management. Available literature on respiratory disorders among goats are sparse and are on pneumonia occurring as complication of upper respiratory tract affections. The nature and severity of this condition vary with the etiological agent though the clinical picture appears similar. Hence clinical differentiation of this condition often becomes a difficult task. In the absence of adequate information on the clinico-therapeutic aspects of this condition as seen from a review of available literature, this investigation was taken up to study the following aspects:

1. The incidence of disease.
2. Clinical symptoms.

3. Haematology in clinical cases.

4. Therapeutic trials with different antibiotics/ chemotherapeutic agents.

REVIEW OF LITERATURE

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Incidence

Constant exposure of respiratory tract to external environment through the upper respiratory passages and the internal environment via the blood vessels predispose the animals to respiratory affections (Jubb and Kennedy, 1970). Adverse environmental conditions like crowding, chilling, shipment or other forms of stress make the respiratory tract more vulnerable to diseases (Raghavan and D'Souza, 1971; Knight, 1977).

Among respiratory disorders the incidence of pneumonia was higher (Chathopadhyay et al., 1971; Bhagwan and Singh, 1972; Mohn and Utklev, 1974; Sarkar and Bhattacharya, 1975).

Pneumonia in kids under six months of age with a mortality rate of 39.3 per cent and highest incidence during the months of October, November, April and May was reported by Minett (1950). Necropsy studies revealed pneumonic lesions in 507 out of 1755 cases of sheep and goats. The percentage of incidence of pneumonia was higher in goats (14-28%) compared to sheep (11-19%) (Ramachandran and Sharma, 1969). Kaw and Khera (1970) reported an incidence of pneumonia (40.2%) among the sheep maintained at Government Farms, Jammu and Kashmir during April to June and occasionally during November

and December. The incidence was highest during the first year of life and mortality rose at the time of migration of sheep from lower altitude to higher altitude after winter and at lambing. Extremes of dry summer and winter climatic conditions found to favour the incidence of pneumonia in sheep (Chathopadhyay et al., 1971). Bhagwan and Singh (1972) reported that the peak incidence (20%) of pneumonia in sheep and goats was noticed from November to January.

Belschner and Edgar (1931) reported infectious nasal catarrh of sheep in Australia, which was found to occur during all the months. No age group difference could be noticed regarding the degree of affection. Koshelev (1942) observed pneumonia in sheep of Crimea, especially during the months of July and August and rarely during winter months. The incidence tended to be high in farms where the hygienic conditions were poor. Slaughter house studies made by Hamdy (1958) showed preser of pneumonic lesions in 438 out of 995 lambs, while Moustafa et al. (1964) observed catarrhal bronchopneumonia in 63 out of the 500 sheep-lungs examined. Van der Veen and Zumpt (1967) observed a high mortality (15-20%) in sheep due to enzootic pneumonia. St. George (1972) observed a wide spread infectious pneumonia in sheep in the age group of two weeks to eight years with a mortality rate of 3 to 8 per cent. Mortality was higher in sheep under one year of age. Pneumonia was noticed

in all seasons but mortality was high between midsummer and autumn. Ojo (1976) observed pneumonia of goats in Nigeria during the month of July. Rahman et al. (1976) reported that in Bengladesh respiratory diseases were found to be the cause of death in 43.75 per cent kids and 36.18 per cent adult goats. Pneumonia cases were found greatly increased in fattening lambs during November to April (Blanco Loizelier, 1975). In a similar study Knight (1977) observed an elevated incidence of pneumonia in goats during fall.

Normal microflora of respiratory tract of sheep and goats

Varieties of bacterial organisms have been isolated from the respiratory tract of normal sheep and goats by different workers (Marsh, 1953; Sawhney, 1958; Hamdy et al., 1959; El-Sherif and El-Ghani, 1974; Alley, 1975 and Knight, 1977). Marsh (1953) and Hamdy et al. (1959) isolated Pasteurella organisms from the upper respiratory tract of sheep and lambs. Staphylococcus, Streptococcus, Corynebacterium, Pasteurella, Pneumococcus, Klebsiella and Haemophilus spp. were the predominant organisms isolated from the respiratory tract of normal goats (Sawhney, 1958). Bacterial isolations from the lungs of healthy sheep reported by El-Sherif and El-Ghani (1974)

include Staphylococcus epidermidis, Escherichia coli, Bacillus cereus and Pasteurella multocida while Alley (1975) found Pasteurella haemolytica, Escherichia coli, Corynebacterium and Staphylococcus spp. from the respiratory tract of normal sheep. Ojo (1976) and Knight (1977) recovered Pasteurella and Mycoplasma spp. from the respiratory tract of normal goats.

Etiological Factors

Among the etiological factors of respiratory tract affections, bacterial infections were rated high. Pasteurella spp. were found to be the most common organisms associated with pneumonia in sheep (Marsh, 1953). Hamdy and Pounden (1959) found that infection with Pasteurella, Pleuropneumonia like organisms and viral organisms was often associated with conditions of stress producing respiratory affections in lambs. Gourlay and Barber (1960) revealed Pasteurella haemolytica from pneumonic goats. It was found that the kids were more susceptible than older animals.

Fenche-kuang et al. (1965) reported Pleuropneumonia in sheep associated with Streptococcus group C infection. A fatal outbreak of respiratory infection in a flock of sheep and goats was found associated with Diplococcus pneumoniae.

Poor bodily condition and maintenance of animals in dusty shed and feeding dry forage favoured the onset of disease (Corrado, 1967).

Ramachandran and Sharma (1969) found Pasteurella, Staphylococcus, Streptococcus and Corynebacteria spp. as etiologies in the production of bronchopneumonia in sheep and goats. Chathopadhyay et al. (1971) found that Corynebacterial organisms were responsible for suppurative pneumonia in sheep. St. George (1972) isolated Pasteurella multocida, Corynebacterium pyogenes and Neisseria spp. from cases of infectious pneumonia in sheep. Though the presence of viruses was also demonstrated their role in initiating the disease was uncertain. Bardarov et al. (1972) isolated Pseudomonas aeruginosa, Pasteurella, Bordetella, Salmonella, Staphylococcus and Mycoplasma spp. from the lungs of sheep with pneumonia.

In outbreaks of respiratory infection in goats, Escherichia coli, Pseudomonas aeruginosa, Pasteurella multocida, Corynebacterium pyogenes, Staphylococcus aureus, alpha haemolytic Streptococci, unclassified Corynebacteria and few other bacteria were typically involved (El-Sherif and El-Ghani, 1974). Stevenson (1974) reported that Streptococcus zooepidemicus was a causative agent of respiratory diseases of sheep. Sarkar and Bhattacharya (1975) recorded acute bronchopneumonia

in Black Bengal goats due to Corynebacterium ovis infection. In pneumonic cases of sheep Livingston (1973) isolated Pasteurella, Staphylococcus and Streptococcus spp. whereas the isolates made by Blanco Loizelier (1975) were Pasteurella haemolytica, Corynebacterium pyogenes and Streptococci. Ojo (1976) isolated Pasteurella and Mycoplasma spp. from caprine pneumonia. Of the organisms, Pasteurella was present in 35 per cent of nasopharynx, 40 per cent of lungs and 4 per cent of trachea of diseased animals. Infections with mycoplasma was noticed only in about 30 per cent of diseased lungs. Swabs taken from 5 and 15 per cent of diseased trachea and lungs respectively were sterile. Bacterial isolates in respiratory diseases in goats by Pillai (1977) included Pasteurella multocida, Streptococcus pneumoniae, Streptococcus pyogenes, Corynebacterium pyogenes, Staphylococcus aureus, Klebsiella pneumoniae and Escherichia coli. However, Bon Durant (1978) reported that Pasteurella was often found to be the single dominant bacterial agent associated with contagious pneumonia in goats.

Culture and sensitivity.

The World Health Organization Expert Committee on Antibiotics, 1961 suggested culture and sensitivity test procedure as diagnostic method for choosing the antimicrobial agents.

Anderson (1970) recommended disc diffusion method as the simple and rapid procedure that could be adopted for this. Sensitivity studies on different bacterial agents causing diseases in animals, using penicillin, chloramphenicol, oxytetracycline and streptomycin revealed that almost all the organisms tested were found sensitive to chloramphenicol. Different species of Corynebacteria were uniformly sensitive to streptomycin and chloramphenicol but not to other antibiotics (Rahman, 1957). In a sensitivity study of Streptococci using erythromycin, streptogramin, oleandomycin, spiramycin, novobiocin and cycloserine, Jones and Finland (1957) found erythromycin the most and cycloserine the least sensitive. For infections involving Staphylococci, Escherichia coli, Proteus vulgaris, Pseudomonas aeruginosa, Mycobacterium tuberculosis and other bacteria, furazolidine was the most active. The bactericidal properties of furazolidine simulates chloramphenicol (Jeney and Zsolnai, 1963). Pasteurella multocida and Corynebacterium pyogenes isolated from pneumonia in calves were found to be sensitive to penicillin, streptomycin, chloramphenicol and tetracycline (Overgoor, 1967). Sengupta et al. (1969) found that out of 528 strains of Staphylococcus aureus associated with different diseases, 350 were sensitive to chloramphenicol, 328 to streptomycin, 220 to tetracycline, 197 to erythromycin and 31 to penicillin. Klebsiella pneumoniae, Erysipelothrix insidiosa, Pasteurella

multocida, Streptococcus agalactiae and all except six strains of Pseudomonas aeruginosa isolated from domestic animals were sensitive to nitrofurans (Anusz, 1963). Stevenson (1974) observed that Streptococcus zooepidemicus isolated from pneumonic cases of sheep was sensitive to chloramphenicol, erythromycin, penicillin and ampicillin. Pillai (1977) conducted in vitro antibiotic sensitivity studies of Pasteurella multocida, Streptococcus pyogenes and Corynebacterium pyogenes isolated from pneumonic cases of goats and observed that Pasteurella multocida was sensitive to nitrofurans, chloramphenicol and tetracycline; Streptococcus pneumoniaeto penicillin, chloramphenicol and bacitracin and Corynebacterium pyogenes to ampicillin, chloramphenicol and penicillin.

Clinical signs

Infectious nasal catarrh in sheep was characterized by the appearance of excessive watery nasal discharge followed in the course of a few days by a rather copious mucoid discharge which runs down the upper lip. The mucus dried around the nostrils and formed crusts which interfered with normal respiration. The bodily condition of these animals was not affected to any extent (Belschner and Edgar, 1931).

Infectious pneumonia in goats was characterized by nasal

discharge, cough and emaciation and it might take an acute or chronic course (Dekhterev, 1942). The first sign of pleuropneumonia in goats caused by Pasteurella was disinclination to eat and drink and a tendency to get isolated from the herd. There was extreme dullness, high temperature varying from 105 to 108°F and the appearance of serous or thick mucoid discharge from the nose and watery discharge from the eyes. The affected animals stood with their heads hanging down and hind legs under the belly. The respiratory symptoms were most marked with heavy abdominal type of breathing. In very acute cases death occurred in 12 to 24 hours after the onset of symptoms (Pande, 1943). Lethargy, anorexia, mucopurulent discharge from both nostrils and eyes, cough, dyspnoea and rise in temperature were the important clinical signs observed in cases of enzootic pneumonia in goats (Borgman and Wilson, 1955). In similar cases of calf pneumonia, initial signs of high rise in temperature, listlessness, anorexia, cough and purulent nasal discharge which progressively developed to have the normal temperature and a more frequent cough were noticed. The cough was found to become pronounced after mild exercise (Anderson and LaMaster, 1956). Wiseman et al. (1976) also observed identical clinical signs in pneumonia of calves.

Studies of Van der Veen and Zumpt (1967) showed dyspnoea, listlessness, sneezing and purulent nasal discharges as the

characteristic signs in respiratory diseases of sheep. Stunted growth, loss of condition, depression, anorexia, dyspnoea, seropurulent to purulent nasal discharge, prostration and a variable temperature reaction were the clinical signs of suppurative pneumonia in goats (Chathopadhyay et al., 1971). Pneumonia caused by Corynebacterium ovis infection in goats was characterized by high rise in temperature (106-108°F), copious nasal discharge, rough body coat, abdominal type of breathing, complete anorexia and emaciation (Sarkar and Bhattacharya, 1975). Stevenson (1977) observed pneumonia in lambs in the age group of 2 to 12 weeks with clinical signs such as cough, absence of fever and poor weight gain with or without hyperpnoea. Pneumonia due to Streptococcal zooepidemicus infection in sheep was characterized by pyrexia, serous to mucopurulent nasal discharge, dyspnoea and depression followed by death in six to seven days time (Stevenson, 1974).

Haemogram.

As an aid to diagnosis of respiratory tract diseases haematology has been suggested by Dekhterev (1942); Gameel (1976); Schalm (1962) and Stevenson (1974).

In acute infectious diseases of generalised nature due to pyogenic cocci there was immediate neutrophilia with lymphopenia. Usually absence of eosinophils was observed. As recovery

ensued the neutrophilia subsided and replaced by post-infective lymphocytes and a temporary increase in eosinophils (Blount, 1930). In generalised acute bacterial infections eosinopenia was a characteristic feature, whereas in chronic infections the reverse was noticed (Archer, 1960).

Decreased erythrocyte count, haemoglobin content and the appearance of band forms of neutrophils were the characteristic features in infectious pneumonia of goats (Dekhterev, 1942). Gameel (1976) observed a progressive decrease in total erythrocyte count, haemoglobin level and packed cell volume and increased neutrophils in pneumonic cases of goats. No abnormalities in the total and differential leukocyte counts could be noticed in streptococcal pneumonia of sheep (Stevenson, 1974). Kracke and Garner (1937) stated that leukocytosis was a characteristic feature in pneumonia and bronchitis due to pyogenic organisms. A mild degree of anaemia was also observed in pneumonia.

A relative neutrophilia with normal total leukocyte count was a common finding in most of the generalised bacterial infections of bovines, but under severe stimuli caused by the infectious agents the leukocyte count exceeded the upper normal limits (Boddie, 1969; Doxey, 1971). In generalised bacterial infections neutrophilia with slight left shift and with

persistence of eosinophils suggested a mild infection but neutrophilia with a relative leukopenia and an absolute eosinopenia indicated a severe infection (Schalm, 1962). Neutrophilia with the appearance of band forms in peripheral blood was a characteristic feature of diseases of goats (Schalm et al., 1975).

Treatment

The rational treatments for respiratory diseases were based on the control of infections, removal of physical obstructions, oxygen therapy, respiratory stimulants and control of secretion. Oxygen therapy was found to be of value only when anoxic anoxia was present and the oxygen saturation of available haemoglobin was incomplete. Carbon dioxide at the rate of 5 to 10 per cent with oxygen and Picrotoxin, Metrazol and Coramine had been widely used as respiratory stimulants (Blood and Henderson, 1971; Suter and Ettinger, 1975).

According to Suter and Ettinger (1975) the most effective method to facilitate removal of excessive secretions was inhalation of humidified air. Steam inhalation decreased the viscosity of respiratory tract secretions. Expectorants containing potassium iodide helped in liquefying bronchial secretions.

Borgman and Wilson (1955) effectively treated caprine pneumonia due to Pasteurella infection with parenteral administration of penicillin at a dose rate of six to nine lakhs units per animal every day for three to five days and chloramphenicol or tetracyclines at the rate of 2 mg per pound body weight. Infectious pneumonia of sheep was successfully treated by parenteral administration of penicillin (Belschner, 1956). Salisbury (1957) obtained favourable results incases of enzootic pneumonia of sheep by treatment with penicillin and sulphadimidine. Sulfamerazine at a dose rate of 65 mg per pound body weight orally in two or three divided doses daily followed by not more than one-half of this amount for a total of five days and penicillin at the rate of 5,000 to 10,000 I.U. per kg body weight for 3 to 5 days were found to be effective in curing pneumonia of sheep (Udall, 1964).

Clark (1978) found parenteral administration of chloramphenicol most effective in cattle, sheep and goat because it was rapidly destroyed by rumen microflora when given orally. A dosage of 50 mg per kg body weight of chloramphenicol succinate given intramuscularly provided effective plasma levels for 8 to 10 hours in ewes and goats. Wachnik (1963) reported that in pneumococcal infection of calves good results were obtained by intramuscular injections of chloramphenicol at the rate of 10 to 20 mg per kg body weight.

Response to kanamycin administration in pulmonary diseases of calves was found irregular (Lambelin et al., 1962). Arisawa et al. (1965) found parenteral administration of kanamycin at the rate of 1 to 5 g daily for 1 to 4 days producing good recovery rate in cows and calves suffering from pneumonia, bronchitis and liver abscess.

El-Amrousi and Nadim (1968) found that oral administration of erythromycin at an initial dose of 500 mg followed by 250 mg daily for four days in 49 buffalo calves causing complete cure in 35, improvement in five and no effect in nine.

Parenteral administration of oxytetracycline at a dose rate of 12 mg/kg body weight for 4 to 6 days produced promising results in treating infectious pneumonia of sheep (Jensen,1974). The drug was also effective in curing pneumonia due to Pasteurella haemolytica infection (Gilmour, 1978). Tetracycline chromoacetate 2.5 per cent solution given intramuscularly at an initial dose of 2 ml/5 kg body weight and on subsequent days at 1.5 ml/5 kg body weight was highly effective for treating respiratory disorders in calves (Catarsini and Molino, 1974). In cases of clinical bronchopneumonia in yearling cattle, Christie et al. (1977) found better response to treatment with oxytetracycline when combined with antihistamines. Wiseman et al. (1976) noticed intramuscular administration of 500 mg

oxytetracycline on three successive days and in severely affected ones by combining dexamethasone effective in treating young single suckled calves with pneumonia.

MATERIALS AND METHODS

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Selected clinical cases of respiratory disorders treated at the University Veterinary Hospitals, Mannuthy and Trichur, Veterinary Dispensary, Ollur and the All India Co-ordinated Research Project on Goats for Milk Production, Kerala Agricultural University, Mannuthy, formed the materials for this study.

The investigation was conducted during the months of November, 1978 to February, 1979. Sixty five goats which were presented with the complaints of coughing, nasal discharge, partial to complete anorexia were selected for the study. Ten apparently normal goats from the All India Co-ordinated Research Project on Goats for Milk Production, were kept for control observations. Data on the incidence of the disease were collected from the records maintained in the different institutions and analysed (Table 1).

A detailed history of the case (including feeding and management practices), stage of lactation or pregnancy, number of animals held by the owner, number of animals affected, maximum yield given, yield during illness and yield after illness were collected to show the influence of feeding and management on the incidence of disease and its effects on production.

Clinical data like breed, sex, age, colour, condition of skin and coat, posture and gait, body temperature, rate, rhythm and character of pulse, appearance of visible mucous membranes, rate and character of respiration, type of nasal discharge, nature and frequency of cough, appetite and body weight of animals were recorded. Detailed examination of the respiratory system including inspection of nasal passages and pharynx, palpation of larynx, trachea and chest region, percussion and auscultation of the lung area were conducted.

Cultural examination and sensitivity tests were conducted using samples of nasal discharge collected from both normal and diseased animals. Samples of nasal discharges were collected by using sterile swabs introduced into the nasal cavity aseptically. Cultural examination was carried out by incubating the samples in nutrient broth at 37°C for 24 hours. Incubated samples were streaked on blood agar plates to isolate the bacterial organisms as described by Merchant and Packer (1971). Pure cultures were made from the specific colonies on blood agar plates and identified by their morphological, cultural and biochemical characteristics as described by Cowan and Steel (1974) and Wilson and Miles (1975).

The antibiotic sensitivity test using the filter paper disc diffusion method recommended by the World Health

Organization Expert Committee on Antibiotics, 1961 was adopted. The paper discs for sensitivity tests were prepared following the method described by Cruickshank et al. (1975). The discs were packed in vials and stored in wet condition in the refrigerator. Chloramphenicol, chlortetracycline, erythromycin, streptomycin, kanamycin, penicillin, nitrofurantoin and 'Proxymer' (Sulphaproxylin and Sulphamerazine combination - Suhrid - Geigy) were chosen for sensitivity tests and were selectively used for the treatment of clinical cases. The drugs were incorporated in each disc in strength at the standards prescribed by Blair et al. (1970). The right antibiotic for early use in clinical cases was chosen by conducting the sensitivity tests on the primary culture. Blood agar medium was used for this and samples were streaked over it. By using flamed forceps the discs were placed on the medium and were gently pressed. Plates were incubated at 37°C and the results were read by measuring the diameter of the visible zone of inhibition of bacterial growth around the disc with a pair of calipers after 24 hours. The diameter of the disc was also included in the measurement. Findings were interpreted adopting the guide lines of Blair et al. (1970) (Appendix-I).

Blood samples were collected in clean vials by jugular puncture using 22 gauge hypodermic needle. Sodium citrate was used as anticoagulant at the rate of 2 to 4 mg for every ml of

blood collected. Estimations of total erythrocyte and leukocyte counts, haemoglobin, packed cell volume, erythrocyte sedimentation rate and differential leukocyte count were made following the methods of Schalm (1965).

The clinical cases were divided into seven groups based on sensitivity findings. The antimicrobial agents studied in the treatment trials were chloramphenicol and chlortetracycline at a dose rate of 5 mg/lb body weight, kanamycin 5 to 15 mg/lb body weight and streptomycin 5 to 10 mg/lb body weight administered intramuscularly daily for 3 to 5 days. Erythromycin, nitrofurantoin and 'Proxymer' were medicated orally at a dose rate of 15 mg, 3 to 6 mg and 65 mg/lb body weight respectively for 3 to 5 days.

RESULTS

RESULTS

During the period from November, 1978 to February, 1979, 720 medical cases of goats were treated in the Veterinary Hospital, Trichur. Out of this 346 cases (48%) were of respiratory disorders while in the Veterinary Hospital, Mannuthy the incidence was 120 out of 239 (50.2%).

Out of 65 cases of non-descriptive female animals studied 18 were in the age group of one and two years, 12 between two and three years, 10 between three and four years, 9 ranged between five and six years and the remaining 16 cases were below one year. The animals were maintained on a ration containing jack leaves, green grasses and groundnut cake except the young kids which were on milk diet. The lactating goats showed a sharp fall in milk yield after the onset of illness and such animals did not come to normal yield even after cure. In 53 cases (81.5%) all the goats possessed by the owners were affected.

The owners complaint in all the cases were frequent dry cough with its intensity more at night and on exertion, partial or complete anorexia and progressive emaciation.

The general condition of the animals were fair. But they were dull, depressed and exhibited varying degrees of anorexia. Refusal to drink water was a characteristic

feature in all the cases. The gait and posture were normal with a tendency to lie down. The visible mucous membranes were congested in febrile animals (41 nos.) and pale in animals with normal temperature (24 nos.). The pulse was weak and accelerated. Respiration was rapid and shallow with prolongation of inspiratory phase in all the animals. Copious bilateral mucopurulent nasal discharge (Plate I) with sneezing was noticed in 55 cases (84.6%) when presented whereas in 10 cases it was watery. In course of time the discharge was found to become dry and formed crusts around the nostrils (Plate II). The rumen motility was reduced in 60 cases and normal in five cases. Passage of dung and urine was normal.

Cough was evident on palpation of the larynx and trachea in 59 cases while it was absent in others (6). Percussion of chest revealed resonance in all the cases. On auscultation of lung area dry rales were noticed in 12 cases, moist rales in 10, exaggerated bronchial sounds in 36 and no abnormality in seven cases. Abnormal respiratory sounds disappeared on completion of treatment. The detailed clinical data are presented in Appendix II(a) and (b).

The <u>in vitro</u> antibiotic sensitivity studies revealed that out of 65 cases, 54 (83%) were sensitive to chloramphenicol, 36 (55.3%) to chlortetracycline, 50 (76.9%) to

nitrofurantoin, 21 (32.3%) to erythromycin, 15 (23%) to kanamycin, 13 (20%) to streptomycin and 14 (21.5%) to sulphaproxylin and sulphamerazine combination (Fig. 3). The details of chemotherapeutic agents studied are given in Table 5 while the sensitivity patterns are illustrated in Table 6.

Out of 13 cases treated with chloramphenicol, 10 cases showed clinical cure in three days time. Out of the remaining cases, two required four days and the other took five days time to obtain clinical cure.

Chlortetracycline was tried in nine cases. Out of this, in four cases clinical cure was evident in three days time while the others required four days.

Treatment with nitrofurantoin was adopted in 10 cases. Out of this, in six animals clinical cure was obtained in three days time while others became apparently normal only after four days treatment.

Among eight cases treated with streptomycin the recovery time required was three days in three animals, four days in four and six days in one animal.

Out of nine cases treated with kanamycin, clinical cure could be achieved within three days in four cases, four days in two end five days in three cases.

Erythromycin therapy tried in seven goats produced recovery of one animal in three days time, two in four days and three in five days. In one case treatment for six days was found necessary.

Therapy with sulphaproxylin and sulphamerazine combination was utilised in nine diseased animals. The time required for recovery was three, four and five days in two, five and two cases respectively.

Out of 65 clinical cases investigated bacterial organisms that could be isolated were Staphylococcus (33), Pasteurella (20), Corynebacterium (16) Streptococcus (12), Escherichia (5) and Klebsiella (4). Details of the various cultural and biochemical tests conducted are given in Tables 3 and 4 and the percentage distribution of microflora is shown in Fig. 2. Studies on the microflora of the respiratory tract of 10 apparently healthy animals revealed Staphylococcus (6), Streptococcus (2), Pasteurella (4), Corynebacterium (2), Escherichia (2) and Citrobacter (1) (Table 2). The percentage distribution of bacterial isolates is illustrated in Fig. 1.

The values of haemoglobin, packed cell volume, total erythrocyte and leukocyte counts of apparently healthy animals were in the range of 9.60 to 13.20, 30 to 42, 8.0 to 12.8 and 6050 to 8450 with a mean of 11.52 $\pm$ 1.32 gm %,

35.50 ± 1.29 %, 10.56 ± 0.56 millions/Cmm and 7275.00 ± 202.38 cells/Cmm respectively. The percentage of lymphocyte, segmented neutrophil, unsegmented neutrophil, eosinophil, monocyte and basophil ranged from 50 to 60, 35 to 48, 1 to 3, 1 to 4, 1 to 3 and 0 to 2 with a mean of 56.40 ± 0.98, 40.70 ± 1.37, 1.60 ± 0.22, 1.40 ± 0.40, 1.50 ± 0.34 and 0.20 ± 0.13 respectively.

On the date of admission in clinical cases the comparable values of haemoglobin, packed cell volume, total erythrocyte and leukocyte counts were in the range of 7.2 to 12.8, 22 to 42, 3.40 to 6.80 and 4200 to 13800 with a mean of 10.08 ± 0.63 gm %, 31.97 ± 0.43 %, 5.04 ± 0.63 millions/Cmm and 8075.85 ± 879.76 cells/Cmm respectively. The lymphocyte, segmented neutrophil, unsegmented neutrophil, eosinophil, monocyte and basophil percentages varied from 20 to 79, 19 to 76, 1 to 12, 1 to 2, 1 to 2 and 0 to 2 with a mean of 41.49 ± 1.35, 57.15 ± 1.66, 6.54 ± 0.86, 1.54 ± 0.22, 0.55 ± 0.09 and 0.20 ± 0.04 respectively.

The values of haemoglobin, packed cell volume, total erythrocyte and leukocyte counts in chloramphenicol treated group (Group I) were 8.0 to 11.8, 24 to 38, 3.80 to 6.00, 5800 to 9200 with a mean of 9.40 ± 0.33 gm %, 29.85 ± 1.42 %, 4.64 ± 0.21 millions/Cmm and 7434.62 ± 297.00 cells/Cmm.

The lymphocyte, segmented neutrophil, unsegmented neutrophil, eosinophil, monocyte and basophil percentages varied from 45 to 71, 54 to 71, 1 to 3, 1 to 2, 1 to 2 and 0 to 1 with a mean of 55.54 ± 2.14, 42.38 ± 2.11, 0.48 ± 0.13, 1.38 ± 0.29, 0.69 ± 0.26, 0.23 ± 0.12 respectively.

The values of haemoglobin, packed cell volume, total erythrocyte and leukocyte counts in chlortetracycline treated animals (Group II) were 6.2 to 9.4, 22 to 30, 3.6 to 4.2 and 6800 to 9500 with a mean of 7.22 ± 0.33, 22.44 ± 1.04, 3.73 ± 1.30 and 7329.44 ± 305.32 respectively. The percentages of lymphocyte, segmented neutrophil, unsegmented neutrophil, eosinophil, monocyte and basophil were 44 to 70, 30 to 51, 1 to 3, 1 to 3, 1 to 2 and 0 to 1 with a mean of 54.78 ± 2.29, 42.78 ± 1.98, 0.29 ± 0.09, 1.56 ± 0.38, 0.89 ± 0.26 and 0.11 ± 0.10 respectively.

In animals treated with nitrofurantoin (Group III) the values of haemoglobin, packed cell volume, total erythrocyte and leukocyte counts were ranged from 6.6 to 12.2, 20 to 40, 3.2 to 6.8 and 7000 to 9100 with a mean of 8.14 ± 0.35, 25.80 ± 1.99, 4.14 ± 0.35 and 8930.00 ± 158.11 respectively. The percentage of lymphocyte, segmented neutrophil, unsegmented neutrophil, eosinophil, monocyte and basophil ranged from 46 to 56, 36 to 69, 2 to 4, 1 to 4, 1 to 2 and 0 to 2 with a mean of 51.50 ± 1.34, 45.10 ± 1.34, 0.43 ± 0.13,

2.60 ± 0.57, 0.80 ± 0.20 and 0.20 ± 0.13 respectively.

In animals treated with streptomycin (Group IV) the values of haemoglobin, packed cell volume, total erythrocyte and leukocyte counts ranged from 6.6 to 11.0, 20 to 35, 3.60 to 5.40 and 7240 to 10000 with a mean of 8.75 ± 0.48, 26.38 ± 1.62, 4.25 ± 1.61 and 8253.75 ± 332.11 respectively. The lymphocyte, segmented neutrophil, unsegmented neutrophil, eosinophil, monocyte and basophil percentages were in the range of 46 to 55, 42 to 50, 1 to 3, 1 to 2, 1 to 2 and 0 to 1 with a mean of 51.13 ± 1.34, 46.63 ± 1.21, 0.40 ± 0.13, 1.25 ± 0.25, 1.00 ± 0.27 and 0.25 ± 0.16 respectively.

In animals treated with kanamycin (Group V) the values of haemoglobin, packed cell volume, total erythrocyte and leukocyte counts were ranged from 7.2 to 10.2, 20 to 32, 3.2 to 5.2 and 6200 to 8500 with a mean of 8.33 ± 0.41, 25.78 ± 1.71, 3.98 ± 0.20 and 7157.78 ± 399.76 respectively. The lymphocyte, segmented neutrophil, unsegmented neutrophil, eosinophil, monocyte and basophil percentages were in the range of 45 to 63, 32 to 52, 2 to 4, 2 to 6, 0 to 1 and 0 to 1 with a mean of 52.44 ± 1.93, 43.89 ± 2.19, 0.35 ± 0.13, 3.11 ± 0.48, 0.67 ± 0.16 and 0.22 ± 0.14 respectively.

In animals treated with erythromycin (Group VI) the values of haemoglobin, packed cell volume, total erythrocyte

and leukocyte counts were ranged from 7.4 to 10.8, 24 to 32, 3.2 to 5.2 and 6240.00 to 9800.00 with a mean of 8.54 ± 0.44, 26.00 ± 1.13, 4.14 ± 0.25 and 8664.29 ± 497.59 respectively. The lymphocyte, segmented neutrophil, unsegmented neutrophil, eosinophil, monocyte and basophil percentages were in the range of 41 to 67, 30 to 56, 1 to 5, 2 to 4, 0 to 1 and 0 to 1 with a mean of 48.43 ± 3.50, 48.29 ± 2.50, 0.29 ± 0.09, 2.86 ± 0.26, 0.43 ± 0.20 and 0.28 ± 0.18 respectively.

In animals treated with 'Proxymer' (Group VII) the values of haemoglobin, packed cell volume, total erythrocyte and leukocyte counts were ranged from 6.60 to 9.20, 20 to 34, 3.20 to 5.60 and 7600 to 10800 with a mean of 8.07 ± 0.47, 24.67 ± 1.63, 3.93 ± 0.24 and 9106.67 ± 335.51 respectively. The lymphocyte, segmented neutrophil, unsegmented neutrophil, eosinophil, monocyte and basophil percentages were in the range of 46 to 50, 47 to 52, 1 to 3, 2 to 3, 0 to 1 and 0 to 1 with a mean of 47.67 ± 0.50, 50.00 ± 0.58, 0.40 ± 0.13, 2.11 ± 0.11, 0.11 ± 0.14 and 0.22 ± 0.14 respectively.

The results of statistical analysis of haematological parameters are presented in Tables 7 and 8.

Table 1. Data on the incidence of respiratory disorders in goats (1974-79).

Year	Veterinary Hospital, Trichur			Veterinary Hospital, Mannuthy		
	Total no. of medical cases in goats	Total no. of respiratory disorders	Total no. of respiratory disorders during November to February	Total no. of medical cases in goats	Total no. of respiratory disorders	Total no. of respiratory disorders during November to February
1974-75	1391	132	45 (34%)	1141	73	30 (41%)
1975-76	1109	125	29 (23.2%)	768	59	10 (16.9%)
1976-77	2385	294	240 (81.6%)	943	161	97 (60.2%)
1977-78	2931	461	357 (77.4%)	1391	177	92 (51.9%)
1978-79	2385	720	346 (48.0%)	915	239	120 (50.2%)

Table 2. Bacterial organisms isolated from ten apparently healthy goats.

Sl. No.	Bacterial organisms	No. of isolates	Percentage
1	Staphylococcus	6	35.2
2	Streptococcus	2	11.7
3	Pasteurella	4	23.5
4	Corynebacterium	2	11.7
5	Escherichia	2	11.7
6	Citrobacter	1	5.8
	Total	17	

Table 3. Characteristics of bacterial organisms isolated.

Sl. No.	Name of Organisms	No. of isolates	Shape	Acid fast	Spores	Motility	Growth in air	Growth anaerobically	Catalase	Glucose (acid)	Oxidation Fermentation
1	Staphylococcus spp.	33	S	-	-	-	+	+	+	+	F
2	Streptococcus spp.	12	S	-	-	-	+	+	-	+	F
3	Corynebacterium spp.	16	R	-	-	-	+	+	+	+	F
4	Pasteurella spp.	20	R	-	-	-	+	+	+	+	F
5	Enterobacteria	9	R	-	-	-	+	+	+	+	F

S - Spherical; R - Rod; F - Fermentation.

+ Positive.
- negative.

Table 4. Characteristics of Enterobacterial organisms encountered.

Sl. No.	Name of organisms	No. of isolates	Motility	Methyl Red	Voges Proskeur	Citrate	Hydrogen sulphide production	Indole	PPA*	Urease	Gas in Glucose	Acid in lactose	Acid in Manitol
1	Escherichia	5	-	+	-	-	-	+	-	-	+	+	+
2	Klebsiella	4	-	-	+	+	-	-	-	-	+	+	+

+ Positive
- Negative
* PPA - Phenyl pyruvic acid production.

Table 5. Details of chemotherapeutic agents used in clinical cases.

Selected antibiotic	Number of cases treated	Dose	Duration	Result
Chloramphenicol	13	5 mg/lb body wt.	3-5 days	Cured
Chlortetracycline	9	5 mg/lb body wt.	3-5 days	Cured
Nitrofurantoin	10	3-6 mg/lb body wt.	3-5 days	Cured
Streptomycin	8	5-10mg/lb body wt.	3-5 days	Cured
Kanamycin	9	5-15mg/lb body wt.	3-5 days	Cured
Erythromycin	7	15mg/lb body wt.	3-5 days	Cured
Sulphaproxylin and sulphamarazine combination	9	65mg/lb body wt.	3-5 days	Cured

Table 6. Sensitivity patterns of organisms isolated from clinical cases of respiratory tract disorders.

Bacterial organisms	Number of isolations	Antibiotics						
		Chloram-phenicol	Chlor-tetra-cycline	Kana-mycin	Erythro-mycin	Strepto-mycin	Sulpha-proxylin and sulpha-merazine	Nitro-furantoi
Staphylococcus	33	26	18	1	11	8	7	25
Streptococcus	12	10	9	1	6	6	3	11
Corynebacterium	16	13	5	4	4	1	3	16
Pasteurella	20	14	10	4	4	1	5	13
Escherichia	5	3	3	2	1	1	1	3
Klebsiella	4	2	3	3	-	-	-	2

Table 7. Mean haematological values in normal and diseased animals.

Items observed	Normal animals (control)	Diseased Animals							
		On the date of admission	Group-I (Chloramphenicol)	Group-II (Chlortetracycline)	Group-III (Nitrofurantoin	Group-IV (Streptomycin)	Group-V (Kanamycin)	Group-VI (Erythromycin)	Group-VII (Proxymet
RBC	10.56±0.56	5.04±0.63	4.64±0.21	3.73±1.30	4.14±0.35	4.25±1.61	3.98±0.20	4.14±0.25	3.93±0.24
Hb	11.52±1.32	10.08±0.63	9.40±0.33	7.22±0.33	8.14±0.35	8.75±0.48	8.33±0.41	8.54±0.44	8.07±0.47
PCV	35.50±1.29	31.97±0.43	29.85±1.42	22.44±1.04	25.80±1.99	26.38±1.62	25.78±1.71	26.00±1.13	24.67±1.63
ESR	Nil/hr	Nil/hr	Nil/hr	Nil/hr	Nil/hr	Nil/hr	Nil/hr	Nil/hr	Nil/hr
WBC	7275.00± 202.38	8075.85± 879.76	7434.62± 297.00	7329.44± 305.32	8930.00± 158.11	8253.75± 332.11	7157.78± 399.76	8664.29± 497.59	9106.67± 335.51
L	56.40±0.98	41.49±1.35	55.54±2.14	54.78±2.29	51.50±1.34	51.13±1.34	52.44±1.93	48.43±3.50	47.67±0.50
N	40.70±1.37	57.15±1.66	42.38±2.11	42.78±1.98	45.10±1.34	46.63±1.21	43.89±2.19	48.29±2.50	50.00±0.58
E	1.40±0.40	1.54±0.22	1.38±0.29	1.56±0.38	2.60±0.57	1.25±0.25	3.11±0.48	2.86±0.26	2.11±0.11
M	1.50±0.34	0.55±0.09	0.69±0.26	0.89±0.26	0.80±0.20	1.00±0.27	0.67±0.16	0.43±0.20	0.11±0.14
B	0.20±0.13	0.20±0.04	0.23±0.12	0.11±0.10	0.20±0.13	0.25±0.16	0.22±0.14	0.28±0.18	0.22±0.14
nseg-ented N	1.60±0.22	6.54±0.86	0.48±0.13	0.29±0.09	0.43±0.13	0.40±0.13	0.35±0.13	0.29±0.09	0.40±0.13

RBC = millions/Cmm; Hb = gms %; PCV = %; ESR = mm/hr; WBC = Cells/Cmm.
L - Lymphocyte(%); N - Neutrophil (%); E - Eosinophil (%); M - Monocyte (%); B - Basophil (%).

Table 8. Paired 't' test for comparison of haemogram of clinical cases on the date of admission and date of discharge.

(a) Chloramphenicol treated.

Items observed	Number of animals	df	't' value
Total RBC (millions/Cmm)	13	12	5.97**
Haemoglobin (gm %)			5.88**
Packed Cell Volume (%)			6.93**
Total WBC (Cells/Cmm)			3.14**
Lymphocyte (%)			3.87**
Neutrophil (%)			2.65*
Eosinophil (%)			0.10
Monocyte (%)			1.11
Basophil (%)			0

*Significant at 5% level.
**Significant at 1% level.
df - degrees of freedom.

(Table 8 contd....)

(b) Chlortetracycline treated.

Items observed	Number of animals	df	't' value
Total RBC (millions/Cmm)	9	8	0
Haemoglobin (gm %)			6.29**
Packed Cell Volume (%)			4.09**
Total WBC (Cells/Cmm)			2.13
Lymphocyte (%)			4.55**
Neutrophil (%)			3.06*
Eosinophil (%)			1.23
Monocyte (%)			0.20
Basophil (%)			1.10

(c) Nitrofurantoin treated.

Total RBC (millions/Cmm)	10	9	4.92**
Haemoglobin (gm %)			2.54*
Packed Cell Volume (%)			3.20*
Total WBC (Cells/Cmm)			4.46**
Lymphocyte (%)			3.52**
Neutrophil (%)			3.81**
Eosinophil (%)			1.27
Monocyte (%)			0.64
Basophil (%)			0.58

(Table 8 contd....)

(d) Streptomycin treated.

Items observed	Number of animals	df	't' value
Total RBC (millions/Cmm)	8	7	2.13
Haemoglobin (gm %)			0.92
Packed Cell Volume (%)			3.50**
Total WBC (Cells/Cmm)			2.73*
Lymphocyte (%)			3.73**
Neutrophil (%)			2.18
Eosinophil (%)			0.83
Monocyte (%)			1.54
Basophil (%)			0

(e) Kanamycin treated

Total RBC (millions/Cmm)	9	8	7.92**
Haemoglobin (gm%)			6.50**
Packed Cell Volume (%)			6.76**
Total WBC (Cells/Cmm)			4.87**
Lymphocyte (%)			3.62**
Neutrophil (%)			4.44**
Eosinophil (%)			2.00
Monocyte (%)			1.20
Basophil (%)			0

(Table 8 contd.....)

(f) Erythromycin treated.

Items observed	Number of animals	df	't' value
Total RBC (millions/Cmm)	7	6	6.28**
Haemoglobin (gm %)			10.57**
Packed Cell Volume (%)			8.41**
Total WBC (Cells/Cmm)			2.38*
Lymphocyte (%)			0.69
Neutrophil (%)			3.32*
Eosinophil (%)			1.75
Monocyte (%)			1.00
Basophil (%)			1.00

(g) 'Proxymer' treated.

Total RBC (millions/Cmm)	9	8	1.75
Haemoglobin (gm %)			11.35**
Packed Cell Volume (%)			5.89**
Total WBC (Cells/Cmm)			7.89**
Lymphocyte (%)			12.85**
Neutrophil (%)			8.28**
Eosinophil (%)			4.62**
Monocyte (%)			1.10
Basophil (%)			0

(Table 8 concl.)

DISCUSSION

DISCUSSION

Diseases of respiratory tract are found very commonly in all domestic animals. The present study has also shown that such conditions form the major component of ailments of goats. From the records in the Veterinary Hospitals, Mannuthy and Trichur it is seen that the percentage of incidence of respiratory involvement during 1977 to 1978 was 51.9 and 77.4 per cent respectively while in 1978 to 1979 the corresponding figures were 50.2 and 48.0 per cent.

The etiological factors of respiratory involvement are mainly considered to be infectious agents. For infectious diseases of respiratory tract, eventhough alternate routes of affection are frequently available, in the majority of cases, the source of infection is mainly aerogenous. It could be said that they represent a breach of local defences.

In places where climatic conditions are well dilineated it has been found that the incidence of respiratory diseases, especially pneumonia is more in winter months (Minett, 1950; Chathopadhyay, 1971; Bhagwan and Singh, 1972 and Blanco Loizelier, 1975). But no definite seasonal influence in the incidence of respiratory diseases was reported by Kaw and Khera (1970) and St. George (1972). Eventhough

there is no well defined winter season in Kerala, here also it is seen that the number of cases is more during the period November to February. In and around Trichur, during the period November to December it is very windy and atmosphere is dusty. Added to that, the difference between day and night temperature is much more than the other seasons. So it could be considered that these factors act as the main extrinsic component in initiating respiratory diseases in the goats. The airborne nature of the infection is substantiated by the fact that the infection started as upper respiratory tract affection and gradually spreading to lower respiratory organs. It has been observed clinically that disease starts as rhinitis, ultimately progressing to laryngitis, tracheitis, bronchitis and to pneumonia. It has been well established by numerous workers (Raghavan and D'Souza, 1971 and Knight, 1977) that there is direct correlation between adverse environment, stress and incidence of respiratory diseases. Even the facultative pathogens present in the upper respiratory tract under conditions of stress could gain upper hand breaking the resistance of the animal and induce respiratory diseases. Eventhough there are reports that malnutrition resulting in devitalised epithelium offers an ideal media for bacteria to multiply, the present study had not given any specific indication that nutritional status of the animal is lowered during the period November

to February when the incidence of respiratory disease is found to be high.

Incidence of affection in animals less than one year of age was found to be only 24.6 per cent. Eventhough Kaw and Khera (1970) opined that the low incidence of affection in young animals was due to passive immunity acquired from dams through the colostrum, the validity of this statement could not be ascertained from the present work. Hinett (1950) and Borgman and Wilson (1955) actually reported that younger animals are more susceptible to infection. St. George (1972) could not find any influence of age on the incidence of disease. A detailed investigation on the immunoglobulin levels in kids and adult goats and its relation to the incidence may give the actual role of maternal antibodies in this condition in young animals.

The spectra of the bacteria isolated from nostrils of animals which are clinically healthy and from animals showing respiratory diseases are almost identical. This clearly indicates factors other than these pathogens are responsible for the initiation of the disease. Hamdy (1958) and Hamdy and Pounden (1959) could not produce pneumonia experimentally in groups of lambs exposed to virus, Pleuro pneumonia like organisms and Pasteurella or in different combinations. But when these agents were combined with

stress pneumonia developedin all the lambs. As mentioned earlier, the adverse environmental factors could have induced stress reactions lowering the immunocompetence of these animals making them ultimately susceptible even to facultative resident bacterial flora. Bacteria of the nasal cavity have been found contributing to the severity of illness but not to initiate disease process (Alley, 1975). No attempt was made in the present investigation to ascertain whether any other pathogen than bacteria has been involved in the causation of this disease syndrome. Considering the fact that many disease process could have a multifactorial etiology the possibility of a viral involvement in such conditions needs further exploraration.

The clinical signs like cough which could be easily induced on palpation of pharynx and trachea, inspiratory dysponea, rapid and shallow respiration, with absence of lung consolidation and abdominal respiration, suggest that the disease is an upper respiratory affection without actual involvement of lung parenchyma. It was a constant clinical observation that animals which had not received proper treatment sufficiently early progressively developed bronchopneumonic conditions.

The haemogram of the affected animals showed a reduced mean total erythrocyte count, haemoglobin percentage

and packed cell volume. Similar observations had made by Dekhterev (1942) and Gameel (1976) in pneumonic cases of goats. Leukocytosis with a shift to the left was noticed, due to the infection probably of bacterial origin. Neutrophilia, lymphopenia and normal eosinophil count are all indicative of mild inflammatory reaction probably of bacterial origin (Schalm, 1962). The slight reduction in erythrocyte count, haemoglobin percentage and packed cell volume noticed in all the clinically affected animals which were treated with antibiotics indicate a depression of bone marrow activity induced by chemotherapeutic agents or due to the toxic products liberated by etiological agents. Benjamin (1973) and Weinstein (1975) reported anaemia in patients treated with streptomycin, chloramphenicol, nitrofurantoin and sulphonamides. Impairement of erythropoesis and shortened survival of red corpuscles resulting in anaemia in infections has been proposed by Wintrobe (1961). On clinical cure the absolute values of lymphocytes showed an increase while the neutrophils both segmented and unsegmented showed a reduction towards normal. The lymphocytosis can be attributed to the immunological response.

In all the clinical cases cure was effected by specific administration of chemotherapeutic agents which were found to be effective to the particular bacteria isolated.

Among the different agents tried chloramphenicol was found to be more effective against different types of bacteria and this was followed by nitrofurantoin in effectiveness. Chloramphenicol was found to be more beneficial because of the short duration required to get clinical cure. Walia et al. (1978) reported that nitrofurantoin is effective against Staphylococcus infection since it is a potent Staphylococcal lipase inhibitor. There are some practical difficulties in the administration of nitrofurantoin even-though it was found effective and cheap. The longer period required for treatment and necessity to administer the drug per os limits its usefulness compared to chloramphenicol. Further, it has been reported that the results of treatment with nitrofurantoin some times unpredictable. From the results of the present study it is evident that if suitable chemotherapeutic agentsare selected and administered before complications set in nearly 100 per cent cure can be obtained.

SUMMARY

SUMMARY

A total of 65 clinical cases of respiratory disorders presented in the University Veterinary Hospitals, Mannuthy and Trichur and Veterinary Dispensary, Ollur were studied. The data collected from the records maintained in the Veterinary Hospitals, Mannuthy and Trichur showed a high incidence of this condition during the periods November to February. The incidence is on the increase in recent years. The affection of all the animals possessed by the owners indicates the airborne infectious nature of this disease. The disease was found to start as an upper respiratory tract affection and gradually spread to the lower respiratory organs.

The clinical history revealed that the affected animals had frequent dry cough, anorexia and emaciation. There was reduction in milk yield in lactating animals. The clinical signs noticed were dullness, depression, congestion of visible mucous membranes in febrile animals or pallor in those with normal temperature, acceleration of pulse and respiration, inspirato[illegible] dyspnoea, easily induced frequent dry cough, bilateral mucopurulent nasal discharge and abnormal respiratory sounds on auscultation.

The in vitro antibiotic sensitivity studies revealed

that out of 65 cases, 54 were sensitive to chloramphenicol, 36 to chlortetracycline, 50 to nitrofurantoin, 21 to erythromycin, 15 to kanamycin, 13 to streptomycin, 14 to sulphaproxylin and sulphamerazine combination ('Proxymer'). Treatment carried out in seven groups based on in vitro antibiotic sensitivity tests proved that chloramphenicol has the maximum curative effect in clinical cases. Nitrofurantoin comes next in the efficacy. If the disease can be treated sufficiently early with suitable chemotherapeutic agents nearly 100 per cent cure is possible.

Bacterial isolates from ten apparently healthy animals were Staphylococcus, Streptococcus, Corynebacterium, Pasteurella, Escherichia and Citrobacter spp. while Staphylococcus, Streptococcus, Corynebacterium, Pasteurella, Escherichia and Klebsiella spp. were isolated from diseased animals. In diseased animals only Klebsiella organisms were found in addition. Adverse environmental conditions were found responsible for the precipitation of an attack of this disease.

Haematological examination on the date of admission showed anaemic changes, leukocytosis, neutrophilia with the left shift and lymphopenia. A further reduction in total erythrocyte count, haemoglobin level and packed cell volume

was noticed on the date of discharge. Significant leukopenia was noticed in groups treated with chloramphenicol, nitrofurantoin, streptomycin, erythromycin and 'Proxymer' while the group treated with chlortetracycline the leukocyte count remained unchanged. Significant neutropenia was evident in groups treated with chloramphenicol, chlortetracycline, nitrofurantoin, kanamycin, erythromycin and 'Proxymer' whereasinthe group treated with streptomycin there was no significant difference. Significant rise in lymphocyte count was observed in all the groups except the group treated with erythromycin.

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APPENDICES

Appendix I. Zone size interpretive chart used for disc sensitivity test.

Antibiotic/Chemotherapeutic agent	Disc potency	Inhibition zone in millimetres		
		Resistant	Moderately sensitive	Sensitive
Chloramphenical	30 mcg	12 or less	13 - 17	18 or more
Erythromycin	15 "	13 "	14 - 17	18 "
Kanamycin	30 "	13 "	14 - 17	18 "
Nitrofurans	300 "	14 "	15 - 16	17 "
Penicillin	10 I.U.	20 "	21 - 28	29 "
Streptomycin	10 mcg	11 "	12 - 14	15 "
Sulphonamides	300 "	12 "	13 - 16	17 "
Tetracyclines	30 "	14 "	15 - 18	19 "

Appendix-II (a). Clinical data on the date of admission.

Sl. No.	Case No.	Description of the animal				Preliminary general examination							
		Breed	Sex	Age (yrs)	Body weight (kg)	General condition	Gait and posture	Skin and coat	Temperature (°F)	Pulse per minute	Respiration per minute	Mucous membrane	Rumen motility per minute
1	Ca 13828	ND	F	6	40	Fair	Normal	Elastic and rough	106.2	90	42	Congested	Feeble 1-2
2	Ca 7819	"	"	6 months	10	"	"	"	102.8	92	42	Pale	"
3	Ca 13932	"	"	5	30	"	"	"	106.2	98	46	Congested	"
4	Ca 7805	"	"	2	25	"	"	"	105.8	100	52	"	"
5	Ca 13826	"	"	2 months	10	"	"	"	106.0	120	58	"	"
6	Ca 8446	"	"	5	35	"	"	"	104.0	72	36	Pale	"
7	Ca 8124	"	"	4	30	"	"	"	106.2	92	32	Congested	"
8	Ca 8575	"	"	5	40	"	"	"	104.8	88	46	Pale	"
9	Ca 8515	"	"	10 months	10	"	"	"	105.8	78	32	Congested	"
10	Ca 14908	"	"	2	25	"	"	"	106.0	80	36	Pale	"

(Appendix-II (a) contd....)

Sl. No.	Case No.	Description of the animal				Preliminary general examination							
		Breed	Sex	Age (years)	Body weight (kg)	General condition	Gait and posture	Skin and coat	Temperature (°F)	Pulse per minute	Respiration per minute	Mucous membrane	Rumen motility per minute
11	Ca 8061	ND	F	5	40	Fair	Normal	Elastic and rough	102.0	82	40	Pale	Feeble 1-2
12	Ca14677	"	"	3	30	"	"	"	105.0	80	42	Congested	"
13	Ca15507	"	"	2	25	"	"	"	106.2	82	48	"	"
14	Ca13827	"	"	3	35	"	"	"	106.2	84	38	"	"
15	Ca 7702	"	"	2	25	"	"	"	102.0	72	32	Pale	"
16	Ca 7949	"	"	2	25	"	"	"	101.8	80	38	"	"
17	Ca 7925	"	"	2	25	"	"	"	106.4	84	42	Congested	"
18	Ca 8109	"	"	1 (month)	10	"	"	"	102.2	100	52	Pale	-
19	Ca 7990	"	"	3	30	"	"	"	106.0	78	28	Congested	Feeble 1-2
20	Ca 8159	"	"	4	40	"	"	"	105.2	98	38	"	"
21	Ca14342	"	"	2	20	"	"	"	106.2	100	52	"	"
22	Ca15501	"	"	3	30	"	"	"	106.2	110	58	"	"
23	Ca14806	"	"	3	25	"	"	"	105.2	80	42	"	"
24	Ca14344	"	"	1	15	"	"	"	103.0	80	42	Pale	"
25	Ca 8108	"	"	5	40	"	"	"	106.0	78	38	Congested	"

(Appendix-II (a) contd....)

Sl. No.	Case No.	Description of the animal				Preliminary general examination							
		Breed	Sex	Age (yrs)	Body weight (kg)	General condition	Gait and posture	Skin and coat	Temperature (°F)	Pulse per minute	Respiration per minute	Mucous membrane	Rumen motility per minute
26	Ca 8160	ND	F	5	40	Fair	Normal	Loose and rough	106.8	120	56	Congested	Feeble 1-2
27	Ca 14642	"	"	4	35	"	"	"	105.2	110	54	"	"
28	Ca 14336	"	"	10 (months)	15	"	"	"	106.6	80	44	"	"
29	Ca 14208	"	"	8 (months)	10	"	"	"	105.2	86	44	"	"
30	Ca 15708	"	"	3	30	"	"	"	106.2	102	78	"	"
31	Ca 15625	"	"	2	20	"	"	"	106.2	98	62	"	"
32	Ca 8335	"	"	4	40	"	"	"	106.2	90	44	"	"
33	Ca 8526	"	"	6	50	"	"	"	106.2	80	42	"	"
34	Ca 13994	"	"	3	30	"	"	"	104.0	80	38	Pale	"
35	Ca 8252	"	"	1	20	"	"	"	104.0	78	38	"	"
36	Ca 8336	"	"	9 (months)	15	"	"	"	103.6	78	30	"	"
37	Ca 8535	"	"	4 (months)	10	"	"	"	103.2	84	42	"	"
38	Ca 8269	"	"	4	35	"	"	"	103.2	78	36	"	"
39	Ca 8218	"	"	2	20	"	"	"	106.2	110	56	Congested	"

(Appendix-II (a) contd.....)

Sl. No.	Case No.	Description of the animal				Preliminary general examination							
		Breed	Sex	Age (yrs)	Body weight (kg)	General condition	Gait and posture	Skin and coat	Temperature (°F)	Pulse per minute	Respiration per minute	Mucous membrane	Rumen motility per minute
40	Ca 13277	ND	F	5	40	Fair	Normal	Loose and elastic	106.0	98	48	Congested	Feeble 1-2
41	Ca 7818	"	"	1	20	"	"	"	105.2	96	52	"	2-3/mt.
42	Ca 14887	"	"	4	40	"	"	"	106.2	88	44	"	Feeble 1-2
43	Ca 8283	"	"	4	40	"	"	"	106.4	88	42	"	"
44	Ca 8182	"	"	2	20	"	"	"	103.4	72	38	Pale	"
45	Ca 7850	"	"	4	40	"	"	"	105.2	82	38	Congested	"
46	Ca 8773	"	"	2	25	"	"	"	103.0	78	52	"	2-3/mt.
47	Ca 8525	"	"	4 (months)	10	"	"	"	106.0	98	44	"	Feeble 1-2
48	Ca 14138	"	"	4	40	"	"	"	105.8	96	38	"	"
49	Ca 4424	"	"	2	20	"	"	"	106.2	110	54	"	"
50	Ca 14138	"	"	4	40	"	"	"	106.0	88	48	"	"
51	Ca 7740	"	"	5	45	"	"	"	105.2	96	48	Pale	"
52	Ca 8535	"	"	9 (months)	10	"	"	"	106.2	78	32	"	"
53	Ca 8259	"	"	2	20	"	"	"	105.2	120	72	Congested	2-3/mt.
54	Ca 14839	"	"	2	20	"	"	"	106.0	96	42	"	Feeble 1-2

(Appendix-II (a) contd...)

Sl. No.	Case No.	Description of the animal				Preliminary general examination							
		Breed	Sex	Age (yrs)	Body weight (kg)	General condition	Gait and posture	Skin and coat	Temperature (°F)	Pulse per minute	Respiration per minute	Mucous membrane	Rumen motility per minute
55	Ca 14837	ND	F	3	30	Fair	Normal	Loose and elastic	105.8	90	46	Congested	Feeble 1-2
56	Ca 14835	"	"	3	30	"	"	"	106.2	98	42	"	"
57	Ca 13426	"	"	3	30	"	"	"	102.0	78	32	Pale	"
58	Ca 13929	"	"	10 (months)	15	"	"	"	106.2	96	48	Congested	"
59	Ca 13224	"	"	3 (months)	15	"	"	"	106.0	68	30	"	"
60	Ca 8217	"	"	2	20	"	"	"	106.6	88	48	"	"
61	Ca 8314	"	"	10 (months)	15	"	"	"	102.0	72	32	Pale	2-3/mt.
62	Ca 7823	"	"	"	15	"	"	"	102.0	78	28	"	Feeble
63	Ca 7924	"	"	"	15	"	"	"	101.2	76	28	"	2/mt.
64	Ca 7431	"	"	3	20	"	"	"	106.2	98	46	Congested	Feeble 1-2
65	Ca 13936	"	"	10 (months)	15	"	"	"	102.2	78	28	Pale	"

ND - Non descriptive
F - Female
Ca - Caprine

(Appendix-II (a) concl.)

Appendix-II (b). Clinical data on the date of admission.

Sl. No.	Case No.	Brief history	Clinical signs arising from respiratory system
1	Ca 13828	Frequent dry cough since five days, anorexia, reduction in milk yield, all the three animals owned were affected.	Copious bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, moist rales on auscultation.
2	Ca 7819	Frequent dry cough during night since two days, anorexia, both the goats owned were affected.	Copious bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, no abnormalities on auscultation.
3	Ca 13932	Frequent dry cough since four days, anorexia, reduction in milk yield, both the goats possessed were affected.	Copious bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, exaggerated bronchial sounds on auscultation.
4	Ca 7805	Frequent dry cough since five days, anorexia, both the goats owned were affected.	Copious bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, exaggerated bronchial sounds on auscultation.
5	Ca 13826	Frequent dry cough during day and night since three days, anorexia, the two goats possessed were affected.	Bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induce cough, moist rales on auscultation.

(Appendix-II (b) contd.....)

Sl. No.	Case No.	Brief history	Clinical signs arising from respiratory system
6	Ca 8446	Frequent dry cough during night since three days, anorexia, reduction in milk yield, all the three animals owned were affected.	No nasal discharge, no inspiratory dyspnoea, no induced cough, exaggerated bronchial sounds on auscultation.
7	Ca 8124	Frequent dry cough since three days, anorexia, reduction in milk yield, owner possessed only one animal.	Copious bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, dry rales on auscultation.
8	Ca 8575	Frequent dry cough since three days, anorexia, reduction in milk yield, owner possessed only one animal.	Copious bilateral mucopurulent nasal discharge, inspiratory dyspnoea, no induced cough, dry rales on auscultation.
9	Ca 8515	Frequent dry cough since three days, anorexia, both the animals owned were affected.	Copious bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, exaggerated bronchial sounds on auscultation.
10	Ca 14908	Frequent dry cough since five days, anorexia, reduction in milk yield, both the goats owned were affected.	Bilateral mucopurulent nasal discharg inspiratory dyspnoea, induced cough, dry rales on auscultation.
11	Ca 8061	Frequent dry cough since five days, anorexia, pregnant, both the goats owned were affected.	No nasal discharge, inspiratory dyspnoea, induced cough, exaggerated bronchial sounds on auscultation.
12	Ca 14677	Frequent dry cough since two days, anorexia, reduction in milk yield, both the goats owned were affected.	Copious bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, exaggerated bronchial sounds on auscultation.

(Appendix-II (b) contd.....)

Sl. No.	Case No.	Brief history	Clinical signs arising from respiratory system
13	Ca 15507	Frequent dry cough since three days, anorexia, reduction in milk yield, two animals reared were affected.	Copious bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, moist rales on auscultation.
14	Ca 13827	Frequent dry cough during night since five days, anorexia, reduction in milk yield, two goats reared were affected.	Copious bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, moist rales on auscultation.
15	Ca 7702	Frequent dry cough since three days, anorexia, reduction in milk yield, owner possessed five animals, but only one affected.	Copious bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, exaggerated bronchial sounds on auscultation.
16	Ca 7949	Frequent dry cough during night since three days, anorexia, reduction in milk yield, single animal owned affected.	No nasal discharge, inspiratory dyspnoea, induced cough, dry rales on auscultation.
17	Ca 7925	Frequent dry cough during night since three days, anorexia, pregnant, the single animal owned affected.	Bilateral mucopurulent nasal discharg inspiratory dyspnoea, induced cough, exaggerated bronchial sounds on auscultation.
18	Ca 8109	Frequent dry cough during night since three days, anorexia, both the goats reared were affected.	Bilateral serous nasal discharge, inspiratory dyspnoea, no induced cough, no abnormalities on auscultation.
19	Ca 7990	Frequent dry cough during day and night since four days, anorexia, both the animals owned were affected.	No nasal discharge, inspiratory dyspnoea, induced cough, exaggerated bronchial sounds on auscultation.

(Appendix-II (b) contd....)

Sl. No.	Case No.	Brief history	Clinical signs arising from respiratory system
20	Ca 8159	Frequent dry cough during day and night since four days, anorexia, reduction in milk yield, both the animals owned were affected.	Bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, dry rales on auscultation.
21	Ca 14342	Frequent dry cough during day and night since four days, anorexia, both the animals owned were affected.	Bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, moist rales on auscultation.
22	Ca 15501	Frequent dry cough since four days, anorexia, reduction in milk yield, three animals possessed were affected.	-do-
23	Ca 14806	Frequent dry cough since five days, anorexia, reduction in milk yield, two animals reared were affected.	Bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, dry rales on auscultation.
24	Ca 14344	Frequent dry cough since three days, anorexia, both the animals possessed were affected.	Bilateral serous nasal discharge, inspiratory dyspnoea, induced cough, dry rales on auscultation.
25	Ca 8108	Frequent dry cough since three days, anorexia, pregnant, three animals owned were affected.	Bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, dry rales on auscultation.
26	Ca 8160	Frequent dry cough since three days, anorexia, pregnant, two animals held were affected.	Bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, exaggerated bronchial sounds on auscultation.

(Appendix-II (b) contd.....)

Sl. No.	Case No.	Brief history	Clinical signs arising from respiratory system
27	Ca 14642	Frequent dry cough since two days, anorexia, pregnant, single animal owned affected.	Bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, dry rales on auscultation.
28	Ca 14336	Frequent dry cough since three days, anorexia, out of two animals owned, one affected.	-do-
29	Ca 14208	Frequent dry cough since two days, anorexia, two animals owned were affected.	-do-
30	Ca 15708	Frequent dry cough since three days, anorexia, reduction in milk yield, both the animals owned were affected.	Bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, moist rales on auscultation.
31	Ca 15625	Frequent dry cough since four days, anorexia, reduction in milk yield, three animals owned were affected.	-do-
32	Ca 8335	Frequent dry cough since three days, anorexia, both the animals owned were affected.	-do-
33	Ca 8526	Frequent dry cough during night since two days, anorexia, reduction in milk yield, three animals reared were affected.	Bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, exaggerated bronchial sounds on auscultation.
34	Ca 13994	Frequent dry cough since four days, anorexia, reduction in milk yield, both the animals owned were affected.	-do-

(Appendix-II (b) contd....)

Sl. No.	Case No.	Brief history	Clinical signs arising from respiratory system
35	Ca 8252	Occasional dry cough since three days, anorexia, single animal owned affected.	Bilateral mucopurulent nasal discharge inspiratory dyspnoea, no induced cough, exaggerated bronchial sounds on auscultation.
36	Ca 8336	Frequent dry cough since five days, anorexia, three animals owned were affected.	Bilateral mucopurulent nasal discharge, induced cough, inspiratory dyspnoea, exaggerated bronchial sounds on auscultation.
37	Ca 8535	Frequent dry cough since two days, anorexia, three animals owned were affected.	-do-
38	Ca 8269	Frequent dry cough since two days, anorexia, reduction in milk yield, both the animals owned were affected.	Bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, dry rales on auscultation.
39	Ca 8218	Frequent dry cough since four days, anorexia, both the animals owned were affected.	Bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, moist rales on auscultation.
40	Ca 13277	Frequent dry cough during night since four days, anorexia, reduction in milk yield, both the animals owned were affected.	Bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, exaggerated bronchial sounds on auscultation.
41	Ca 7818	Frequent dry cough during night since three days, anorexia, both the animals owned were affected.	-do-
42	Ca 14887	Frequent dry cough since four days, anorexia, both the animals owned were affected.	-do-

(Appendix-II (b) contd.....)

Sl. No.	Case No.	Brief history	Clinical signs arising from respiratory system
43	Ca 8283	Frequent dry cough since four days, anorexia, reduction in milk yield, both the animals owned were affected.	Bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, exaggerated bronchial sounds on auscultation.
44	Ca 8182	Frequent dry cough during day and night since three days, anorexia, reduction in milk yield, both the animals owned were affected.	-do-
45	Ca 7880	Frequent dry cough during day and night since three days, anorexia, reduction in milk yield, both the animals owned were affected.	-do-
46	Ca 8773	Frequent dry cough during night since five days, taking food and water normally, both the animals owned were affected.	No nasal discharge, inspiratory dyspnoea, induced cough, exaggerated bronchial sounds on auscultation.
47	Ca 8525	Frequent dry cough during day and night since five days, anorexia, out of three, one animal affected.	Bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, exaggerated bronchial sounds on auscultation.
48	Ca 14138	Frequent dry cough during day and night since two days, anorexia, both the animals reared were affected.	-do-
49	Ca 4424	Frequent dry cough during day and night since four days, anorexia, both the animals owned were affected.	-do-

(Appendix-II (b) contd....)

Sl. No.	Case No.	Brief history	Clinical signs arising from respiratory system
50	Ca 14138	Frequent dry cough since two days, anorexia, both the animals owned were affected.	Copious bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, exaggerated bronchial sounds on auscultation.
51	Ca 7740	Frequent dry cough since five days, anorexia, three animals owned were affected.	-do-
52	Ca 8535	Frequent dry cough during day and night since five days, anorexia, three animals owned were affected.	No nasal discharge, inspiratory dyspnoea, induced cough, exaggerated bronchial sounds on auscultation.
53	Ca 8259	Frequent dry cough during night since three days, taking food and water normally, both the animals owned were affected.	-do-
54	Ca 14839	Frequent dry cough during night since five days, anorexia, three animals owned were affected.	Copious bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, dry rales on auscultation.
55	Ca 14837	Frequent dry cough during night since three days, anorexia, reduction in milk yield, two animals owned were affected.	Copious bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, exaggerated bronchial sounds on auscultation.
56	Ca 14835	Frequent dry cough since three days, anorexia, reduction in milk yield, out of two, one animal affected.	-do-
57	Ca 13426	Frequent dry cough during night since four days, anorexia, reduction in milk yield, both the animals owned were affected.	-do-

(Appendix-II (b) contd.....)

Sl. No.	Case No.	Brief history	Clinical signs arising from respiratory system
58	Ca 13929	Frequent dry cough during day and night since three days, anorexia, three animals owned were affected.	Bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, exaggerated bronchial sounds on auscultation.
59	Ca 13224	Frequent dry cough during night since two days, anorexia, out of two, one animal affected.	Copious bilateral mucopurulent nasal discharge, inspiratory dyspnoea induced cough, no abnormalities on auscultation.
60	Ca 8217	Frequent dry cough during night since three days, anorexia, both the animals owned were affected.	Bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, exaggerated bronchial sounds on auscultation.
61	Ca 8314	Frequent dry cough during day and night since three days, taking food and water normally, both the animals owned were affected.	Bilateral mucopurulent nasal discharge, inspiratory dyspnoea, no induced cough, no abnormalities on auscultation.
62	Ca 7823	Occasional dry cough since three days, anorexia, both the animals owned were affected.	Bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, no abnormalities on auscultation.
63	Ca 7924	Occasional dry cough since four days, taking food and water normally, three animals owned were affected.	No nasal discharge, inspiratory dyspnoea, induced cough, no abnormalities on auscultation.
64	Ca 7431	Frequent dry cough during night since four days, taking food and water normally, out of three, two animals affected.	Bilateral mucopurulent nasal discharge, inspiratory dyspnoea, induced cough, exaggerated bronchial sounds on auscultation.
65	Ca 13936	Frequent dry cough since three days, taking food and water normally, three animals owned were affected.	Bilateral mucopurulent nasal discharge, no inspiratory dyspnoea, no induced cough, no abnormalities on auscultation.

ILLUSTRATIONS

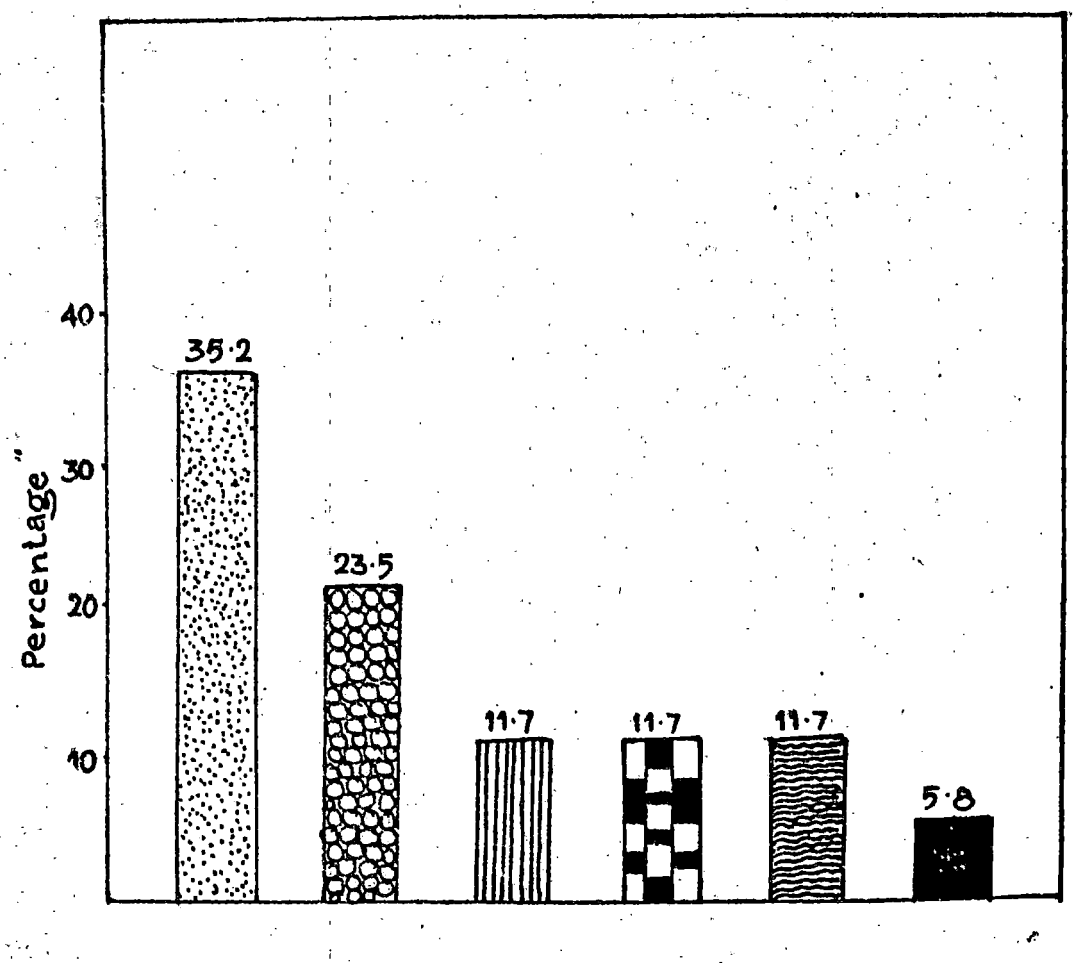

Fig. 1. Percentage distribution of 17 bacterial isolates from apparently normal goats.

- Staphylococcus spp.
- Pasteurella spp.
- Streptococcus spp.
- Corynebacterium spp.
- Escherichia spp.
- Citrobacter spp.

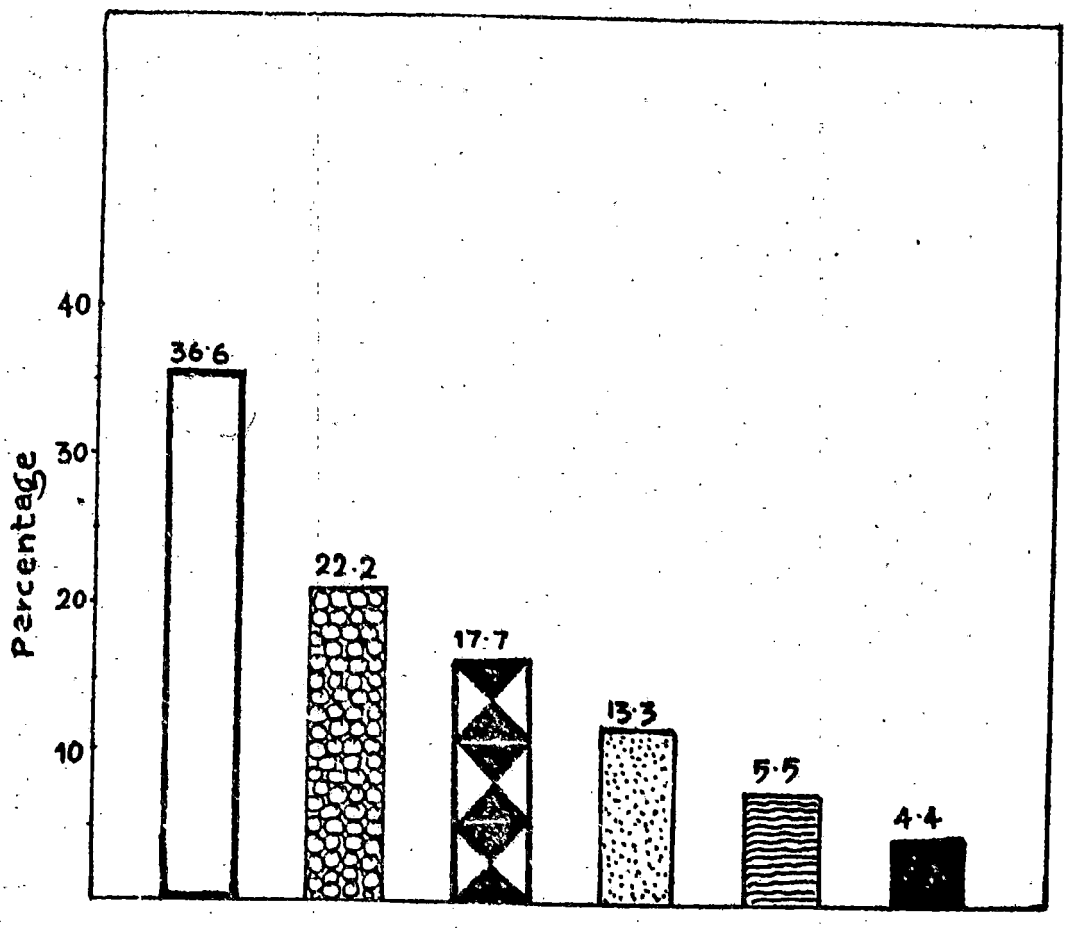

Fig.2. Percentage distribution of 90 bacterial isolates from diseased goats.

- Staphylococcus . spp.
- Pasteurella spp.
- Corynebacterium spp.
- Streptococcus spp.
- Escherichia spp.
- Klebsiella spp.

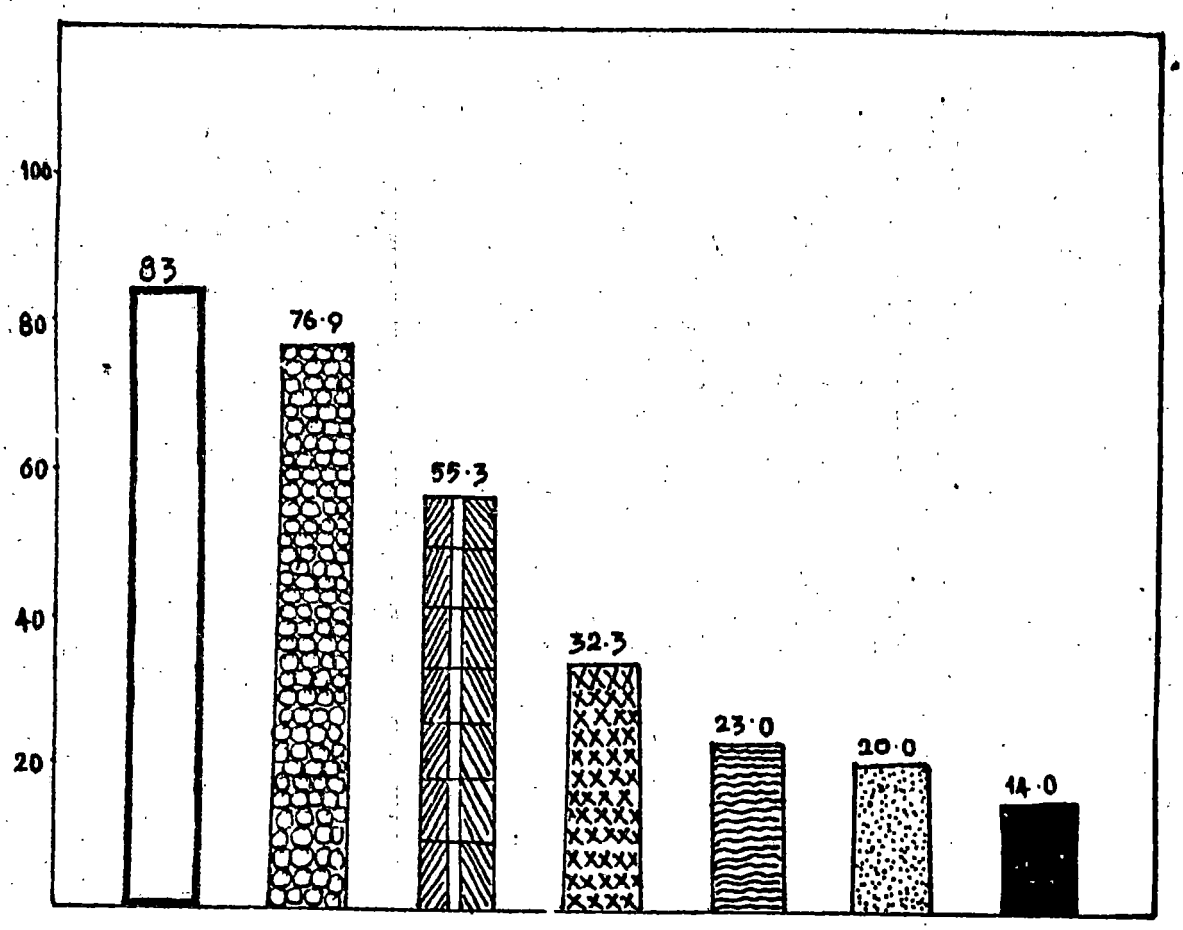

Fig.3. Antibiotic susceptibility pattern in 65 clinical cases.

- Chloramphenicol.
- Nitrofurantoin.
- Chlortetracycline.
- Sulphaproxylin and sulphamerazine combination.
- Erythromycin.
- Kanamycin.
- Streptomycin.

CLINICAL INVESTIGATIONS ON THE SEASONALLY OCCURRING RESPIRATORY DISEASE IN GOATS

BY

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ABSTRACT OF A THESIS

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ABSTRACT

Incidence of a seasonally occurring respiratory disease problem in goats is on the increase in recent years. Review of available literature revealed paucity of adequate information on the clinico-therapeutic aspects of this condition. The present study was takenuup to throw more light on them. A total of 65 clinical cases of respiratory disorders admitted to the University Veterinary Hospitals, Mannuthy and Trichur and Veterinary Dispensary, Ollur during the period November 1978 to February, 1979 were studied, keeping 10 apparently healthy goats of All India Co-ordinated Research Project on Goats for Milk Production as control. The investigation included collection of data on the incidence, clinical examination, culture and sensitivity tests of nasal swab, haematological examination and therapeutic trials with suitable chemotherapeutic agents in clinical cases.

The data collected from the records maintained in the Veterinary Hospitals, Mannuthy and Trichur showed a high incidence of this condition during the period November to February. The condition usually started as an upper respiratory tract affection and gradually spread to the lower respiratory organs. The important clinical signs noticed were anorexia, emaciation, easily induced frequent dry cough, mucopurulent nasal discharge, rise or normal temperature, increased pulse and respiratory rates, inspiratory dyspnoea,

abnormal sounds on auscultation and fall in milk yield in lactating animals.

In vitro antibiotic sensitivity tests and efficacy of treatment in clinical cases showed that chloramphenicol is the drug of choice, followed by nitrofurantoin. If the disease can be treated sufficiently early with suitable chemotherapeutic agents nearly 100 per cent cure is possible. Bacterial isolates from apparently healthy animals were *Staphylococcus*, *Streptococcus*, *Corynebacterium*, *Pasteurella*, *Escherichia* and *Citrobacter* spp. while *Staphylococcus*, *Streptococcus*, *Corynebacterium*, *Pasteurella*, *Escherichia* and *Klebsiella* spp. were isolated from diseased animals.

Leukocytosis, neutrophilia, lymphopenia and normal eosinophil count with a reduction in total erythrocyte count, haemoglobin and packed cell volume were observed in diseased animals. Anaemic changes were noticed even after getting clinical cure. Fall in total leukocyte count and neutrophil percentage towards normal and a slight increase in lymphocyte percentage was noticed on the date of discharge. Significant leukopenia was evident in chloramphenicol, nitrofurantoin, streptomycin, erythromycin and 'Proxymer' treated groups while in chlortetracycline and kanamycin groups no change was noticed. Significant neutropenia was noticed in chloramphenicol, chlortetracycline, nitrofurantoin, kanamycin and

erythromycin groups whereas the difference was not significant in streptomycin group. Significant lymphocytosis was observed in all the groups treated except erythromycin group.