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CANINE BACTERIAL FLORA OF THE LUNGS IN UPPER EGYPT

(With 4 Tables)

By

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دراسة بكتريولوجية عن الالتهاب الرئـــــوي في الكلاب في صعيد مصـــر

صبـــاح مصطفـــــــــــــــــي

اجريت هذه الدراسة لمعرفة المسببات البكتيرية للالتهاب الرئوي بصعيد مصر حيـــث تم أخذ عينات من الرئتين لعدد ١٥ كلبا تحت اشتراطات صحية ووجد أن ١٩ عينـــــة تحتوي علي ميكروبات مختلفة الأنواع كما أن أعراض الالتهاب الرئوي كانت واضحـــــة في ١٥ رئة · وباستخدام الطرق الميروبيولوجية المختلفة أمكن عزل الميكروبات التاليـــة *Streptococcus pneumoniae, Staph aureus, Staph epidermidis, Micrococcus sp., Posteurella multocida, Pseudomonas aeruginosa, Klebsiella pneumoniae, E.coli Achromobacter sp., Serratia marcescens, Proteus mirabilis and Flavobacterium sp.*

وكان عدد العترات المعزولة من كل نوع بالترتيب هو ٨ ، ٥ ، ٣ ، ٤ ، ٣ ، ٣ ، ٣ ، ٢ ، ٢ ، ١ عترة · وتم اختبار مدي حساسية الميكروبات التي تم عزلها وعددها ٤٠ عتـــرة لعدد ١٢ نوعا مختلفا من المضادات الحيوية ولقد وجد أن معظم الميكروبات البالبة الجـــرام أكثر حساسية للجنتاميسين والكلورامفينيكول والأربثرومايسين أما الميكروبات الموجبـــة الجرام فكان معظمها أكثر حساسية للأمبيسلين والكلورامفينيكول والتوبرامايسين · تـــم مناقشة الاجراءات الوقائية لتلافي حدوث الالتهاب الرئوي البكتيري في الكلاب ·

SUMMARY

Specimens of the lungs of 25 dogs were studied. 76% of the examined lung specimens were positive for bacteria. Pneumonia was observed in 15 cases. The predominant bacteria isolated from the lung parenchyma were Streptococcus pneumoniae, Staph aureus, Staph epidermidis, Micrococcus sp., Pasteurella multocida, Pseudomonas aeruginosa, Klebsiella pneumoniae, E.coli, Achromobacter sp., Serratia marcescens, Proteus mirabilis and Flavobacterium sp. All the isolated organisms (40 strains) were tested for their antibiotic sensitivity and there was variance of resistance. Most of the isolated Gram-positive bacilli were sensitive to ampicillin, chloramphenicol and tobramycin, while recovered Gram-negative bacilli were sensitive to gentamicin, chloramphenicol and erythromycin. Preventive measures to avoid bacterial pneumonia in dogs were discussed.

INTRODUCTION

Diseases of the respiratory system of the dog are frequently encountered in clinical practice. Many of these diseases are infectious in nature, caused by viral, bacterial, parasitic, protozoal, fungal or mycoplasmal agents, alone or in combination (DHEIN and GORHAM, 1986).

Bacterial pneumonia is more common in the dog than in the cat. Primary bacterial pneumonia in the dog can be the result of infection with Bordetella bronchiseptica under natural and experimental conditions (BATEY and SMITH, 1976; THOMPSON, et al. 1976). On the other hand, GARNETT, et al. (1982) reported the isolation of lancefield group c Streptococcus zooepidemicus from 14 research (facility) dogs that had died suddenly in the absence of preceeding clinical signs, yet demonstrated diffuse, haemorrhagic pneumonia at necropsy. However, other bacteria become established as secondary invadors following viral infections of dog and cat. In this respect, different microorganisms isolated from the lower airways of dogs with bacterial pneumonia were Pseudomonas, Staphylococcus, E.coli, Streptococcus (alpha and beta haemolytic and non haemolytic), Bordetella bronchiseptica, Pasteurella, Corynebacterium, Enterobacter, Flavobacterium, Moraxella, Acinetobacter, Achromobacter, Paracolon bacterium, Bacillus, Alcaligenes, Serratia, Diphtheroid bacilli, Enterococcus, Diplococcus and Proteus mirabilis as cited in different reports conducted by CREIGHTON and WILKINS (1974), HARPSTER (1981), THAYER and ROBINSON (1983).

The normal bronchi and lungs are sterile from the first bronchial division to the treminal lung units (NEWHOUSE, et al. 1976). Whereas the conclusions drawn from different studies conducted by PECORA (1976), LINDSEY and PIERCE (1978), and MCKIERNAN, et al. (1984) suggest that the trachea and lungs from normal dogs are not always sterile where normal dogs probably aspirate oral and pharyngeal bacteria during sleep but their presence is transient as they are removed promptly by normal defense mechanism (LINDSEY and PIERCE, 1978). The most frequently isolated organisms from the tonsilar crypts of 172 dogs were Streptococcus sp., Staphylococcus sp., Micrococcus sp., Corynebacterium sp., E.coli, Klebsiella sp., Proteus mirabilis, Proteus morganii, Paracolon bacterium, Moraxella sp., Mima sp., Pasteurella sp., Niesseria sp., Achromobacter sp., Flavobacterium sp., Pseudomonas sp., Alcaligenes sp., and Bordetella bronchiseptica. Cultures of nasal swabs of 18 dogs yielded alpha haemolytic Streptococcus, Enterococcus sp., Staph aureus, Staph albus, Micrococcus sp., Bacillus sp., Klebsiella sp., Pasteurella multocida, Niesseria sp., and Pseudomonas aeruginosa (WILKINS and HELLAND, 1973). Another report revealed that bacteria recovered from throat specimens of military dogs during an epizootic of respiratory disease were haemolytic Streptococci, E.coli, Micrococcus sp., Achromobacter sp., Flavobacterium sp., Coliform, Bacillus sp., Pasteurella haemolytica, Pseudomonas sp., Alcaligenes sp., Klebsiella sp., and Mycoplasma sp., (BINN, et al. 1968).

Antibiotics are the principal therapy for bacterial infections of the lower airway and the choice of drug depends on the results of antibiotic sensitivity (THAYER, 1984). In one study, gentamicin and chloramphenicol were demonstrated to be effective in vitro against most Gram-negative isolates from dogs with bacterial pneumonia, and chloramphenicol and ampicillin were effective against most Gram-positive isolates (THAYER and ROBINSON, 1983). In another survey conducted by HARPSTER (1981), there appeared to be no significant differences among the 18 drugs tested against Gram-positive organisms isolated from dogs with bacterial pneumonia. However, variations of sensitivities among the different groups of organisms isolated from the respiratory tract of dogs were wide (BINN, et al. 1968, WILKINS and HELLAND, 1973; GARNETT, et al. 1982).

The present study was undertaken to report the predominant microorganisms in canine bacterial pneumonia in Assiut City, as well as, the sensitivity of the isolated strains to different antibiotics.

MATERIAL and METHODS

25 dogs of mixed breeds, both sexes and various ages were used. All had been presented to the veterinary teaching hospital, Faculty of Veterinary Medicine, Assiut University for experimental studies.

Lung specimens were collected aseptically at necropsy in sterile plastic bags for bacteriological investigation. Obtained samples were plated on trypticase-soy agar with 5% sheep blood, MacConkey agar and Mannitol salt agar. Inoculated plates were incubated at 37°C for 24 hours. Colonies having different morphological characteristics were selected, subcultured for purity and identified on the basis of morphologic features, Gram reaction, cultural characteristics and routine biochemical properties as recommended by CRUICKSHANK, et al. (1975), BAILEY and SCOTT (1978), and KNONEMAN, et al. (1979). Furthermore, the biochemical characterization of the Gram-negative bacilli was accomplished by the API 20 E Enterobacteriaceae (Analytab Products, Plainview, NY).

The antimicrobial sensitivity pattern of each isolate was determined with discs containing Ampicillin 10 mcg, Carbencillin 100 mcg, Cephalothin 30 mcg, Chloramphenicol 30 mcg, Clindamycin 2 mcg, Erythromycin 15 mcg, Gentamicin 10 mcg, Neomycin 30 mcg, Piperacillin 100 mcg, Streptomycin 10 mcg, Tetracycline 30 mcg and Tobramycin 10 mcg per disc as in the recommended manufacturer's instructions (Difco Laboratories, Deteroit Michigan).

RESULTS

Results of in vitro aerobic bacterial isolations from lung parenchyma of 25 dogs are listed in Table (1). 19 out of 25 examined dogs (76%) revealed the presence of microorganisms in the lung tissue. Signs of pneumonia including congestion and focal areas of consolidation were apparent in 15 of 19 dogs (78.9%) which were positive for the presence bacteria. The remainder 6 samples were free from infection.

Table (2) reveals that bacterial isolates from normal lungs were E.coli, Proteus mirabilis and Micrococcus sp. while the recovered microorganisms from lungs with signs of pneumonia were Streptococcus pneumoniae, Staph aureus, Staph epidermidis, Micrococcus sp., Klebsiella pneumoniae, Pasteurella multocida, Pseudomonas aeruginosa, E.coli, Serratia marcesens, Proteus mirabilis, Achromobacter sp. and Flavobacterium sp.

On the other hand Table (3) shows that microbiological cultures of lung specimens yielded Streptococcus pneumoniae 8, Staph aureus 5, Staph epidermidis 3, Micrococcus sp. 4, Pasteurella multocida 3, Pseudomonas aeruginosa 3, Klebsiella pneumoniae 4, E.coli 3, Achromobacter sp. 2, Serratia marcescens 2, Proteus mirabilis 2 and Flavobacterium sp. 1.

Results of sensitivity tests done on the isolated organisms are included in Table (4). Variation of sensitivities among the different groups of organisms was wide. Most Gram-negative isolates were sensitive to chloramphenicol, gentamicin and erythromycin, while ampicillin, chloramphenicol and tobramycin were effective against most Gram-positive isolates from dogs with bacterial pneumonia.

DISCUSSION

Bacterial pneumonia may occur as a primary disease process independent of the presence of canine distemper virus or any of the etiologic agents of infectious tracheobronchitis or secondary to viral infection. Several anatomic or functional defects, which may be either congenital or acquired, may predispose an animal to the development of bacterial pneumonia. Swallowing disorders, cleft palate, megaesophagus, and tracheasophageal fistulas may all result in aspiration with subsequent development of bacterial pneumonia. Damage to respiratory tract by smoke inhalation may lead to the development of bacterial pneumonia (AUGUST, et al. 1982; EDWARDS, et al. 1983; DHEIN and GORHAM, 1986).

The predominant bacteria in several studies of canine bacterial pneumonia were Pseudomonas sp. Klebsiella sp, E.coli, Staphylococcus sp, alpha haemolytic streptococci, serratia sp, Flavobacterium, Proteus mirabilis and Pasteurella as recorded by CREIGHTON and WILKINS (1974), HARPSTER (1981) and THAYER (1984) which agree with our results.

The same organisms isolated from normal dogs are often isolated from dogs with bacterial pneumonia. Similar results were recorded by LINDSEY and PIERCE (1978) and MCKIERNAN, et al. (1984) who suggested that the trachea and lungs from normal dogs were not always sterile and the organisms most often cultured were normal oral and pharyngeal flora including Staph aureus, Streptococcus sp, Pasteurella multocida, Klebsiella pneumoniae, E.coli and Corynebacterium sp. However, normal dogs and persons probably aspirate oral and pharyngeal bacteria during sleep but their presence is transient as they are removed promptly by normal defense mechanisms (LINDSEY and PIERCE, 1978).

The mainstay of therapy for animals with bacterial pneumonia is antibiotics. Rational antibiotic therapy should be based on culture and susceptibility results from material obtained by transtracheal aspiration, bronchial lavage, bronchial brushing, or fire needle lung aspiration (THAYER, 1984).

During the course of this study ampicillin, chloramphenicol and tobramycin were effective against most Gram-positive isolates while gentamicin, chloramphenicol and erythromycin were effective against most Gram-negative isolates from dogs with bacterial pneumonia. Our results run parallel to those reported by THAYER and ROBINSON (1983).

Obtained results indicate that treatment of bacterial pneumonia in dogs with chloramphenicol is recommended where it was effective against both Gram-positive and negative bacteria.

However, systemic antibiotics should be administred at the high end of the dosage range to assure that maximum concentrations are being achieved in the lung tissue. Moreover, antibiotics should be continued for a minimum of 10 days after the resolution of clinical signs (THAYER, 1984).

Prevention of bacterial pneumonia may be accomplished by elimination of predisposing factors. Routine vaccination may prevent infection with viruses that predispose to bacterial pneumonia. Close observation of immunosuppressed patients such as those on chemotherapy may allow early recognition and more successful treatment of bacterial pneumonia (DHEIN and GORHAM, 1986).

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Table 1: Prevalence of different microorganisms in the examined lung specimens of dogs.

No. of examined animals	Positive animals for bacteria*	
	No	%
25	19	76

* 15 of 19 dogs positive for bacteria showed signs of pneumonia.

Table 2: Results of aerobic bacterial isolation from the examined lung specimens

Item	Microorganisms	No. of isolates
Bacteria isolated from 15 lungs with signs of pneumonia	Streptococcus pneumoniae	8
	Staph aureus	5
	Staph epidermidis	3
	Micrococcus sp.	2
	Klebsiella pneumoniae	4
	Pasteurella multocida	3
	Pseudomonas aeruginosa	3
	E.coli	2
	Serratic marcescens	2
	Proteus mirabilis	1
	Achromobacter sp.	2
	Flavobacterium sp.	1
	Total	36
Bacteria isolated from 4 normal lungs	E.coli	1
	Proteus mirabilis	1
	Micrococcus sp.	2
	Total	4

Table 3:
Frequency distribution of isolated organisms from the examined lung specimens

Isolated organisms	Frequency	
	No	%
Streptococcus pneumoniae	8	20
Staph.aureus	5	12.5
Staph.epidermidis	3	7.5
Micrococcus sp.	4	10
Klebsiella pneumoniae	4	10
Pasteurella multocida	3	7.5
Pseudomonas aeruginosa	3	7.5
E.coli	3	7.5
Serratia marcescens	2	5
Proteus mirabilis	2	5
Achromobacter sp.	2	5
Flavobacterium sp.	1	2.5
Total	40	100.0

Organisms tested	No. of isolates	Ampicillin 5%	Cephalothin 5%	Carbencillin 5%	Clindamycin 5%	Clorampheniçol 5%	Erythromycin 5%	Gentamicin 5%	Neomycin 5%	Piperacillin 5%	Streptomycin 5%	Tetracycline 5%	Tobramycin 5%
Streptococcus pneumoniae	8	7 (87.5)	7 (87.5)	3 (37.5)	0 (0)	6 (75)	5 (62.5)	1 (12.5)	4 (50)	3 (37.5)	1 (12.5)	2 (15)	4 (50)
Staph aureus	5	5 (100)	0 (0)	3 (60)	2 (40)	4 (80)	0 (0)	2 (40)	0 (0)	0 (0)	3 (60)	0 (0)	0 (0)
Staph epidermidis	3	3 (100)	1 (33.33)	1 (33.33)	0 (0)	3 (100)	1 (33.33)	0 (0)	2 (66.67)	0 (0)	0 (0)	0 (0)	2 (66.67)
Micrococcus sp.	4	3 (75)	1 (25)	3 (75)	1 (25)	4 (100)	2 (50)	3 (75)	1 (25)	1 (25)	0 (0)	1 (25)	2 (50)
Klebsiella pneumoniae	4	1 (25)	0 (0)	2 (50)	0 (0)	3 (75)	3 (75)	4 (100)	0 (0)	1 (25)	1 (25)	0 (0)	1 (25)
Pasteurella multocida	3	2 (66.67)	2 (66.67)	0 (0)	0 (0)	2 (66.67)	1 (33.33)	2 (66.67)	2 (66.67)	0 (0)	1 (33.33)	2 (66.67)	2 (66.67)
Pseudomonas aeruginosa	3	1 (33.33)	3 (100)	2 (66.67)	1 (33.33)	3 (100)	1 (33.33)	3 (100)	2 (66.67)	2 (66.67)	0 (0)	0 (0)	2 (66.67)
E.coli	3	1 (33.33)	0 (0)	3 (100)	2 (66.67)	3 (100)	2 (66.67)	2 (66.67)	0 (0)	3 (100)	1 (33.33)	1 (33.33)	2 (66.67)
Serratia marcescens	2	0 (0)	0 (0)	1 (50)	0 (0)	2 (100)	1 (50)	2 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Proteus mirabilis	2	0 (0)	0 (0)	0 (0)	1 (50)	1 (50)	1 (50)	2 (100)	0 (0)	1 (50)	0 (0)	2 (100)	2 (100)
Achromobacter sp.	2	1 (50)	2 (100)	0 (0)	0 (0)	2 (100)	2 (100)	2 (100)	1 (50)	0 (0)	0 (0)	1 (50)	0 (0)
Flavobacterium sp.	1	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	0 (0)	1 (100)	0 (0)