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THE OCCURRENCE OF SEPTIC ARTHRITIS IN CALVES: BACTERIAL ISOLATION AND THEIR ANTIBIOTICS SENSITIVITY PATTERNS

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SUMMARY

This study was carried on 50 calves with septic arthritis. Synovial effusion was obtained by arthrocentesis from the joints of these calves and examined bacteriogically to determine the antibiotic sensitivity patterns of the isolates to 14 antibacterial agents. The results showed that the incidence of septic arthritis was higher in male calves (74%) than in females (26%). The higher incidence was found in calves under two months of age.

The most frequent bacterial isolates were Escherichia coli, Klebsiella spp., Proteus mirablis, Corynebacterium pyogenes, beta-haemolytic Streptococcus spp., Staphylococcus aureus and Pseudomonas aeruginosa.

It was shown that most of gram positive isolates were susceptible to ampicillin, cloxacillin, erythromycine, fucidin, garamycin and pencillin. Pseudomonas aeruginosa was the most resistant microorganism to all antibiotics used except amikacin and garamycin.

INTRODUCTION

Septic arthritis in calves is a form of joint disease that demands prompt diagnosis and therapy[1]. It is an inflammation of all structures inside the joint[2]. The most common form of the disease in calves occurs as a result of infection of the umbilicus at birth, or it may occur as a result of intrauterine

infection[2, 3, 4]. The metastatic form of septic arthritis is most prevalent occurring intercurrent to a systemic infectious process or it may occur as a complication of septicemia[5].

The disease tends to be polyarticular in calves affecting the large joints (carpel and hock joints). The affected joints are swollen and the synovial tissue become oedematous and thickened causing pain and lameness of the affected limb. Systemic infection are so severe in some calves resulting in lateral recumbency of the affected animals[3, 6].

There are various microorganisms principally involved as the aetiological agents of septic arthritis in calves; the most common of which are (E. coli, Pr. mirable, Kl. ozaenae, C. pyogenes, Staph. aureus, Streplococcus spp. and Salmonella spp.)[3, 6, 7]. Other microorganisms occassionally incriminated are (Erysipelothrix insidiosa, Fusobacterium necrophorum, Mycoplasma bovine, Chlamydia psittaci)[3, 8].

The antibiotics, most frequently used for the treatment of septic arthritis, were penicillin, erythromycin, tetracycline and chloramphenicol[5,14,17].

The purpose of this investigation is to study the occurrence of septic arthritis in calves, espically in relation to age and sex. The antibacterial sensitivity patterns of various bacterail isolates were also studied.

MATERIALS AND METHODS

Collection of samples:

For the bacteriological examination, samples of synovial fluids were obtained by arthrocentesis from 50 calves with septic arthritis from Al-dijayla dairy station and Al-Thabab Al-Abiad village around Baghdad, during the period from 1990-1993. The occurrence of the infection in calves was determined in relation to age and sex groups.

Isolation of the bacteria:

The samples were inoculated onto brain-heart infusion (BHI) broth and incubated at 37 °C for 24-48 hours. Blood agar plates, MacConkey agar plates and Mannitol salt agar plates were streaked from the broth culture and incubated as mentioned above. The microorganisms were isolated in pure cultures and identified by standard procedures for bacteria according to Cowan and Steel[18].

Antibiotic sensitivity test:

The bacterial isolates were provided for in vitro antibiotic sensitivity test using agar diffusion technique (disc method)(oxoid). After incubation at 37 °C for 24 hours, the results were evaluated. Lack of growth inhibition zones was recorded as "resistant", and a definite zone of bacterial growth inhibition was recorded as "sensitive"[18].

The antibiotics used were ampicillin, cloxacillin, erythromycine, fucidin, garamycin, pencillin, amikacin, cephaloridine, chloramphinicol, kanamycin, lincomycin, dalacin, sulfa-trimethoprim and tetracycline.

RESULTS

The results of microbial isolation are summarized in Table (1). The microorganisms most frequently isolated were in descending order of frequency, E. coli, Streptococcus spp., Klebsiella spp.,C. pyogenes, Pr. mirablis, Staph. aureus and Ps. aeruginosa.

The age and sex of calves are indicated in Table (2). Although, it was shown that the occurrence of the disease is higher in male (74%) than that in female (26%), there was no significant difference between the two sex and age groups of calves according to Qi square.

The antibacterial sensitivity patterns for the 40 positive joint isolates are presented in Table (3).

Most of the gram positive isolates were sensitive to ampicillin, cloxacillin, erythromycin, fucidin, garamycin and penicillin. In the other hand, most of the gram negative isolates were found to be sensitive to amikacin particularly E. coli and Ps. aeruginosa, while the latter bacteria was resistant to several antibacterial agents and sensitive to garamycin.

Table 1: Bacterial patterns observed in septic arthritis in calves.

Bacterial isolates	No. of cases	Percentages
E. coli	8	16
Klebsiella spp.	6	12
Proteus mirablis	4	8
Pseudomonas aeruginosa	4	8
Corynebacterium pyogenes	6	12
Streptococcus spp.	8	16
Staphylococcus aureus	4	8
No. bacterial growth	10	20
Total	50	100

Table 2: Incidence of positive cases in relation to age and sex of affected calves.

Age (months)	Male		Females		Total	
	No.	%	No.	%	No.	%
Birth-1	15	30	5	10	20	40
1-2	13	26	3	6	16	32
2-3	4	8	2	4	6	12
Over 3	5	10	3	6	8	16
Total	37	74	13	26	50	100

Table 3: Antibacterial sensitivity of bacteria isolated from infected joints.

Bacterial Isolates	No.of isolates	Antibacterial agents PN S	PN R	AX S	AX R	CR S	CR R	C S	C R	OB S	OB R	D S	D R	E S	E R	FD S	FD R	CN S	CN R	KN S	KN R	L S	L R	P S	P R	ST S	ST R	TE S	TE R
C. pyogenes	6	5	1	2	4	2	4	4	2	4	2	5	1	2	4	4	2	5	1	4	2	4	2	5	1	1	5	1	5
Staph. aureus	4	4	0	1	3	2	2	3	1	4	0	2	2	4	0	4	0	3	1	3	1	3	1	4	0	3	1	3	1
Beta hemolytic-Streptococcus	8	5	3	2	6	3	5	4	4	6	2	3	5	5	3	6	2	5	3	5	3	6	2	7	1	5	3	3	5
E. coli	8	7	1	8	0	1	7	3	5	1	7	2	6	3	5	1	7	4	4	6	2	5	3	0	8	3	5	1	7
Klebsiella spp.	6	2	4	4	2	2	4	5	1	1	5	2	4	3	3	2	4	5	1	5	1	4	2	1	5	2	4	2	4
Proteus mirablis	4	4	0	3	1	4	0	3	1	0	4	2	2	1	3	1	3	4	0	2	2	1	3	0	4	2	2	3	1
Pseudomonas aeruginosa	4	0	4	4	0	0	4	0	4	0	4	1	3	0	4	0	4	2	2	0	4	0	4	0	4	0	4	1	3

Abbrevations:

PN = Ampicillin 10 ug, AK = Amikacin 30 ug, CR = Cephaloridine 30 ug, C = Chloramphenicol 30 ug,
OB = Cloxacillin 5 ug, D = Dalacin 10 ug, E = Erythromycin 15 ug, FD = Fucidin 10 ug,
CN = Garamycin 10 ug, KN = Kanamycin 30 ug, L = Lincomycin 2 ug, P = Penicillin 10 ug,
ST = Sulfa-Trimethoprim 25 ug, TE = Tetracycline 30 ug.
S/R= Sensitive/ Resistant.

DISCUSSION

The spectrum of the isolates in this study was similar to those reported previously by other studies carried in United States of America [4, 7, 9] and in Iraq[8]. However, in this study, isolation of Pseudomonas aeruginosa is reported for the first time from the joints of the calves with arthrities in Iraq, although the bacteria have been reported to be isoald from the joints of foals[10] and man[18].

This study demonstrated a much more greater frequency of E. coli isolates than that reported previously in this country[8]. The failure of microorganisms isolation from synovial effusion samples of the affected calves could be attributed to the adminstration of the antibiotics or sulfonamides prior to the collection of the samples or absence of bacteria from the synovial effusion at the time of arthrocentesis, or it may be due to idiopathic septic arthritis [7].

Male calves revealed a higher incidence of infection (74%) than female (26%), which is in agreement with that reported by other research workers [8, 11, 12]. This could be atttributed to the fact that owners provided better attention to females than males. Among the calves examined, the highest incidence (40%) was recorded during the first month of life followed by (32%) during the second month of life. Similar trend was observed in calves and foals[8, 13].

In the present study, according to the results of the in vitro antibiotic sensitivity test, garamycin was found to be effective against most of gram negative isolates espically Pr. mirablis, whereas penicillin proved to be the most effective antibiotic against all gram positive isolates espically Staph. aureus.

Due to insufficient data and lack of references in the field of antibiotics and treatment of arthritis in calves and even in cattle, so we will oblige to discuss

our results in comparison to a horse and man as great numbers of references were available. Rose and Love[14] reported that Staph. aureus isolated from the joints of two horses was sensitive to chloramphenicol, erythromycuin, tetracycline, lincomycin, methicillin and cloxacillin while the same bacteria isolated from the joint of another horse was sensitive to penicillin, tetracycline and chloramphenicol. This observation agrees with the finding of the present study that all of the staphyloccoci isolates tested were found to be highly sensitive to most antibiotics used except amikacin, cephaloridine and dalacin (less sensitive).

All isolates of C. pyogenes tested were highly sensitive to ampicillin, dalacin, garamycin and penicillin and slightly sensitive to erythromycin, amikacin and cephaloridine, but resistant to sulpha-trimethoprim and tetrcycline. Nakama et al[17] found that most of C. pyogenes were highly sensitive to penicillin, synthetic penicillin, tetracycline, erythromycine and kanamycin, and were resistant to sulphaisomezol.

Vanpelt and Rilley[5] showed that beta-haemolytic Streptococci spp. isolated from foals were most sensitive to proc. penicillin. This observation and the results of other study in man[18] agrees with those of the present study. However, the same research workers[5] used chloramphenicol for the treatment of infectious arthritis caused by non-haemolytic E. coli in foals whereas our findings showed that E. coli isolates were highly sensitive to amikacin and ampicillin and markedly sensitive to chloramphenicol.

Cobbs and Kays[18] stated that arthritis in man caused by Klebsiella spp. was frequently sensitive to colistin and kanamycin only, while our findings revealed that Klebsiella spp were most semsitive to amikacin, chloramphenicol, garamycin in addition to kanamycin.

In the present study, all Ps. aeruginosa isolated from cases of arthritis in calves were found to be

resistant to the most antibacterial agents tested except amikacin and garamycin, whereas in man, Pseudomonas strains were usually sensitive only to colistin and polymixin B [18].

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حدوث التهاب المفصل الانتاني في العجول: العزل البكتريولوجي وحساسية البكتريا للمضادات الحيوية

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الخلاصة

أجريت هذه الدراسة على ٥٠ عجلاً مصاباً بالتهاب المفصل الانتاني. تم سحب السائل الزليلي من المفاصل المصابة بطريقة البزل المفصلي لغرض الفحص الجرثومي واجراء اختبار الحساسية لـ١٤ من المضادات الحيوية.

أثبتت النتائج بأن اعلى نسبة اصابة بالتهاب المفصل الانتاني كانت في الذكور (٧٤٪) مقارنة بالاناث (٢٦٪). ووجدت اعلى نسبة اصابة في العجول التي اعمارها تتراوح اقل من شهرين. ومن اهم العزولات الجرثومية كانت:

Escherichia coli, Klebsiella spp., Proteus mirabilis, Corynebacterium pyogens, B hemolytic streptococcus ssp., Staphylococcus aureus, and Pseudomonas aeruginosa.

ووجد ان اغلب العزولات الموجبة لصبغة اكرام كانت حساسة لـ: Ampicillin, Cloxacillin, Erythromycin, Fucidin, Garamycin and Penicillin.

أما جرثومة Pseudomonas aeruginosa فكانت مقاومة لمعظم المضادات الحيوية ماعدا Amikacin and Garamycin.