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دراسات جراحية وميكروبيولوجية لعلاج التهابات السرة في عجول الفريزيان حديثة الولادة في مصر

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أجريت هذه الدراسة الميدانية بهدف الوقوف على المسببات والملابسات المختلفة التي تحيط بحدوث التهابات السرة في عجول الفريزيان حديثة الولادة وذلك لما تسببه هذه الالتهابات من مضاعفات سيئة مختلفة تؤدى إلى ضعف نمو وإنتاجية العجول المصابة وقد تؤدى إلى نفوقها .

في هذا الصدد أجريت فحوص بكتريولوجية لالتهابات السرة في ٣٧ عجل فريزيان وتحديد مصادرها المختلفة وأمكن عزل عدد من فصائل الجراثيم المختلفة والتي كان أهمها (ايشيريشيا كولاي ، كورينبييوجينز ، بيتا هيمولتيك ستريبتوكاي) كما أختبر مدى حساسية هذه البكتريا المعزولة للمضادات الحيوية المختلفة وأمكن استعمال أفضلها تأثيرا وهو عقار (الجنتاميسين) في ثلاثة برامج علاجية مختلفة وهذا أمكن التوصل إلى اختيار أفضل هذه البرامج .

ومن ناحية أخرى فإن الحالات شديدة الإصابة والتي لم تستجب إلى العلاج الكليني باستخدام العقاقير (المضادات الحيوية) وتحولت إلى صورة مزمنة يصحبها تكوين حبل سري متليف قد أمكن علاجها جراحيا كما أمكن علاج وإيقاف الآثار السيئة الناتجة عن وجود بعض العيوب الخلقية المتمثلة في وجود اليوراكس السري والتي تحدث التهابات صديدية في المثانة البولية عن طريق تلوث والتهابات السرة في هذه العجول . وقد تم تسجيل مختلف نتائج هذه الدراسة ومناقشتها تفصيلا .

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**SURGICAL AND MICROBIOLOGICAL MANAGEMENT OF THE
NEONATAL NAVEL INFECTIONS IN FRESIEN CALVES
IN EGYPT**

(with 3 Tables and 2 Figures)

By

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SUMMARY

Bacteriological examination was conducted through 37 newly born Fresien calves with navel infections. Escherichia coli, Corynebacterium pyogenes and B-haemolytic streptococci were the most predominant isolated bacterial invaders. These were all highly sensitive to Gentamicin which proved to be of high therapeutic efficacy when used both locally and systemically. Particular emphasis was given to the environmental predisposing factors for induction of such conditions to minimize the incidences of these infections with consequent reduction of the undesirable secondary drastic complications. Surgical interference was conducted when being indicated.

INTRODUCTION

Inflammations of the umbilical cord of the newly born Fresien calves constitute one of the major field troubles amongst such imported species in Egypt. As regards etiology, GÖTZE and MERKT (1953), DIRKSEN (1970), DIETZ *et al.* (1975), ASSMUS (1978), ROSENBERGER (1978) and BLOOD and HENDERSON (1981) reported that post natal infection with Corynebacterium pyogenes or mixed infection with Streptococci, Staphylococci, Spherophorus necrophorus and Pasteurella spp. occur, most probably, immediately or soon later after calving. AMSTUTZ (1970) and ROSENBERGER (1978) reported that, in exceptional cases, the conditions scarcely occur as a sequel to endogenous infection during the embryonic life.

According to the structure involved in the umbilical cord in the process of inflammation, BOUCHAERT and De MOOR (1965), DIETZ *et al.* (1975) and ROSENBERGER (1978) classified the inflammation of such cord into subacute abscess formation (omphalitis), inflammation of the umbilical vein; Fig. 1:1 (omphalophelebitis), inflammation of one or the two umbilical arteries; Fig. 1:2 (omphaloarteriitis) or inflammation of the urachus developing urachal fistula with or without purulent urocystitis thus a permanent purulent fistula (omphalovasculitis) may develop.

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On account of the comprehensive anatomy of the umbilical cord of calves which has been diagrammatically illustrated by CHELI (1968), the diagnosis can be differentially achieved by palpation as soon as the urachus or umbilical blood vessels are affected (DIETZ *et al.*, 1975 and ROSENBERGER, 1978). The skin fold of the umbilical cord is rolled between the fingers where a dense cord can be palpated. In omphalophelebitis, it runs craniodorsally to the liver or, in case of omphaloarteriitis or omphalourachitis, the inflamed cord passes caudodorsally towards the hypogastric artery, aorta or the urinary bladder respectively. The authors added that a sterile elastic probe can be introduced to determine the direction of the inflamed structure. However, in doubtful cases, fistulography through the introduction of a small flexible canula for injection of a contrast material as tri-Opaque or barium sulphate can be performed (BOUCHAERT and De MOOR, 1965). KHAMIS (1979) stated that exploratory laparotomy is a necessary diagnostic procedure.

The aim of the present study, however, is to prospect the precise prevalent bacterial invaders and determination of their sources in Fresien calves in Egypt. Particular emphasis has been given to the most favourable pattern of medicinal conservative therapy as indicated by the results of culture and antibiotic sensitivity tests (CAST) as well as the surgical treatment when being indicated.

MATERIAL and METHODS

A survey on newly born Fresien calves was conducted thorough examination of umbilicus of 107 calves of both sexes. The animals were examined during the last year at Shoubra Shehab (Kaliobia Province) Military Farm for a full programmed rearing system for Fresien cattle. These calves were ranging in age from 5 days to 1 month old. The umbilical cord for each calf was previously severed for about 10 centimeters distance soon after calving and routinely touched with 5% Tincture of iodine. The environment, the hygienic measures and the pattern of rearing were all taken in consideration.

Of these animals, 37 calves elicited different degrees of navel infection. The clinical symptoms were recorded in each case. Of such calves, 5 ones of both sexes showed signs indicated the persistence of the pervious urachus. The associated symptoms with each case were also recorded.

Under strict aseptic measures, bacteriological swabs from the site of the lesion were separately collected. Meanwhile, swabs from the os uteri, vagina, uterine secretions and foetal fluids 1 - 2 days before calving and soon after calving respectively of the recently parturated dams as well as from the ground and gutters were also collected for similar investigation. Such swabs were spread on blood agar plates and aerobically incubated at 37°C for 24 hours. The identification of the isolated organisms was carried out by the methods described after FINEGOLD and MARTIN (1982). From cases with persistent urachus, urine samples during voiding were collected through the umbilical fistula and were analysed for detection of pus cells or other clinico-pathological findings. Culture and antibiotic sensitivity test patterns of the isolated organisms were done using antibiotic sensitivity nutrient and blood agar beside antibiotic standard discs of " Difco ".

According to the severity of the existing inflammation and on account of the results of CAST, the affected calves were randomized into 4 groups, conservatively treated 3 groups (Table III) and a control one of 3 calves. These were dealt with as follows:

Group I: Calves of this group were intramuscularly (i.m.) injected with 1 mg./Kg.b.w. Garamycin @ (Gentamicin).

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Group II: The Gentamicin was infiltrated into the periomphaitic region at the same previous dose.

Group III: The total calculated dose was equally divided for periomphaitic as well as for i.m. routes.

Group IV: (Control one): Calves of this group were left without treatment.

The treatment of groups I, II and III was adopted once daily for 5 successive days and was carried out after the usual dressing using 1:4 hydrogen peroxide then touched with 5% Tincture of iodine.

Of the calves whose previous urachus was persisted and still patent, three were surgically treated through left prepubic paramedian laparotomy under the influence of 0.05 mg./Kg.b.w. Rompun (Bayer) injected i.m. together with local infiltration anaesthesia of 2% procaine hydrochloride solution. The urinary bladder was thoroughly inspected and the cranioventral urachal stump was resected at the point of connection with the bladder wall together with a minimal amount of the adjacent wall of the latter which was also partially resected in each calf. The resultant cystotomy wound was sutured with two layers of Lembert's suture using Dexon (Braided polyglycolic acid) threads No. 00. The other two calves with such affection, surgical interference was not indicated.

On account of the CAST of the collected urine, the operated calves were given the appropriate antibiotic, Gentamicin i.m. at the same previously prescribed dose for 5 successive days. The skin stitches were removed 8 days post operatively.

In cases with rebellious or refractory response, the surgical interference became more indicated. Those which developed simple localized umbilical abscesses (omphalitis) were surgically treated the same as for the umbilical abscesses and great care was taken to avoid the development of secondary complications. The cases whose umbilicus developed a thick fibrous cords, were surgically extirpated.

Thereafter, in another 112 approximately synchronized newly born calves of both sexes, the umbilical cord was routinely severed and touched with 5% Tincture of iodine. These calves were isolated and raised on dry clean ground of littered pens using a pile of fresh straw which was daily changed for several days. These were kept under such new penning measures and observed for about one week. The incidence of development of navel infections was recorded. The affected calves were isolated and similarly treated as for those of group III.

RESULTS

Examination of the affected Fresien calves revealed that the resultant navel infection assumed the form of thickened fluctuated painful swelling at the navel with the hair around stuck with purulent discharges (Fig. 2). The swellings were more or less circumscribed with a central or semi so wrinkled orifice. On compression, a thick yellow, whitish or creamy pus was discharged. In some calves, the umbilical stump was so thick and indurated whereas suppuration was scanty.

These cases (7) associated with development of localized closed abscesses (omphalitis) satisfactorily responded within 3 - 4 weeks to the adopted surgical treatment. Healing by second intention was the rule. In 3 calves whose umbilici were accompanied with thick, fibrous cords after resolution of the suppuration, favourably responded to the total extirpation of such cords.

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In calves which showed signs indicated the persistence of the urachus, the micturition was frequent, painful and partially jetted through the umbilical fistula and partially through the normal avenues. The umbilical region and the adjacent ventral abdominal floor always appeared to be moistened with urine. The voided urine was always turbid. Generally, those calves were poorly developed. Of these 5 calves, the operated 3 ones favourably tolerated the operations. Cessation of jetting the urine through the umbilical fistula was immediately achieved after the surgery. Thereafter, the natural micturition was resumed through the urethra.

With the application of the Gentamicin based on CAST for urine samples from these calves, the turbidity of the urine disappeared, the pain associated with the micturition was alleviated and the frequency was reduced to the normal limits. On other hand, spontaneous closure within one month was recorded in the the other 2 calves so that surgical treatment was not indicated.

Before handling the farm, the primary incidence of navel infections amongst the Fresien calves was 34.6%. It was observed that the majority of such figure was in the summer season. Having used newly littered penning measures, the incidence of the navel affections was reduced about 6%. The incidence of case with persistent urachus was about 5%

The bacteriological results as regards those cases of navel infections are shown in tables I and II.

Urinalysis revealed the existence of over 100 pus cells/H.P.F. From all urine samples, Escherichia coli and Coryne. pyogenes were the only isolated organisms. The same bacterial species were also isolated from the navel of these calves. Strains of these species were highly sensitive (+++) to Gentamicin, Kanamycin and Erythromycin, moderately sensitive (++) to Ampicillin, Streptomycin and Colistin sulphate and resistant (-) to Penicillin and Sulfatriad.

The bacteriology of the vaginal, uterine secretions and foetal fluids' swabs which were collected from the pregnant dams 1 - 2 days before parturition and soon after calving respectively revealed that 40% of the cases were contaminated with E. coli, 20% contained C. pyogenes, 10% of the cases showed mixed infection of both organisms while 30% of the cases showed negative results. E.coli, Proteus mirabilis as well as Pseudomonas aeruginosa were the isolated organisms from the gutters and grounds of the pens of the calves.

The response to the conservatively treated calves with the antibiotic Gentamycin is shown in table III.

DISCUSSION

The findings reveal that the time of onset of prevalence of navel infections in Fresien calves (5 days) indicate a postnatal infection soon after calving. Such period is known to that exogenous infection occurs during or soon after calving, a fact which is in agreement with the statements of GÖTZE and MERKT (1953), DIRKSEN (1970), DIETZ et al. (1975), ASSMUS (1978), ROSENBERGER (1978) and BLOOD and HENDERSON (1981). Such suggestion is reported on account of absence of clinical gross pathological lesions in the navel of our animals soon after alving. In addition, the correlation of the isolated bacteria from the genitalia of full termed pregnant dams and from the uterine secretions or foetal fluids 1 - 2 days before parturition with those from infected navels for many calves may consolidate this suggestion.

However, regardless of the origin of the neonatal navel infection, the results show that following the conventional management of the umbilical cords, the early removal of the calves from the contaminated environment to a sanitary hygienic littered pens is a worth necessary

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measure. This greatly reduces the incidences of infection with a consequent reduction of the undesirable sequellae. These results may be reinforced by the obtained results of the microbiology of the environment with those of the infected navels for many calves. In this respect, it has been found that the majority of the infections in our farm is due to E.coli indicating faecal pollution of the recently severed umbilical cords. These results differ from those reported by DIRKSEN (1970), DEITZ et al (1975) and ROSENBERGER (1978) who found that C.Pyogenes represents the most predominant organism in navel infections in their calves. Nevertheless, C.pyogenes was isolated from the navel lesions many of our calves particularly those whose dam's genitalia contained the same bacterial species. Moreover, the source of Proteus mirabilis and Pseudomonas aeruginosa may mainly be attributed to faecal contamination of the recently severed umbilical cords. Thus, it seems logic that the maximal sanitary hygienic measures to be fulfilled, particularly in the summer seasons, the minimal the reduction of the incidence of infection and vice versa.

It is worthy to state that whatever may be the source of infection, the resultant navel lesions are better medicinally treated preferably on CAST basis. In this respect, the topical infiltration of the appropriate antibiotic together with its parenteral administration (Group III) gives a maximal therapeutic efficacy rather than those of the other groups including, by virtue, the control one. This may be attributed to the synergistic local and systemic effect of the antibiotic of choice which, in its systemic antibacterial action, includes the secondary metastatic bacterial spread elsewhere in the body.

From the surgical point of view, the well prominent circumscribed suppurative omphalitis of large sizes are best treated on the same basis as for umbilical abscesses and great care should be taken to avoid the development of the secondary anticipable complications. However, such results are in coincidence with the clinical findings experienced by DEITZ et al. (1975), ROSENBERGER (1978) and KHAMIS (1979). On the other hand, when the navel becomes thick, fibrosed, indurated and resistant to the medicinal therapy, the total extirpation of such cords as if they are tumours proved to be of satisfactory results.

The correlation of the isolated E.coli and C.pyogenes from the infected navels of the calves with persistent urachus with the same isolated species from the urine samples indicates that these organisms are the cause of the resultant purulent urocystitis. The origin of the latter inflammation is the infective navels whereas the transmission is through the preexisting patent urachal channel. These results are in agreement, to a great deal, with those declared by BOUCHAERT and De MOOR (1965), DEITZ et al. (1975) and ROSENBERGER (1978).

Anyhow, the surgical treatment for reconstruction of such congenital defect through paramedian laparotomy as well as the administration of systemic course of the antibiotic of choice based on CAST basis proved to be very beneficial. In this respect, the allied frequent painful urination and the associated complications with the patent urachus (Purulent urocystitis) are entirely alleviated. The surgical approach for treatment of these cases is approximately the same as for the classically known partial urocystectomy. The chemical means for closure of the persisted urachus that described by OHEME and PRIER (1974) seemed to be dispensable simply because of the incidences of failure of providing permanent or adequate closure as stated by the same authors.

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Table I
Organisms isolated from calves with navel affections

The isolated organisms	Numbers of calves
<u>Escherichia coli</u>	11
<u>Corynebacterium pyogenes</u>	5
<u>E. coli</u> + <u>C. pyogenes</u>	3
B- haemolytic streptococci	5
<u>Enterobacter cloacae</u>	3
<u>Proteus mirabilis</u>	3
<u>Pseudomonas aeruginosa</u>	2
Total No.	32

Table II: Antibiogram of the different organisms from navel infection of Friesian calves against the different antibiotics and antimicrobials used.

Antibiotics & Antimicrobial agents	Organisms isolated																				
	<i>Escherichia coli</i> (14) ①	<i>Corynebacterium pyogenes</i> (8) ②	<i>B-haemolytic streptococci</i> (5) ③	<i>Enterobacter cloacae</i> (3) ④	<i>Proteus mirabilis</i> (3) ⑤	<i>Pseudomonas aeruginosa</i> (2) ⑥	S. M.S. R.	S. M.S. R.	S. M.S. R.	S. M.S. R.	S. M.S. R.										
Gentamycin	10	4	7	1	4	1	1	4	1	1	2	1	1	2	2	2	2	2	2	2	2
Kanamycin	6	5	3	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Erythromycin	-	4	10	3	3	2	-	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Colistin sulphate	5	6	3	-	-	2	3	-	2	1	1	1	1	1	1	1	1	1	1	1	1
Melidixic acid	3	7	4	1	7	2	4	1	2	2	2	2	2	2	2	2	2	2	2	2	2
Penicillin	3	7	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Ampicillin	1	6	14	3	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Streptomycin	2	4	7	2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Chloramphenicol	2	6	8	2	4	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Tetracycline	1	4	6	4	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Neomycin	2	4	9	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Neomycin Nitrofurazone	1	8	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sulfafrid	3	10	1	-	-	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Sulfafrid	-	4	11	-	-	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4

S. = Sensitive (zone of inhibition of 15 mm. or more), M.S. = Moderately sensitive (zone of inhibition less than 15 mm.), R. = Resistant. ① = Number of strains isolated. In case of Erythromycin S = more than 10 mm. M.S. = Less than 10 mm.

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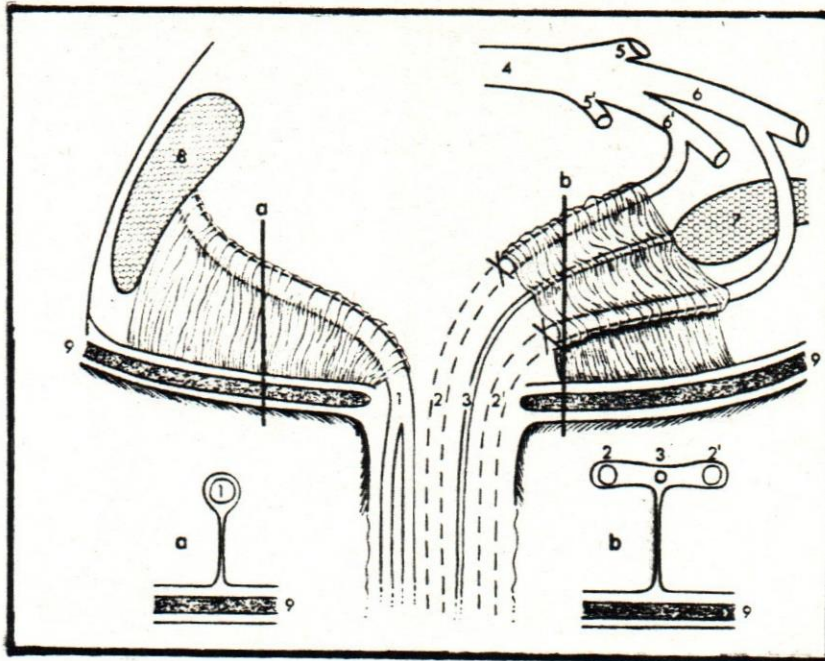
Table III
 Illustrating the number of Fresien calves of different groups with or without constitutional manifestations as well as the degree of response to the medicinal treatment used:

No. of group	I Local inj.			II Syst.inj.			III Loc.&Sys.			IV Control		
	S.	M.	M'.	S.	M.	M'.	S.	M.	M'.	S.	M.	M'.
No. of calves Before treatment	4	3	2	4	4	2	3 [Ⓞ]	4	3	2	1	-
H. R.	2	1	2	-	1	1	2	3	3	-	-	-
M. R.	1	1	-	1	1	1	1	1	-	-	-	-
Md. or no R.	1	1	-	3	2	-	-	-	-	2	1	-

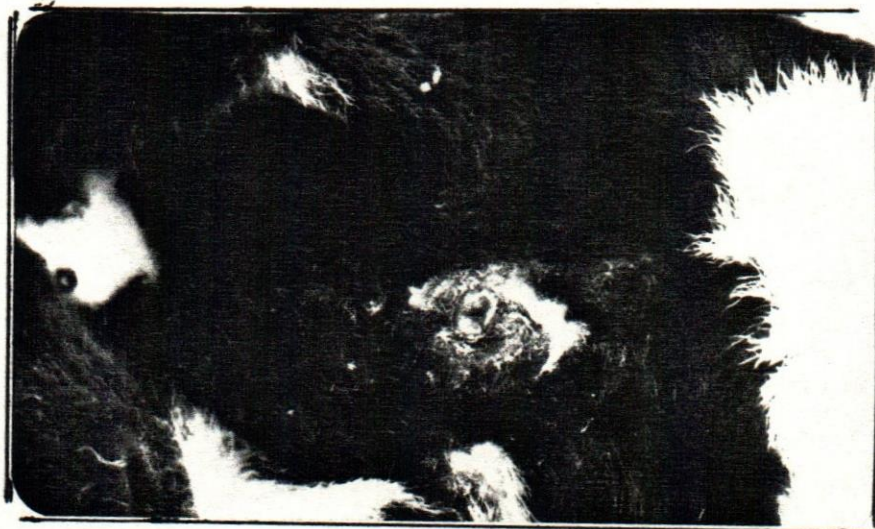
S., M. M'. = Severe, medium and mild degrees of inflammations respectively.

H. R., M. R. and Md. or no R. = High, moderate and mild degrees of response or no response respectively.

Ⓞ = 2 calves were showing, in addition to the local navel affection, constitutional symptoms in the form of fever (39.8 - 40.2°C), enteric manifestations in the form of diarrhoea and straining and a respiratory dysfunction in the form of cough, frothy nasal discharges and conjunctival cyanosis. These two calves were entirely recovered from the said associated symptoms.



(Fig. 1) Diagram illustrating the umbilical blood vessels in calves (After Cheli, 1968): 1= V. umbilicalis (which is transformed into the round ligament of the liver "lig. teres hepatis" After Getty, 1975), 2= Aa. umbilicalis (which is spontaneously retracted to point x after severance of the umbilical cord), 3= Urachus, 4= Aorta, 5,5' = Aa. iliaca internae, 6,6' = Aa. hypogastricae, 7= Urinary bladder, 8= Liver, 9= M. rectus abdominis; Linea alba. a= Transverse section through the lig. falciform (Crossing the V. umbilicalis) and b= Transverse section through the a. umbilicalis and urachus).



(Fig. 2) A Fresien calf with severe form of navel inflammation

