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A SURVEY OF THE BACTERIAL FLORA IN THE GENITAL TRACT OF CATTLE, WITH EMPHASIS ON CAMPYLOBACTER FETUS

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ABSTRACT

A survey of the bacterial flora in the genital tract of cattle with emphasis on Campylobacter fetus was carried out in 48 bulls and 98 cows from herds in Selangor and Negeri Sembilan.

Cervical samples were collected with sterile swabs while preputial scrapings were collected using pipettes. Samples were cultured into blood agar and selective media of Brucella broth and brain heart infusion agar with and without antibiotics. The bacteria isolated were identified while growths in the selective media were checked for C.fetus.

The major organisms isolated from the animals were Staphylococcus epidermidis (61.8%), corynebacterium (45.1%), micrococcus (41.7%) and Staphylococcus aureus (34.0%). The major bacteria common in the fertile and infertile animals were Staphylococcus epidermidis, corynebacterium, bacillus and micrococcus. Staphylococcus epidermidis, was predominant in animals at UPM and at MARDI, while E.coli and micrococcus was predominant in Ijok and Pantai respectively.

No C.fetus was seen from direct smears and none were isolated from the selective media. However no conclusive findings could be drawn from the selective cultures since pure C.fetus samples also did not grow in the selective media.

The results suggest that a range of bacterial types occur as a normal population in the genital tract of cattle. The major bacteria isolated in the female animals in the present study can cause endometritis under favourable conditions but their overall significance in infertility need to be further studied.

CONTENTS

INTRODUCTION

Infertility can be a major problem among farm animals. It results in economic losses both in potential calf and milk production.

Infertility may result from either inherited or congenital anomalies, nutritional deficiencies, poor management, environmental factors or infectious diseases.

Infections of the reproductive tract are classified as specific and nonspecific. Brucellosis, vibriosis and trichomoniasis are the major specific diseases whereas staphylococci, streptococci, corynebacterium and E.coli are causes of nonspecific infections.

The present study was conducted to determine the bacterial microflora in the preputial secretions of 46 bulls and in the cervical mucus of 98 cows with emphasis on Campylobacter fetus.

LITERATURE REVIEW

A) Campylobacter fetus

Campylobacteriosis has been recognised as a cause of abortion in cattle, but as a cause of infertility it received little attention until the last three decades (Arthur, 1968). Plastridge et al. (1947) (cited by Arthur, 1968) were the first to suggest that the organism played an important role in infertility. Since then, it is known that C.fetus causes a venereal disease of cattle which is transmitted at service.

a) Serotypes

There are three pathogenic types of C.fetus. C.fetus var venerealis causes 90% of bovine campylobacter infertility and abortion while 10% is due to C.fetus var intestinalis serotype I. Sporadic

abortion may be caused by C.fetus var intestinalis serotype II. Saprophytic campylobacter include C.bulbulus and C.fecalis and are found in the alimentary tract and prepuce of cattle (Arthur, 1968).

b) Habitat

The natural habitat of C.fetus venerealis is in the preputial cavity especially mucosa of the glans penis, prepuce and the distal urethra. In females the predilection sites are the vagina, cervix, uterus and oviducts (Clark, 1971).

c) Diagnosis

Diagnosis is based upon the herd history and the results obtained from preputial scrapings, cervical mucus and aborted fetuses. Preputial secretions are examined by culture on a selective medium and by the fluorescent antibody technique (Dufty 1967; Philpott, 1968). Diagnosis in bulls is the method of choice in herd diagnosis. In addition, cervical and vaginal mucus for bacteriological examination is also an aid to diagnosis. Agglutinins formed in mucus samples with C.fetus infection are detected by the vaginal mucus agglutination test. (Newsam and Monsbourgh, 1967). Two indirect hemagglutination tests for demonstrating antibody against C.fetus have been developed (Newsam & St. George, 1967; Newsam et al, 1967).

d) Culture media

In recent years a wide range of selective media have been used. Balchev (1968) used a medium containing aqueous meat extract, peptone, sodium chloride, sodium bisulfate, sodium thiosulfate, ferric ammonium citrate, phenol red and water.

3/..

Dufty and Kenneth (1969) was able to make positive diagnosis using nutrient blood agar with bacitracin, polymixin B sulfate, novobiocin and cylcoheximide.

Ullman (1975) reported that chocolate agar, brain heart infusion and bacteria tryptose agar incubated with 10% carbon dioxide were suitable media.

Simon (1976) reported that a medium consisting of a solid base of cystine heart agar, with thioglycollate medium of Brewer as the liquid overlay, yielded maximum growth of C.fetus.

Neill et al. (1980) innoculated preputial or vaginal washings into a semi-solid leptospira medium with 5-fluoroucil and rabbit serum and incubated it at 30°C. Samples were then taken from the subsurface growth and cultured on blood agar with lysed horse blood and carbenicillin and incubated at 30°C in a carbon dioxide atmosphere.

e) Regional distribution

Bovine campylobacteriosis has an international distribution. In Australia the disease was reported in both dairy and beef herds. (Jakovljevic and Beattie, 1969; Turnbull, 1977; Cockram and Stephens, 1979).

Jakovljevic and Beattie (1969) reported positive reactions by the vaginal mucus agglutination test in 1415 mucus samples from 66 infertile beef berds and in 275 mucus samples from slaughtered cattle. Cockram and Stephens (1979) reported C.fetus in 9.1% of slaughtered bulls in New South Wales and they concluded that C.fetus infections are relatively common in beef bulls.

In America, Hoerlein (1965) showed that 145 herds in Colorado were infected with C.fetus. Roberts (1979) described infertility and abortion caused by C.fetus in Scotland. Gauthier and Cheve' (1962) found 237 animals out of 2,571 dairy cattle infected with campylobacteriosis in France.

Other countries where campylobacteriosis has been reported include Germany (Bingol et al., 1970). Denmark (Adler and Lindegaard, 1964), Bulgaria (Kolev et al., 1977), USSR (Ochavenkoet al., 1975), Poland (Rosanowksi et al., 1972) Argentina (Roberts et al., 1967), Uruguay (Errico et al., 1978), Jamaica (Garcia et al., 1980), Brazil (Medeiros and Fiquerredo, 1971), Turkey (Doguer, 1971), Taiwan (Young and Yeh, 1969), Malawi (Klastrup & Hallinell, 1977) and India (Namboodiripad and Raja, 1972).

B) Other bacteria in the female reproductive tract

Studies on the genital flora of normal and repeat breeder cows showed a wide spectrum of bacteria (Nunn, 1970; Decun & Rosli, 1973). The organisms isolated include staphylococcus, streptococcus, E.coli, corynebacterium, hemophilus, proteus and bacillus species. Dawson (1959) isolated micrococci, streptococci, E.coli, Corynebacterium renale and Corynebacterium pyogenes in the normal bovine vagina.

Hardenbrook (1958) attributed nonspecific infections in the reproductive tract of infertile cattle to be due to micrococci, streptococci, corynebacterium spp., proteus spp. and E.coli.

Gibbons et al. (1958) isolated streptococci, staphylococcus, proteus, bacilli, E.coli, aerobacter and C.fetus in the cervical mucus

of post partum cows.

Recently Panangala et al.(1978) isolated 25 bacterial types in the cervicovaginal mucus of fertile and repeat breeder cows. Their frequencies in both groups did not reveal any significant difference. The organisms of the Enterobacteriaceae family and the genus corynebacterium occurred in higher numbers in the repeat breeders.

Anaerobic bacteria, Peptococcus indolicus and C.pyogenes have also been found in the vagina of healthy cattle. (Sorenson, 1976; Fukuyama et al., 1978).

C) Other bacteria in the male genital tract

A wide range of microflora have also been isolated from the prepuce of bulls. Schwardtner (1961) found C.bulbulus, proteus, E.coli, Pseudomonas pyocyanea and corynebacterium from preputial washings.

Marinov et al. (1966) isolated Proteus vulgaris, Pseudomonas aeruginosa, E.coli and Bacilli megatherium while Reddy and Krishnamurthy (1972) found bacillus spp., Staphylococcus pyogenes, Proteus vulgaris, Pseudomonas pyocyanea and Staphylococcus epidermidis.

Hubrig & Kohler (1961) isolated Pseudomonas pyocyanea and Hiromune et al. (1975) found Corynebacterium renale among healthy bulls.

MATERIALS AND METHODS

Samples of cervical mucus and preputial secretions were obtained from female animals and from bulls, respectively. Most of the non-pregnant females had a history of infertility. These animals were from herds at Universiti Pertanian Malaysia (UPM), Malaysian Agriculture

Research and Development Institute, (MARDI) and government farms in Selangor and Negeri Sembilan. A total of 144 animals consisting of 98 females and 46 males were investigated. This study was carried out for a period of 7 weeks commencing from October to November 1980.

Collection of cervical samples

The vulva was washed before a sterile plastic vaginal speculum was introduced through the vulva. The light source was then attached to the speculum and the cervix located. A sterile cotton swab, attached to an artificial insemination pipette was then inserted through the external os of the cervix. The cervical opening was then swabbed by quick, gentle rotation. The swab was withdrawn and inserted immediately into a sterile test tube. It was labelled with the identification of the animal and date of collection.

Where samples cannot be delivered for culture within six hours of collection, the swabs were inserted into bijou bottles containing Stuart's transport medium and transferred to the laboratory in a small insulated box.

Collection of preputial washings

The bull was put in a crush and the left hind leg fastened with a leg rope. The preputial hair was clipped. A sterile plastic tube (diameter 1cm. and length 35cm.), bent at an angle of 120^{o} at one end, was then introduced into the prepuce to its full length. A 60ml. plastic syringe was connected to the exposed end of the pipette with the aid of a rubber tubing. Repeated suction was carried out by pulling and releasing the plunger for one minute. The pipette was directed onto the ventral fornix and the dorsal surface of the penis by mani-

pulation with both hands. After removal from the preputial cavity, the pipette was rinsed by sucking up 4 ml. of sterile physiological saline and allowing this to drain back into the bijou bottle. The bottle was labelled with the identification of the bull and date of collection.

Laboratory identification and culture

a) Culture media

Three types of media were used for the culture. The first medium was blood agar. The second medium was devised Brucella broth with brain heart infusion agar. This consisted of Brucella broth, brain heart infusion, thiotone peptone, trypticase peptone, sodium chloride, dextrose and disodium phosphate.

The third medium was similar to the second medium, with addition of antibiotics. 5 fluoroucil (o.12g/ litre), polymixin B-sulfate (0.024 g/l), nalidixic acid (0.0012 g/l) and cycloheximide (0.04 g/l) were added. These latter two media were selective media for campylobacter organisms.

Plates were stored in the cold room until use.

b) Laboratory procedures

Cervical swabs in test tubes were dipped into sterile tryptose soy broth before they were streaked on the three media. Swabs in Stuart's transport medium were directly streaked on the media. Control plates, streaked with pure C.fetus,were also set up.

Preputial samples were centrifuged at 1200 rpm for three minutes and the supernatant plus the deposit were streaked on the media.

Direct smears from cervical swabs and preputial secretions were

made and stained with Gram's stain. Stained smears were then examined for campylobacter organisms and other bacteria using the light microscope.

The innoculated blood agar plates were incubated for 24-48 hours at 37°C in ordinary atmosphere while the innoculated selective media were put into carbon dioxide containers, provided with 20% carbon dioxide and incubated at 37°C for 4-5 days.

The blood agar plates were examined after 24-48 hours, and smears of bacterial colonies made and Gram stained. Method of identification of the bacterial colonies were based on Cowan and Steel's scheme of identification (Cowan, 1974).

After 4 days, the selective media plates were opened and each bacterial colony growing in them was checked for campylobacter. This was done by making smears and staining with Gram's stain. The organisms were identified by its morphological characteristic consisting of gram negative comma-shaped rod. Suspicious colonies were subcultured onto new plates of the same media, incubated at 37°C in 20% carbon dioxide and reexamined.

Statistical analysis was carried out using the proportion method (Croxton et al., 1975).

RESULTS

A) Campylobacter fetus

Stained direct smears were negative for comma-shaped organisms and no campylobacter organism was isolated from the selective media used.

TABLE 1: TYPES AND FREQUENCIES OF BACTERIA ISOLATED IN MALE AND FEMALE ANIMALS

ISOLATES	FREQUENCY No.	%
Staphylococcus epidermidis	89	61.8
Corynebacterium spp.	65	45.1
Micrococcus spp.	60	41.7
Staphylococcus aureus	49	34.0
Bacillus spp.	42	29.2
E.coli	39	27.0
Pseudomonas spp.	30	20.8
Acinetobacter spp.	27	18.8
Streptococcus spp.	21	14.6
Proteus spp.	11	7.6
Citrobacter spp.	10	6.9
Aeromonas spp.	10	6.9
Enterobacter spp.	10	6.9
Salmonella spp.	3	2.1
Pasteurella spp.	2	1.4
Neisseria spp.	2	1.4
Klebsiella spp.	1	0.7

TABLE 2: TYPES AND FREQUENCIES OF BACTERIA ISOLATED IN BULLS AND COWS

ISOLATES / FREQUENCY	MALES		FEMALES	
	No.	%	No.	%
Staphylococcus epidermidis	29	63.0	60	61.2
Corynebacterium spp.	31	67.4	34	34.7
Micrococcus spp.	26	56.5	34	34.7
Bacillus spp.	19	41.3	23	23.5
Staphylococcus aureus	27	58.7	22	22.4
E.coli	20	43.5	19	19.4
Streptococcus spp.	6	13.0	15	15.3
Acinetobacter spp.	18	39.1	9	9.2
Pseudomonas spp.	22	47.8	8	8.2
Proteus spp.	7	15.2	4	4.1
Enterobacter spp.	6	13.0	4	4.1
Citrobacter spp.	9	19.6	1	1
Aeromonas spp.	10	21.7	-	-
Salmonella spp.	3	6.5	-	-
Pasteurella spp.	2	4.4	-	-
Neisseria spp.	2	4.4	-	-
Klebsiella spp.	1	2.2	-	-

TABLE 3: TYPES AND FREQUENCIES OF BACTERIA ISOLATED IN FERTILE AND INFERTILE FEMALES

FREQUENCY / ISOLATES	FERTILE FEMALES Nos.	FERTILE FEMALES %	INFERTILE FEMALES Nos.	INFERTILE FEMALES %
Staphylococcus epidermidis	23	85.2	39	54.9
Corynebacterium spp.	13	48.1	21	29.6
Micrococcus spp.	11	40.7	21	29.6
Bacillus spp.	8	29.6	17	23.9
E.coli	2	7.4	17	23.9
Streptococcus spp.	4	14.8	11	15.5
Staphylococcus aureus	11	40.7	11	15.5
Acinetobacter spp.	1	3.7	8	11.3
Enterobacter spp.	2	7.4	2	2.8
Pseudomonas spp.	-	-	6	8.5
Proteus spp.	-	-	4	5.6
Citrobacter spp.	-	-	1	1.4

TABLE 4: TYPES AND FREQUENCIES OF BACTERIA ISOLATED IN THE VARIOUS BREEDS

EQUENCY / ISOLAT	ANTA ERTRUDIS	KEDAH KELANTAN	BRAHMAN	JERSEY	FRIESIAN	HEREFORD	CROSS BREDS
Staphylococcus epidermidis	66.7	40.9	36.7	50.0	90.5	70.0	60.6
Staphylococcus aureus	50.0	40.9	23.3	35.0	42.8	-	36.4
Corynebacteri spp.	16.7	59.0	33.3	40.0	80.9	10.0	36.4
Bacillus spp.	16.7	22.7	23.3	20.0	19.0	50.0	45.4
Micrococcus spp	16.7	18.2	10.0	40.0	57.1	60.0	75.8
Streptococcus spp.	83.3	-	3.3	15.0	4,8	30.0	9.
Pseudomonas spp	16.7	40.9	16.7	5.0	19.0	20.0	6.
Acinetobacter spp.	16.7	27.3	16.7	15.0	14.3	10.0	18.
E.coli	-	-	53.3	20.0	19.0	30.0	27.
Proteus spp.	-	-	23.3		4.8	-	6.
Citrobacter spp.	-	-	3.3	25.0	9.5	20.0	-
Aeromonas spp.	-	-	-	25.0	9.5	-	9.
Salmonella spp.	-	13.6	-	-	-	-	-
Enterobacter spp.	-	-	-	-	4.8	-	27.
Klebsiella spp.	-	-	-	-	-	-	3.0
Neisseria spp.	-	4.5	3.3	-	-	-	-
Pasteurella sp	-	4.5	-	-	-	-	3.0

TABLE 5: TYPES AND FREQUENCIES OF BACTERIA ISOLATED IN ANIMALS OF VARIOUS FARMS

FREQUENCY IN FARMS / ISOLATES	UPM		MARDI		IJOK		PANTAI	
	Nos	%	Nos	%	Nos	%	Nos	%
Staphylococcus epidermidis	37	86.0	25	50.0	7	36.8	19	59.0
Staphylococcus aureus	20	46.5	15	30.0	3	15.8	10	31.3
Corynebacterium spp.	24	55.8	20	40.0	8	42.1	11	34.4
Bacillus spp.	13	30.2	12	24.0	2	10.5	14	43.8
Streptococcus spp.	9	20.9	6	12.0	-	-	1	3.1
Micrococcus spp.	18	41.9	17	34.0	1	5.3	24	75.0
Acinetobacter spp.	7	16.3	9	18.0	5	26.3	4	12.5
Pseudomonas spp.	9	20.9	11	22.0	3	15.8	1	3.1
E.coli	7	16.3	7	14.0	15	78.9	9	28.1
Proteus spp.	-	-	-	-	9	47.4	2	6.3
Citrobacter spp.	2	4.6	7	14.0	1	5.3	-	-
Aeromonas spp.	1	2.3	5	10.0	-	-	4	12.5
Salmonella spp.	-	-	3	6.0	-	-	-	-
Enterobacter spp.	-	-	-	-	-	-	10	31.3
Klebsiella spp.	-	-	-	-	-	-	1	3.1
Neisseria spp.	-	-	-	-	1	5.3	-	-
Pasteurella spp.	2	4.6	-	-	-	-	-	-

No cases of abortion were reported during the study period. Therefore no study could be made to isolate campylobacter organisms from aborted fetal materials.

Other bacteria

The major organisms that grew in the selective media were staphylococci, streptococci, E.coli, corynebacterium, micrococci, bacillus and pseudomonas. Growth of these organisms were not as profuse in the selective media as compared with those in blood agar.

A total of 17 types of bacteria were isolated from the bulls.

12/..

Twelve types were isolated from the females. The common organisms isolated in males and females were Staphylococcus epidermidis (61.8%), corynebacterium (45.1%), micrococcus (41.7%), Staphylococcus aureus (34.0%), bacillus (29.2%) and E.coli (27.0%). Other less frequently isolated organisms inculde pseudomonas (20.8%), acinetobacter (18.8%) and streptococcus (14.6%) (Table 1).

Twelve cultures had no growths and these were from cervical swabs. Samples from the bulls and cows yielded an average of 5.1 isolates and 2.7 isolates respectively.

Staphylococcus epidermidis was the most common bacteria isolated in the female animals ($p < 0.05$) (Table 2).

The major organisms isolated in bulls were corynebacterium, (67.4%), Staphylococci epidermidis (63.0%), Staphylococcus aureus (58.7%) micrococcus (56.5%), and pseudomonas (47.8%) (Table 2). There was no single dominant organism as statistical analysis indicated their frequencies were not significant ($p < 0.05$).

The major organisms isolated in males and females were similar. Statistically, higher frequencies were isolated in the males for corynebacterium, micrococcus, bacillus, Staphylococcus aureus, E.coli and acinetobacter ($p < 0.05$).

The major bacteria found in the various breeds were quite similar although their frequencies varied (Table 4). Staphylococcus epidermidis, corynebacterium, micrococcus, bacillus and pseudomonas were found in all breeds sampled. The lowest number of isolates were isolated from Santa Gertrudis (8 isolates) and the highest ih the

crossbreds (14 isolates).

Based on calving to conception intervals and the age at first calving of various breeds reported by Ramli (1979), the cows used in the study were divided into two groups, fertile and infertile. With these criteria, 71 cows were classified as infertile while 27 were classified as fertile females.

In the infertile group, 12 types of bacteria were isolated. The most common bacteria included Staphylococcus epidermidis (54.9%), corynebacterium (29.6%), micrococcus (29.6%), bacillus (23.9%) and E.coli (23.9%) (Table 3).

There were nine types of bacteria in the fertile group, the most common being Staphylococcus epidermidis (85.2%) followed by corynebacterium (48.1%), Staphylococcus aureus (40.7%) and micrococcus (40.7%) (Table 3).

Upon comparing the fertile and infertile groups of animals, Staphylococcus epidermidis and Staphylococcus aureus was found at a higher frequency in normal females than infertile females ($p < 0.05$). The frequencies of occurrence of the rest of the bacteria were not significantly different between both groups.

An average of 12 isolates were found in each farm (Table 5). Eight isolates were common in all the farms but their frequencies varied from farm to farm. The most common bacteria isolated in UPM was Staphylococcus epidermidis while it was E.coli in Ijok and micrococcus in Pantai. In MARDI, corynebacterium and Staphylococcus epidermidis were predominant ($p < 0.05$)

The less common bacteria (eg. klebsiella, pasteurella, neisseria)

were found in only a few animals.

DISCUSSION

Campylobacter fetus

The absence of campylobacter organisms from direct smears could indicate the absence of C.fetus in the animals but this could not be supported by the negative results obtained from cultures as pure C.fetus cultures also did not grow in the media.

Brucella heart infusion has been suggested by Ullman (1975) to be a suitable media while the antibiotics added, namely, fluoroucil, polymixin B-sulfate and cycloheximide, have been used previously, by Neill et al. (1980). Incubation under carbon dioxide have been suggested by Clark et al. (1975). No growth of campylobacter could be detected and the absence of growth in the devised media could be due to various reasons.

The viability of the lyophilised campylobacter organisms could be poor due to improper preparation, storage and thawing, resulting in no growth in the media. The viability of these organisms could not be checked in our laboratory and due to limited supply, no other vials of C.fetus were used for culture.

The absence of C.fetus growth from preputial scrapings and cervical swabs could suggest that the organism was absent from the animals tested or the number of organisms present were very low and its growth were inhibited by the growth of other bacteria. Campylobacter organisms are sensitive in their growth requirements and the growth of other bacteria could inhibit C.fetus growth.

Other possibilities could be that the selective media. were not enriched sufficiently to support C.fetus growth, or there could be errors in preparation of the media and setting the optimum conditions for its growth. Hence, from direct smears, C.fetus was absent in the animals of the present study, but no conclusive findings can be made from selective media cultures.

Other bacteria

The major organisms isolated in both males and females were similar to those reported by other researchers (Reddy & Krishnamurthy, 1972; Decun & Rosli, 1973; Panangala et al. 1978).

The mean number of different isolates per sample were 5.1 and 2.7 for the males and females, respectively. These values are higher than those reported by other workers. Heist and Tanabe (1974) recorded a mean of 1.9 microflora types while Decun and Rosli (1973) found a mean of 1.3 species per sample from the cervical secretions.

The organisms isolated from the prepuce were considered to be the normal flora as they do not cause any pathologic conditions locally. The normal preputial flora may cause venereal infections in served females but these conditions are rare (Bane, 1980).

The bacteria types isolated from the females has frequently been reported as the cause of nonspecific bacterial infections of the genital tract. Hardenbrook (1958) mentioned micrococci, streptococci, corynebacterium, proteus and E.coli as the cause of non specific infections in the reproductive tract and Dawson (1960) concluded that staphylococci, streptococci and E.coli were the main pathogens in

first and second degree endometritis while C.pyogenes was important in third degree endometritis. However Panangala et al. (1978) reported that there was no difference in the frequencies of occurrence of different bacteria types between the fertile and repeat breeding animals. He concluded that their significance in the repeat breeder syndrome remained undetermined.

Upon comparing each species of bacteria between the fertile and infertile groups, it was observed that except for Staphylococcus epidermidis and staphylococcus aureus, there was no significant difference in the frequency of occurrence of the different species. This indicates that there is a 'normal' bacterial population resident in the cervical mucus. This finding is supported by Gibbons et al. (1959) who observed that infertile cows do not show a higher percentage of bacterial isolations than those from fertile cows. Nunn (1970) observed that similar genera of bacteria were isolated from fertile and infertile cows.

Heist and Tanabe (1974) stated that once microorganisms gained entrance into the uterus, they may persist whether the animal return to estrus or became pregnant, while Vigue et al. (1959) concluded that the vagina served as a habitat for many types of saprophytic organisms some of which are 'opportunists' which under favourable circumstances may impair fertility.

Pseudomonas, proteus and citrobacter were isolated from the infertile but not in the fertile group. They could not have had an effect on fertility in the present study because they occurred in only a small number of animals and also they are considered not to be very

pathogenic.

In comparing the frequency of occurrence of bacteria among breeds, all the common organisms isolated were found in all breeds sampled although their frequencies in each breed varied. This suggest that the organisms were not breed specific. The crossbreds had the largest number of bacterial types although the number of infertile animals in the group were less than other breeds. This could indicate that these animals might be more resistant to reproductive infections and were able to accomodate a wide range of bacteria.

The different predominant bacterial types in each farm could indicate that there is a variation in the bacteria species in relation to location of the herd. These farms are situated far apart from each other and factors such as management, environment and soil types could influence the type of predominant organism in the farm.

Conclusion:

Direct smears indicated the absence of C.fetus in the herds investigated but no conclusive findings could be drawn from the selective media cultures. Further studies are needed to determine the incidence of C.fetus in our cattle population in view of the continued importation of animals for breeding from countries with campylobacteriosis. Other methods, like the fluorescent antibody technique, could be used together with cultural techniques in aiding diagnosis.

The results suggest that there is a range of bacterial types

occurring as a normal population in the genital tract of cattle. The major bacteria isolated in the female animals in the present study can cause endometritis under favourable conditions but their overall significance in infertility needs to be further evaluated.

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•Abstracts taken from the Veterinary Bulletin. (1970-1980)

APPENDIX

BREEDING HISTORY OF THE FEMALE ANIMALS

Animal Identification	Breed	Date of last calving	No of inseminations/ services since last calving & other remarks	
A) FIELD 16, UPM				
ES 189	Santa Gertrudis	17/1/79	3AI	-
YY 13	Santa Gertrudis	15/8/80	-	-
SG 18	Santa Gertrudis	28/7/80	-	-
33-5	Santa Gertrudis	19/9/80	2AI	-
9-7	Santa Gertrudis	24/1/80	-	-
B) FIELD 15, UPM				
XJ8116	Friesian	Heifer	6AI 1NS	Born on 26/8/78
27-7	Friesian	16/6/79	9AI	-
46-7	Friesian	23/3/80	5AI	-
2-79	Friesian	17/8/80	4AI	-
22-7	Friesian	14/4/80	3AI	-
9041	Friesian	Heifer	3AI	Born on 22/2/79
58-7	Friesian	9/10/80	Not bred	-
8109	Friesian	Heifer	INS	Born on 20/3/78
300	Friesian	29/8/80	1AI	-
290	Friesian	5/10/80	Not bred	-
36-7	Friesian	17/7/80	1AI	-
267	Friesian	25/12/79	5AI	-
298	Friesian	9/9/80	-	-
252	Friesian	29/8/80	1AI	-
257	Friesian	14/10/80	Not bred	-
255	Friesian	30/8/79	5AI	-
C) BRAHMAN UNIT - UPM				
8113	Brahman	Heifer	Born in 1978	-
171	Brahman	30/8/80	-	-
8097	Brahman	Heifer	Born in Aug. 1978	-
R916	Brahman	28/8/79	2AI	-
126	Brahman	22/9/80	-	-
R908	Brahman	25/1/80	1AI	-
135	Brahman	28/8/79	2AI	-
197	Brahman	18/11/79	1AI	-
905	Brahman	24/10/79	No record of breeding since last calving	
8090	Brahman	Heifer	Born in 1978	-

Animal Identification	Breed	Date of last calving	No. of inseminations/ services since last calving & other remarks	
JERSEY UNIT - MARDI				
375	Jersey	19/3/80	5AI	-
371	Jersey	25/2/80	6AI	-
317	Jersey	26/11/79	10AI	-
354	Jersey	22/10/79	4AI	-
382	Jersey	22/1/80 (abortion)	2AI	-
353	Jersey	9/10/79 (full term abortion)	10AI	Cystic ovaries
303	Jersey	Abortion in Dec. '78	11AI	Adhesion of right ovary
300	Jersey	24/11/79	5AI	-
322	Jersey	Abortion in Oct. 1978	8AI 1NS	-
335	Jersey	31/5/80	3AI	-
376	Jersey	19/5/80	3AI	-
358	Jersey	2/5/80	2AI	-
32	Jersey	26/2/80	7AI	-
34	Jersey	26/10/78	13AI 4NS	Cystic ovaries
365	Jersey	23/4/80	6AI	-
HEREFORD UNIT - MARDI				
6026	Hereford	12/10/78	2NS	-
6046	Hereford	21/8/80	No record of breeding since last calving	
6012	Hereford	24/9/78	2NS	-
6049	Hereford	18/6/80	No record of breeding since last calving	
6067	Hereford	1/10/78	5NS	-
6035	Hereford	4/10/78	1NS	-
6054	Hereford	4/9/78	2NS	-
6040	Hereford	14/5/80	No record of breeding since last calving	
KEDAH KELANTAN - MARDI				
165	Kedah Kelantan	25/1/80 7th month abortion	1NS	-
25	Kedah Kelantan	19/12/79	1NS	-
167	Kedah Kelantan	9/2/80	-	-

Animal Identification	Breed	Date of last calving	No of inseminations/ services since last calving & other remarks	
KEDAH KELANTAN - MARDI				
169	Kedah Kelantan	27/12/79	-	)
168	Kedah Kelantan	21/1/80	-	)
225	Kedah Kelantan	20/1/80	-	)
X5	Kedah Kelantan	Heifer	-	) Natural Service
17	Kedah Kelantan	15/12/79		) No heat or servi
228	Kedah Kelantan	22/12/79		) records kept.
216	Kedah Kelantan	3/7/79 (Dystocia)	-	)
155	Kedah Kelantan	22/11/78	-	)
20	Kedah Kelantan	27/12/79	-	)
2	Kedah Kelantan	17/12/79	-	)
IJOK				
138G	Brahman	Heifer	-	)
135Y	Brahman	Heifer	-	)
272	Brahman	Heifer	Natural service	)
73R	Brahman	Heifer	No heat or service	)
544R	Brahman	Heifer	records kept	) Animals
49G	Brahman	Heifer	-	) are ove
222G	Brahman	Heifer	-	) 3 years
534R	Brahman	Heifer	-	) old.
537R	Brahman	Heifer	-	)
46G	Brahman	Heifer	-	)
268Y	Brahman	Heifer	-	)
223G	Brahman	Heifer	-	)
166Y	Brahman	Heifer	-	)
32G	Brahman	Heifer	-	)
PANTAI				
JAJ2	JAJ	20/9/79	-	
ZAJ30	ZAJ	2/6/80	2AI	
280	FFA	Heifer	-	Born on 7/8/79
Q3	D/Master	2/6/80	1AI	
P134	1FAJ	25/8/80	-	
P117	JFA	15/4/80	1AI	
BAJ1	BAJ	11/1/80	1AI	
P187	JA	1/1/80	1AI	
P210	JAF	Heifer	1AI	
JAJ7	JAJ	15/10/79	1AI	
FA91	FX5	21/7/77	3AI	
IL1	IL	26/7/79	2AI	
JAJ30	JAJ	2/4/80	-	

Animal Identification	Breed	Date of last calving	No. of inseminations/ services since last calving & other remarks
PANTAI			
ZAF38	ZAF	28/2/79	1AI
GA12	GA	23/4/80	3AI
ZAF37	ZAF	27/1/80	2AI
BAF3	BAF	22/1/80	2AI

Keys to abbreviations

PANTAI FARM:
F = Friesian
A = Sindhi
J = Jersey
S = Sahiwal
B = Brahman
Z = Zebu (KK)
G = Guernsey
= LID
I = ALS