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INCIDENCE OF MASTITIS IN IMPORTED JERSEY COWS

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RINGKASAN

Kertas ini membincangkan tentang kejadian barah tetek (1979–1981), kuman-kuman yang menyebabkannya dan kesannya ke atas pengeluaran susu lembu baka Jersey. Dari lewat 1979 hingga Disember 1980, peratus yang mengidap barah tetek telah menurun dari 95% hingga 15.2% dan dari 55.7% hingga 10.9% tetek yang berbarah. Dari Januari 1981 hingga Julai 1981 terdapat naik turun di dalam kadar peratus penyakit barah tetek, iaitu dari 63% hingga 27.5% lembu yang berbarah tetek dan dari 34% hingga 19.4% tetek yang berbarah. *Staphylococcus aureus* adalah kuman yang terbanyak diasingkan. Hanya 2.2% *Streptococcus agalactiae* telah diasingkan. Peperiksaan lekas terasa dengan antibiotik telah dijalankan ke atas *S. aureus* dan *Pseudomonas aeruginosa*. Ke atas *S. aureus*, 12.5% tidak lekas terasa terhadap penicillin, 25% terhadap tetracycline, 13.3% terhadap ampicillin, 11.8% terhadap chloramphenicol dan 20% terhadap streptomycin. *P. aeruginosa* tidak lekas terasa dengan semua jenis antibiotik yang telah dicuba kecuali terasa sedikit terhadap kanamycin dan 100% lekas terasa terhadap polymyxin B. Lembu yang mempunyai barah tetek dengan keputusan RMT 2 atau lebih menghasilkan pada purata kurang 386 kg susu pada satu tempoh bersusu jika dibandingkan dengan lembu-lembu yang tidak berbarah tetek.

INTRODUCTION

Mastitis is the inflammation of the udder caused by infection, injury, secretory malfunction or physiological changes. This disease is usually associated with microbial infection. The term mastitis is derived from the Greek word *mastos* meaning breast, and the suffix *itis* meaning inflammation of.

The disease has been and continues to be the most costly dairy cattle disease. In the United States, the cost to the dairy industry due to mastitis was in excess of US$245 millon annually and the cost of mastitis treatment preparation was US$15 to US$20 million (SCHALM, CARROLL and JAIN, 1971).

KOH and JOSEPH (1974) showed that 60.1% of the cows (Sindhi, Local Indian Dairy (LID) and Sindhi/LID breeds) from Institut Haiwan Kluang and 29.4% of the quarters from these cows were infected. Out of a total of 226 cows examined, 2.6% were affected with clinical mastitis, and 57.55% with subclinical mastitis. WILSON (1968) claimed that 50% of the cows would have subclinical mastitis during a lactation.

The objective of this paper is to describe the incidence of mastitis, the causative organisms and the effect of the infection on milk production in a herd of imported Jersey cattle at MARDI, Serdang.

The term mastitis used in the context refers to clinical and subclinical mastitis infection.

MATERIALS AND METHODS

a) Animals

A total of 107 pregnant Jersey heifers were imported from New Zealand in 1978. The first batch of 89 heifers, four to five months pregnant arrived in April 1978, and the second batch arrived in August the same year. They were seven to eight months pregnant. These animals calved down between October and December 1978.

b) Milk Production.

At the end of May 1981, a total of 111 complete lactations have been recorded. The milk production during the first and second lactations were 1 672 ± 454 kg and 2 043 ±

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399 kg, respectively. The lactation length and the average daily milk production during lactations one and two were 292 ± 50 days, 5.7 kg and 300 ± 17 days, 6.8 kg, respectively.

c) Management of the Animals

The animals were grazed on *Brachiaria decumbens* and *Setaria spp.* pastures at night, and during the daytime, they were kept in the shed. While in the shed, cut fodder grasses and about 4 kg/cow/day of concentrate were offered. Water and mineral licks were made available at all times.

A portable milking machine was used. It was standardized at a vacuum level of 15 in. Hg at a pulsation rate of 60 per minute. A proper mastitis control programme was implemented which included the use of disinfectant, strip cup, individual paper towels for drying the udder after washing, teat dips and keeping of monthly Rapid Mastitis Test (RMT) records.

d) Rapid Mastitis Test (RMT)

The teats were cleaned from dirt using water and then disinfected with Habitane$^{(R)}$. The first few streams of foremilk were removed and the teats were then sterilized with swabs soaked in alcohol.

About 3 ml of foremilk were drawn from each of the four mammary quarters into the respective cups, and an estimated equal volume of RMT reagent was added. Mixing was accomplished by gentle circular motion of the paddle in a horizontal plane.

This mixing resulted in an anionic detergent which reacted with mastitic milk to produce a visible effect that can be scored numerically with reference to the content of somatic cells (SCHALM, *et al.*, 1971). Results were read after a few seconds and classified as follows:–

Reaction	Reading	Interpretation
No slime	0	Healthy
Slight slime	1	Suspicious
Thick slime	2	Infected
Heavy slime or clot	3	Heavily infected

e) Test for Bacteriological Composition

The teats were sterilized with swabs soaked in alcohol. Milk was withdrawn into a sterilized screw-capped bottle and stored in a flask containing an ice pack for transportation immediately. All aseptic techniques were adopted during sampling. In the laboratory, bacteria were isolated, identified and antibiotic sensitivity tests were performed (Kirby-Bauer technique).

f) Effect of Mastitis on Milk Production

Fourteen cows were selected, seven of the cows were with infected quarters with a RMT score of 2 and above. The average daily milk yield of two lactations was recorded. The ages of the cows were approximately similar with an average age of 26 months (ranging from 25 months to 27 months) for the first lactation and an average of 41 months (ranging from 38 months to 46 months) for the second lactation. The animals were maintained with 4 kg concentrate per day and released for grazing on pasture.

RESULTS AND DISCUSSION

a) Incidence of Mastitis

Figure 1 and *2* show the incidence of mastitis from late 1979 till July 1981. There were no records on RMT in certain months and these were labelled as broken lines *(Figure 2)*. The highest percentage of cows infected was 95%, involving 55.7% of infected quarters. This infection occurred during January 1980 *(Figure 2)* prior to the introduction of the mastitis control program. After the introduction of the control program, the infection rate was as low as 15.2% and 10.9% in the cows and quarters, respectively. There was again an increase in the infection rate from early 1981 onwards, despite the implementation of the mastitis control program *(Figure 2)*. SCHALM *et al.*, (1971) stated that new infections appear in the dry period and tend to show up more frequently in those cows with already existing infections in other quarters. Of these new infections, about 17% resulted in mastitis following parturition.

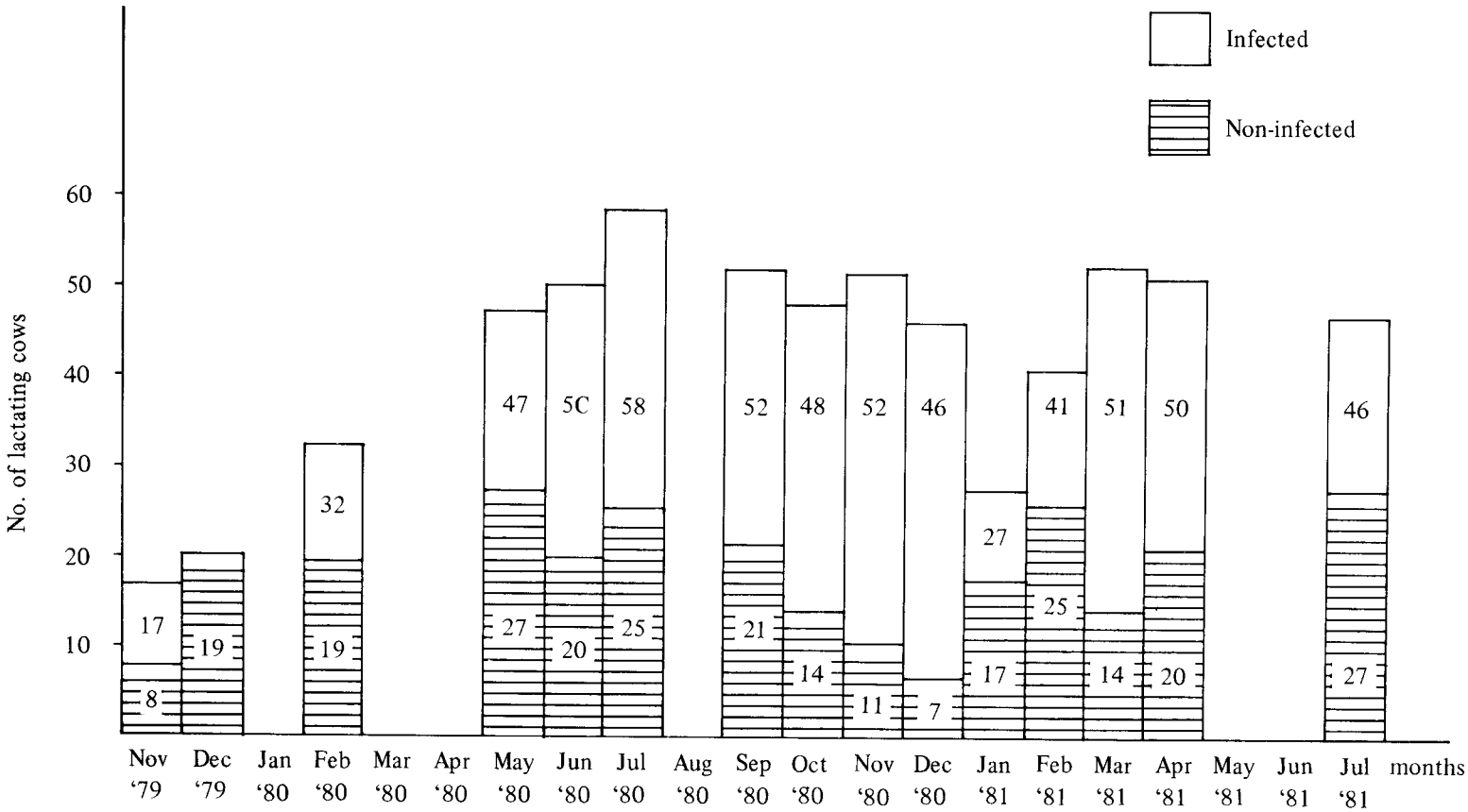

Figure 1. Incidence of udder infection (1979–1981).

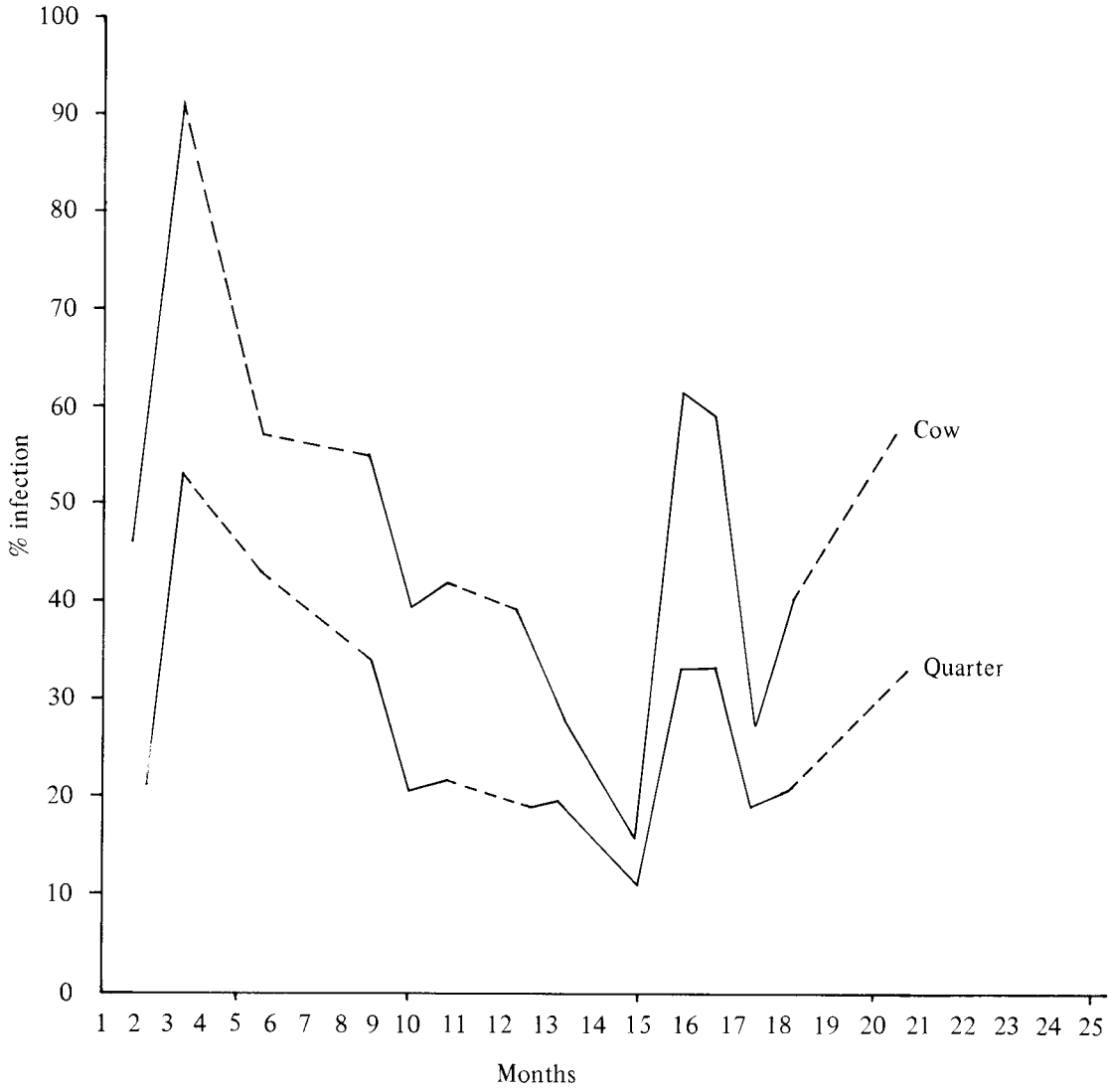

Figure 2. Percentage of infection of cow's udders and quarters.

b) Bacterial Flora

Table 1 and *Figure 3* show the bacterial flora isolated from the foremilk of 317 quarters. The most predominant bacteria isolated was *Staphylococcus* species (31.6%) which consisted of *S. aureus* (20.8%) and *S. epidermidis* (10.8%).

Even though between 90% to 95% of all mastitis were caused by *Staphylococcus aureus*, *Streptococcus dysgalactiae*, and *Streptococcus uberia* (PHILPOT, 1975). Only 2.2% of *Streptococcus agalactiae* was isolated. This might be due to the use of antibiotics for clinically infected and drying-off cows. Streptococci in general were susceptible in practically all cases to the existing antibiotics (PLOMMET and LOUDEC, 1975).

It has been reported (OEHME and COLES, 1967) that Staphylococci were one of the most significant organisms producing mastitis in the United States. It is also the bacterial species most often encountered in infections of mastitis in Sweden (LINDE, HOLMBERG and ASTROM, 1975).

Table 1. Bacteria isolated from quarter foremilk samples

Species	Farm Station MARDI Serdang		Koh & Joseph (1974)	Mohd. Shah & Nadzri Salim			
	No.	%	%	1976 %	1977 %	1978 %	1979 %
Staphylococcus aureus	66	20.8	26.2	43.9	57.0	52.7	12.7
Staphylococcus epidermidis	34	10.8	1.6	4.9	14.9		37.9
Staphylococci infection	100	31.6	27.8	48.8	71.9		
Streptococcus agalactiae	7	2.2	9.9				
Streptococci infection	7	2.2	13.6	3.7	4.3	30.5	0.9
Pseudomonas aeruginosa	4	1.3	3.7		2.7	2.7	1.4
Bacillus subtilis	9	2.8	14.6				
Corynebacterium pyogenes	2	0.6		3.7	1.6		
E. coli	6	1.9	3.7	3.7	4.3	13.9	13.7
Klebsiella pneumonia				1.2		5.5	
Leptospira icterohaemorrhagiae						2.8	
No. bacteria isolated	189	59.6	15.2				

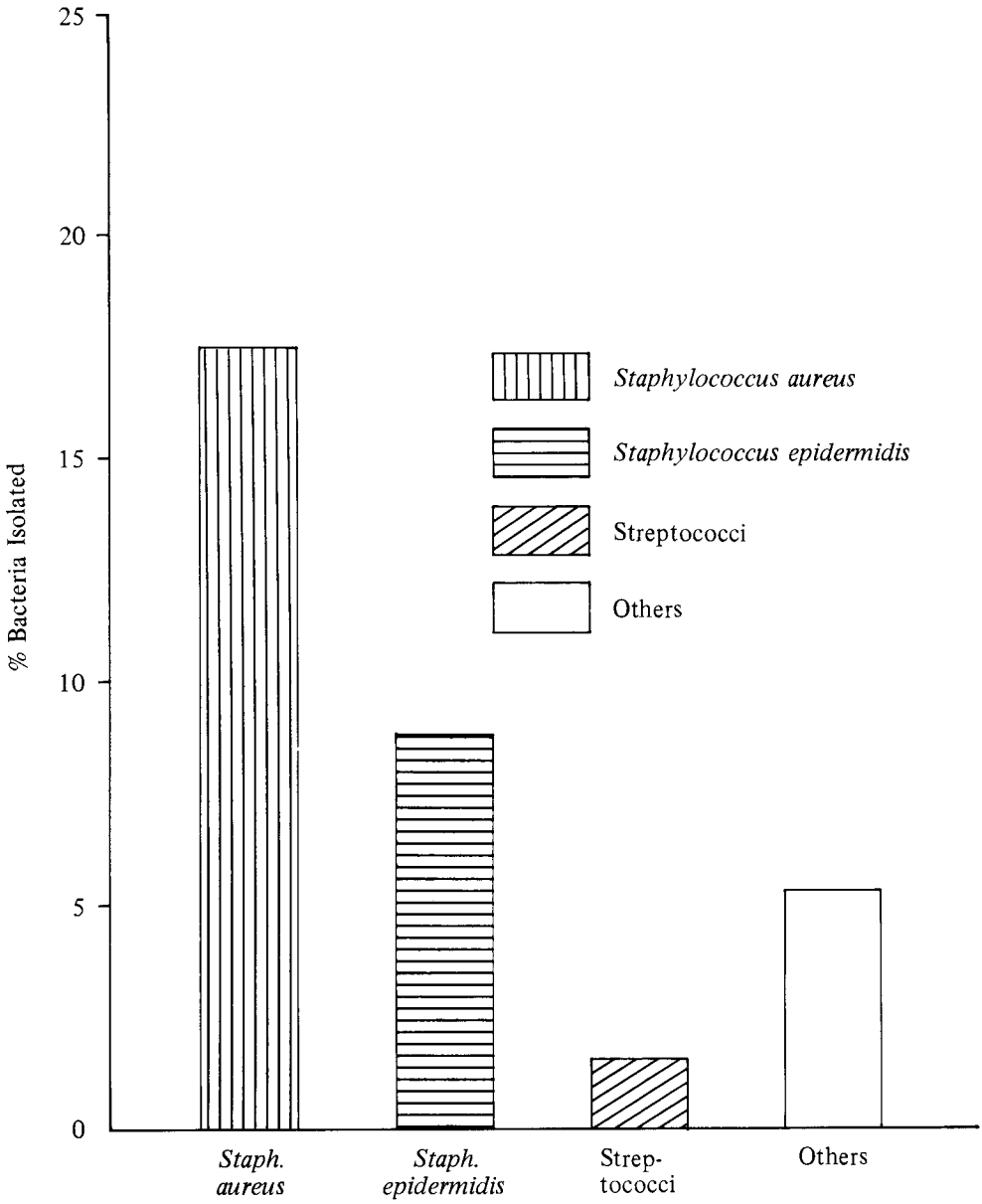

Figure 3. The proportion of bacteria isolated from the milk samples. The streptococci infections was due to ***S. agalactiae****; the other pathogens were* ***E. coli, Pseudomonas aeruginosa, Corynebacterium pyogenes*** *and* ***Bacillus subtilis.***

Staphylococcus aureus readily penetrate the duct walls of the udder and become established in numerous foci that are quickly walled off with fibrous tissue (PATTISON, 1958). As a result of fibrous tissue formation, it makes it difficult to get drugs to the organisms in concentrations that are bactericidal. Besides, *Staphylococcus aureus* may develop resistance to certain antibiotics.

In general, *S. aureus* is difficult to treat, but most workers agree that an efficacy of 50% against Staphylococci is acceptable (BLACKBURN, 1956). This may account for the higher isolation of this organism compared to other organisms *(Figure 3)*.

c) Antibiotic Sensitivity Tests

Antibiotic sensitivity tests were done

on *Staphylococcus aureus* and *Pseudomonas aeruginosa* isolates. The results are summarised in *Table 2*.

Staphylococcus aureus was found to develop resistance in 12.5% and 13.3% of the isolates against penicillin and ampicilin, respectively. This is due to the fact that many staphylococci produce penicillinases which inhibit the action of penicillin. Even though *in vitro* studies indicate that *S. aureus* was sensitive to penicillin (87.5%), tetracycline (75%), ampicillin (86.7%), chloramphenicol (88.2%), kanamycin (91.7%) and streptomycin (80%), these responses may be lower in *in vivo* due to the fact that *S. aureus* readily penetrates the duct walls of the udder resulting in fibrous tissue formation. This tissue barrier makes it difficult to get drugs to the organisms.

Pseudomonas aeruginosa was isolated in chronically infected quarters. Chronic udder infection are resistant to common antibiotics. *In vitro*, the organism was resistant to penicillin, tetracycline and chloramphenicol. Treatments with polymyxin B and streptomycin were effective, while with kanamycin

Table 2. Antibiotic sensitivity tests on *Staphylococcus aureus* and *Pseudomonas aeruginosa* isolates

Organism	Antibiotics	No. Tested	Sensitive		Resistant	
			No.	%	No.	%
S. aureus	Penicillin	16	14	87.5	2	12.5
	Tetracycline	20	15	75.0	5	25.0
	Ampicillin	15	13	86.7	2	13.3
	Chloramphenicol	17	15	88.2	2	11.8
	Carbenicillin	6	0	0	6	100
	Kanamycin	12	11	91.7	1	8.3
	Streptomycin	5	4	80.0	1	20
	Colistin	4	0	0	4	100
	Polymyxin B	6	0	0	6	100
	Triple sulpha	11	2	18.2	9	81.8
P. aeruginosa	Penicillin	3	0	0	3	100
	Tetracycline	3	0	0	3	100
	Chloramphenicol	3	0	0	3	100
	Streptomycin	1	1	100	0	0
	Kanamycin	3	2	66.7	1	33.3
	Polymyxin B	6	6	100	0	0

the organism was slightly sensitive (66.7%). The other drug effective against it was neomycin (KOH and JOSEPH, 1974; SCHALM *et al.*, 1971).

d) Effect of Mastitis on Milk Yield

Figure 4 shows that there was a marked difference in average daily milk yield between cows with and without infection. The peak milk yield for the uninfected cow was achieved during the second month of lactation with an average daily milk yield of 8.92 kg milk. Infected cows never reached peak production but showed progressive decline in daily milk yield.

Cows infected produced on an average 1.34 kg less milk per day or 386 kg less per lactation. With milk selling at $0.73 per kg, the loss as a result of mastitis was $282 per lactation. OEHME and COLES (1967) estimated costs to dairymen in the United States at $19.53 per cow per year.

With *S. aureus* (THIEL, and DODD, (1977), the relative yield of quarters during the period of infection was depressed by a mean of 15.3 ± 2.5 percent.

JANZEN (1970) reported that quarters with a California Mastitis Test (CMT) reaction of 3 produced 2.7 kg per day less milk than the opposite negative quarter. MARX, (1971) reported that in 16 cows infected quarters produced 20.3% less milk than uninfected quarters. An additional loss of 10.5% occurred if the infected quarter required therapy. In a more recent report by NATZKE, EVERETT, GUTHRIE, KEOWN, MEEK, MERRILL, ROBERTS and SCHMIDT, (1972), quarters infected with *S. aureus* produced approximately 760 kg less milk per lactation than uninfected quarters. Reduc-

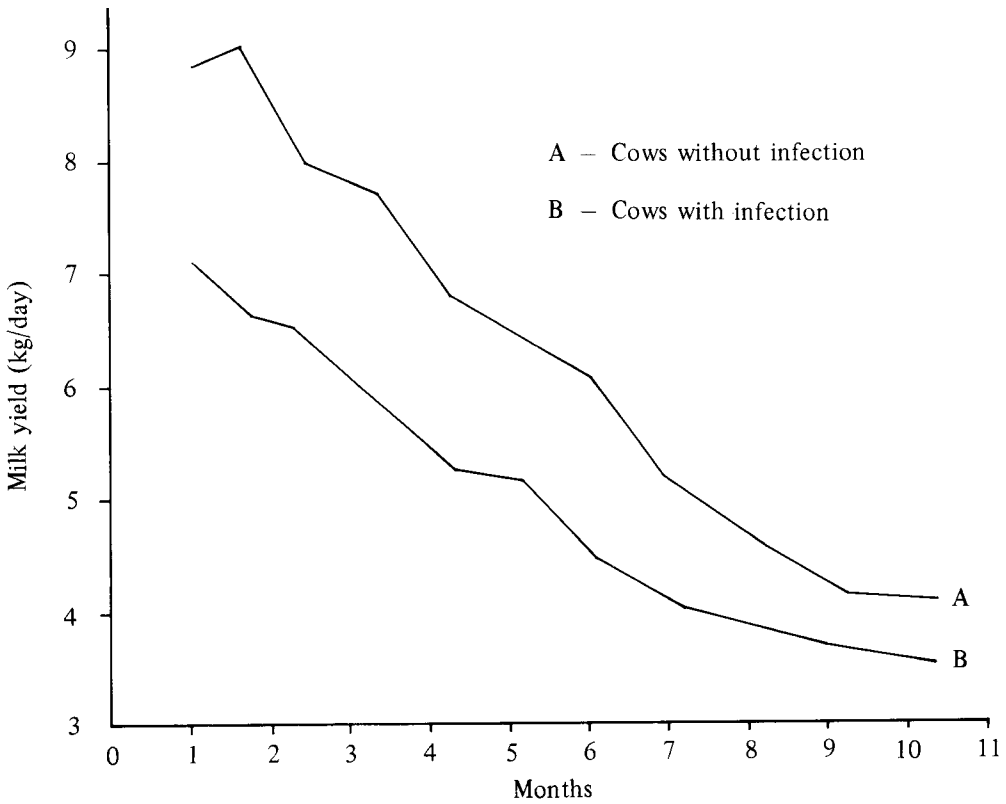

Figure 4. A comparison between infected and non-infected cows with respect to milk yield (kg/day).

tion in milk production was most severe when infections began during early lactation.

CONCLUSION

Despite a strict mastitis control programme, the level of infection was found to be fluctuating. *S. aureus* was the predominant organism isolated. Infected cows, with a Rapid Mastitis Test score of 2 and above, produced less milk per lactation than uninfected ones.

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SUMMARY

This paper reports the mastitis incidence, its causative organisms and the effect of the infection on milk production in a herd of imported Jersey cattle at MARDI, Serdang from 1979 to 1981. From late 1979 to December 1980 the levels of infection in cows dropped from 95% to 15.2% and from 55.7% to 10.9% in quarters. From January 1981 till July 1981, fluctuations in infection ranged from 63% to 27.5% in cows and from 34% to 19.4% in quarters. *Staphylococcus aureus* was the predominant organism isolated. *Streptococcus agalactiae* occurred in 2.2% of the samples. In antibiotic sensitivity tests were performed on *S. aureus*, 12.5%, 25%, 13.3%, 11.8% and 20% of the isolates were resistant to penicillin, ampicillin, chloramphenicol and streptomycin, respectively. *P. aeruginosa* was resistant to all but was slightly resistant to Kanamycin and 100% sensitive to polymyxin B. Infected cows with a Rapid Mastitis Test (RMT) score of 2 above produced on an average 386 kg less milk per lactation than uninfected cows.

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