BOVINE INFECTIOUS KERATOCONJUNCTIVITIS IN DIFFERENT CATTLE BREEDS

B.M. BURNS*, C.J. HOWITT+ and C.R. ESDALE**

SUMMARY

The incidence and persistence of bovine infectious keratoconjunctivitis, or "pink-eye" , was investigated over three drafts in Hereford, Simmental and Africander-Hereford heifers. Incidence of infection was greatest in Herefords (43.1%), intermediate in Simmentals (21.4%) and least in Africander-Herefords (7.2%). Persistence of infection was related to breed, with Herefords retaining more signs of infection than Simmentals or Africander-Herefords. Infected animals had lower average daily weight gains (479 g/d) than uninfected animals (516 g/d). No relationship was found between eyelid pigmentation, the incidence or persistence of infection and average daily weight gain. The higher average daily weight gains and lower incidence and persistence of bovine infectious keratoconjunctivitis in Africander-Herefords suggest that tropically adapted breeds are more viable commercially in sub-tropical and tropical environments.

Key words: Bovine infectious keratoconjunctivitis, cattle breeds, weight change.

INTRODUCTION

Bovine infectious keratoconjunctivitis (BIK), commonly known as "pink-eye", is probably the only serious infectious disease of cattle common in all cattle producing areas of Australia. It is a disease affecting the eyes of cattle and is characterised by an acute to chronic inflammation of the cornea and surrounding tissue. Gallagher (1954) found 'that the intense discomfort, pain'and temporary or permanent blindness associated with BIK reduced grazing time to a point where growing, breeding and fattening were affected. BIK is an economically important disease because of these production losses (Thrift and Overfield 1974).

The disease is seasonal in occurrence, with a high incidence in young stock during summer (Spradbrow 1967). Possible factors associated with hot conditions which predispose animals to infection are dust, sunlight and flies (Wilcox 1968). Degree of eyelid pigmentation has also been related to the incidence of BIK, eyelids with complete pigmentation being less affected (Frisch 1975).

This paper reports on the incidence and persistence of BIK, its effect on liveweight gain, and the relationship between eyelid pigmentation and BIK.

MATERIALS AND METHODS

Location and experimental animals

The experimental animals were three-quarter and higher Hereford (H) with the residual being Shorthorn, three-quarter and higher Simmental (S) with the residual being Hereford, and F2 et seq. Africander-Hereford (AH) cattle reared at Brigalow Research Station, Theodore. The incidence and persistence of BIK in weaner heifers from three calf crops was observed from 1984 to 1986. Location, pastures and herd management have been described by' Rudder et al. (1986).

* "Swan's Lagoon" Beef Cattle Research Station, Millaroo, 4807
+ Qld. Dept. Primary Industries, G.P.O. Box 46, Brisbane, 4001
** Qld. Dept. Primary Industr ies, G.P.O. Box 485, Biloela, 4715

Experimental procedure

Heifers were examined for BIK at monthly intervals, with each eye being allocated a score of 1 to 6 using the following scale: 1 = no blight, 2 = acute blight, 3 = yellow cornea, 4 = pointed cornea, 5 = eyeball rupture, 6 = chronic white cornea. Live weights of heifers were also recorded monthly. A subset of these animals, selected at random across breeds from 1984 and 1985 to be replacement breeders, was also weighed at 30 months of age. Pigmentation of each eye, based on the percentage of the eyelid pigmented, was recorded at birth.

The period from October to April, when heifers were 12-18 months of age and corresponding to the period of peak predisposing factors to infection (Wilcox 1968), was chosen to investigate both the incidence and persistence of BIK. No cattle were examined in November. A binary variable was redefined from the six original eye scores where 1= infected (eye score of 2-6) in at least one eye and 0 = not infected (eye score of 1) in both eyes. One incidence and three persistence variables were defined as infected at least once, twice, three times and four times of the six chosen observations. For pigmentation an average percentage pigmentation was obtained for each animal and classed as follows: 0–12.5%, 12.5–87.5% and 87.5–100% pigmentation. The low levels of incidence and persistence and high levels of full eyelid pigmentation in the AH precluded analysis of this breed. Average daily weight gain was calculated from October to April. These variables were analysed using standard analyses of variance for unequal subclass numbers. Factors investigated were breed, year and breed x year interaction. For average daily weight gain, disease incidence or persistence was included as a main effect. For relationships between pigmentation and BIK, pigmentation was included as a main effect. All other interactions were found to be nonsignificant (P>0.05).

RESULTS AND DISCUSSION

The average percentage incidence and persistence of BIK for H and S are shown in Table 1. The corresponding figures for AH are 7.2%, 4.4%, 1.2% and 0.0%. Whilst incidence and persistence of BIK were high in H and S, there was little or none in AH. The low levels in AH correspond with 90% of these animals having 100% eyelid pigmentation. Similarly, in other studies the incidence and persistence of BIK was reported to be higher in Bos taurus breeds compared to Bos indicus breeds and their crosses (Jackson 1953; Frisch 1975; Dodt 1977).

Table 1 Least square means of percentage incidence and persistence of BIK over six observations for breed and year

			Min. no. times infected			
		Number	1	2	3	4
Breed	H	200	43.1a	29.8a	18.4a	13.2a
	S	177	21.4b	13.4b	8.8b	3.9b
Year	1984	111	32.7a	16.7a	11.6a	5.4a
	1985	148	32.4a	24.3a	13.5a	8.1a
	1986	118	31.7a	23.8a	15.6a	12.2a
SD			46.10	41.11	34.49	28.00

Within each factor means in columns followed by different letters differ significantly (P<0.01).

There was a significant difference (P<0.01) between H and S breeds for incidence and persistence of BIK (Table 1). Levels of incidence and levels of persistence for animals infected at least twice and three times were twice as high in H as in S, and three times as high for animals infected at least four times. Similarly, the percentage of animals infected only once, twice or three times in the six observations was higher in the H (13.3, 11.4 and 5.2%) than the S (8.0, 4.6 and 4.9%) and the AH (2.8, 3.2 and 1.2%), respectively. There was no significant difference (P>0.05) in incidence or persistence between years; however for animals infected at least four times there was a significant (P<0.05) breed by year interaction. While percentage persistence remained relatively low and stable for S it rose from 5.1 to 12.2 to 22.4% across the three years for H. The rate of infection has been reported to be higher in the Hereford breed than in other Bos taurus breeds (Jackson 1953).

There was no significant difference (P>0.05) between H and S breeds for average daily weight gain after adjusting for years and incidence or persistence of infection. However, AH had a significantly greater (P<0.01) average daily weight gain (605 + 104.1 g/d, mean + SD, n=249) than both H and S (498 and 510 g/d, respectively). There was a general trend in both H and S for average daily weight gain to decrease as persistence of infection increased. The difference in average daily weight gains between years contributed to a significant (P<0.01) breed by year interaction for all levels of incidence and persistence. This interaction was due to the low performance of S, relative to the performance of H, during periods of nutritional stress as experienced in 1985. Large European breeds have the capacity for hiqh growth potential in temperate environments (Mason 1971). The degree to which these breeds can express this high growth potential In sub-tropical and tropical environments will depend on the severity of environmental constraints.

Table 2 Least square means of ave age da ly weight gain (g/d) for incidence and pers istence of BIK over six observations

		Min. no. times infected			
		1	2	3	4
Uninfected	Number	252	292	324	343
	Mean	516a	516a	512a	509a
Infected	Number	125	,85	53	34
	Mean	479b	461b	452b	444b
SD		111.8	110.8	111.1	111.5

Means in columns followed by different letters dlffer significantly (P<0.01).

Those animals that were Infected had a significantly lower (P<0.01) average daily weight galn than those that were uninfected for all levels of disease incidence and persistence (Table 2). Generally the infected animals had a 10% reduction In average dally weight gain compared with the uninfected animals, which is In agreement with the observations of Thrift and Overfield (1974) and Frlsch (1975). The subset of animals weighed at 30 months of age showed that those, heifers originally classed as Infected at least once had significantly lower (P<0.05) l lve weights (417 ± 38.1 kg, n=39) than those that were uninfected (432 kg, n=88). The reduction In livewelght performance and lower subsequent l lve weights of previously Infected animals In our study agrees with Thrift and.

Overfield (1974) who found that Hereford bulls with no BIK during the preweaning period had significantly greater ($P<0.05$) post weaning average daily weight gains and live weights than those bulls that were infected.

There were no differences in the incidence or persistence of BIK with level of eyelid pigmentation, these results agreeing with those of Jackson (1953). By contrast, Frisch (1975) found that the proportion of animals with BIK decreased as the level of eyelid pigmentation increased. In our experiment, the level of eyelid pigmentation had no effect on average daily weight gain in either infected or uninfected animals. Frisch (1975) reported that uninfected animals had heavier live weights than infected animals at 8 and 15 months of age for all levels of eyelid pigmentation. Frisch (1975) also reported that infected animals with fully pigmented eyelids were heavier than Infected animals with unpigmented eyelids; The differences between these two results may be caused by subtle differences in resistance to BIK between Hereford cattle used in our experiment and F3 et seq. Hereford-Shorthorn crossbreed cattle used by Frisch (1975). Jackson (1953) cited differences with Bos taurus breeds and our experiment demonstrated differences between Hereford and Simmental in the incidence and persistence of BIK. .

Commercial relevance

Although there were significant differences in average daily weight gain between infected and uninfected animals, the commercial relevance depends on the incidence of infection.. Average daily weight gains (g/d) from October to April for infected and uninfected animals by breed were H, 475, 516; S, 486, 516; AH, 605, 605 respectively. Elimination of BIK would increase average daily weight gain by 4, 1 and 0% in H, S and AH, respectively. It follows that to be commercially viable any remedial procedure to reduce or eliminate BIK must be associated with low cost inputs. One such procedure is to breed animals that already have an inherently high resistance to BIK.

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REFERENCES

DODT, R.M. (1977). Aust. Vet. J. 53: 128.
FRISCH, J.E. (1975). Anim. Prod. 21: 265.
GALLAGHER, C.H. (1954). Aust. Vet. J. 30: 61.
JACKSON, F.C. (1953). Am. J. Vet. Res. 14: 19.
MASON, I.L. (1971). Anim. Breed. Abstr. 39: 1.
RUDDER, T.H., SEIFERT, G.W. and BURROW, H.M. (1986). Proc. Aust. Soc. Anim. Prod. 16: 347.
SPRADBROW, P.B. (1967). Aust. Vet. J. 43: 55.
THRIFT, F.A. and OVERFIELD, J.R. (1974). J. Anim. Sci. 38: 1179.
WILCOX, G.E. (1968). Vet Bull. 38: 349.