

Pink Eye (Infectious Keratoconjunctivitis) in Grazing Cattle

By MOTOI OKA

Tohoku Branch Laboratory, National Institute of Animal Health

Infectious bovine keratoconjunctivitis (IBK), usually named pink eye, is an acute or chronic infectious disease caused by *Moraxella bovis* and its clinical symptoms are characterized by the appearance of lachrymation, swelling of eye lid and cloudiness and ulcer of cornea¹⁻⁴⁾.

The first outbreak of IBK in Japan occurred in 1945 when many cattle were imported and since then IBK outbreaked only several times in the following twenty years. This epidemiological findings suggested that IBK failed to persist and resulted in temporary local outbreaks in some areas where imported cattle were introduced. But concurrently with the frequent importations of many cattle for the purpose of breeding beef cattle since 1960, the outbreaks of IBK occurred annually at the breeding farms in some districts that introduced imported cattle. And the infection of IBK spreaded gradually to the cattle reared at the neighbouring public pastures and farms, resulting in the persistence of this disease at many districts.

In 1972 IBK outbreaked in 16 prefectures and number of infected cattle clinically confirmed reached 2,800, suggesting a nationwide infiltration of this disease via transportations of asymptomatic cattle from infected districts to clean ones, and at present the same situation exists.

The infecting source of this nationwide infiltration of IBK would presumably be ascribed to the outbreak in Hokkaido, Iwate⁵⁾ and Aomori⁵⁾ where several hundreds of imported beef cattle were introduced several

times respectively. On the other hand in Okinawa where imported cattle were introduced many times IBK outbreaked since 1945, suggesting the persistent infiltration of this disease at this districts. And also IBK outbreaked frequently in another prefectures where imported cattle were introduced; sometime at the animal quarantine stations, and recently endemically in Kumamoto and Oita prefectures. In view of such situation that IBK outbreaked at a nationwide scale in recent three years, the establishment of preventive method to control this disease is urgently needed.

Oka et al. reported the occurrence of IBK in 1970 at a breeding farm of imported cattle (Hereford Breed) in Aomori with results of some examinations. Subsequently IBK has spread to many cattle reared at the neighbouring pastures and farms.

Therefore, the study on the persistence of this disease at the infected breeding farm and its infiltration into the neighbouring districts was carried out. Results of the study, together with results of bacteriological examinations and medical treatment are given in the present paper with some discussions on the hygienic method of control IBK.

History of outbreak of IBK

The course of outbreak of IBK at the breeding farm (hereford breed) for a period of 4 months from June to September 1973 was shown in Table 1. This survey was carried out mainly with calves, because the

Table 1. Outbreaks of IBK at a Hereford breed farm in 1973

Month	Number of cattle examined			Number of cattle showing clinical symptoms*				Total
	Adult	Calves	Total	Lachrymation and Congestion		Keratitis		
				Adult	Calves	Adult	Calves	
June	175	161	336	52 (29.7)*	26 (16.1)	40 (22.8)	2 (1.2)	120 (35.7)
July	123	77	200	62 (50.4)	20 (25.9)	29 (23.5)	4 (5.1)	115 (57.5)
Aug.	—	157	157	—	20 (12.7)	—	3 (1.9)	23 (14.6)
Sept.	—	49	49	—	12 (24.4)	—	3 (6.1)	15 (30.6)
Total	298	444	742	114 (38.2)	78 (17.5)	69 (22.4)	12 (2.7)	273 (36.7)

* Numbers of cattle showing the indicated symptoms (percentage of diseased cattle)

herds examined were on pasture, so that the survey was focused to the groups easy to be examined each times.

Such clinical findings as congestion of eye, lachrymation and keratitis were observed with 273 (36.7%) out of a total of 742 cattle examined. Ninety (20.2%) out of the total of 444 calves and 183 (60.6%) out of

the total 298 cows proved to be infected. But this difference in the morbidity observed between calves and cows must be carefully interpreted, because rather detailed examination was carried out to detect IBK at the early stage and once detected, immediate medications were tried in case of calves, whereas with cows some chronic cases carrying

Table 2. Outbreaks of IBK at other farms

Farm examined	Number of herd examined	Date of examination	Number examined			Clinical symptoms				Total
			Adult	Calves	Total	Keratitis		Lachrymation		
						Adult	Calves	Adult	Calves	
I	1	6.1	36	45	81			4	6	10(12.3)*
II	2	1		330	330		35		32	67(20.3)
III	3	4	74		74	2		9		11(14.8)
	4	5		126	126				26	26(20.6)
	5	6	49	26	75			3		3(4.0)
IV	6	5	10	46	56		11			11(19.6)
V	7	7	176	147	323	2		9	4	15(4.6)
VI	8	11	63	35	98	1		12	11	24(24.5)
	9	12	70	38	108	1		2		3(2.7)
VII	10	21	32	60	92	5		15	2	22(23.9)
VIII	11	7.9	6	35	41	3	10	2		15(36.5)
IX	12	20	296	248	544	1		186	148	335(61.5)
	13	28	57	73	130	1	1	54	14	70(53.8)
	14	8.17	51	47	98	1	2	50	45	98(100)
X	15	23	38	11	49	7	2	14	6	29(59.1)
XI	16	24	368	219	587	9	2	270	200	481(81.9)
XII	17	31	40	40	80	1		10	14	25(31.2)
XIII	18	31	71	48	119	5		6	9	20(16.8)
XIV	19	9.28	12		12	6		3		9(75.0)
Total			1,449	1,579	3,023	45	63	659	515	1,274(42.1)

* Figures in parenthesis indicates the morbidity of IBK in each group examined.

keratitis did not respond to medications, resulting in the increase of total diseased cases in the adult group. A relatively higher morbidity was shown in June. Of course some cases of clinical symptoms observed might possibly have been evoked by the stimulus of insects or other causes, but no differentiations from IBK were made in this study.

The outbreaks of IBK in cattle reared at the neighbouring districts and the distribution of infected herds were shown in Table 2.

The herds examined were grazing on pastures except 2 herds (farm II in Table 2), and 1274 (42.1%) out of 3023 cattle examined showed characteristic clinical symptoms of IBK during 4 months from June to September in 1973.

Farms I, II, V and X were located within the same village where the infected Hereford herd had been fed and farm XI was at the neighbourhood. The other farms were located within the same county. In the Farm XI small male calves collected from dairy farms were reared for about six months and then sold to another farms for beef production. Cattle were not necessarily grazed at the same pasture every year but same cattle moved to other pastures.

The outbreaks of IBK were liable to occur in summer season such as July and August. The spread of clinical symptom such as keratitis among herds and the isolations of *M. bovis* from nasal and ocular swabs made sure that observed abnormalities of eye were due to the infection with IBK in most cases.

Although the possibility of the spread via contaminated insects is considered, the main infecting route in such endemic outbreak must be the transportation of asymptomatic carriers originating from infected herds, resulting in the stepwise spreads into the neighbouring herds.

Bacteriological findings

Isolation of *M. bovis* was attempted from 194 clinical cases taken from 15 herds reared

in 13 farms except the Hereford farm, employing ocular and nasal swabs during the period from 1971 until 1974. As shown in Table 3, *M. bovis* could be isolated from 33 test materials showing 17.0% of isolation rate. It was noteworthy that *M. bovis* was isolated from I, IV and XII group where IBK outbreaked for 3 successive years. And also positive cultural results were obtained from each nasal swabs of 1 case of group III and 2 cases of group XII respectively.

When cultural findings were analysed in relation to the severity of clinical symptoms, positive results were obtained from 6 (27.2%) out of 22 severe cases, 10 (24.3%) out of 41 moderate cases and 15 (18.0%) out of 88 mild cases respectively. As a whole the isolation rate was low contrary to expectation. Pure cultures of *M. bovis* were obtained, although at a low rate, from some mild cases, but in most cases many kinds of bacteria such as diplococcus, staphylococcus, corynebacterium and gram negative bacteria appeared which made the detection of *M. bovis* difficult. The low isolation rate of *M. bovis* would be explained from these reasons.

Medical treatment

Various medications were tried according to the severity of clinical findings. For mild cases (acute form) the washing with 3% boric acid solution and application of tetracycline, tyrosin and oxytetracycline ointment were effective and clinical symptoms such as lachrymation, the swelling of eyelid and photophobia disappeared within a short period of treatment. For moderate cases (subacute form) showing corneal vascularization, the above mentioned medications added with parental administration of penicillin (8000 units/kg body weight) and oxytetracycline (3 mg/kg body weight) were effective, but a longer period of the treatment was required for healing compared to acute forms. In case of superficial corneal ulcer the healing commenced slowly forming

Table 3. Results of bacteriological examinations and clinical symptoms of clinical cases

Number of herd examined	Date of examination	Number of cattle examined	Clinical symptoms			Positive cultures of <i>M. bovis</i>	
			Serious case	Moderate case	Mild case	Ocular swab	Nasal swab
I	1971. 9. 18	19	5* ¹	7(1)	7	1	
II	23	4	2(1)* ²	1	1	1	
III	10. 11	16			1(1)	1	1* ⁴
IV	1972. 4. 17	19		1(1)	18(1)	2	
V	5. 30	7	3	1	3		
VI	7. 29	23	1	3(1)	19(2)	3	
VII	30	6		3	3(2)	2	
VIII	8. 3	6	1	1	4		
IX	7	3	1	2(2)		2	
X	1973. 6. 5	19	2(1)	4	4	1	
XI	21	15	1	3(1)	6(2)	4(1)* ³	
XII	25	38	5(4)	12(4)	2(1)	10(1)	2
XIII	7. 20	3	1		2		
XIV	25	10			10(5)	5	
XV	1974. 10. 1	6		3	3(1)	1	
Total		194	22(6)	41(10)	83(15)	33	3

*¹ Number of cattle showing indicated clinical symptoms.

*² Figure in parenthesis indicates number of cattle whose cultural finding was positive for *M. bovis*.

*³ Figure in parenthesis indicates number of asymptomatic cattle whose cultural finding was positive for *M. bovis*.

*⁴ Positive cultural results was also obtained from ocular swabs when nasal swabs proved the presence of *M. bovis*.

localized white scar within 3-7 days after local application of antibiotics, and the resulted white scar persisted necessitating a longer period of treatment for recovery. For such cases the application of IDu(5-iodo-2-deoxyuridine) ointment was effective. For further advanced cases involving marked cloudiness and rupture of cornea, the application of cortisone and the washing with acriflavine or iode drug solutions was effective only to a limited extent, and the outwardly projected cornea and circumscribed white scar had to wait for natural recoveries. For the treatment of IBK hygienic measures, namely prevention of physical and mechanical stimulus such as sunlight and insects must be taken in conjunction with medical treatment and diseased cattle must be isolated to a separated shed.

Based on the aboved mentioned studies, some critical points in controlling this dis-

ease will be suggested as follows:

As IBK is an infectious disease affecting eye, causing conjunctivitis and superficial keratitis at an early stage, it is essential to detect and to treat infected cattle as early as possible. At this stage medical treatments are usually effective and the isolation of *M. bovis* can be made with an ease. Once introduced and spread into herds many clinical forms would be observed.

To prevent the infiltration of IBK into clean herds the danger of transmission via asymptomatic carriers must be stressed. The information concerning the nature and clinical symptoms of IBK must be given to the breeders. The detailed examinations including bacteriological examinations and preventive medications, if necessary, of introduced cattle from districts where IBK outbreaked would be made with profits.

References

- 1) Bryan, H. S. et al.: Some bacteriologic and ophthalmologic observations of bovine infectious keratoconjunctivitis in an Illinois beef herd. *J. Amer. Vet. Med. Assn.*, **163**, 739-741 (1973).
- 2) Hughes, D. E. & Pugh, G. W. Jr.: A five year study of infectious bovine keratoconjunctivitis in a beef herd. *J. Amer. Vet. Med. Assn.*, **157**, 443-451 (1970).
- 3) Jones, F. S. & Little, R. B.: An infectious ophthalmia of cattle. *J. Exp. Med.*, **38**, 139-148 (1923).
- 4) Jones, F. S. & Little, R. B.: The transmission and treatment of infectious ophthalmia of cattle. *J. Exp. Med.*, **39**, 803-810 (1924).
- 5) Oka, M. & Matsuda, K.: On infectious bovine keratoconjunctivitis in Aomori Prefecture. *Jap. J. Vet. Sci.*, **33**, suppl. 15, (1971). [In Japanese. Summary of oral presentation].
- 6) Yamaguchi, J. et al.: On infectious bovine keratoconjunctivitis in Iwate Prefecture. *Jap. J. Vet. Sci.*, **31**, suppl. 27-28 (1969). [In Japanese. Summary of oral presentation].