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A Further Study on the Incidence of Ruminal Lesions and Liver Abscess in the Beef Cattle in Miyagi Prefecture

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Summary

The rumens and livers of 200 beef cattle killed at Sendai Meat Plant in Miyagi Prefecture were examined grossly in November and December of 1974. The incidence of various ruminal lesions and liver abscess was recorded following the criteria employed in our previous study at the same slaughter house in 1970 and 1971. The high incidence of rumen parakeratosis and acute rumenitis was observed, though the severity of these lesions was much reduced in comparison with those observed previously. The incidence of chronic rumenitis and liver abscess had slightly increased. The incidence of the latter lesion was significantly higher in Holstein cattle than in Japanese Native cattle.

The statistical correlation between rumen parakeratosis and other lesions were not significant in this study, except the negative one observed between rumen parakeratosis and chronic rumenitis. Considerable amounts of rice straw were found in the majority of the rumen contents examined. Rice straw, given as a substitute for roughage, may be responsible for the reduction of the severity of rumen parakeratosis and of the acute rumenitis observed in this study.

We reported the high incidence of rumen parakeratosis and liver abscess in the beef cattle killed at Sendai Meat Plant in Miyagi Prefecture during from May, 1970 to July, 1971. Severe rumen parakeratosis was statistically correlated with acute rumenitis and liver abscess, forming the "Complex" of these three lesions (1). During the past several years, the feeding practise of fattening beef cattle has been substantially changed, mainly due to the sharp increase of feed prices in 1973 to 1974.

We report here the results of our recent survey on the incidence of rumen parakeratosis and associated lesions in rumens and livers of fattened beef cattle killed at the same slaughter house as in our previous study.

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Materials and Methods

The rumens and livers of 200 beef cattle were grossly examined following the criteria employed in our previous study (1). The animals were killed at Sendai Meat Plant in Miyagi Prefecture in November and December of 1974. The severity of acute rumenitis was expressed by the following scoring; 2 (strong or severe), 1 (weak or mild), and 0 (negative or normal). The incidence of traumatic reticulitis was also observed grossly. The amount of rice straw in the rumen contents was grossly expressed by the scoring of 0 (no rice straw) to 4 (abundant rice straw). The overall incidence of liver abscess was surveyed from the records of the Division of Sendai Meat Hygiene Inspection.

Results

1. Incidence of Rumen Parakeratosis and Acute Rumenitis.

The overall incidence of rumen parakeratosis was as high as 47.5%. It was, however, 33.5% in the two loci of the rumen chosen for observation; the anterior dorsal blind sac (*Atrium ruminis*) and the uppermost region of dorsal sac. The difference between the overall and local incidences of the lesion was due to the fact that the clumping of papillae at the dorsal blind sac and the patchy adhesion of rumen contents to mucosa at the uppermost part of dorsal sac did not always coincide in the same organ. Mean parakeratosis score was 0.86, the majority of the rumens examined being of weak parakeratosis (Table 1). The incidence of acute rumenitis was high (64.0%), while the mean score was 0.75. The area of rumen mucosa affected by severe acute rumenitis was limited, and the inflammation and necrosis of rumen papillae was not frequent (16.0%). This indicated that the extent of acute rumenitis was moderate in most cases (Table 1).

TABLE 1. *The Incidence of Rumen Parakeratosis and Acute Rumenitis*

Farm No.	Nos. of Animals	Rumen parakeratosis			Acute rumenitis		
		Clumping (a)	Adhesion (b)	a+b	Diffuse (c)	Papillary (d)	c+d
1	70	21	27	35	32	9	37
2	61	21	16	28	44	9	49
3	19	7	8	9	8	6	11
4	15	7	6	9	8	3	8
5	8	1	2	2	5	0	5
6	6	1	0	1	5	0	5
7-15 ¹⁾	21	9	8	11	11	5	13
total	200	67	67	95	113	32	128
%		33.5	33.5	47.5	56.5	16.0	64.0

1) Farms of less than five cattle

a: Clumping of rumen papillae at dorsal blind sac

b: Patchy adhesion of rumen contents to mucosa at uppermost part of dorsal sac

c: Diffuse inflammation of rumen mucosa

d: Inflammation of individual papilla in clumps

2. *Incidence of Chronic Rumenitis, Liver Abscess, and Traumatic Reticulitis.*

Chronic rumenitis observed in this study consisted of scar, ulcer, erosion and nodules of mucosa. The overall incidence was 23.0%, while that of scar and ulcer was 16.5% (Table 2). The incidence of liver abscess was 9.2% in Holstein cattle and 1.30% in Japanese Native cattle. The overall incidence was 6.0% (Table 2). The incidence of traumatic reticulitis was as high as 10.0% (Table 2).

TABLE 2. *The Incidence of Chronic Rumenitis, Liver Abscess, and Traumatic Reticulitis*

Farm No.	Nos. of Animals	Chronic rumenitis		Liver abscess	Traumatic reticulitis
		Scar & Ulcer	Overall ¹⁾		
1	70	11	14	4	8
2	61	11	17	6	6
3	19	1	3	1	1
4	15	6	6	0	1
5	8	2	2	1	0
6	6	1	1	0	4
7-15	21	1	3	0	0
total	200	33	46	12	20
%		16.5	23.0	6.0	10.0

1) Scar, ulcer and nodular formation of mucosa

3. *Correlation between Rumen Parakeratosis and Other Lesions.*

The parakeratosis scores were slightly higher in the rumens affected by severe acute rumenitis. The correlation between the two lesions was, however, not significant (Table 3). The negative correlation between the incidence of rumen parakeratosis and chronic rumenitis was significant. Namely, rumen parakeratosis was less frequent and less severe in the rumens affected by chronic rumenitis (Table 3). The correlation between rumen parakeratosis and liver abscess was not statistically significant (Table 3).

4. *Correlations Between Rumen Parakeratosis and Various Records of Cattle, and the Nature of Rumen Contents.*

The correlation between rumen parakeratosis and body weight of cattle was statistically significant. Namely the incidence and score of the lesion increased in animals of heavier body weight (Table 4). The correlations between rumen parakeratosis and breed (Holstein and Japanese Native), and sex were not significant.

The majority of the rumens examined contained a substantial amount of rice straw. The incidence and score of rumen parakeratosis showed a good correlation with the score of rice straw contents (Table 4). Namely the parakeratosis score was as low as 0.60 in the rumens containing a large amount of straw (score 4), while it was 2.86 in the rumens which contained no straw (score 0).

TABLE 3. Correlations between Rumen Parakeratosis and other Ruminal Lesions, and Liver Abscess

Ruminal lesion		Rumen parakeratosis							
		Parakeratosis score					Total	Mean	Incidence (%)
		0	1	2	3	4			
Acute rumenitis score	0	40	15	11	4	2	72	0.79±0.27	44.4
	1	56	27	12	9	3	107	0.84±0.23	47.7
	2	9	5	2	5	0	21	1.14±0.57	57.1
	total	105	47	25	18	5	200	0.86±0.17	47.5
	%	61.9	68.1	56.0	77.8	60.0	64.0		
Chronic rumenitis	-	77	33	23	16	5	154	0.95±0.20	50.0
	+	28	14	2	2	0	46	0.52±0.24	39.1
	%	26.7	29.8	8.0	11.1	0	23.0		
Liver abscess	-	99	45	23	16	5	188	0.85±0.17	47.3
	+	6	2	2	2	0	12	1.00±0.74	50.0
	%	5.7	4.3	8.0	11.1	0	6.0		

The result of χ^2 -test:

	χ^2	p	n
Acute rumenitis	8.60	>0.10	8
Chronic rumenitis	8.12	<0.10	4
Liver abscess	1.60	>0.10	4

TABLE 4. Correlations between Rumen Parakeratosis and Body Weight of Animals, and the Amount of Rice Straw in Rumen Contents

		Rumen parakeratosis							
		Parakeratosis score							Incidence (%)
		0	1	2	3	4	Total	Mean	
Body weight (kg)	-499	7	4	2	0	0	13	0.62±0.45	38.5
	500-549	22	8	12	1	0	43	0.81±0.44	48.8
	550-599	56	23	8	9	1	97	0.72±0.22	42.3
	600-	20	12	3	8	4	47	1.23±0.43	57.4
	total	105	47	25	18	5	200	0.86±0.17	47.5
Amount of rice straw	0 (none)	0	1	4	5	4	14	2.86±0.54	100.0
	0.5 (little)	0	1	0	1	0	2	2.00±0.13	100.0
	1 (some)	2	4	6	3	0	15	1.67±0.54	86.7
	2 (much)	13	10	3	0	0	26	0.61±0.29	50.0
	3 (abundant)	90	31	12	9	1	143	0.60±0.17	37.1
	total	105	47	25	18	5	200	0.86±0.17	47.5

The results of χ^2 -test:

	χ^2	P	n
Body weight	28.98	<0.01	12
Rice straw	96.24	<0.001	16

5. Annual Incidence of Liver Abscess in the Cattle killed at Sendai Meat Plant during from 1970 to 1974.

The annual incidence of liver abscess in the cattle killed at Sendai Meat Plant was given in Table 5. The incidences were high in Holstein cattle and low in

TABLE 5. Annual Incidence of Liver Abscess in the Cattle Killed at Sendai Meat Plant during from 1970 to 1974

Year	Incidence of liver abscess (%)		
	Holstein	Japanese Native	Overall
1970	7.0	0.9	3.9
1971	7.0	1.7	4.4
1972	5.2	1.0	2.8
1973	4.1	1.4	3.1
1974	8.6	1.1	6.0

Japanese Native cattle from 1970 to 1974. The incidence decreased in the former breed in 1972 and 1973, but again it was high in 1974.

Discussion

The results of our present study and those of our previous one (1) were summarised in Table 6. It is noted that the severity of rumen parakeratosis and acute rumenitis was much reduced in 1974, though nearly half of the rumens examined were affected by these lesions. The result that liver abscess was more frequent in Holstein cattle than in Japanese Native cattle was in good agreement with the annual incidence of lesions in the past five years. The incidence of traumatic reticulitis was surprisingly high in 1974, while we found few cases of this lesion in 1970-71. We found, in addition to rice straw, some foreign materials such as hemp and plastic rope. This suggests that the animals probably had a better opportunity to ingest them, and possibly some metal pieces which cause traumatic reticulitis.

It seems likely that the feeding of a large amount of rice straw probably reduced the incidence and severity of rumen parakeratosis and acute rumenitis.

TABLE 6. Summarised Data of two Studies in 1970-1971 and 1974

Date of study	May, 1970-July, 1971	1974
Numbers of cattle examined	272	200
Rumen parakeratosis		
clumping (a)	54.4%	33.5%
adhesion (b)	33.1%	33.5%
overall (a+b)	61.8%	47.5%
Mean parakeratosis score	1.30±0.16	0.86±0.17
Acute rumenitis		
diffuse (c)	64.7%	56.5%
papillary (d)	57.4%	16.0%
overall (c+d)	72.1%	64.0%
Chronic rumenitis		
scar and ulcer	12.5%	16.5%
overall	13.2%	23.0%
Liver abscess	10.3%	6.0%
Traumatic reticulitis	—	10.0%

The failure to find significant correlations between the ruminal lesions and liver abscess may be due to the reduction of severity of the ruminal lesions. Liver abscess was present mostly in the animals affected with severe rumen parakeratosis (2). The administration of 10% rice straw to concentrate diet was highly effective in reducing the severity of rumen parakeratosis and acute rumenitis, and the incidence of liver abscess (3). Care should be taken, however, to avoid the feeding of an excessive amount of rice straw to fattened cattle, since we found that chronic rumenitis was more frequent in the rumens containing a large amount of the straw.

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