Lymphoreticular Lesions in Beef Cattle at an Ontario Abattoir

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Abstract

During the period April 1983 to March 1986, lymphoreticular lesions in cattle were surveyed at an Ontario abattoir. Postmortem examination of 171,157 cattle revealed macroscopic lesions in 696 animals (0.4%). The most frequent finding was abscessation of a single lymph node, a finding that was observed in 353 cases (50.7% of animals with lesions/0.2% of total slaughter). Actinobacillary granulomas were present in 252 lymph nodes (36.2%/0.1%). Other specific lesions included mycobacteriosis and mycotic or parasitic lymphadenitis. Cases of nonspecific chronic lymphadenitis or granulomas in lymph nodes, pigmentations, malformations, hyperplasia, and neoplasia were also seen. Abscesses were the most common splenic lesions. One animal had localized lymphangiectasia of the epicardium.

Résumé

Les lésions lymphoréticulaires chez des bovins dans un abattoir d'Ontario

On a relevé des lésions lymphoréticulaires chez des bovins dans un abattoir d'Ontario durant la période d'avril 1983 à mars 1986. L'examen post-mortem de 171,157 vaches a révélé des lésions macroscopiques chez 696 animaux (0,4%). La lésion la plus fréquemment observée fut un abcès d'un ganglion lymphatique chez 353 cas (50,7% des animaux avec une lésion /0,2% de tous les animaux abattus). On a retrouvé des granulomes actinobacillaires dans 252 ganglions lymphatiques (36,2%/0,1%). La mycobactériose et la lymphadénite mycotique ou parasitaire figurent parmi d'autres lésions spécifiques retrouvées dans les ganglions. On a en outre observé des cas de lymphadénite chronique non spécifique ou de granulomes ganglionnaires, de même que des pigmentations, des malformations, de l'hyperplasie et de la néoplasie. Les abcès furent donc les lésions les plus fréquemment rencontrées. Un des animaux présentait une lymphangiectasie localisée de l'épicarde.

Can Vet J 1988; 29: 730-734

Introduction

Archer reported on lesions detected in lymph nodes at 23 export and 20 nonexport abattoirs in Queensland, Australia (1). Lesions were found in 1.75% of 674,322 animals, including both dairy and beef breeds. The present survey was intended to determine the prevalence of various conditions in slaughter cattle in Ontario, and to compare gross lesions with laboratory findings in selected representative cases. Comparison of the prevalence of lesions in lymph nodes of the head, thorax, and carcass was also of interest to us. It was hoped that this information would also be of use when considering revision of inspection procedures.

Materials and Methods

Lymphoreticular tissues (lymph nodes and spleen) were incised and inspected between April 1983 and March 1986 at a Toronto abattoir where only beef cattle were slaughtered. Lymph nodes of the head, thorax and abdomen of every animal were routinely examined. If lesions were found in any of these lymph nodes, carcass lymph nodes were also examined. Postmortem inspection was followed by histological and microbiological examination of representative gross lesions to confirm a diagnosis or assist in decisions of final carcass disposition. All lesions of a fibrous, proliferative, tuberculous, or mineralized nature were submitted to the laboratory in order to confirm the presence or absence of mycobacterial infection as part of the Canada-wide, slaughter surveillance used in the Agriculture Canada program for eradication of *Mycobacterium bovis* infection. Lesions seen grossly to consist of a caseous or liquid purulent material with a red border or fibrous capsule typical of an abscess were only submitted for laboratory examination when internal organ(s) were also affected by abscess in order to help in the decision for final disposition. Enlarged lymph nodes with a homogeneous cut surface were submitted to the laboratory to help differentiate hyperplasia from lymphosarcoma in equivocal cases. Actinobacillary lesions were diagnosed by the presence of typical sulfur granules in lymph nodes and by the lesions in the tongue and/or lung. Formalin-fixed tissues were routinely processed, stained with hematoxylin and eosin, Ziehl-Neelsen, Gram, and Grocott stains. Routine aerobic culture techniques were used as well as standard techniques used at the Animal Diseases Research Institute (ADRI) for culture of mycobacteria.

Results

During the survey period, 171,157 beef cattle were slaughtered. The animals originated from western Canada, the United States (1%), and local Ontario producers. About 60% of the animals were Hereford or Charolais and their crosses. The other 40% were other British or continental European breeds and their crosses. Examination of the dentition of 10% of the

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TABLE 1
Seasonal Prevalence of Lymphoreticular Lesions

Period	Lesions	% of Total	Slaughter	Lesion %
April - June	232	26.0	46,586	0.5
July - Sept	259	29.1	43,891	0.6
Oct - Dec	208	23.4	40,260	0.5
Jan - Mar	188	21.1	40,420	0.5
Total	887		171,157	

TABLE 2
Distribution of 882 Lesions Detected at Slaughter in the Lymphoreticular System of 746 of 171,157 Beef Cattle from an Ontario Abattoir

Abnormality	Location of Lymph Node				
Lymph Node	Head	Thorax	Abdomen	Carcass	Total
Lymphadenitis					
Actinobacillosis	226	12	14	0	252[b]
Mycotic	0	2	10	0	12
Parasitic	2	4	27	0	33
Mycobacteriosis	0	2 (1)[g]	5 (3)[f]	0	7
Other bacterial	161	30	154	8	353[a]
Nonspecific	11	2	7	1	21
Hyperplasia	22	14	14	28	78[d]
Lymphosarcoma	3	0	3	6	12[e]
Pigment					
Pigment (black)	0	26	69	0	95[c]
Pigment (green)	4	0	0	0	4
Spleen					
Abscess					14
Neoplasm					3
Duplication					2
Lymphatics					
Lymphangiectasia, epicardial					1

[a]305 animals
[b]190 animals
[c]Due to flukes
[d]Fourteen animals
[e]Three animals
[f]*Mycobacterium avium*
[g]*Mycobacterium bovis*

TABLE 3
Distribution of Lymphoreticular Lesions by Site Affected

Lymph node				
Head	retropharyngeal	208		
	submaxillary	129		
	parotid	92		
		Subtotal	429	49.5%
Pluck	mediastinal	43		
	bronchial	49		
		Subtotal	92	10.6%
Viscera	portal	75		
	mesenteric	228		
		Subtotal	303	34.9%
Carcass	prescapular	20		
	ilial[a]	21		
	ischial[a]	2		
	popliteal	0		
		Subtotal	43	5.0%
		Total	867	
Spleen			19	
Lymphatics			1	
		Total	887	

[a]These lymph nodes are examined as part of carcass although they drain viscera

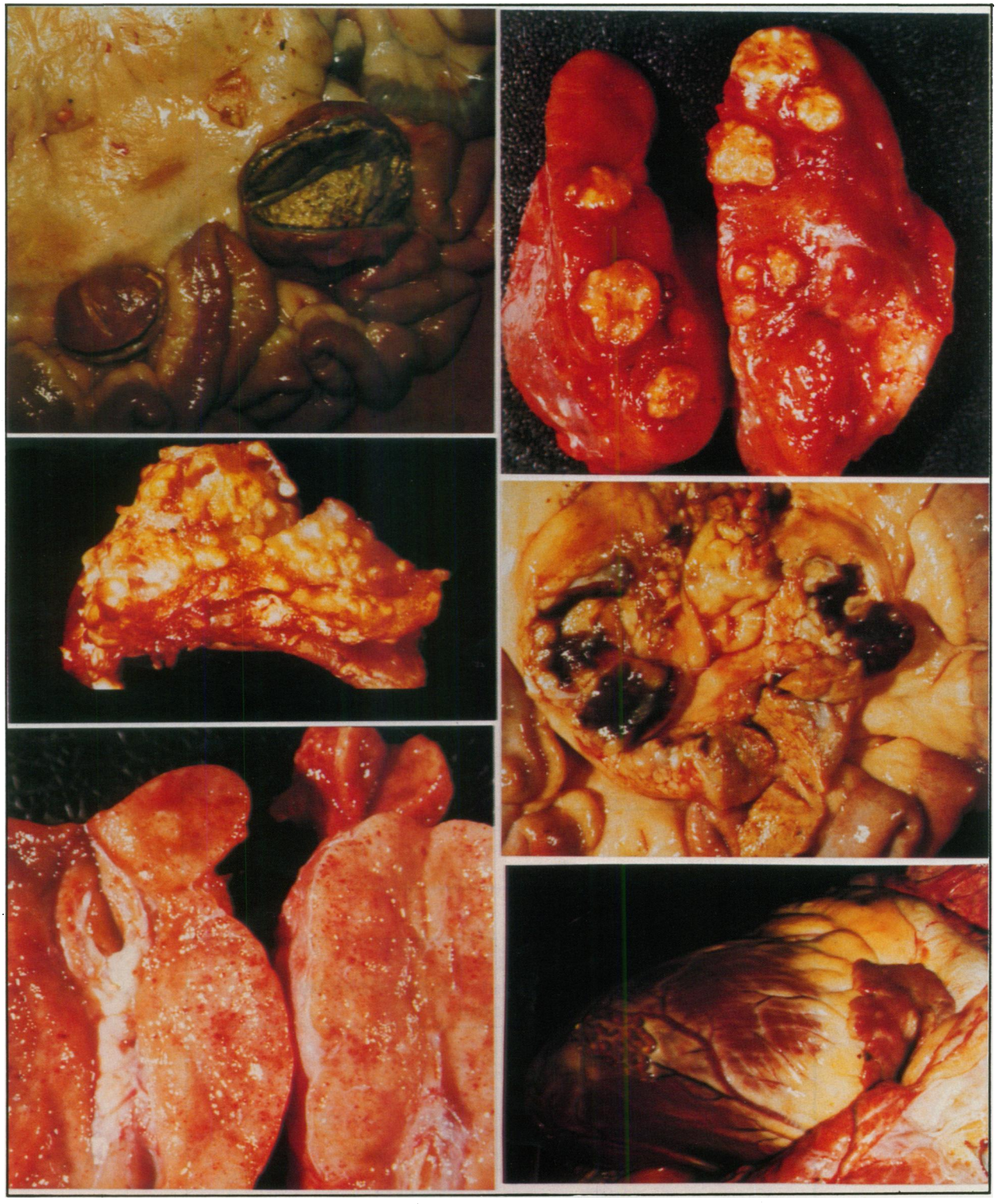

Figure 1. Chronic abscess of a mesenteric lymph node.

Figure 2. Actinobacillary granulomas in retropharyngeal lymph nodes.

Figure 3. Mineralized tubercles in a mediastinal lymph node. *Mycobacterium bovis* isolated.

Figure 4. Mycotic lymphadenitis in mesenteric lymph nodes.

Figure 5. Partial duplication of retropharyngeal nodes.

Figure 6. Lymphangiectasia on epicardial surface of bovine heart.

animals revealed that about 75% were less than two years of age (15-20 mo) and 25% were between two and three years (24-30 mo).

Lymphoreticular lesions were more frequent in summer than in winter ($p < 0.01$, Table 1). A total of 887 lesions was found in 696 animals (0.4% of the total slaughter); multiple lesions were found in 191 affected animals.

The most frequent finding was bacterial lymphadenitis with abscess formation (40.7% of lesions in lymph nodes) (Table 2). Lymph nodes most commonly abscessed were those of the head (161 lesions) and the viscera (154 lesions) (Table 3, Figure 1). In only eight cases were abscesses detected in other body lymph nodes. Pathogenic and some nonpathogenic organisms were isolated, including *Actinomyces (Corynebacterium) pyogenes, Rhodococcus (Corynebacterium) equi, Bacillus* spp., coliforms, *Streptococcus* spp., and *Pseudomonas* spp.

Actinobacillosis was found in 252 lymph nodes from 190 animals (27.3% of affected animals/0.1% of total slaughter). Lymph nodes of the head were those most frequently affected by actinobacillary lesions (89.7% of lesions in head). Histological confirmation was made in the four cases submitted to the laboratory. Most lesions seen were small yellow lobulated granulomas and others were soft grey-yellow bulging pyogranulomatous masses with fistulae. The surrounding tissue was reddened and zones of central liquifaction were seen (Figure 2).

Forty lesions of a granulomatous/tuberculous nature submitted for histological examination, and mycobacterial culture. A granulomatous, nonspecific, chronic lymphadenitis was diagnosed in 21 cases, whereas specific agents were identified in the other 19 cases. Seven of these 19 cases (Figure 3) were confirmed histologically to have acid-fast bacteria. *Mycobacterium avium* complex or *M. bovis* were identified on culture in four of these seven (Table 2). A diagnosis of mycotic granuloma was made in the remaining 12 cases (Figure 4). Mycotic granulomas were not submitted for culture because the agents involved die rapidly (2).

Black discoloration of lymph nodes secondary to migration of flukes in lungs and liver was seen in both the mediastinal and bronchial lymph nodes of 13 animals or as single lesions in portal lymph nodes in another 69 animals. Flukes or migration tracts were identified in tissues drained by the affected lymph nodes. Green pigment originating from the tattoo ink in the ipsilateral ear was found in parotid lymph nodes of four animals.

Parasitic lesions were seen in 33 animals; twenty-seven of these lesions were found in the mesenteric lymph nodes. Green foci were seen grossly, and small abscesses or masses of eosinophils were detected histologically. Sometimes, remnants of parasites could be observed in these lesions. Mineralization was found in some of the larger granulomatous lesions.

Hyperplastic lobulated retropharyngeal nodes were found in eight animals (Figure 5).

Lymphoid hyperplasia was detected in some lymph nodes of the head, viscera, or carcass of 14 cattle. Only two of these lymph nodes were sent for histological confirmation. Neoplasia was suspected in three animals and all were confirmed histologically as lymphosarcoma. Head, visceral, and carcass lymph nodes were involved.

Lymphangiectasia was seen on the epicardial surface of one heart as an incidental finding (Figure 6). A double spleen was seen in two animals and splenic tumors, hemangioendotheliomas, were diagnosed histologically in three others. Fourteen spleens contained abscesses. *Actinomyces pyogenes* was isolated from two of 14 splenic abscesses.

Discussion

There were some differences in the prevalence of lymphoreticular lesions between our study and a previously published survey. Lesions in the lymph nodes of the head were detected in one of every 73 carcasses studied by Archer (1) whereas one lesion was detected in 398 carcasses in our study. The study by Archer included 674,322 cattle — about three times as many as ours, but many more abattoirs were included in his study. Lesions in mesenteric, mediastinal, and bronchial lymph nodes were comparable in both surveys.

The prevalences of actinobacillary lesions or other bacterial abscesses were also similar in the two surveys. Actinobacillary lesions of the head comprised 82.7% of head node lesions in Archer's study (1) and 89.7% in this study. Abscesses accounted for 15.3% and 39.8% of total lesions respectively. Because many fungi can be pathogenic if circumstances are favorable, it is important to examine all other organs including placenta in pregnant animals, for sources of infection. The findings of Angus *et al* (3) suggested that the bovine intestine may be an important site of entry in systemic fungal infections. In a previous Canadian study, 90% of a goup of 100 mycotic lesions were found in mesenteric lymph nodes (2). There were twice as many lesions in mesenteric lymph nodes in the Australian study but 66% of the mesenteric lesions in that study were *Pentastoma*-related. If this specific agent (not seen in Canada) is excluded, the prevalence of mesenteric lesions was similar. Another agent not seen in Canada but found in cattle lymph nodes in the USA is *Coccidioides immitis* (E. Himes, USDA, Ames, Iowa, personal communication). In this survey, mycobacteriosis accounted for 0.8% of lymph node lesions, but only four (0.5%) were culturally positive for mycobacteria. Five of seven mesenteric nodes were affected (culturally, three *M. avium* and two negative). Pulmonary lymph nodes were histologically positive for mycobacteria in two cases. One of these, which originated in the USA, was culturally positive for *M. bovis*. Mycobacterial lesions have occasionally also been found in Canadian cattle slaughtered in the USA (E. Himes, USDA, Ames, Iowa, personal communication).

The only neoplasm seen in this study was lymphosarcoma, but various neoplasms affecting lymph nodes are often seen in Canada (4). Generally, the prevalence of lymphoreticular lesions in our study was low (0.52%). However, the findings for specific lesions, especially those resembling tuberculosis (0.8% of total

lymphoreticular lesions), suggests that incision of lymph nodes is warranted in order to detect these lesions.

Examination of national meat inspection data regarding *M. bovis* culture from tuberculosis-like lesions submitted from routine slaughter of cattle in Canada as part of the Bovine Tuberculosis Eradication program revealed only one per 1150 lesions submitted to be positive for *M. bovis*. The majority of suspicious lesions are caused by other organisms, similar to what was found in this study. Findings in the lymphoreticular system must be combined with the assessment of the rest of the carcass.

Acknowledgments

We wish to thank the inspection staff (PPIs) at the study plant for their help in examination and collection of lesions. Appreciation is also expressed to Dr. Ian Sutherland and staff at the regional office, Toronto; to Mr. B. Stewart, Dr. C. Turcotte, Dr. A. Bundza and the staff of ADRI, Nepean; and to Dr. T. Feltmate, Chief, Epidemiology, Meat Hygiene Division for assistance in preparing the manuscript. CVJ

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Abstract

The Pathogenicity of *Yersinia enterocolitica* for Piglets

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Swine at slaughter age frequently carry strains of *Yersinia enterocolitica* in their throats that are identifiable as human pathogens. The pathogenicity of *Y. enterocolitica* was studied in piglets by oral challenge of two litters, one derived by cesarean section and deprived of colostrum, and the other delivered at full-term. Six full-term piglets challenged with three serotypes of *Y. enterocolitica* (O:8, O:21, O:13) survived for 15 days without any signs of illness. These piglets had fewer positive rectal cultures and showed less extensive colonization of internal organs at necropsy than did cesarean-derived piglets. The results of this challenge experiment suggest that piglets are capable of restricting colonization by *Y. enterocolitica* to the throat and intestinal tract without the development of serious illness.

(Can J Vet Res 1988; 52: 325-330)