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The Disclosure of Tuberculous Lesions at Slaughter in Cattle from Attested Herds in Co. Monaghan in 1994 and 1995

P. W. White and J. M. Griffin

Introduction

During the period, 1988 to 1995, the annual number of factory lesion re-tests in County Monaghan increased from 48 to 155, an increase of over 200%. Over the same period the number of factory lesion tests increased nationally from 1,138 to 2,172, an increase of 91%. This study describes both animal and herd variables for herds in Co. Monaghan that had a factory lesion test in the years, 1994 and 1995, and identifies factors which were at variance with national trends.

Materials and Methods

In all cases in which a suspected tuberculous lesion is detected at slaughter in an animal from an attested herd, (i.e. a herd not subject to movement restrictions due to tuberculosis) that lesion is submitted to the Department of Agriculture and Food's Veterinary Research Laboratory for histological and/or microbiological examination. Where a tuberculous lesion is confirmed, the herd of origin is traced, and undergoes a factory lesion tuberculin test.

A list of herds in Co. Monaghan that had a factory lesion test in either 1994 or 1995 was obtained using the report generator programme in Monaghan District Veterinary Office. The questionnaire used for systematic recording of data from herd files is given in Appendix 1. Where the animals had been purchased from within the county, a trace-back was undertaken. Where a factory lesion retest resulted from the disclosure of more than one animal

with confirmed lesion(s), a separate questionnaire was completed for each animal. The results were computerised using the ACCESSTM, Version 2.0, data analysis package.

Results

In 1994 and 1995 there were 280 factory lesion tuberculin tests carried out in Co. Monaghan. Records were available locally for 241 of these herds which contained details of 308 cattle with lesions of tuberculosis at slaughter (Table 1). The remaining 39 herds were excluded from the study.

Although a number of herds showed more than one non-reactor animal with confirmed lesion(s), none of the herds had more than one factory lesion retest during either year (Table 1).

Distribution of the number of animals in the herd with a factory lesion

The distribution of lesion-positive animals disclosed in 1995 between herds of varying size is shown in Table 2. The majority (81%) of herds had only one animal with confirmed lesion(s); these herds accounted for 59% all confirmed lesion animals. The remainder of herds (19%) had between 2 and 8 confirmed lesion-positive animals.

¹ Microsoft Corporation (1993) MS AccessTM. Relational Database Management System for WindowsTM Version 2.0.

Table 1. The number of factory lesion tests carried out in Co. Monaghan and the number of animals and herds for which detailed records were available in Monaghan District Veterinary Office (DVO) in 1994 and 1995

Year	Number of factory lesion tests carried out in Co. Monaghan	Number of herds with detailed records available	Number of lesion positive animals identified in these herds	Number of herds with more than one lesion positive animal
1994	125	98	110	8
1995	155	143	198	27
Total	280	241	308	35

When the mean size of factory lesion herds (as measured by the number of animals presented at the test preceding the factory lesion tuberculin test) was categorised by of number of confirmed lesion animals per herd, the mean herd size increased as the number of animals with a lesion in a herd increased (Table 2). The mean herd size for the 1995 lesion-positive herds was 64, whereas the mean herd size for other restricted herds that did not have a factory lesion retest in 1995 was 52. Herds that were not restricted in 1995 had a mean size of 34.

Accompanying Identification

The attested animals were categorised on the basis of whether they were

accompanied by an identity card or movement permit when sent for slaughter. Animals from attested herds not qualifying for an identity card may be slaughtered under permit for any of the following reasons:

1. An inconclusive tuberculin test result on the previous test resulted in the identity card being retained by the District Veterinary Office.
2. Where the animal's identity card is missing and the animal has not qualified for a replacement card by undergoing at least two consecutive tuberculin tests within the herd.

Table 2. Mean size of factory lesion herds categorised by the number of animals with factory lesions per herd

Animals per Herd (a)	No. of Herds (b)	Total animals (c)	Mean herd size (d)	% of herds (e)
1	116	116	62	81
2	11	22	73	8
3	11	33	82	8
4	2	8	125	1
5	1	5	20	1
6	1	6	0	1
8	1	8	5	1
Totals	143	198	-	-

- (a) number of animals with confirmed lesions disclosed by the herd in 1995;
 (b) number of herds with the number of animals disclosed in column (a);
 (c) total number of lesion positive animals disclosed by these herds;
 (d) mean herd size at the previous herd test;
 (e) percentage of herds with the number of lesions recorded in column (a);

Table 3. The animal class distribution of animals slaughtered with either (a) an identity card or (b) a movement permit

Animal Class	Identity Card	%	Permit	%	Total	%
Cows	84	32	22	45	106	34
Heifers	47	18	7	14	54	18
Steers	118	46	15	31	133	43
Bulls	4	2	0	0	4	1
Not specified	6	2	5	10	11	4
Total	259	100	49	100	308	100

3. Where the animal was re-tagged at the last tuberculin test, and the previous identity of the animal cannot be established.
4. Where the animal has been re-tagged at the last tuberculin test, and the herd-owner fails to produce an identity card corresponding to the previous identity of the animal.
5. Where the animal is under suspicion for other reasons.

There were 259 lesion-positive animals slaughtered with an identity card and 49 animals with a movement permit.

Animal Class

Among the 308 animals in the study there were 106 cows, 54 heifers and 133 steers. There was little variation in the distribution of animal classes between the years 1994 and 1995. An analysis by animal class showed that cows were most frequently found among lesion-positive animals sent

on permit (45%), and that steers were most frequently found among lesion-positive animals slaughtered with an identity card (46%) (Table 3).

Tuberculin test history of lesion positive animals

Details of the result of the tuberculin test preceding the slaughter of an animal were available for more than 90% of both permit animals and non-purchased identity card animals, and for 12% of the purchased animals with identity cards. This information for the latter group was only obtainable where the animal in question could be traced to a known herd number within the county. Where skin measurements of the previous test were available, it was found that in 1994 and 1995 respectively, 68% and 33% of the permit animals had been inconclusive to the severe interpretation of the tuberculin test (Table 4).

Table 4. The number of confirmed factory lesion animals sent for slaughter accompanied by either a permit or an identity card in 1994 or 1995 which were inconclusive to severe interpretation on the previous tuberculin test

Year	Permit or identity card	Animals Inconclusive	Animals Tested	%	Total Animals
1994	Identity Card	1	62	2	85
	Permit	17	25	68	25
1995	Identity Card	2	114	2	174
	Permit	7	21	33	24
1994 & 1995	Total	27	222	12	308

Table 5. Animals classified by site of tuberculous lymph node and animal class for both animals slaughtered with an identity card and with a permit during the years 1994 and 1995

Lymph node location	Cows	Heifers	Steers	Bulls	Not specified	Total animals	as % of animals	% of tuberculin test reactor animals nationally*
Retropharyngeal	21	10	37			68	22.1	31.1
Submaxillary		1	3			4	1.3	1.0
Parotid		1				1	0.3	0.8
Bronchial	46	18	44	2	1	111	36.0	32.0
Mediastinal	27	15	33	2	5	82	26.6	22.8
Hepatic		1				1	0.3	0.2
Other			2			2	0.6	0.2
More than 1 site	9	7	10		1	27	8.8	9.9
Not specified	3	1	4		4	12	3.9	-
Totals	106	54	133	4	11	308	100	

* Distribution of lesions in tuberculin test reactor animals taken from a survey of 50,600 reactor cattle throughout the state, during the period 1989 to 1994 (Crowley & O’Keeffe, 1996)

Site of lesions

The three most common lymph nodes found to have tuberculous lesions on *post-mortem* examination were bronchial (36%), mediastinal (26.6%) and retropharyngeal nodes (22.1%), as shown on Table 5.

Animals from attested herds in Co. Monaghan showed a higher percentage of bronchial and mediastinal lesions and a lower percentage of retropharyngeal lesions than that seen in tuberculin test reactors nationally (Crowley & O’Keeffe, 1996). In cows the highest percentage of lesions were in the bronchial lymph nodes (43%). The lowest proportion of retropharyngeal lesions were found in

cows and heifers (20% and 19% respectively). The percentage of animals showing lesions at more than one location (9%) was similar to that for reactor animals (11%). These findings may reflect variations in the distribution of animal classes between the two different groups. Alternatively, they may be influenced by the method of examination employed or by the stage of development of the tuberculous lesions in these cattle.

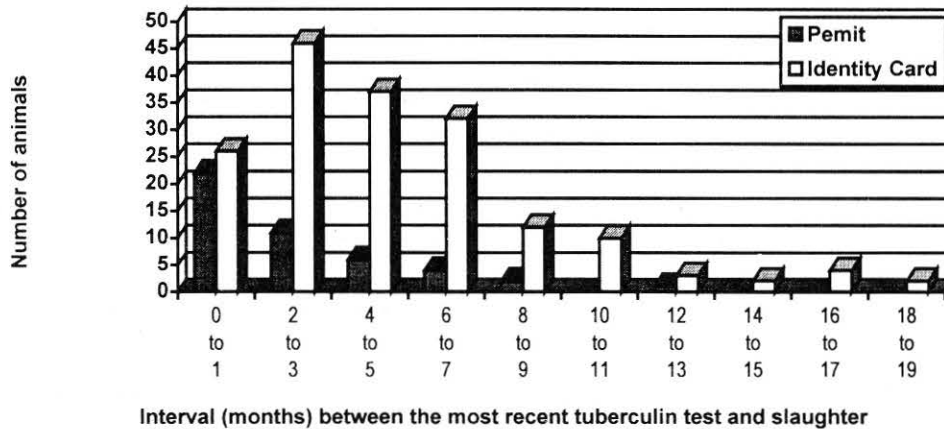
Movement history of lesion positive animals slaughtered with an identity card

Among animals slaughtered with an identity card, the proportion that had been purchased since the last test was 26% in

Table 6. The association between the proportion of herds which showed reactors at subsequent tests and the purchase of one or more identity card animals that gave rise to confirmed lesions 1995-1996

Movement history of lesion positive animals	Outcome of subsequent testing			
	Herds with reactors	Herds without reactors	Total No. of Herds	% of herds with reactors
Animal(s) purchased	6	40	46	13
No animals purchased	57	138	195	29
Total Herds	56	145	201	28

Figure 1. The interval between the previous test and slaughter for animals slaughtered under either identity card or permit for the years 1994 and 1995



1994 and 29% in 1995. In 1995 it was possible to trace 16 of the 50 identity card animals that had been purchased to herds within Co. Monaghan. The majority (32 of 50) of these purchased animals were steers. There was no difference in mean herd size observed between herds that purchased their lesion-positive animals and those who had not.

Where a herd had purchased animals that were found to be tuberculous at slaughter, the risk of finding tuberculin test reactors at subsequent tests was lower than in the case of herds where lesion-positive animal(s) were not purchased ($P < 0.05$) (Table 6).

Interval to last tuberculin test prior to slaughter

An analysis of confirmed lesion animals where data was available for the previous tuberculin test, revealed that 84% of all animals had been tested within 8 months of slaughter (Figure 1). The mean interval between the last tuberculin test and slaughter was lower for animals slaughtered with a permit (77 days) than

animals slaughtered with an identity card (154 days).

Outcome of subsequent tuberculin testing

The percentage of herds that showed reactors at the factory lesion re-test and at subsequent tests following the disclosure of the lesion-positive animal(s) was 28% in 1994, and 25% in 1995. This figure varied according to the interval between the date of slaughter of the lesion-positive animal and its most recent tuberculin test. Where the interval was less than 60 days, only 21% of herds disclosed tuberculin test reactors at the factory lesion test and subsequent tests, whereas 39% of herds showed reactors where the interval was greater than 180 days (Table 7). This finding suggests that a more frequent tuberculin testing reduces the time interval during which transmission of *Mycobacterium bovis* can occur with infected herds.

Table 7. The percentage of factory lesion herds which showed reactors at subsequent tuberculin tests in 1994 and 1995 and the interval to the most recent tuberculin test prior to slaughter of the animal(s) with confirmed lesion(s)

Interval to previous test (days)	Herds with reactors at the factory lesion re-test and subsequent tests	Total herds which had a factory lesion retest	% of herds with reactors
0 to 59	12	57	21
60 to 119	13	44	30
120 to 179	10	34	29
Over 179	22	56	39

Conclusions

The finding of tuberculous lesion(s) at *post-mortem* examination in cattle slaughtered from attested herds is retrospective evidence of infection with *M. bovis*. In many cases it is difficult to determine when an animal became infected. While the sensitivity of the test may be as high as 95% when carried out under ideal conditions (Monaghan *et al.*, 1994), the test as applied in the field is subject to a number of constraints which may result in a lower sensitivity. The severe interpretation of the tuberculin test was used in all tests carried out during 1994 and 1995 in Co. Monaghan. Under these circumstances fewer animals would have been falsely classified as negative to the test, resulting in a higher sensitivity than if the standard mode of interpretation had been used.

The primary complex for tuberculosis in cattle is in the lungs and their associated lymph nodes, in at least 60% of cases (O'Reilly *et al.*, 1995). In this study, the majority (63%) of lesions were detected in the lymph nodes of the thorax, and the head (23%). Where there is a high proportion of lesions confined to the head or to the lung, and there is a low number of affected sites, this suggests that the animals may have been slaughtered early in the course of the disease (Pritchard, 1988). Given that 84% of the animals in the present study had been tested in the

previous 8 months, the numbers and distribution of lesions are consistent with recently acquired infection.

The current study was descriptive in nature. Further case-control studies, using a county with a low frequency of confirmed lesions in attested herds as a control group, is under consideration. With the increasing availability of map co-ordinates for breakdown herds, the analysis of confirmed factory lesion breakdown herds using geographical information systems would allow clustering patterns to be examined in detail in the future.

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APPENDIX 1

Form for recording of non-reactor animals that showed lesions at post-mortem examination

Herd Number:

Tag number of animal:

Abattoir details:

Abattoir Number: Slaughter date

(B)] Animal type: [Steer(S) / Heifer (H or MH or PH) / Cow(C) / Bull

Hep] Lesion type: [0 = Ret; 1 = Sub; 2 = Par; 3 = Bro; 4 = Med; 5 =
10 = NVL] [6 = Mes; 7 = Pre; 8 = Other gland; 9 = Mul;

Was the animal sent on permit ? N = No Y = Yes

If Yes, please record number of animals sent for

Movement History:

Was animal sold since the last test? N = No Y = Yes

If Yes, please record Herd Letter and Number.

Was animal purchased since the last test ? N = No Y = Yes

If Yes, please record Herd Letter & Number :
If No, then record the following details:slaughter

If No, please record if the identiy card was on file : N = No Y = Yes

Details of last test prior to the slaughter of the animal with lesion(s)

Test date:

Test type: [1=Rnd; 3=IC; 4=RR; 5=SCT; 7= SMC; 8=CT; 9=FLR]

Animal type: [Steer(S) / Heifer (H or MH or PH) / Cow(C) / Bull (B)]

Avian increase (mm): Bovine increase (mm):

Code of testing vet:

Result of first test following the disclosure of the factory lesion

Number of animals tested: Number of reactor animals which occurred at subsequent breakdown.

Comments: