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Effect of Cattle Enterprise Type on the Rate of Disclosure of Tuberculin Reactors

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Introduction

The rate of disclosure of tuberculin reactors in the Irish cattle population has remained constant over the past 15 years during which period some 30,000 animals have been so identified each year. This is considerably in excess of what had been achieved in other countries (Pritchard, 1988) which have operated similar bovine tuberculosis eradication programme. Sources of infection associated with a tuberculous breakdown are often attributed to cattle production practices involving trading systems. In dairy or suckler herds which contain a high proportion of animals over 2 years of age, the hypothesis is that among older animals there may be an infected but anergic animal which could be an excreter which would represent an increased risk of infection.

This study was undertaken on the national cattle herd over a 6-year period to determine the effect of enterprise type, dairy, drystock, suckler or unknown on the rate of disclosure of tuberculin reactors adjusted for herd size and geographic region.

Materials and Methods

The national cattle population data for the period 1988 - 1993 were used. The data were interrogated on a herd unit basis. A herd was defined as a unit having cattle present at a full herd tuberculin test. Herds with no test record or having no stock recorded in the period, 1991-1993, were deleted from the analysis.

Cattle enterprise categories were defined as follows:

1. Dairy - herds which had:
a) been assigned a milk ring test result in 1993, based on milk supplied to a creamery;
b) did not have any cows eligible for beef cow premia; and
c) had cows in the herd in 1993.
2. Suckler - herds which were:
a) eligible for beef cow premia payments in 1992 and or 1993; and
b) herds which had cows in 1993.
3. Drystock - herds which had:
a) no cows in 1993;
b) no milk ring test results in 1993; and in which
c) no cows were eligible for beef cow premia in 1992 and or 1993.
4. Unknown - herds which had:
a) cows in 1993 but were not assigned an MRT in 1993 or were not eligible for beef cow premia in 1992 or 1993;
b) herds which had both dairy and beef cows present in 1993; and
c) No test in 1993 and had animals present during any of the previous 5 years.

Herd size category was designated on the basis of the largest number of animals present at a full test annually.

Using the above herd notation, herds were categorised as :

Small -	less than 30 cattle
Medium -	30 to 59 cattle
Large -	60 to 99 cattle
Very large -	100 or more cattle

Region was based on the geographic location according to county, as follows:

Western -	Donegal, Sligo, Leitrim, Mayo, Roscommon, Galway and Clare.
Sth. West -	Limerick, Kerry, Cork, Waterford and South Tipperary.
East -	Louth, Meath, Dublin, Kildare, Wicklow and Wexford.
Midland -	Cavan, Monaghan, Longford, Westmeath, Offaly, Laois, Kilkenny, Carlow and North Tipperary.

Results

A total of 165,000 herds were included in the study. Of these, 85,600 had less than 30 cattle (Table 1). When the herds were classified by region, the mean herd sizes were 28, 56, 58 and 52 for West, South West, East and Midland respectively (Table 2). The corresponding percentage of clear herds in each of these regions in the 6-year period, 1988 to 1993 was 80.5, 77.5, 65.2 and 59.8 respectively.

Enterprise type (dairy, beef cow, dry stock or other) had no effect on the prevalence of tuberculin reactors for herd sizes less than 30, 30 to 59, 60 to 99 or 100 or more cattle (Tables 3 to 6). Similarly, enterprise type did not affect the disclosure rate of herds with more than 5 reactors within any of the

four herd size categories. The number of herds with tuberculin reactors was greatest in the Midland region and lowest in the South West region (Tables 3 to 6) within each of the four herd size categories.

The annual rate of disclosure expressed and the number of reactor animals per 1,000 animals was similar for the four herd size categories (Table 7) within each of the regions.

Discussion

The rate of disclosure of tuberculin reactors was independent of cattle enterprise type within the four regional categories. This finding was unexpected as the hypothesis was that in dairy and suckler herds, the age profile would be much higher than in a dry stock herd. On the other hand, the expectation was that dairy or suckler herds would produce a higher prevalence of reactors. The results demonstrated a clear regional effect on the rate of disclosure of reactors, with the highest prevalence of reactor herds in the Midland region and lowest in the South West. The data do not identify any factor which might explain this regional difference.

The observation that reactor disclosure rate was independent of herd size was unexpected, as it was anticipated that in the extra large herds (>100 cattle), there would be greater opportunity for animal to animal transmission compared to those in small herds (< 30 animals). However the data presented in Table 7 show no differences between herds with > 100 animals and herds with < 30 animals when expressed as number of reactors per 1000 animals.

This finding supports the observation of O'Keeffe (1993), that the chance of reactor disclosure increases as herd size increases. However, the risk of reactor disclosure is

similar for any individual animal irrespective of whether it is in a large or small herd.

References

O'Keeffe, J. (1993).

A model of the effect of herd size on outcome of tuberculin test. Tuberculosis Investigation Unit, University College Dublin, Selected Papers 1992, 39-44.

Pritchard, D.G. (1988).

A century of bovine tuberculosis 1888-1988: conquest and controversy. J. Comp. Path. **99**, 357-399.

Table 1. Relationship of herd size to the rate of disclosure of tuberculin reactors over a six year period from 1988 to 1993.

	HERD SIZE (No. of cattle)			
	Small(<30)	Average (30-59)	Large (60-99)	Very Large (100 or more)
No. of herds (000's)	85.6	41.2	21.8	16.9
% of herds with:				
no reactors	84.1	68.1	56.7	45.8
1-2 reactors	11.1	18.1	20.8	19.3
3-5 reactors	3.1	7.2	10.3	12.9
>5 reactors	1.7	6.7	12.2	22.0

Table 2. Relationship of region to the rate of disclosure of tuberculin reactors over a six year period from 1988 to 1993.

	REGION			
	West	Sth. West	East	Midland
No. of animals (000's)	1.8	2.4	1.0	2.0
No. of herds (000's)	65.2	43.4	18.1	38.7
Average herd size	28	56	58	52
% of herds with:				
no reactors	80.5	75.5	65.4	59.5
1-2 reactors	12.1	13.3	18.6	19.9
3-5 reactors	4.0	5.4	7.4	9.6
>5 reactors	3.4	5.8	8.6	11.0

Table 3. Relationship of enterprise type to the rate of disclosure of tuberculin reactors in small herds (less than 30 cattle) according to region, 1988 to 1993.

	REGION			
	West	Sth. West	East	Midland
<u>Dairy</u>				
No. of herds (000's)	1.0	2.2	0.2	0.8
% with no reactors	82.9	82.9	76.4	65.4
% with > 5 reactors	2.3	1.8	3.6	3.7
<u>Beef cow</u>				
No. of herds (000's)	30.6	7.0	2.8	7.6
% with no reactors	88.0	88.4	81.4	74.1
% with > 5 reactors	1.1	1.2	1.9	3.8
<u>Dry stock</u>				
No. of herds (000's)	8.0	5.3	3.0	5.5
% with no reactors	85.6	90.4	84.3	77.3
% with > 5 reactors	1.4	0.9	1.4	2.6
<u>Other</u>				
No. of herds (000's)	3.9	3.0	1.6	2.7
% with no reactors	85.8	87.7	82.9	76.1
% with > 5 reactors	1.7	0.9	1.6	2.6

Table 4. Relationship of enterprise type to the rate of disclosure of tuberculin reactors in medium herds (30 to 59 cattle) according to region, 1988 to 1993.

	REGION			
	West	Sth. West	East	Midland
<u>Dairy</u>				
No. of herds (000's)	1.4	3.7	0.5	1.5
% with no reactors	70.8	73.0	58.1	51.7
% with > 5 reactors	5.1	5.1	8.6	11
<u>Beef cow</u>				
No. of herds (000's)	10.8	3.9	2.4	5.6
% with no reactors	72.8	76.4	66.1	59.0
% with > 5 reactors	5.8	4.7	5.9	9.4
<u>Dry stock</u>				
No. of herds (000's)	0.9	1.3	0.9	1.4
% with no reactors	69.7	75.2	63.5	56.9
% with > 5 reactors	7.3	4.3	6.1	8.7
<u>Other</u>				
No. of herds (000's)	2.3	2.2	0.6	1.9
% with no reactors	71.5	73.2	66.3	56.3
% with > 5 reactors	2.3	4.8	5.2	10.5

Table 5. Relationship of enterprise type to the rate of disclosure of tuberculin reactors in large herds (60 to 99 cattle) according to region, 1988 to 1993.

	REGION			
	West	Sth. West	East	Midland
<u>Dairy</u>				
No. of herds (000's)	1.0	4.0	0.8	1.8
% with no reactors	64.8	64.1	47.7	41.2
% with > 5 reactors	10.0	10.2	9.3	15.3
<u>Beef cow</u>				
No. of herds (000's)	2.7	1.8	1.3	2.9
% with no reactors	62.1	68.2	54.9	47.4
% with > 5 reactors	11.0	9.7	11.9	16.9
<u>Dry stock</u>				
No. of herds (000's)	0.1	0.4	0.4	0.5
% with no reactors	53.2	69.4	51.4	44.1
% with > 5 reactors	12.7	7.2	11.4	16.8
<u>Other</u>				
No. of herds (000's)	0.9	1.3	0.5	1.4
% with no reactors	63.9	65.4	46.8	44.4
% with > 5 reactors	8.4	8.2	11.5	16.3

Table 6. Relationship of enterprise type to the rate of disclosure of tuberculin reactors in very large herds (100 or more cattle) according to region, 1988 to 1993.

	REGION			
	West	Sth. West	East	Midland
<u>Dairy</u>				
No. of herds (000's)	0.6	5.1	1.4	2.6
% with no reactors	60.3	54.8	34.4	29.3
% with > 5 reactors	13.2	15.7	29.3	31.8
<u>Beef cow</u>				
No. of herds (000's)	0.7	0.9	0.9	1.7
% with no reactors	55.9	61.3	42.8	37.6
% with > 5 reactors	16.0	15.8	21.2	28.8
<u>Dry stock</u>				
No. of herds (000's)	0.1	0.3	0.3	0.2
% with no reactors	73.2	59.5	38.3	32.8
% with > 5 reactors	12.5	16.3	27.6	25.8
<u>Other</u>				
No. of herds (000's)	0.2	0.8	0.4	0.7
% with no reactors	47.4	60.0	36.1	34.6
% with > 5 reactors	18.7	15.2	23.1	27.7

Table 7. Relationship of herd size on the prevalence of reactors (reactors/1,000 cattle) according to region, 1988 to 1993.

	HERD SIZE			
	Small	Average	Large	Very Large
<u>WEST</u>				
Mean herd size	14	41	74	141
No. of herds	43,598	15,377	4,699	1,593
No. of animals	613,268	634,048	349,028	225,204
Reactors/1000 animals	4.37	4.66	4.64	4.85
<u>SOUTH WEST</u>				
Mean herd size	14	43	77	168
No. of herds	17,744	11,103	7,483	7,097
No. of animals	253,342	476,751	575,490	1,138,809
Reactors/1000 animals	3.72	3.99	3.93	3.69
<u>EAST</u>				
Mean herd size	14	43	77	168
No. of herds	7,640	4,390	3,027	3,043
No. of animals	109,584	188,320	234,338	510,983
Reactors/1000 animals	4.94	4.90	5.00	5.41
<u>MIDLAND</u>				
Mean herd size	15	43	77	155
No. of herds	16,723	10,273	6,565	5,149
No. of animals	254,978	439,419	504,109	796,300
Reactors/1000 animals	7.92	7.39	7.47	6.90