The Risk of Disclosure of Further Reactors in Herds which were Derestricted after One Clear Reactor Retest

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Introduction

The objective of the study was to compare a range of working definitions of an unconfirmed breakdown that could be used to derestrict herds after one clear reactor retest. These definitions were based on characteristics which were likely to indicate that no further reactors would be identified during a restriction following the test at which reactor(s) were initially disclosed.

Methodology

The rate of disclosure of reactor(s) at the second reactor retest in herds which were clear at the first reactor retest was assessed by examining data from new breakdowns in Counties Donegal, Kerry and Roscommon in 1990. A total of 1,079 new breakdowns were recorded in these counties during that year.

The characteristics which were examined were

a. Herd size
b. The number of reactors at the breakdown test
c. The presence of reactor animals with lesions at the breakdown test
d. Testing date
e. The avian and bovine skin measurements of the reactor animals at the breakdown test
f. The previous tuberculosis history of the herd
g. The tuberculosis status of the contiguous herds
h. Location of the herd in relation to blackspot areas

Data were collected in two stages. Firstly, analyses of herd size, the number of reactors identified at the breakdown test, the presence of lesioned animals at the breakdown test and testing date were carried out for all new breakdowns (1079). Then, only those break downs in which there were less than five reactors with no lesions and which were clear at the first reactor retest were analysed in relation to the remaining characteristics. This latter section of the study consisted of 560 breakdowns.

The information was collected at the DVO's from herd files and the Nixdorf Computer System using a customized form. The data was analysed using the Epi Info Programme.

Results

1. Overall breakdown rate at the first and second reactor retests

The number of new breakdowns recorded in Counties Donegal, Kerry and Roscommon during 1990 were 253, 394 and 432 respectively. One or more animals were deemed "reactor" at the first reactor retest in 114 (10.6%) of these herds, with Kerry having the highest breakdown rate and Donegal the lowest (Table 1).

Table 1. Number of herds with reactors at the first reactor retest, by county

County	No. of herds	Number with reactors
Donegal	253	18 (7.1)
Kerry	394	49 (12.4)
Roscommon	432	47 (10.9)
Total	1079	114 (10.6)

Overall, reactors were disclosed at the second reactor retest in 37 (3.8%) of the 965 herds which were clear at the first reactor retest (Table 2). Twenty one (57%) of these herds had one reactor at this test, 10 (21%) had 2 reactors, and only 6 (16%) had more than 2 reactors.

Table 2. Number of herds with reactors at the second reactor retest, having passed the first reactor retest.

County	No. of herds	Number with reactors
Donegal	235	11 (4.7)
Kerry	345	15 (4.3)
Roscommon	385	11 (2.9)
Total	965	37 (3.8)

2. The association between herd size and the disclosure of reactors at the first or second reactor retest

Herds which were restricted at private tests and inconclusive retests were excluded from this section of the analysis because of the unavailability of herd size data.

There was a strong association between herd size and the disclosure of reactors at the first reactor retest. The mean herd size for the 766 herds which were clear at the first reactor retest was 41 compared to 63 for the 91 herds were disclosed further reactors at this test. This difference was statistically significant.

The difference in herd size at the second reactor retest for those herds which passed their first reactor retest, however, was not statistically significant. The respective means for herds which were clear and those which disclosed reactors were 40 and 48.

3. The association between the number of reactor animals at the breakdown test and the disclosure of reactors at the first or second reactor retest

In 702 (65.1%) of the 1079 breakdown tests[1] only one reactor was disclosed (Table 3).

If the whole breakdown, including the breakdown test and all subsequent reactor retests, was considered, then 59% of the breakdowns disclosed only one reactor animal.

4. The association between testing date and the disclosure of reactors at the first or second reactor retests

Breakdowns were divided into two categories and analysed in relation to the date on which the first reactor retest was undertaken. These categories were April 1 to October 31 which corresponds, approximately, to the grazing season, and November 1 to March 31, the winter housing period. A similar analysis was undertaken for the second reactor retest.

The breakdown rates at the first reactor retest for herds tested during the grazing and housing periods were 11.5% and 9.2%, respectively. The corresponding figures at the second reactor retest for herds which passed their first reactor retest were 4.9% and 2.9%. Neither of these differences were statistically significant.

There was a significantly higher risk of disclosure of further reactors at both the first and second reactor retests in herds that had more than one reactor disclosed at the breakdown test compared to those herds where only a single reactor was disclosed (Tables 4 and 5).

[1] For this study, reactors at a breakdown test included (a) those animals identified at the breakdown itself i.e. reactor(s) identified at non-type 4 tests, (b) any reactor identified at type 4 tests which were carried out within 45 days of the breakdown test. These latter consisted of tests on the remainder of herd which had been restricted at type 3 or type 6 tests, and (c) non reactor animals which were found to have tuberculosis at p.m.e. immediately prior to a type 9 test.

Table 3. Number of breakdown tests at which only one reactor was disclosed

County	No. of breakdown tests	Number with one reactor only
Donegal	253	175 (69.2)*
Kerry	394	245 (62.2)
Roscommon	432	282 (65.3)
Total	1079	702 (65.1)

* percent

Table 4. Number of herds with reactors at the first reactor retest, categorised by the number of reactor animals at the breakdown test

Number of reactors at breakdown test	Number of first reactor retests	Number at which reactors were disclosed
1	702	51 (7.3)*
>1	377	63 (16.7)
Total	1079	114 (10.6)

* percent P < 0.001

Of the 20 herds which disclosed reactors at the second reactor retest following the disclosure of a single reactor at the breakdown test, 12 (60%) again contained singletons, 7 contained 2 reactor animals, and one herd had three reactors at the second reactor retest.

Comparable differences were observed when the analysis was confined to those herds which had no animals with lesions at the breakdown test.

5. The association between skin measurements at the breakdown test and the disclosure of reactors at the second reactor retest in herds which had passed their first reactor retest

There was no association between the size of the skin measurements at the breakdown test and further disclosure of reactors at the second reactor retest in herds that had passed their first reactor retest.

Table 5. Number of herds with reactors at the second reactor retest having passed the first reactor retest, categorised by the number of reactor animals at the breakdown test

Number of reactors at breakdown test	Number of second reactor retests	Number at which reactors were disclosed
1	651	20 (3.1)*
>1	314	17 (5.4)
Total	965	37 (3.8)

* percent P = 0.08

6. The association between the interval since a previous breakdown in the herd and the disclosure of reactors at the second reactor retest in herds which had passed their first reactor retest

There appeared to be a relationship between the breakdown rate at the second reactor retest and the interval since a previous restriction in the herd (Table 6). However it was difficult to measure this relationship statistically because of the small number of herds which had previous breakdowns. Overall, 8.0% of the herds had been restricted in the previous year, and 20.2% had been restricted in the preceding five years.

7. The association between restrictions in contiguous herds and the disclosure of reactors at the second reactor retest in herds which had passed their first reactor retest

There was no association between the disclosure of reactors in a herd at the second reactor retest and the fact that contiguous herds were restricted immediately before or after the herd under study. Overall, 249 (44%) of the herds in the study were contiguous to one or more restricted herds.

Table 6. Number of herds with reactors at the second reactor retest, having passed the first reactor retest, categorised by the interval to the previous restriction

Number of months to previous breakdown	Number of second reactor retests	Number at which reactors were disclosed
12 or less	45	3 (6.7)*
24 or less	76	4 (5.3)
36 or less	99	5 (5.1)
60 or less	113	5 (4.4)
Overall	560	17 (3.0)

* percent

8. The association between the location of breakdown herds in blackspot areas and the disclosure of reactors at the second reactor retest in herds which had passed their first reactor retest

There was no association between the disclosure of reactors in a herd at the second reactor retest and being located in a blackspot area. Overall, 134 (24%) of the herds were located in blackspots.

9. The association between the disclosure of animals with lesions at the breakdown test and the disclosure of reactors at the first or second reactor retest

A total of 427 (40%) of the 1079 herds had one or more lesioned animals at the breakdown test. There was no statistical association between the finding of a lesion at the breakdown test and the disclosure of further reactors at the first or second reactor retest. This finding applied equally to breakdowns where there was more than one reactor animal at the breakdown test and to breakdowns where only one animal was identified at the breakdown test.

Discussion

The objective of the study was to compare a number of working definitions that could be used to derestrict herds after one clear reactor retest, in unconfirmed breakdowns.

Overall, the breakdown rate at the second reactor retest was very low. Only 3.8% of the herds which passed their first reactor retest had reactors at the subsequent test.

A number of possible definitions, in order of increasing severity, are presented in Table 7.

The least severe definition of an unconfirmed breakdown was that (i) there were no animals with lesions at the breakdown test and, (ii) that no further reactors were disclosed at the first reactor retest. Fifty five percent of the herds which were restricted in 1990 qualified under this definition and the breakdown rate in these herds at the second reactor retest was 3.2%.

Because this initial breakdown rate was so low, increasing the severity of the conditions did not give rise to a marked decrease in the reactor disclosure rate at the second reactor retest. The breakdown rate could be marginally decreased by confining the definition to breakdowns where only one reactor animal was identified at the breakdown test (See Definition 2) and to herds which did not have a previous breakdown within 12 months. When these two conditions were added, 38% of the breakdowns studied qualified and the breakdown rate at the second reactor retest was 2.5% (See Definition 3).

None of the other criteria led to a significant improvement in the breakdown rate at the second reactor retest. However, some of them, if included, led to a significant decrease in the number of breakdowns within the definition. The results showed that, for example, 44% of the herds were contiguous to one or more restricted herds; if this condition was included in a definition, the total number of herds that qualified fell to 22% of the total breakdowns (See Definition 4), but there was no decrease in the breakdown rate.

There was no statistical association between the disclosure of one or more animals with lesions at the breakdown test and the disclosure of reactors at the second reactor retest. Thus, if the selection of herds was based solely on subsequent risk, herds which contained animals with lesions should not be automatically excluded.

There were no further reactors identified following the initial breakdown test in 86% of the herds, indicating that the tuberculin test was very effective in eliminating overt infection. This finding suggests that point source infection was the most common method of transmission in these breakdowns and that early intervention had been effective in their control.

Table 7. Definitions of unconfirmed breakdowns

Definition 1

Conditions

1. No animals with lesions at the breakdown test
2. No reactors at the first reactor retest

Results

Number of breakdowns that would qualify	589 (55%)
Number with reactors at the second reactor retest	19 (3.2%)

Definition 2

Conditions
Both conditions from definition 1 and, in addition

3. Only one reactor animal at the breakdown test

Results

Number of breakdowns that would qualify	443 (41%)
Number with reactors at the second reactor retest	13 (2.9%)

Definition 3

Conditions
All conditions from definition 2 and, in addition

4. No breakdown in the herd in the previous 12 months

Results

Number of breakdowns that would qualify	407 (38%)
Number with reactors at the second reactor retest	10 (2.5%)

Definition 4

Conditions
All conditions from definition 3 and, in addition

5. None of the contiguous herds restricted immediately prior or subsequent to the herd under study

Results

Number of breakdowns that would qualify	235 (22%)
Number with reactors at the second reactor retest	6 (2.6%)