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Cattle Manure and the Spread of Bovine Tuberculosis

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Introduction

The Tuberculosis Investigation Unit is examining the possible role of farm husbandry practices, including farm waste management, in the occurrence of Tb in cattle. The purpose of this project is to establish if manure/slurry from a restricted herd could constitute a risk and if so to examine methods of reducing the risk.

Literature review

The microorganism which causes bovine Tb, *Mycobacterium bovis*, may be excreted in the faeces of infected cattle. In the past, inwintered cattle were generally fed hay in houses liberally bedded with straw. This resulted in high dry matter solid manure which composted with a significant rise in temperature (60-70°C) and resulted in a rapid die off of bacteria. This type of solid manure was considered free of bacteria after 3 weeks composting and therefore was not regarded as a serious source of Tb. In more recent times, two changes in winter-housing cattle appear to have increased the disease risk associated with cattle manure:-

- a. Silage is the main roughage fed to inwintered cattle generally and this together with the use of reduced levels of straw in straw bedded housing results in solid manure having a higher moisture content. Anaerobic conditions can develop in this type of solid manure which may not compost and increase in temperature as quickly, resulting in a longer survival time for bacteria - 10 weeks to 6 months. However, since solid manure is generally stored from the time cattle leave the shed in the spring until the following autumn (6-8 months) before land application, it does not appear to constitute a serious disease risk.
- b. In many cases cattle manure is stored in the form of liquid slurry, i.e. faeces + urine + water. *Mycobacterium bovis* can survive for 6 months in slurry in climatic conditions similar to those in Ireland. Slurry with less

than 6 months storage time is frequently land spread on Irish farms. Cattle have contracted Tb after grazing recently experimentally contaminated grassland and a risk exists for cattle grazing grass shortly after the application of slurry from restricted herds. Furthermore, droplets sufficiently small to be inhaled are produced and can drift for a considerable distance when slurry is landspread in the form of a spray. In Ireland slurry is generally spread by tanker with a splash plate spreading mechanism. This produces a spray which may create a health risk for cattle in neighbouring farms also as well as people in the vicinity. For this reason, the management of manure/slurry on restricted farms is strictly controlled in some countries e.g. disinfection of slurry is mandatory in Germany. The regulation which applies to Tb restricted farms in Ireland stipulates that "manure" must be (1) disinfected before removal from cattle housing (2) stored for at least 2 months and (3) must not be spread on grazing land at all.

Research Projects

Two projects have been carried out at Johnstown Castle, in conjunction with Teagasc and the Faculty of Veterinary Medicine, U.C.D.

Project 1: (a) to measure the extent of the dispersal of bacteria contained in slurry while spreading slurry (b) to compare the distance bacteria in slurry are dispersed using the 5 different types of slurry spreader available:

1. Shallow injection spreader
2. Band spreader
3. Low trajectory splash plate spreader
4. High trajectory splash plate spreader
5. Raingun

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This involved the seeding of a suitable non-pathogenic marker bacterium, *Serratia rubidaea*, in slurry and the land application of this slurry using the 5 different spreaders. The distance bacteria were dispersed was identified by placing petri dishes containing McConkey agar on the ground at various distances downwind from the slurry tanker. The plates were subsequently collected and incubated and colony counts taken.

Project 2: To evaluate the effects of disinfected slurry on grass growth and silage quality.

This consisted of disinfecting slurry with 2 different products, (a) lime milk and (b) hydrated lime and applying it to grass plots, harvesting the plots for silage approximately 7 weeks later, measuring grass yield, ensiling the grass and analysing silage quality.



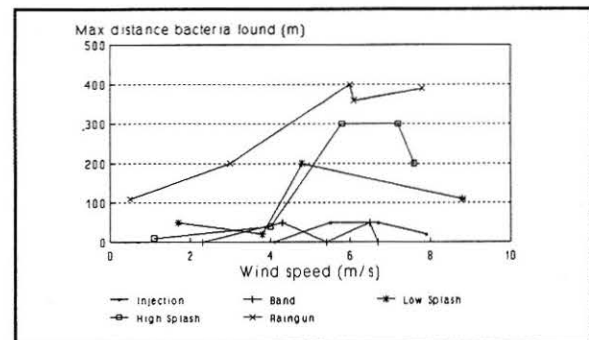
The bandspreader minimises drifting of slurry spray

Results

The data from these projects are being analysed at present and preliminary results indicate the following:

1. There was a correlation between windspeed and the distance bacteria were dispersed by slurry spreaders (Figure 1). Slurry was spread in different weather conditions ranging from calm to very windy.

Figure 1. The effect of wind speed on the maximum distance at which *Serratia* were found



2. There was a large variation in the distance bacteria in slurry were dispersed by different spreaders (Figure 2). The more recently developed spreaders i.e. shallow injection and band spreader machines caused least dispersal, the 2 splash plate methods were quite similar and were responsible for significantly more dispersal while the rain gun method consistently dispersed the bacteria to a much greater extent than all other methods, e.g. up to the maximum point (400m) measured in windy conditions.
3. There was no visual difference between grass plots treated with disinfected slurry and those dressed with ordinary slurry or no slurry at all. Grass yield and silage quality data have not yet been analysed.

Conclusion

Based on the available evidence, manure from Tb restricted herds should be treated as a potential source of Tb and steps should be taken to minimise the risk. The risk can be reduced by each of the following measures:

Slurry

- a. storing for at least 6 months before spreading.
- b. disinfecting with lime before spreading.
- c. spreading the slurry on tillage ground or land closed for silage, using a band or injection type spreader only so as to eliminate/minimise drift
- d. ensuring that contractors' slurry equipment is cleansed and disinfected before moving onto the farm.

Solid manure

Storing for at least 6 months before spreading.

Figure 2. The effect of spreader type on dispersal of bacteria

