Decision Analysis Model for Paratuberculosis Control in Commercial Dairy Herds

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Introduction

Johne's disease (paratuberculosis) control programs involve both herd management changes to limit transmission of *Mycobacterium avium* subspecies *paratuberculosis* infections to calves, as well as testing of adult cattle to detect those that serve as the source of infection. No work has yet been reported on economic optimization, i.e., cost-benefit analysis, of paratuberculosis control programs.

Materials and Methods

Created using Excel® and PrecisionTree® software, the model incorporates costs and benefits of herd management changes, diagnostic testing and different management actions based on test results to control paratuberculosis in commercial dairy herds. This novel "JD-Tree" model includes a herd management decision node (four options), a test/no test decision node (two options), a diagnostic test choice decision node (five options), test result chance nodes (four levels of possible results) and test action decision nodes (three options: cull, manage, no action). The model culminates in a chance node for true infection status. Outcomes are measured as a net cost-benefit value to the producer.

Results

The model demonstrates that improving herd management practices to control infection spread (hygiene) is often more cost-effective than testing; not all herds should test as part of a paratuberculosis control program. For many herds, low-cost tests are more useful than more sensitive, higher-cost tests. The model also indicates that test-positive cows in early stages of infection may be retained in the herd to generate farm income, provided they are managed properly to limit infection transmission.

Significance

JD-Tree is a useful instructional tool, helping bovine practitioners understand the complex interactions affecting the economics of paratuberculosis control and appropriate use of diagnostic tests. This model will help practitioners refine and economically justify paratuberculosis control programs to their clients.