ABSTRACT

The Israel control program for Johne's disease was initiated in 2003. This voluntary program aims to detect infected herds and provide management approaches for the reduction or prevention of herd infection. During 2003 and 2004 88 dairy herds were tested (17400 cows). The mean within herd seroprevalence mean was 2.7% (min 0%, max 9%). Sixty-one percent of the herds were found to be infected with paratuberculosis (54.5% of these had clinical cases in the last 3 years and in 6.5% MAP was isolated from fecal cultures). In 20% of the herds, the infection could not be confirmed despite a more than 0 and up to 4% seropositivity. 19% didn't show any signs of infection (0% seroprevalence without clinical cases). A seroprevalence cutoff of 4% had 95% positive predictive value for the prediction of true infection of the herd (at least one positive culture or clinical case). The relative risk for true infection was 1.84 higher in herds which numbered more than 80 cows (p=0.02), and 1.5 higher in open herds (which purchased cows in the last 5 years) (p=0.021).

Despite the high number of infected herds the in herd serological prevalence do not reach high. Implementing a proper management practices without introducing new cows into the herd and testing with smart selection may result reducing prevalence while maintaining economical and healthy herds.

Keywords: control program, Paratuberculosis, Johne's disease, Israel.

INTRODUCTION

The Israeli dairy industry consists of 1083 dairy herds with 100,000 dairy cows producing 1146 million liters of milk per year. Milk production is planned by quotas. Johne's disease is a well-known and recognized disease in Israel. Its routine diagnosis is based on clinical signs and laboratory tests, primarily fecal smear (acid-fast stained), microscopically examined for mycobacteria and serological (ELISA) tests.

In the past, the primary way of dealing with the disease was culling the clinically affected cows. Little was done to prevent new infections by changing management practices. However, animal trade was controlled by requiring that all cattle moving from one herd to another must be tested for Johne's disease by ELISA in advance. Only seronegative cows are permitted to be moved. The herd prevalence was not taken in consideration when moving individual cows.

In 2003 a voluntary control program was established and dairy farms were asked to participate. The objectives of the program were to evaluate the within and across herd prevalence of Johne's disease nationally. In addition, a risk assessment was completed to develop management practices that would improve biosecurity.

Control program design

The ensuing stages of the program are as follows:

1. Farm risk assessment focused on 5 management practices: maternity pen, colostrum and waste milk usage, suckling replacement calves, weaned replacement calves and replacement strategy (closed or open herd). A mark (0 to 5 scale) was given to each risk area and a total mark calculated to every
Proceedings of 8ICP 2005  Theme 1: Prevention and Control – National Level

management practice. The evaluation of all 88 herds was done by the same person in order to reduce the subjectivity of the evaluation.
2. The herd owner was required to complete a management plan.
3. Whole adult herd testing by ELISA.
4. Fecal samples from ELISA positive cows using Harrold’s media.
5. Herds were classified between 1 and 8 depending on clinical and serological prevalence and fecal cultures as follows (scheme 1)

<table>
<thead>
<tr>
<th></th>
<th>NO</th>
<th>YES</th>
</tr>
</thead>
<tbody>
<tr>
<td>No seropositive cows = class 1, 2 or 3</td>
<td>Herd seroprevalence is 5% or less = class 7</td>
<td></td>
</tr>
<tr>
<td>Seroprevalence 2%&gt; without positive fecal culture = class 4</td>
<td>Herd seroprevalence is over 5% = class 8</td>
<td></td>
</tr>
<tr>
<td>Seroprevalence 2-5% or positive fecal culture ) = class 5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seroprevalence 5%&lt; with or without fecal culture = class 6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Scheme 1 Classification of dairy herds by clinical or serological prevalence or by fecal culture

6. A herd safety mark is calculated (0-100% scale) using the risk assessments results, diagnostic testing results and clinical prevalence.
7. A management program is devised to reduce the risk of infection in herd and from outside sources incorporating these recommendations:
   a. Farms must use a clean dry maternity pen for calving of one cow only at a time.
   b. Colostrum or waste milk from seronegative cows only or milk must be pasteurized or milk replacer must be used.
   c. Different or cleaned tools in the young livestock pens.
   d. Fecal shedders are culled, and seropositive cows are marked and subsequent culling based on milking and other health factors.
   e. Herd replacements may be introduced into the herd only from herds classified at a lower risk of infection than the farm buying and after permission of the "program field coordinator”.

STATISTICAL ANALYSES

The serologic cut-off point for prediction of true infection was analyzed using ROC curve. Management practices were analyzed by chi square.

RESULTS

The results shown here include 88 dairy herds with 17,400 cows evaluated in 2003 and 2004. Herd size averaged 198 cows (minimum 28, maximum 890). Cows were Israeli Holstein in their first to seventh lactations and included both milking and dry cows. "Truly infected herds” were herds defined as containing at least one cow with clinical signs of Johne’s disease or one fecal culture positive cow within the last 5 years. Sixty-one percent of the herds were found
to be "truly infected" with MAP (54.5% with clinical cases and 6.5% with fecal culture (Figure 1). These herds showed positive serologic prevalences ranging from 0 to 8% (Figure 2). Thirty nine percent of the herds were "not confirmed as infected" (20% of these had positive serologic results ranging from 0.2% and 6% of the herd; 19% were seronegative).

![Fig. 1. Johne's disease prevalence by laboratory diagnosis](image1)

![Fig. 2. Seroprevalence in "truly infected herds" with Clinical cases or MAP isolation and "herds not confirmed as infected"](image2)

The ROC curve demonstrated a seroprevalence cutoff of 4% for prediction of true infection of the herd (PPV=95%, NPV=50%).

Three of the risk areas were statistically associated with herd prevalence: herd size, replacement purchase policy and maternity pen management. Herds milking 80 cows or more had a relative risk of being infected that was 1.84 times higher than herds milking fewer cows. \( p=0.02, \text{OR}=1.84 \). Herds that purchased at least one cow in the last 5 years (open herds) had a relative risk 1.5 higher then those that were closed during the same time period \( p=0.02, \text{OR}=1.5 \).

The association between maternity pen practices and true infection of the herd with MAP was not significant statistically. However, herds that used a separate clean and dry maternity pen were more likely to seropositive rates less than 4% of the herd \( p=0.02, \text{OR}=0.7 \).

**DISCUSSION**

Classification of herds with a clinical history of Johne's disease or culture of MAP is a useful method with a minimal risk of misclassification. If serologic results are available, herds may be classified as positive with 95% confidence if the seroprevalence reaches 4% or higher (PPV=95%). Classification of herds with a lower prevalence as "negative" may lead to high proportion of false negative herds (NPV=50%).

The control program's management practices are being adopted by the farmers because they understand the disease and routes of transmission and because diagnostic testing costs have been subsidized.
Even though the connection between some of the management practices and infection with MAP could not be proved (i.e., the association between the practice and prevalence was not statistically significant) the farmers have continued with all aspects of their management programs.

CONCLUSIONS

A large proportion (61%) of Israeli dairy herds are infected with MAP but within herd prevalence remains below 8% even in herds considered to have suboptimal management practices. Implantation of a control program integrating education for management practices (mainly clean maternity pens, separation of adult cows from young livestock and maintaining closed herds), testing (ELISA and fecal culture) and a culling strategy that incorporates the risk of transmission may reduce the number of new MAP infections and preserve economic milk production for the future.