

NYSCHAP Johne's Disease Module, A Program to Change Management of Dairy Farms to Reduce Johne's Disease Prevalence

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Abstract

The objective of this study was to determine the characteristics of farms (herd size, objectives to join, etc.) which participated in the core and Johne's disease (JD) modules of the New York State Cattle Health Assurance Program (NYSCHAP). In addition, we evaluated whether the NYSCHAP JD module was successful in motivating farmers to adopt recommended management practices that limit transmission of enteric diseases, including JD. First, descriptive parameters of farms engaged in the NYSCHAP were determined. Second, adoption of recommended management practices was evaluated in a sub-group of farms.

The average NYSCHAP herd was larger than the average dairy herd in New York state and had higher milk production. Goals for participation in the JD module mentioned most frequently by participants were 1) limit transmission of the disease, 2) become a JD negative herd and 3) gain information and have knowledge to change management on the farm. Most farms (94%) intended to do some kind of herd testing for JD and 83% intended to test 75-100% of their herd. The large number of laboratory tests conducted for each farm showed that completed testing corresponded with intended plans. The average percentage of advised management practices implemented by a sub-group of NYSCHAP herds was 74%. This indicates that the average farm appeared to implement 13 of 17 advised measures. An educational, process-oriented program, such as NYSCHAP, may be a successful way to encourage producers to improve herd health management on farms.

Résumé

L'objectif de cette étude était de déterminer les caractéristiques des fermes (taille du troupeau, objectifs visés, etc.) qui participaient au module principal et au module de la maladie de Johne (JD) tous deux offerts par le programme d'assurance de la santé du bétail de l'état de New York (NYSCHAP). De plus, nous avons évalué si le module de la maladie de Johne (Module JD) encourageait les fermiers à adopter les pratiques de gestion recommandées pour limiter la transmission des maladies entériques incluant la maladie de Johne. Dans un premier temps, les paramètres descriptifs des fermes inscrites au NYSCHAP ont été déterminés. Ensuite, le niveau d'adoption des pratiques de gestion recommandées a été évalué dans un sous-ensemble de fermes.

Le troupeau moyen inscrit au NYSCHAP était plus gros que celui de la ferme laitière moyenne de l'état de New York et avait une production de lait plus élevée. Les buts les plus couramment cités pour participer au Module JD étaient les suivants : 1) limiter la transmission de la maladie, 2) devenir une ferme négative pour cette maladie, et 3) obtenir de l'information et avoir une meilleure connaissance permettant de changer les pratiques de gestion à la ferme. La plupart des fermes (94%) comptaient tester le troupeau d'une manière ou d'une autre pour la maladie de Johne et 83% des fermes pensaient tester entre 75% et 100% du troupeau. Le grand nombre de tests en laboratoire organisés par chaque ferme montrait que la finalisation des tests faisait partie des plans prévus. Le pourcentage moyen du nombre de pratiques de gestion recommandées

adoptées dans le sous-ensemble de fermes du NYSCHAP était de 74%. Ceci indique que 13 pratiques de gestion sur 17 étaient adoptées par la ferme moyenne. Un programme éducationnel axé sur les procédures, comme le NYSCHAP, peut être un bon moyen pour encourager les producteurs à améliorer la gestion de la santé du troupeau à la ferme.

Introduction

Control and/or eventual elimination of Johne's disease (JD) from dairy herds can only be done by adopting stringent management measures that prevent spread of the disease within and among herds.^{4,9} The New York State Cattle Health Assurance Program (NYSCHAP) was developed to provide quality assurance and biosecurity programs to NYS cattle herds.^{6,11} Public concern about the possible relationship between JD (caused by *Mycobacterium avium* subsp. *paratuberculosis* and also known as paratuberculosis) in cattle and Crohn's disease in humans increases the importance of programs to control and/or eliminate JD.⁵ Dairy herds are the primary target group, but a small number of beef herds have also joined this program.

The NYSCHAP consists of a core module that evaluates basic management practices addressing biosecurity and general herd health, and specific modules for control of JD, salmonella, mastitis, bovine leukosis virus and bovine virus diarrhoea. The program is implemented by a team consisting of a state field veterinarian, the farm's attending veterinarian, the producer, farm managers and other key advisors. All farms are enrolled in the core module and, of all enrolled farms, 90% participate in the JD module. On farms that participate in the NYSCHAP a baseline survey is used to collect demographic data, information on farm goals, health issues and resources. Management data and diagnostic test data are reviewed and collected. A risk assessment of the farms is performed, resulting in a written herd plan with farm-specific recommendations for management changes accounting for the farm's goals, resources and priorities. Annual reviews are performed to evaluate whether suggested management changes have been implemented and which changes still need to be made.

During the annual review, state veterinarians recorded their impressions of management changes implemented during the previous year. Their impressions were based on direct observations of the state veterinarian or on information provided by the farmer or farm employees. Reviews differed among veterinarians because of differing ways to evaluate management progress on farms. The data also differed over time because the original forms used for the reviews were modified.

The NY state government strongly encourages NYSCHAP and finances this program. The success of a management program, such as NYSCHAP, is best quantified by decreased prevalence of disease or increased pro-

ductivity in participating herds compared with non-participants. For JD, however, this is not feasible in the short term because the incubation period of 2 to 10 years is very long, and thus management changes take years to produce results.¹² In addition, prevalence estimates for JD are not very accurate because tests have a low sensitivity.^{1,2} Our study examined whether farmers adopted the recommended best management practices to reduce the risks of JD transmission in their herds, providing an initial estimate of a management program's success.

The first objective of this study was to describe the type of farms engaged in the NYSCHAP. We evaluated a number of herd parameters, goals and the intended testing regime for JD. The study provides a description of participating herds and suggestions for program improvement. The second objective was to investigate adoption of recommended best management practices in a sub-group of farms in the NYSCHAP JD module. We looked at management measures that were either implemented or not implemented. Results should suggest whether a process-oriented program, such as NYSCHAP, can improve Johne's risk management on dairy farms.

Materials and Methods

General data for NYSCHAP participants

Data were collected from 426 NYSCHAP baseline surveys, herd plans and diagnostic laboratory herd test strategy forms available in the New York State Animal Health Diagnostic Laboratory (NYS AHDL) at Cornell University. Of the twenty variables examined, not all were recorded on all forms. A database was created in the statistical program SPSS 11.0 to perform aggregated statistical analyses on the data. All data were labeled with a farm identification code to ensure privacy. The twenty variables that were examined are presented in Table 1. When more than one answer was given in an open question (e.g., what are your goals?), only the first answer was recorded in the database.

Figures on herd size and production are shown in Tables 2 and 3. Data from New York Agricultural Statistics⁷ are compared with data of NYSCHAP farms.

There are several testing strategies used in the program to support Johne's management and farm goals in a herd. Tests generally used in commercial herds are serology, fecal culture, or a combination of these tests. The farmer can test all cows or a sub-group of cows, and can test at one point in time or several times per year (e.g., yearly whole-herd test or monthly rolling herd tests of mid-gestational or dry cows). The testing strategy and choice of tests is selected to best meet the resources and needs of the specific herd.

Implementation of management

We investigated a sub-group of 30 farms that joined the NYSCHAP JD module between January 1998 and

Table 1. Collected variables retrieved from enrollment and review documents.

Table 2. Number of adult cows in NYSCHAP herd.

Variable	Frequency	Percent
< 100 cows	113	42
100-400 cows	110	40
> 400 cows	49	18
Total no. herds	272	100

Table 3. Current NYSCHAP herd milk production per cow per year.

Variable	Frequency	Percent
< 15,000 lb	9	6
15,000-20,000 lb	41	26
20,000-25,000 lb	86	55
> 25,000 lb	21	13
Total no. herds	157	100

May 1999. The number of farms was limited because we included only reviews conducted by two state veterinarians (P. Leids and L. Denney) to ensure comparable results. Adoption of recommended management practices was based either on direct observations of the state veterinarian or on information provided by the farmer or farm employees. Annual reviews were stored at the NYS Department of Agriculture and Markets in Albany and used for analysis. All 30 farms had at least one annual review, completed 12 months after the first recom-

mendations were given. Twelve farms had two annual reviews and four farms had three annual reviews; they had participated for 3 and 4 years, respectively. Incomplete or non-readable data were defined as missing. The data were entered in an SPSS database to perform statistical analyses. Only the 1999 reviews were used in these analyses to prevent multiple observations from the same farm.

ELISA test data from individual cows on 30 farms from May 1999 to March 2001 were obtained from the database of the NYS AHDL. When a group of animals was chosen, specific tests to use were selected, and the stage in the production cycle to collect samples was determined. The NYS AHDL at Cornell University uses a kinetics ELISA (KELA) test with a protoplasmic antigen, which is carried out in a standard indirect ELISA protocol, using peroxidase bound to a monoclonal antibody specific for protein IgG1 (M-23) as the conjugate.⁸ In low-prevalence herds, a kinetic ELISA test is fast, but less sensitive and specific compared with fecal culture.² The fecal culture was carried out at the NYS AHDL using the double incubation and centrifugation technique with solid HEYM.¹³ Fecal culture takes up to 12 weeks for results and is more expensive than KELA.¹⁵

Results

Global Overview of NYSCHAP Participants

General data for NYSCHAP participants

The average number of adult cows in NYSCHAP herds was 264, compared to an average number of 86 milking cows for NYS. Average milk production per cow per year in NYS is 17,376 lb (7,898 kg);⁸ NYSCHAP farms produced an average of 21,688 lb (9,858 kg). Thus, NYSCHAP herds were larger and produced more milk than the average herd in NYS.

Goals of participants

The three goals mentioned most were 1) limit transmission of disease (29%), 2) become a JD negative herd (27%) and 3) gain information and have knowledge to change management on the farm (20%) (Figure 1).

Intended test strategy

Most of the farmers (94%, n=308) intended to do partial-herd or complete-herd testing for JD. The intended test strategy was not clearly defined for all farms, but testing of certain sub-groups of cows was the strategy mentioned most. The group of cows selected for testing varied among farms (Figure 2).

A majority of herd owners (71%) intended to use a combination of fecal culture and serum ELISA (KELA) on subsets of cows within the herd (Table 4).

Some 83% of participating herd owners wanted to test 75-100% of their herd. Data on intended test strategy of all NYSCHAP farms were compared with data

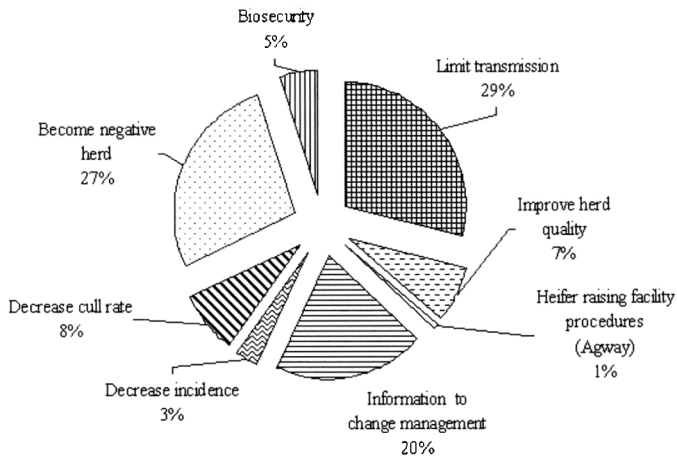


Figure 1. Goals of participants in the NYSCHAP Johne's disease module (n=348).

from the NYS AHDL on samples received during past years from the 30 farms. Three of the 30 farms did not do any testing. Nearly 86% of the testing on the remaining 27 farms was done using the KELA test; 56% of the farms (15) tested large numbers of cows and 44% of farms (12) tested only small numbers of cows with the KELA test. Eleven farms (41%) tested from 8 to 559 cows using fecal culture. On farms that utilized fecal culture, 23% of cows tested for JD were tested (range 1.4 to 42%). Moreover, one of the farms (4%) tested using fecal culture only, 8 farms (30%) tested small numbers of cows using fecal culture, and 8 farms (30%) did not utilize fecal culture. Both KELA tests and fecal culture were used by 63% of farms. On average, 9% of cows in the complete dataset were tested in parallel with KELA and fecal culture or had a follow-up fecal culture after a positive KELA result.

Adoption of Management Practices

From an average 17 management changes advised for each farm in 1999, 13 (74%) were implemented. In other words, the average farm attempted to incorporate 13 of 17 recommended management measures. Figure 3 shows management changes fully implemented as a percentage of the total suggested management changes in the herd plan, following the reviews of 1999.

Figure 4 illustrates how different management measures were handled after a farmer was advised to change them, and shows the management measures most likely to be implemented and those more difficult to achieve.

A ranking of advised management measures is defined in Table 5. Also shown are changes advised, but not reviewed after one year.

Discussion

Studies show that management is essential to reduce JD prevalence on dairy farms.⁴ Furthermore,

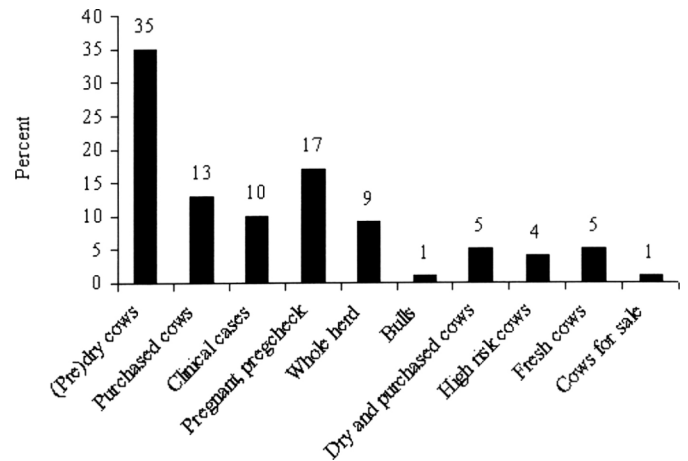


Figure 2. Reasons groups of cows were selected to be tested for Johne's disease (n=100).

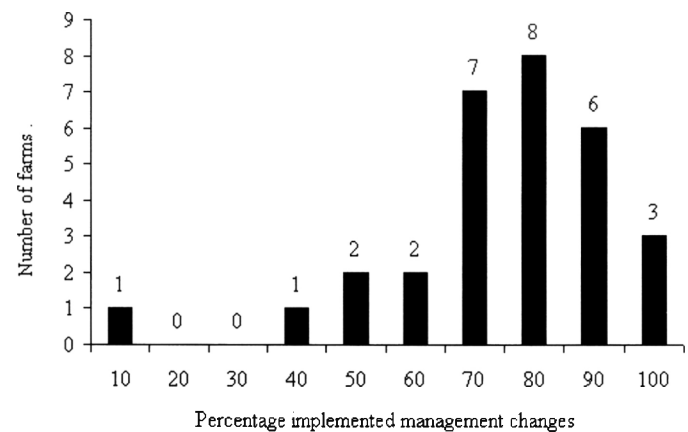


Figure 3. Percent of implemented management changes on a sub-group of 30 NYSCHAP herds, reviews 1999.

knowledge about JD management is low.¹⁴ The NYSCHAP JD module is a program developed to encourage dairy farms to adopt best management practices to address JD transmission risks. Often first adopters are quick to enter management programs like this. On average, enrolled herds had higher production and were larger herds than the NY state average.

The outcomes are valid for the investigated NYS dairy herds but we must exercise caution extrapolating the study findings. In these herds, implementation rate of management measures appeared to be high. However, impressions of management changes were subjective, were not collected in a standardized fashion, and the rate of adoption may be slightly overestimated when based on producer observations. In cooperation with the herd veterinarian and the state veterinarian, the farmer can prioritize test strategies and management changes according to established goals, farm resources and identified risks. Goals to participate in the NYSCHAP JD module differed from farm to farm. For 20% of farmers, the most important reason to join the NYSCHAP JD

Table 4. Intended test procedure and groups for JD testing in 252 NYSCHAP herds.

Intended test procedure	Intended test group			
	Whole herd on 1 occasion (%)	Groups (%)	Sporadic (%)	Total (%)
KELA only	4.8	18.2	2.0	25.0
Fecal culture only	1.2	2.4	0.4	4.0
KELA and fecal culture	21.8	42.9	6.3	71.0
Total (%)	27.8	63.5	8.7	100.0

Subsidized testing fees for NYSCHAP herds is \$3.00 for each KELA test and \$7.00 for a fecal culture (US dollars).

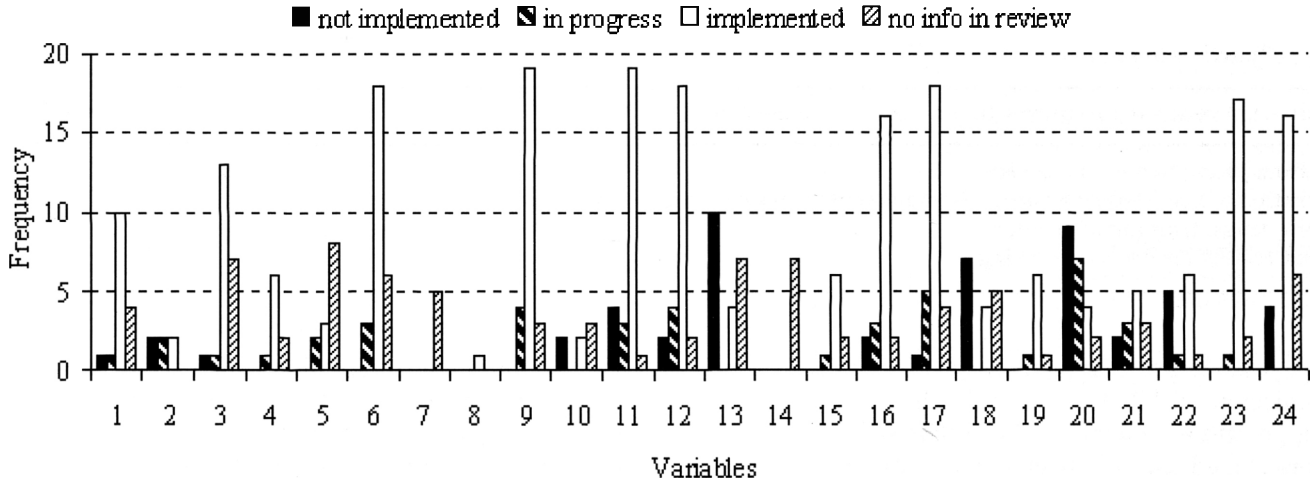


Figure 4. Level of implementation for each management variable for a sub-group of 30 NYSCHAP herds, reviews 1999.

Legend management variables:

1. Staff meetings, training of personnel
2. Standard operating procedures
3. Cooperation of herd veterinarian with implementation and review of herd plan
4. Record keeping regarding Johne's disease
5. Work from young to older animals
6. Clean boots, personnel, equipment, stalls in calf area
7. Veal calves outside / separate
8. Try to raise replacements at farm, closed farming system
9. Avoid manure contamination, keep manure buildup to a minimum
10. No manure on pasture, no animals on possibly infected pasture
11. Designated separate clean and dry calving area
12. Remove calf from maternity pen as soon as possible
13. One animal in each calving pen
14. Clean udder and teats of cows before calving
15. Minimize calf contacts and exposure to other cows
16. Feed calves milk replacer
17. Feeding calves colostrum from cows with a low ELISA value or from likely negative cows
18. Identify likely positive animals
19. No refusal feed to heifers
20. Segregate age groups, specifically young heifers separated by solid panels, separate sick cows
21. Avoid overcrowding in sheds
22. Testing of purchased animals
23. Cull (suspected) clinical cases
24. Use test results for decision making

Table 5. Ranking of management variables in three different groups (percentage is calculated as percentage of the total of answers given on a variable advised in herd plan).

Management measures most often implemented	n	% implemented
Cull (suspected) clinical cases	17	48
Avoid manure contamination, keep manure buildup to a minimum	19	44
Designated separate clean and dry calving area	19	41
Feed calves milk replacer	16	38
Management measures least often implemented	n	% not implemented
One animal in each calving pen	10	85
ID likely positive animals	7	73
Segregate age groups, young heifers separated by solid panels, separate sick cows	9	70
Testing of purchased animals	5	70
Measures not returning in review though advised in herd plan	n	% not reviewed
Work from young to older animals	8	62
Cooperation of herd veterinarian with implementation and review of herd plan	7	32
Staff meetings, training of personnel	4	25
Use test results for decision making	6	23

module was to get management information to limit transmission of JD (Figure 1). With the information exchange that accompanies the NYSCHAP JD module, farmers can educate their employees and other professionals that work on or visit the farm. A program such as the NYSCHAP JD module can improve communications among farmers, employees, herd veterinarians and state veterinarians about training and cooperation. Improved communication was often mentioned as an important management practice, but in the review it often was not clearly defined as to how communication might be improved (Table 5).

The intended testing strategy was available for most farms. Eighty-three percent had intended to test at least 75% of their herd. The actual amount of testing was obtained for 30 farms, but unfortunately the data on herd size was only available for 5 of the 30 farms. However, the large number of tests per farm showed that actual rate of testing seemed to correspond with intended plans, which was confirmed by personal communication with state veterinarians. Seventy-one percent of the herds intended to test cows with both the KELA test and fecal culture, which was slightly higher than the observed testing approach which showed that 63% of farms used both tests. Most cows, however, were tested with KELA only (86%) despite program recommendations to follow serology with confirmation by culture for individual animal management decisions. At the time of this study, Johne's testing was unsubsidized and the use of fecal culture was limited because of limited laboratory resources and capacity to support fecal culture.

We could not distinguish which group of cows was actually tested, but most farmers intended to test (pre) dry cows (Figure 2). Thirty-five percent of the farmers intended to test during or just before the dry period, which is related to decisions making about colostrum management of tested cows. The KELA test can be completed within a few days, and is therefore the most logical test to use for dry cows. In comparison, fecal culture takes at least 6 weeks to complete, which may be too late to complete before calving. Costs of tests, test turn-around time for culture results, and the inaccuracy of interpreting ELISA results on individual cows were previously thought to be constraining factors for use of testing by veterinarians working with the NYSCHAP JD module. With 83% of the farmers intending to test 75-100% of their herd, it appears farmers are willing to make this effort. However, the greatest benefit of the NYSCHAP JD module is expected to be improved management to limit JD transmission.

On average, farms appeared to adopt 74% of all management suggestions. By enrolling in the NYSCHAP JD module, farms were given a herd-specific plan with prioritized intervention strategies to limit the risk of JD transmission on their farm. Although we could not compare these results with management of non-participant farms in NYS, general perception is that NYSCHAP-participant herds are more likely to change their management.

When compared with studies of compliance to best management practices in Australia,¹⁶ the Netherlands,¹⁰ and in other US dairies,⁷ farms that participated in NYSCHAP JD module seemed to comply well with the program. For example, in the Netherlands 12% of farm-

ers used clean boots in calf facilities compared to 67% of the NYSCHAP herds (Figure 4, variable 6). Fifty-four percent of farms in the Netherlands removed calves from calving pens as soon as possible (Figure 4, variable 12), while 69% of NYSCHAP herds had adopted this practice. In the Netherlands 24% of farms fed calves milk replacer compared to 70% of NYSCHAP herds (Figure 4, variable 16).¹⁰ We also determined management changes that were least likely to be implemented, such as testing of pre-purchased animals, or at least having some information about the herd of origin, which is important to limit introduction of JD onto a farm (Table 5). Although, the NYSCHAP JD module emphasized the risk of purchased animals for transmission of JD among herds, few farmers tested purchased animals for JD. The reasons for purchasing untested animals may be the shortage of replacements and age of replacements combined with a lack of accuracy of Johne's tests in individual animals, which made pre-testing impractical.

The NYSCHAP could be better validated if a database is established from which different variables could be derived. To gather these data, everyone involved must be well informed about the purpose of collecting this information and enrollment forms should be very clear. Subsequent studies on NYSCHAP JD module achievements should focus on technical results of participating NYSCHAP farms in relation to compliance to best management practices, compared to non-participating farms. Reduced JD prevalence among heifers on NYSCHAP farms is one of the first variables that could be determined to measure the effectiveness of the NYSCHAP JD module for reducing JD transmission. Moreover, it would be interesting to look at test results over an extended time period because this could show a relationship between management changes and JD prevalence at the farm level. A management program can only be successful when farmers are satisfied with it. The cooperation of farmers and their veterinarians is of significant value to the success of NYSCHAP and is fostered by the program's team approach.

Conclusions

Results of this study gave a good measure of management changes that occurred on NYSCHAP farms. Programs such as NYSCHAP are designed to improve the health of dairy herds by promoting implementation of better health management practices on farms. Possible drawbacks are cost, and maintaining uniformity of subjective herd assessment when more farmers enroll and more veterinarians are involved. A program such as the NYSCHAP JD module can create improved communication between farmers, employees, herd veterinarians and state veterinarians, and may be successful in changing management practices in herds to limit transmission of JD.

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