Assisting Dairies in Mastitis Culturing On-farm

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Abstract

An on-farm milk culturing program can generate useful information that may be used to facilitate treatment decisions that reduce farm expenses. Prior to beginning an on-farm milk culturing program, detailed protocols must be developed that include information about which cows will have milk samples collected and cultured, milk culturing procedures, and how culture results will be used in therapeutic decision-making. Because many milk cultures result in the growth of no pathogens or gram-negative pathogens, and many farms elect not to treat such cases, a milk culturing program can result in reduced expenses associated with treatment of mastitis. Discontinuation of on-farm culture programs is common; in order to increase the likelihood of success of the program, procedures must be clear and simple, the program must be beneficial to the farm, and the farm staff in charge of the program must be interested in mastitis microbiology and have time to perform related duties. In addition, the limitations of on-farm culture must be understood and accepted; it is not equivalent to milk culture performed at a diagnostic microbiological laboratory. Proper farm and personnel selection, comprehensive protocols, simple procedures, and proper utilization of culture results will help increase the likelihood of success of an on-farm culture program.

Résumé

Un programme de culture de lait à la ferme peut générer de l'information utile pouvant être utilisée pour faire des choix de traitement qui réduisent les dépenses à la ferme. Avant d'entamer un programme de culture de lait à la ferme, des protocoles détaillés doivent être développés permettant d'une part de choisir les vaches dont des échantillons de lait seront prélevés et mis en culture et les procédures de culture du lait, et établissant d'autre part un lien entre les résultats de culture et les choix de thérapie. Parce que plusieurs cultures de lait ne montrent aucune croissance de pathogènes ou de pathogènes à Gram négatif, et que plusieurs fermes choisissent de ne pas traiter ces cas, un programme de culture de lait à la ferme peut réduire les coûts associés au traitement de la mammite. L'arrêt des programmes de culture de lait à la ferme est courant; afin d'accroître les chances de succès du programme, les procédures doivent être claires et simples, le programme doit être bénéfique pour la ferme et les employés de la ferme en charge du programme doivent montrer un intérêt pour la microbiologie de la mammite et avoir le temps de faire les tâches rattachées. Il faut aussi reconnaître et accepter les limites de la culture à la ferme; elle n'est pas l'équivalent de la culture de lait faite par l'entremise d'un laboratoire d'analyses microbiologiques. Le choix judicieux du personnel et de la ferme, des protocoles complets, des procédures simples et l'utilisation adéquate des résultats de culture permettront d'accroître les chances de succès du programme de culture de lait à la ferme.

Introduction

Over the last 10 years, microbial culture of milk, performed on the dairy, has been discussed and investigated as a method of rapidly obtaining information that may be used to facilitate treatment decisions that reduce farm expenses. When undertaken with reasonable expectations, an understanding of the limitations of the process, and commitment to training and execution, on-farm milk culture may become a useful tool on some dairy farms.

Getting Started

If you would like to help a dairy develop an on-farm milk culture program, there are several needs that must be met to ensure success:

1. The mastitis pathogens on the farm must have the potential for adequate control and treatment using on-farm tools. Herds in which *Mycoplasma* species or *Streptococcus agalactiae* are present are better managed using laboratory methods. Depending on the prevalence, *Staphylococcus aureus* may also be better addressed using a diagnostic laboratory.
2. There **must** be a person on the farm with an interest in mastitis microbiology, a commitment to learning milk culture techniques, and adequate time to devote to the milk culturing program.
3. The veterinarian or other trainer must commit the time necessary to help the on-farm staff learn and master the process.
4. Detailed protocols **must** be developed for case selection, culture procedure, and how culture results will be recorded and used in decision-making. Items to be determined and recorded in protocols include:

a. Definition of a case to be cultured. Will this include subclinical cases or only clinical cases? If subclinical cases are to be cultured, how will they be selected? CMT? SCC? When? For clinical cases, will they all be cultured, or only mild-to-moderate cases? What about chronic cases?
b. What will be done with cows while culture results are pending?
c. Which cows will be treated, and with what drug? Will only gram-positive cultures result in treatment, or will gram-negative cases also be treated?
d. How will cultures be evaluated for the presence of a causative pathogen? How many bacterial colonies on a plate are considered significant? What is the definition of a contaminated sample? Will contaminated samples be re-collected and re-cultured?
e. How will treatment outcomes be evaluated? Will CMT, SCC or clinical signs be rechecked after a certain amount of time? If so, when? What will be done about treatment failures or reoccurrences of mastitis?
f. What kind of quality control procedures will be in place to check that information obtained by the on-farm culturing program is accurate?
g. What kind of equipment, workspace, and time commitment will the person in charge of the program need? How will this be determined?

During the development of an on-farm mastitis microbiology program, the veterinarian can be especially helpful in identifying the many decisions that should be made ahead of time and facilitating the design of protocols for diagnosis, culture, and treatment that are simple, understandable, and appropriate to the farm.

The duration of on-farm culturing programs is often brief; a survey in the midwest in the early 00s found that, of 81 surveyed farms that had purchased an on-farm system for bacteriologic culture in the previous 2.5 years, 26 of the farms (32%) had apparently discontinued milk culturing.[2]

Because of the high risk of discontinuation, it is best to begin with a simple protocol and a clear understanding of the objectives and limitations of the program. Split agar gel plates with three or four different types of agar are available, but it is probably easiest to start with a bi-plate that has either blood agar (grows most bacteria and yeast) or factor medium (gram-positive selective) on one side and MacConkey's agar (gram-negative selective) on the other side. The function of plates in differentiating gram-positive and gram-negative pathogens is easily understood and easily related to the choice of drug treatment based on spectrum of activity. Because it is typical for about 25-30% of milk cultures from clinical cases of mastitis to yield no pathogen growth, even a moderately sized farm may realize some savings from this very simple approach if cases of no pathogen growth are not treated with drugs.[2,3] In addition, many farms choose not to treat cases with gram-negative pathogens isolated; this approach may cut the number of cows treated by about half.[1,2]

If the microbiological procedures can be done in a room with a relatively stable temperature, cultures may be incubated in a styrofoam egg incubator, which is inexpensive and readily available. After incubation is complete, agar gel plates may be saved in the refrigerator so that results recorded by farm personnel for each plate may be reviewed by the veterinarian or other trainer. Colonized plates may be taped shut and sent to a diagnostic lab if definitive organism identification is desired. In addition, milk samples may be frozen and those that yield uncertain results or treatment failures may be sent to a diagnostic laboratory for further investigation. It is good practice to periodically send some milk samples to the diagnostic laboratory for validation of on-farm findings. Further identification of pathogens can also help in the design of strategies for mastitis prevention.

Once the on-farm laboratory is up and running, upgrades to a purpose-built incubator (used ones can be bought online) or culturing systems more complex than the two-gel plates may be considered, but the program should initially be kept simple to maximize the likelihood of success and increase the confidence of the person executing the program.

There are a number of websites that contain useful details regarding the specifics of culturing procedures and interpretation guidelines. Michigan State University has one such site at http://user.cvm.msu.edu/~sears/isolation.htm

An Alternative Approach

Another approach for the veterinarian is to start a small mastitis microbiology lab in the veterinary clinic. A veterinary technician or veterinarian is apt to require less training and practice to master the techniques and knowledge involved, particularly if the clinic serves numerous farms and a steady flow of samples can be provided. In addition, a veterinary technician or other clinic employee may be made available to travel to the farm to pick up samples or even collect milk samples from designated cows. One pitfall that must be avoided in the clinic laboratory is the development of overconfidence on the part of the clinic staff; I have watched with consternation as a technician went through a stack of plates, announcing the genus or species of bacteria on each one based solely on the morphology of the colonies on blood agar gel. This must be avoided.

It is important to remember the limitations of on-farm or in-clinic culture. Useful results can be obtained; it has been suggested that positive and negative predictive values of such programs are about 80%.[4] Nevertheless, a lab that does not have the equipment and personnel associated with a veterinary diagnostic microbiological laboratory must not be expected to function in the same capacity. On-farm or in-clinic laboratories are a great screening tool when used correctly.

Conclusion

A simple on-farm milk culturing program can generate useful information, provided that staff commitment, well-written protocols, quality control measures, and an understanding of the limitations of the on-farm approach are in place. In such cases, the veterinarian or veterinary clinic can help the farm develop microbial milk culturing into a tool that provides information to reduce the cost of mastitis treatment and make informed decisions about management and prevention of mastitis. Proper farm selection, comprehensive protocols, and simple procedures will help increase the likelihood of success of an on-farm culture program.

References

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