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Survey of Factors Associated With Milk Quality Underway

The outcomes of mastitis — lower milk production and reduced quality milk — are affecting the sustainability of the southeastern dairy industry and the Southeast Quality Milk Initiative (SQMI), a USDA-funded project that aims to help dairy farmers throughout the region control mastitis and lower bulk tank SCC through cost-effective control strategies. The second phase of this study began in late June and focuses on evaluating the milking parlor, housing facilities and cows of 96 farms (approximately 304 farms in total: 96 in both Virginia and Kentucky and 16 in Mississippi). More specifically, the evaluation in the parlor focuses on the function of the milking equipment and the milking routine. The evaluation of the housing facility focuses on the suitability, cleanliness and management of the main housing area for the lactating herd, and the cow-focused portion examines teat end condition, hygiene and incidence of lameness. There is also a farmer survey designed to gather information on the approach to managing and treating mastitis. Participation in the current on-farm evaluation is open to all interested farms in Tennessee. The results of the evaluation will be used to develop recommendations for controlling mastitis and lowering SCC that are effective for the conditions found in the Southeast.

Questions about the SQMI project or participating in the on-farm evaluation can be addressed to your local county Extension agent, or you can contact a member of the evaluation team directly: Peter Krawczel (krawczel@utk.edu; 865-974-8941) or Gina Pighetti (pighetti@utk.edu; 865-974-7297).

The SQMI is a partnership of six universities: Mississippi State University, University of Florida, University of Georgia, University of Kentucky, University of Tennessee and Virginia Tech University.

What Is the FDA Doing?

The U.S. Food and Drug Administration (FDA) is taking action to promote the judicious use of medically important antimicrobial drugs in food animals. The goal of the strategy is to work with industry to protect public health by releasing two documents to help phase out the use of medically important antimicrobials in food animals for production purposes (e.g., to enhance growth or improve feed efficiency) and to bring the therapeutic uses of such drugs (to treat, control or prevent specific diseases) under the oversight of licensed veterinarians.

The first document, "New Animal Drugs and New Animal Drug Combination Products Administered in or on Medicated Feed or Drinking Water of Food-Producing Animals: Recommendations for Drug Sponsors for Voluntarily Aligning Product Use Conditions with GFI" #209 (Guidance #213), provides guidance for drug companies to voluntarily revise the FDA-approved labeled use conditions to (a) remove the use of antimicrobial drugs for production purposes; (b) add, where appropriate, scientifically supported disease treatment, control or prevention uses; and (c) change the marketing status from over-the-counter to veterinary feed directive for drugs administered through feed or to prescription status for drugs administered through water in order to provide for veterinary oversight or consultation.

In order to help phase in veterinary oversight of those drugs that move from OTC to VFD status once changes are made in line with the guidance, the FDA is also releasing a proposed rule for public comment that would update the agency's existing regulations relating to VFD drugs. The use of VFD drugs in feed requires specific authorization by a licensed veterinarian based on procedures outlined in the agency's VFD regulations. The VFD proposed rule is intended to update the existing VFD process to clarify and increase the flexibility of the administrative requirements

for the distribution and use of VFD drugs. Such updates to the VFD process will assist in the transition of OTC products to their new VFD status.

What are antimicrobial drugs and antimicrobial resistance, and what is the difference between an antibiotic and an antimicrobial?

Antimicrobial drugs include all drugs that work against a variety of microorganisms, such as bacteria, viruses, fungi and parasites. An antibiotic drug is effective against bacteria. All antibiotics are antimicrobials, but not all antimicrobials are antibiotics.

Antimicrobial resistance occurs when bacteria or other microbes become resistant to the effects of a drug after being exposed to it. This means that the drug, and similar drugs, will no longer be effective against those microbes.

Antimicrobial resistance is a complex phenomenon with many causes. We know that all uses of antimicrobials, whether in humans or animals, can spur resistance. Sometimes resistance even occurs spontaneously.

What do you mean by "production purposes"?

"Production purposes," as used in the two documents the FDA is releasing, refers to the use of these products with the intent of enhancing growth (to make animals grow faster) or to improve feed efficiency (the animals need less food to gain weight).

What types of drugs are the focus of the FDA's strategy?

This action focuses on antimicrobial drugs that are:

- Medically important drugs (i.e., important for treating human disease);
- Penicillin, tetracycline, erythromycin, cephalosporin, florfenicol;
- Currently FDA-approved to be used for production purposes, such as to enhance growth or improve feed efficiency;
- Available over the counter; and
- Used in the feed or drinking water of food-producing animals.

How can the FDA ensure that animal producers won't use these products the same way they always have, under the guise of "preventing" disease, and why is the involvement of a veterinarian important?

First, once product labeling is voluntarily changed, it will be a violation of the Federal Food, Drug, and Cosmetic Act to use these products in feed for production purposes. In addition, the FDA's regulations on extralabel use do not permit drugs to be used in an extralabel manner for production purposes, whether administered through feed or otherwise, since the regulations do not permit extralabel use for nontherapeutic purposes.

Second, it is important to note that all of the products affected by this plan are currently available as over-the-counter products. A key component of the FDA's plan is to transition these products from their current OTC status to one that will require producers to have a prescription or order from a licensed veterinarian to obtain them. The FDA believes that the judicious use of medically important antimicrobial drugs intended for use in food-producing animals should involve the oversight of licensed veterinarians, given the importance of their scientific and clinical training and knowledge.

In the case of prevention, a veterinarian practicing judicious use principles would consider relevant factors to determine the risk of a specific bacterial disease and whether it would be appropriate in a particular situation to use medically important antimicrobials for prevention purposes. For example, the veterinarian would consider the way the drug acts against the particular bacteria in question, whether it can effectively get to the place of infection, and how long the drug maintains effective levels at the site of infection.

Other important factors veterinarians consider when determining whether a particular drug is appropriate for preventive use include whether (1) there is evidence that the drug will be effective in treating the particular disease, (2) such preventive use is consistent with accepted veterinary practice, (3) the use is intended to address particular bacteria, (4) the use is appropriately targeted to animals at risk of developing a specific disease, and (5) there are no reasonable alternatives for intervention.

For example, a veterinarian may determine based on the client's production practices and history that weaned beef calves arriving at a feedlot in bad weather after a lengthy transport are at risk of developing a bacterial respiratory infection. In this case, the veterinarian might choose to

preventively treat these calves with an antimicrobial approved for prevention of that bacterial infection. On the other hand, the FDA would not consider a judicious use for prevention to be the administration of a drug to apparently healthy animals in the absence of any information that such animals were at risk of obtaining a specific disease.

How will the FDA ensure that animal producers and veterinarians are no longer using the affected medically important antimicrobial drugs for production purposes like growth enhancement or feed efficiency?

The FDA has been working closely with the American Veterinary Medical Association, other veterinary associations and animal producer organizations, as well as holding listening sessions around the country to hear concerns from both producers and veterinarians. Based on this outreach, we are confident that animal producers and veterinarians understand the role that they play in ensuring that these important drugs are used appropriately and judiciously.

By law, drugs administered through feed must be used according to the approved labeling. In addition, the extralabel use of approved drugs in animals by or on the lawful order of licensed veterinarians is limited to situations where the health of an animal is threatened or suffering or death may result from failure to treat.

Therefore, once manufacturers voluntarily make these changes, medically important antimicrobial drugs can no longer be used for production purposes, and their continued use to treat, control or prevent disease in food animals will require an order or prescription from a licensed veterinarian.

What won't change?

Producers will still be able to obtain and use medications that are not considered to be medically important feed-grade products. These include ionophores such as Rumensin, Bovatec and most coccidiosis medications. These medications are rarely used in human medicine, so their use will not be changed.

Injectable antibiotics will still be available at local suppliers, but a prescription will be needed from a veterinarian in order to obtain them.

Veterinarians will still be able to prescribe feed-grade antibiotics only if deemed necessary to treat or control a current disease outbreak. Using a feed-grade medication for any other use than what is specified on the label is illegal.

Group Housing for Calves: How Much Space to Give?

Calf hutches and other forms of individual calf housing have been used widely for the past 50 years or so to reduce the transmission of disease among dairy calves. However, this method of managing calves is labor-intensive for farm workers, especially on larger dairies. Because of recent interests in reducing labor associated with caring for calves as well as increasing public concern about dairy calf welfare, housing calves in groups has become more popular. According to a 2007 USDA dairy survey, 15 percent of dairy producers utilized group housing.

Group housing provides a more natural environment for calves than hutch housing, which may reduce weaning stress and encourage group learning. Housing calves in groups also reduces the amount of labor associated with calf management. In a study at the University of Delaware, calves housed in individual hutches required approximately 10 minutes per day of labor to manage. Calves housed in a group with a computerized feeder required around one minute per day of labor. The time saved feeding calves could reduce staffing needs in the calf barn, allow staffers to engage in other management tasks to ensure the health of the calves, or free up more time for staff to perform other chores around the farm.

With the advantages of decreased stress for calves, better weight gains after weaning, and decreased labor requirements, many producers are eager to implement group housing but should consider the amount of space required. Providing adequate space for calves is an important factor in overcoming some of the challenges associated with housing them in groups, such as disease transmission and cross suckling. Additionally, resting behavior, which is positively correlated with growth in calves, may be reduced if there is not enough space for animals to lie down comfortably.

The National Animal Disease Information Service in the United Kingdom recommends a minimum of 16 square feet per calf (this amount of space as well as group housing of calves who are 8 weeks old or older are required by law in the UK). Although 16 square feet is the minimum amount of space required, NADIS recommends that group-housed calves be given 22 square feet of space per calf. For larger calves weighing 220 pounds or more, the recommended

space allowance increases to 43 square feet per calf. The Midwest Plan Service in the United States recommends that preweaned group-housed calves have a minimum of 25-30 square feet of space per calf. Although the recommendations differ slightly, both of these sources state that more space is always better for group-housed calves and that producers should aim to provide as much space as is practically possible.

In addition to considering the recommended space allowances mentioned previously, it is important to use common sense when deciding on space allowance for dairy calves. Calves should be observed to determine if the amount of space available allows them to stand, rise and lie down with limbs outstretched without difficulty. An excellent indicator of adequate space allowance and good calf welfare is the observation of play behavior in calves (Jensen et al., 1998). The calf breed may also be considered when designing a group housing facility, as smaller breeds such as Jerseys may not need as much space as larger calves such as Holsteins. Group housing is an excellent way to reduce labor associated with raising calves and to improve calf and worker comfort. Follow recommendations for space allowance and be sure to observe grouped calves to determine if they have enough space to behave naturally in order to help ensure the success of group housing on your operation.

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Bucket vs. Bottle: A Calf Management Battle

Calf management is extremely important in establishing a productive future for a dairy herd. The process begins with the delivery of milk to preweaned calves. Two management schemes are currently used for feeding preweaned calves: nipple feeding and bucket feeding. Bucket feeding is widely used due to the simplicity of the system. However, the physiological method of drinking presents disadvantages to using this system.

Calves fed using the bucket feeding method “drink” milk while nipple-fed calves “suck” milk (Wise and LaMaster, 1968). These physiological differences may actually affect where milk travels. Calves that are 2 weeks old and younger are essentially monogastric animals, because the milk bypasses the ruminoreticulum into the abomasum (or the true stomach in a ruminant). This process occurs when calves suck through the action of the esophageal groove, the outer walls of which contract and rotate, forming a tube (Comline and Titchen, 1951). However, a drinking behavior creates inconsistency in groove closure and, therefore, where milk travels.

Calves allowed to suck during meals display high incidences of esophageal groove closing and few changes in the pattern of closing while sucking. However, calves that drink meals exhibit a higher incidence of esophageal groove opening and a greater variation in the closing pattern while drinking (Wise et al., 1984). The amount of

milk that escapes into the ruminoreticulum during meals indicates how high the incidence of esophageal groove opening is. Calves fed using a nipple have little to no milk detected in the ruminoreticulum, whereas milk escapes into the ruminoreticulum in bucket-fed calves (Wise and Anderson, 1939). However, other studies have indicated that both methods allow milk to escape into the ruminoreticulum, with no difference in the function of the esophageal groove (Abe et al., 1979). Therefore, training and nipple type may influence esophageal groove function.

Milk entering the rumen creates a number of concerns. Unthrifty appearance, loss of appetite, abdominal distention and a dry, long coat characterize calves whose esophageal grooves do not fully close (Breukink et al., 1988) Calves also display claylike feces, which is predominately a symptom of increased water absorption in the large intestine due to dehydration. Calves suffer from nutrient malabsorption due to villous atrophy in the small intestine (Breukink et al., 1988) and metabolic acidosis (Gentile et al., 1998). Further, when fat is hydrolyzed in the rumen instead of in the small intestine, accumulation in the large intestine may occur (Breukink et al., 1988) further indicating malabsorption of nutrients. Differences also exist in curd formation. Calves drinking from a nipple system drink slower, allowing coagulation as milk and saliva mix (Wise and Anderson, 1939). Curd formation controls the rate of passage into the small intestine for further digestion and absorption. Drinking milk too quickly may alter curd formation and flood the small intestine, reducing nutrient absorption.

The changes calves experience physiologically depending on feeding method should theoretically impair calf performance. However, similarities in growth, health and external appearance have been demonstrated between the two systems (Wise and LaMaster, 1968). The authors noted that these similarities are likely due to the frequency of feeding and amount of milk, which limits the volume of milk entering the abomasum. Pempek et al. (2013) observed a higher dry matter intake in calves sucking from a bottle compared to drinking from a bucket. However, no differences in average daily gain or grain intake existed. In contrast, a study comparing elevated pails and nipple bottles determined that calves were heavier when fed from pails (Kesler et al., 1956). Bull calves exhibited similar average daily gain and dry matter intake when fed from a bucket and bottle (Bernal-Rigoli et al., 2012). These findings indicate the importance of management and small, frequent meals when using a bucket feeding system to reduce milk flow into the ruminoreticulum and maintain nutrient absorption.

Both the nipple- and bucket-feeding systems can be effective in calf management. However, when using a bucket system, it is important to feed small, frequent meals to minimize the outflow of milk from the esophageal groove and improve curd formation in the abomasum. Additionally, it is important to monitor calves for external signs of milk flowing into the rumen, such as claylike feces, unthrifty appearance and abdominal distention, as the calf may be drinking too much milk too quickly.

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When to Wean Calves on Accelerated Growth Programs

Accelerated growth programs have become a popular topic. These programs can include milk replacers with high protein content ranging from 26-28 percent (Morabito, 2013) or milk replacers fed at a larger amount than conventional calf programs. Due to the increase in consumption of higher protein content, should the weaning process be different from calves that are fed conventionally?

Jasper and Weary (2002) assigned 28 calves to either a conventionally fed group receiving milk at 10 percent of the calf's body weight spread through two feedings or an ad libitum-fed group receiving continuous access to milk from a nipple. Prior to weaning, the ad libitum-fed group consumed an average of 19.4 pounds of milk compared to 10.3 pounds for the conventionally fed group. For both groups, weaning began at week five by diluting milk with water by 10 percent of the total volume for the evening meal; for each subsequent meal the amount of water increased by 10 percent of the total volume until 100 percent water was delivered at the end of the week. Average daily gain decreased during and immediately after weaning for both groups, but by week seven, average daily gain recovered with calves fed at ad libitum, maintaining a weight advantage until the end of the study.

To determine the long-term effects of an enhanced-growth feeding program, Terré et al. (2009) observed the effects of feeding calves a milk replacer with 18 percent dry matter at a gradual increase from 4 L/d to 7 L/d at week three, then gradually decreased back down to 3 L/d. Afterward, they compared the calves to a conventionally fed group. Both groups were weaned on day 50. The average daily gain for both groups was similar after weaning and throughout the growing period, but the authors found that a gradual weaning process could help with avoiding lowered average daily gain and increase starter intake (Brown et al., 2005). There were no differences between groups for the age of the entrance to the breeding pen, age at pregnancy, or 305-DIM milk yield, which shows that the enhanced-growth feeding program did not improve post-weaning performance.

A study observed the effects of using a higher starter protein content with an enhanced milk replacer, where CP was 28.5 percent and fat was 15 percent, on Holstein calves that were split into three treatment groups: conventional milk replacer plus conventional starter, enhanced milk replacer plus conventional starter, and enhanced milk replacer plus high-CP enhanced starter (Stamey et al., 2012). Calves on the conventional milk replacer were fed at 1.25 percent of their birth body weight for two feedings from weeks one to five; for week six, a milk replacer was fed at 0.625 percent of birth body weight once a day for weaning transition. During the weaning transition, calves on the enhanced milk replacer were fed at 1.25 percent of birth body weight two times a day for week one, then increased to 2 percent of body weight for weeks two through five, and decreased to 1 percent of body weight once per day for week six. By week seven, all calves were weaned. Overall, calves fed the enhanced milk replacer with high-CP enhanced starter tended to have a higher body weight and heart girth than others, but the average daily gain for weeks eight and 10 were similar for all treatments.

These studies help illustrate that weaning can be done in multiple ways: diluting the milk (Jasper and Weary, 2002) and gradual weaning (Stamey et al., 2012; Terré et al., 2009). Overall, although the results from each study do not focus on the process of weaning and its effects, the calves from each study were weaned by weeks six and seven.

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