Antibiotics in calf milk replacer – worth it?

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It is not uncommon for dairy producers to request that medications be added to powdered calf milk replacer fed to dairy replacement heifers. According to the 2014 NAHMS Survey (USDA, 2014a), more than one third of operations fed some type of medicated replacer. Some medications are included for the control of coccidia (Deccox, Bovatec, Rumensin), the control of flies (Clarifly), or for the control or treatment of diarrhea and pneumonia (neomycin, tetracycline). Nine percent of operations (representing 11% of all calves) reported feeding neomycin and oxytetracycline (USDA, 2014a). Because these medications are delivered in feed, the FDA has stringent regulations on how they are used (and how they are combined). For example, no extra-label use is allowed for feed-grade medications, even under the direction of a veterinarian. Label directions must be followed exactly, and withdrawal periods should be followed before marketing an animal that has consumed that feed.

Regulatory changes

Antimicrobial use in cattle has been under increased public and regulatory scrutiny lately, since it is implicated in the development bacterial antimicrobial resistance and could cause violative milk and tissue residues. The FDA changed the rules on the inclusion of the antimicrobials used in milk replacers in 2010, and will change the rules again in January of 2017. The current rules allow producers to obtain oxytetracycline and neomycin over the counter (OTC) to be used in combination in a 1:1 ratio at two different levels:

- The low level inclusion (0.05-0.1 mg/ lb/day) is labeled to be fed continuously “for increased rate of gain and improved feed efficiency”. This dose does not have a withdrawal period.
- The higher dose (10 mg / lb/day) is to be fed for 7-14 days “for treatment of bacterial pneumonia (shipping fever complex) caused by Pasteurella multocida susceptible to oxytetracycline, and for the treatment and control of colibacillosis (bacterial enteritis) caused by Escherichia coli susceptible to neomycin.” The higher inclusion has a slaughter withdrawal period of 5 days, and is not intended to be fed to calves to be processed for veal.

Starting January 2017, the FDA will be enforcing new regulations that will no longer allow the lower inclusion rate for improved rate of gain and feed efficiency. The higher inclusion will still be allowed, but this will no longer be OTC and will require a Veterinary Feed Directive (VFD) for these antimicrobials to be included in milk replacer. A VFD is similar to a veterinary drug
prescription, and will require oversight of a licensed veterinarian and a valid Veterinary Client Patient Relationship (VCPR). The added regulations also mean added paperwork and potential liability, which may not outweigh their questionable benefit for the prevention and treatment of diarrhea and pneumonia.

Residue Risks

Many labels for medicated milk replacers include the phrase “do not use in calves to be processed for veal.” The USDA has strict definitions of classes of cattle, and the classes for calves can change very quickly depending on the owner’s desire. With changes in calf prices and feed prices, producers who buy and sell calves may decide to harvest a calf as bob veal (less than 150 pounds), raise it is formula-fed veal (around 450 to 500 lbs), or raise it to typical beef slaughter weight (1200-1500 lbs). What happens to a calf after it leaves a farm is usually unknown, and how it is managed before it leaves can add liability to its original and new owner, especially as animal identification and traceability improves. A calf that receives a meal of medicated milk replacer can be harvested as bob veal within a few days, which would not allow a proper slaughter withdrawal, and probably result in a violative residue. Bob veal calves are responsible for a disproportionate number of drug residue violations. In 2014, 25% of violative residues in cattle were found in bob veal calves (USDA, 2014b), most of which were due to neomycin and oxytetracycline.

Efficacy

The addition of neomycin and oxytetracycline to milk replacers is common practice, but has not been proven to be effective within modern housing and nutrition programs for calves. Studies done in the 1960’s and 1970’s showed some benefits to including these in milk replacer at low levels, but newer studies have not replicated these results, and have even shown the opposite effect (Smith, 2013). A more recent study on a California calf ranch, where calves had varying levels of passive transfer, and were fed 2 quarts of a 23% protein and 18% fat milk replacer twice a day, showed a positive effect of feeding oxytetracycline and neomycin at 10mg/lb/day (Berge et al., 2005). The study concluded that in this group of environmentally and disease challenged calves, “the use of antibiotics in milk replacer was associated with decreased morbidity and increased weight gain.” It should be noted that the overall mortality was 21 calves out of 120 (17.5%) over a 28 day period, and the weight gain in each group ranged from around 5 pounds to 11 pounds (0.2 pounds per day to 0.4 pounds per day). These outcomes were likely due to the management of calf ranch calves both before they arrived at the calf ranch (poor colostrum management, transportation, and comingling), as well as unusual environmental conditions during the trial that resulted in increased disease pressure. Several calves that died cultured positive for a multiple-antibiotic resistant strain of Salmonella newport. Another study (Berge et al., 2009) was done by the same research group on a farm with low calf mortality (<3%), better colostrum management, and that fed 2 quarts twice a day of pasteurized non-saleable milk. In that study, calves fed neomycin and tetracycline had 28% higher risk of diarrhea compared to calves not fed neomycin and tetracycline. The average
daily gain in calves fed antibiotics in milk and those not fed antibiotics was not different (both around 0.6 pounds per day). These contrasting results show that management factors other than the inclusion of antibiotics in feed really drive the outcomes of health and growth.

The label claim for oxytetracycline in milk replacer for the treatment of respiratory disease is not well supported by research. The FDA approval requirements for this drug to prove efficacy only require that a drug show bioequivalence to an older approved drug, so many formulations for oral use have been piggybacked onto older drugs with very little data. A meta-analysis done on the treatment of bovine respiratory disease in beef cattle showed that injectable oxytetracycline was ranked as the worst antimicrobial of those examined, and was not statistically better than a non-active control (O’Connor et al., 2013). Part of the low efficacy could be due to resistance, but variable gut absorption could also be to blame. A recent study found tetracycline resistance to be very common in Pasteurella multocida recovered from cattle with respiratory disease (Welsh et al., 2004). Today, there are much better choices of antimicrobials for the treatment of calves with pneumonia, and injectable products that reduce the variability of absorption through the gut are preferred over oral products.

Antimicrobial resistance

Exposure of any bacterial population to antimicrobials selects for those bacteria that can survive, which then pass their genetic resistance mechanisms to their offspring, and also to neighboring bacteria through the process of conjugation. Animal agriculture has been implicated as one source of the development of antimicrobial resistance, and recent regulatory changes have attempted to mitigate that risk. Resistant organisms on the farm reduce the efficacy of our treatment of sick calves, and can also be transmitted to calf caretakers and their families and cause significant disease.

A recent study in New York (Pereira et al., 2011) showed that most fecal E. coli isolates were resistant to tetracycline, ampicillin, streptomycin, and sulfamethoxazole-trimethoprim, and the isolates from a farm that fed sulfamethazine and chlorotetraycline in milk replacer had higher levels of resistance. Another study (Kaneene et al., 2009) evaluated resistance patterns in E. coli, Salmonella, and Campylobacter cultured from calf feces, calf pens, and maternity pens on dairy farms before and after removing oxytetracycline and neomycin in calf milk replacer. They showed that herds that stopped feeding antibiotics in milk replacer had “greater decreases in multi-drug resistance than control herds.” This shows that although feeding antibiotics in milk replacer can contribute to antimicrobial resistance, we can probably reverse the trend with management changes. Much more work is on-going in the area of antimicrobial resistance in calves, and the feeding of antimicrobials is likely to be a significant risk factor for its development.

Recommendations

Based on the risk of residues, the questionable efficacy in properly managed calves and the risk of contributing to resistance, the addition of 10mg/lb of oxytetracycline and neomycin cannot
be recommended as a blanket management approach. If a producer is battling enteric or respiratory disease in a group of calves, the risk factors for disease should be addressed before jumping to antibiotic treatment. First, the colostrum program should be evaluated, including the collection, testing, temperature control, and delivery of colostrum. Then, the feeding program should be evaluated, especially the energy content of milk provided to calves, taking into consideration the size of the calves and the environmental temperature. A spreadsheet to calculate energy needs and energy supplied by milk replacer is available on the UGA Food Animal Health and Management Program website (www.vet.uga.edu/foodanimal). There may, however, be times when the addition of these antimicrobials may be of benefit, and the risks and benefits and the implementation strategy should be discussed by the herd management team, including the herd veterinarian. When appropriate, other means of delivering antimicrobials to sick calves should be considered.

If you decide to feed a medicated milk replacer with oxytetracycline and neomycin to a group of calves, the first step is to ensure that a valid VCPR is in place. The label directions must be followed exactly, including the dose prescribed. This will have to be calculated based on the inclusion in powder and the amount of replacer fed per calf per day. Proper animal identification and slaughter withdrawal must be followed before any animals are marketed, and the paperwork must be kept for a minimum of two years. This strategy should only be viewed as a temporary approach while the calf management plan is improved.

References


