

## MEDICATED MILK REPLACER MODULE

### Module Objectives:

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1. Understand that the term “medicated milk replacer” means that antibiotics have been added to the dairy milk replacer.
2. Be able to list the antibiotics that are most commonly added to medicated milk replacer.
3. Understand the disadvantages associated with using medicated milk replacer.
4. Understand that proper management and preventive medicine, including sanitation and a good colostrum program, are critical to long-term calf health and can often replace the need for medicated milk replacer.
5. Be able to describe a good colostrum management program for dairy calves.

- I. Farm background
- II. Farm tour
- III. Medicated milk replacer
- IV. Calf management
- V. Medicated milk replacer
- VI. MMR frequency of use
- VII. Sanitation and hygiene
- VIII. Summary
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## 1. Farm Background

It is a Tuesday morning at the Dairy Solutions Veterinary Clinic. When Dr. Karl arrives, his receptionist meets him at the door with a message from local dairyman Chuck Erby regarding a continuing struggle with scours (diarrhea) in his calves.

When Dr. Karl returns the call, Chuck explains, "Well, for the past two weeks I've been treating several scouring calves with sulfa antibiotics and oral fluids. I have some calves with pneumonia too. One calf died this morning, and several more look like they may die soon." Chuck is calling for help treating the sick calves, but Doc knows that the long-term solution to Chuck's problem requires improved management to help his calves stay healthy. Doc agrees to stop by later that morning.

Dr. Karl and a fourth year veterinary student named Gretchen head out to visit Chuck and his calves. Dr. Karl explains that Chuck Erby is a long-time client who runs a small dairy operation with about 80 milking cows [Note: Most dairy herds will have about as many calves and heifers as they have cows of milking age.] Over the past few years, Mr. Erby has had frequent problems with scours in his calves and usually treats these cases with antibiotics and supportive therapy such as fluids and electrolytes. Mr. Erby has almost no help in running his farm and has said he does not have time to make the management changes that Doc has recommended before.



Based on the information available to you at this time, the scours problem on this farm is? (select one)

- A) An acute problem ( of <10 days duration)
- B) A chronic problem (of >10 days duration)
- C) Not a concern because few calves have died.

See answer box below the references section

## 2. Farm Tour

When they arrive, Gretchen sees that few updates or changes have been made to the original farm structures. The milk house is small and cluttered with various items including tools, drugs, cleaning solutions and clothing. The tie-stall barn houses the milking herd and has poor lighting and ventilation. Cows are tied facing the walls on each side of the barn, and a walkway traverses the middle of the barn. A few calves are housed at one end of the tie-stall barn. Twice a day the cows walk by the calves on their way to the milking parlor.

Several abandoned calf hutches are just a few yards from the milk house. Gretchen recently learned in school that calf hutches are a good way to isolate calves from each other and from the older cattle to reduce their exposure to opportunistic enteric and respiratory pathogens [Note: Opportunistic pathogens are agents that can cause disease in the presence of the proper combination of contributory causes that are present on most farms.] Gretchen wonders if maybe Dr. Karl will attempt to convince Chuck to try using the calf hutches again, even if they may be more work.

Calf scours and respiratory disease are the two most common and costly diseases of dairy calves and are also the two disease conditions for which the most antibiotics are used in dairy calves<sup>1,2</sup>. For a discussion of calf scours, go to "[Neonatal Scours, Antibiotics and Dairy Calves](#)" in this website . For a discussion of bovine respiratory disease, go to "[Introduction to Bovine Respiratory Disease \(BRD\)](#)"

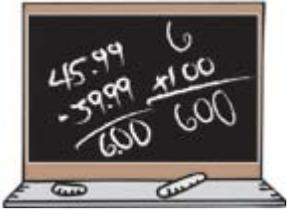
Dr. Karl and Gretchen start looking at the calves. The bedding seems to have been recently changed – perhaps in anticipation of their visit. However, because the calves are dirty, Dr. Karl suspects that the level of sanitation for the calves has not been very good. The calves are not isolated from each other and are exposed to the milking herd twice a day when the cows take the concrete walkway to get to the milking parlor. Dr. Karl tells Gretchen that on previous visits he has told Mr. Erby to isolate the calves from each other and from the cows to prevent transmission of pathogens, but this clearly has not been done.

For further recommendations on proper colostrum feeding, please consult the APHIS Info Sheet "Colostrum Feeding."<sup>4</sup>

- <http://www.calfnotes.com/pdf/CN093.pdf>
- [http://www.aphis.usda.gov/vs/ceah/ncahs/nahms/dairy/dairy02/Dairy02\\_is\\_Colostrum.pdf](http://www.aphis.usda.gov/vs/ceah/ncahs/nahms/dairy/dairy02/Dairy02_is_Colostrum.pdf)

Gretchen notices a 50 lb bag of milk replacer propped up next to the calf buckets. According to the label, the bag contains "Medicated Milk Replacer". She reads the ingredients and sees that oxytetracycline and neomycin have been added to the milk-based ingredients "to aid in the treatment of bacterial diarrhea (scours)." She remembers from lecture that neomycin, oxytetracycline and chlortetracycline are the antibiotics most commonly added to medicated milk replacer. She asks, "Mr. Erby, do you always use a milk replacer that contains antibiotics?"

### 3. Medicated Milk Replacer



Intrigued, Gretchen wonders about the difference in price between medicated milk replacer and non-medicated milk replacer. When she gets back to the veterinary clinic, she thumbs through a couple of pages in some farm catalogs and finds that the price from one company for a 50 pound bag of medicated milk replacer is \$45.99 and non-medicated is \$39.99. That's a difference of about 10%. Using the non-medicated milk replacer could save Chuck about \$600 a year.

"I guess I didn't realize my milk replacer had antibiotics," replied Mr. Erby. Later, Gretchen learned that some dairy producers purchase medicated milk replacer (milk replacer to which low levels of antibiotics have been added) without really understanding that the term "medicated" means that subtherapeutic levels (concentrations lower than what is needed for effective treatment of clinical disease) of antibiotics have been added. Other producers know that medicated milk replacer contains antibiotics, but do not realize the concentrations are too low to treat clinical disease caused by bacteria such as *E. coli* and *Salmonella*.

Dr. Karl tells Mr. Erby, "Preventing scours needs to start right at the birth of the calf. The calf should be isolated immediately from the dam and all other animals to prevent disease transmission. The calf should be given good quality colostrum within one to two hours of birth (4). The quality of colostrum can be assessed with a colostrometer to measure the immunoglobulin levels. Total immunoglobulin concentration of the colostrum should be greater than 60 mg/ml. A second feeding of colostrum should take place within 12 hours of birth. Maximum absorption occurs within the first 24 hours of life, so it is important to administer the good quality colostrum within the first 24 hours. After two feedings of good quality colostrum, you can then start feeding milk replacer or pasteurized milk." Dr. Karl has been telling Mr. Erby that he should occasionally test his colostrum for immunoglobulin levels. The calf should receive the equivalent of about 10% of its body weight in colostrum each day. The amount of colostrum for each feeding should be two to four liters depending on the size of the calf. This quantity of colostrum will likely require the use of an esophageal feeder. Thereafter, calves should be fed milk or milk replacer at 10% of their body weight each day for six to eight weeks. The calves should also be supplied with free choice grain and water.

Dr. Karl explains that medicated milk replacers have a label stating they are to be used for disease prevention and growth promotion, and on this basis are often thought to be an economically sound choice. Studies conducted under conditions of modern calf management in the 1990's, however, showed that medicated milk replacers are not highly useful for growth promotion (5, 6). In a 2006 study, Raymond (2) discusses several studies which have conflicting results regarding the benefits of medicated milk replacer, but points out that effective passive transfer in cattle is more effective in reducing calf morbidity and mortality compared with subtherapeutic feed additives. With respect to medicated milk replacer, Raymond (2) reports that more than two-thirds of farms in his Washington study were not using medicated milk replacer, illustrating that medicated milk replacer is not necessary to maintain calf health.

## 4. Calf Management

### Calf Management Recommendations:

- Isolate the calf from the dam and other cattle at birth to prevent disease transmission. (Note that Chuck's calves are constantly being exposed to manure from the adult cows and the other calves.)
- Give good quality colostrum, ideally from mature cows. Assess the quality of the colostrum by using a colostrometer to measure the immunoglobulin level. Good quality colostrum has a total immunoglobulin concentration greater than 60 mg/ml. (Note that Chuck does not check his colostrum but just assumes the colostrum he feeds is of adequate quality.)
- Ideally, the first feeding of colostrum should be given within one to two hours after birth. A second feeding of colostrum should be given within 12 hours after birth. All feedings of colostrum should be given within the first 24 hours of birth for maximum absorption. (Note that Chuck admits to not getting colostrum to his calves this quickly.)
- Each time that colostrum is fed, give two to four liters, depending on the size of the calf. Give an 80 lb calf four liters of colostrum, which is approximately 10% of the calf's body weight. Give a 60 lb calf three liters of colostrum, which is approximately 10% of the calf's body weight. (10% body weight of an 80 lb calf is 8 lbs. 8 lbs = 128 oz = 4 quarts or 3.79 liters).
- Occasionally check the immunoglobulin level in the calf's blood to assure that the colostrum has been properly absorbed. A reasonable goal for the immunoglobulin level in the blood is 10 g/l. (Note: Chuck does not do this.)
- After the first two feedings of colostrum, other milk (i.e. milk replacer or pasteurized milk from the bulk tank) can be fed.
- Continue to feed milk to the calves twice a day for six to eight weeks. Give an 80 lb calf four liters of milk, which is approximately 10% of the calf's body weight. Give a 60 lb calf three liters of milk, which is approximately 10% of body weight. (10% body weight of an 80 lb calf is 8 lbs. 8 lbs = 128 oz = 4 quarts = 3.79 liters). The amount of milk or milk replacer should be adjusted as the calf grows.
- Supply free-choice fresh grain and clean water.

## 5. Medicated Milk Replacer

Gretchen asks Dr. Karl, “Besides the additional cost and low dose of antibiotics being used, are there any other disadvantages to using medicated milk replacer instead of non-medicated milk replacer?”

Dr. Karl replies, “Any use of antibiotics can contribute to the development and maintenance of antimicrobial resistant bacteria. Such resistant bacteria may eventually lead to treatment failures on farms if antibiotics are needed for treating sick animals. Also, antimicrobial resistance genes may be transferred to human pathogens and can eventually find their way to people via direct animal contact or through meat or milk products. Another problem is that the use of medicated milk replacer can result in residues in meat, such as neomycin drug residues in veal (7).

Dr. Karl continues, “Antibiotic resistance may develop more quickly when subtherapeutic levels of an antimicrobial are used, such as the low levels used in medicated milk replacer (8). High doses of antibiotics tend to kill the entire target bacterial population and can also kill most of the commensal bacteria. In contrast, low doses of antibiotics are more likely to select for bacterial subpopulations with antibiotic resistance traits, thereby allowing these subpopulations to survive and reproduce (8). These commensal bacteria are ‘innocent bystanders,’ but they can still develop resistance traits that can eventually be shared with their more pathogenic bacterial relatives and neighbors.”

### NAHMS Dairy 2002

The 2002 National Animal Health Monitoring System (NAHMS) dairy report<sup>1</sup> indicates that scours and respiratory disease were by far the most common reasons for antibiotic use in dairy calves.

Overall, about 56% of dairy farms used medicated milk replacer. A higher proportion of medium-sized operations (64.1%) fed medicated milk replacer to heifers at least occasionally compared with large or small operations (37.7% and 54.4%, respectively). Oxytetracycline with neomycin was the most commonly used medication, and chlortetracycline was also used occasionally.

### NAHMS Dairy 200714

The most recent NAHMS survey found very similar information to what was found five years previously on the 2002 survey.

- 57.5% of dairy operations used medicated milk replacers (MMR).
- Use of MMR was less common in larger operations (43.6%)
- The most common medicants for milk replacer were:
  - Oxytetracycline with or without neomycin (71.4%)
  - Decoquinatate (18.8%)
  - Chlortetracycline (12.1%)

## 6. MMR Frequency of Use

Guess how many operations use MMR and what antibiotics they use?



What is the estimated percentage of dairy operations in the United States that routinely use medicated milk replacer? (select one)

- A) 10-20%
- B) 20-30%
- C) 30-40%
- D) 40-50%
- E) 50-60%
- F) 70 – 80%

See answer box below the references section



Which antibiotics are commonly used in medicated milk replacer?  
(Select Yes or No for each answer )

- Yes  No A.) Ampicillin
- Yes  No B.) Neomycin
- Yes  No C.) Penicillin
- Yes  No D.) Gentamicin
- Yes  No E.) Oxytetracycline
- Yes  No F.) Chlortetracycline
- Yes  No G.) Sulfadimethoxine

See answer box below the references section

## 7. Sanitation and hygiene

### Oxytetracycline Facts <sup>10-13</sup>

- Oxytetracycline (OTC) is one of the most common medications used in veterinary medicine.
- OTC is a broad spectrum antibiotic.
- OTC becomes widely distributed throughout the body.
- 60-80% of OTC is absorbed via oral administration if the calf is fasted.
- Concurrently feeding milk or other feed may reduce oral OTC absorption by about 50%.
- OTC has affinity for  $\text{Ca}^{++}$ , which chelates the drug to make it inactive.
- OTC stains bone & teeth when given to young animals.
- Antimicrobial resistance to OTC is common among many types of bacteria, including strains of *E. coli* that can cause calf scours.

The next day while driving, Gretchen asks Dr. Karl, “ How can over 40% of all dairy farms do just fine without ever using medicated milk replacer?”

Dr. Karl replies, “I like to encourage dairy producers to prevent scours and respiratory disease with the use of good sanitation and hygiene, proper nutrition, vaccination, appropriate ventilation, and a good colostrum program. Most dairy managers agree that it is more cost effective to prevent disease than to allow the calves to get sick and then try to treat them. Dairy producers that have good management practices with low rates of calf disease will usually not benefit from using a medicated milk replacer. The antibiotic resistance fostered by the unnecessary use of antibiotics makes it more difficult to treat future animal diseases and may contribute to the antibiotic resistance burden in animal agriculture and human medicine. Plus, medicated milk replacer costs more than non-medicated milk replacer.

## 8. Summary

Many producers purchase medicated milk replacer without recognizing that it contains antibiotics and without understanding that the dose of antibiotics is too low to treat common bacterial causes of calf scours or respiratory disease. Use of medicated milk replacers can contribute to the dissemination of antimicrobial resistant bacteria, possibly causing treatment failures on farms or in human hospitals.

Almost half of U.S. dairy producers have found that sound animal husbandry practices eliminate the need for the routine use of medicated milk replacers. They have found that it is more effective to prevent scours and respiratory disease in calves through management procedures such as sanitation, isolation and an adequate amount of high quality colostrum given within 24 hours of birth.

### "Five C's" to Successfully Raise Calves

- Colostrum
- Cleanliness
- Consistency
- Calories
- Comfort



With the information provided above, should producers be advised to use medicated milk replacer for: (select one)

- A) Growth Promotion?
- B) A Disease Prevention?
- C) Disease Treatment?
- D) None of the above?

See answer box below the references section

## 9. References

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7. Reminder - Medicated Milk Replacers Can Cause Antibiotic Residues in Bob Veal Calves. CVM Update. FDA:Center for Veterinary Medicine. July 29, 2004 [http://www.fda.gov/cvm/CVM\\_Updates/bobvealup.htm](http://www.fda.gov/cvm/CVM_Updates/bobvealup.htm)
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10. Braidwood JC and Henry NW. Clinical efficacy of chlortetracycline hydrochloride administered in milk replacer to calves. *Vet Rec.* 1990;127:297 - 301.
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13. Palmer GH, Bywater RJ, Stanton A. Absorption in calves of amoxicillin, ampicillin, and oxytetracycline given in milk replacer, water, or an oral rehydration formulation. *Am J Vet Res.* 1983;44:68-71.
14. NAHMS Dairy 2007. USDA:APHIS:VS Centers for Epidemiology and Animal Health, 2150 Centre Ave, Bldg B. Fort Collins, CO 80526 NAHMS@aphis.usda.gov <http://nahms.aphis.usda.gov>

Page 1: (B) A chronic problem

Page 6, Question 1: (E): 50-60%

Page 6, Question 2: Neomycin, oxytetracycline, chlortetracycline

Page 8: (D) None of the above