



Milk & Dairy Beef Drug Residue Prevention

Reference Manual 2022-2023



ANTIBIOTIC
STEWARDSHIP





National Milk Producers Federation (NMPF) does not endorse any of the veterinary drugs or tests identified on the lists in this manual. The lists of veterinary drugs and tests are provided only to inform producers and veterinarians what products may be available, and the producer and veterinarian are responsible for determining whether to use any of the veterinary drugs or tests. All information regarding the veterinary drugs or tests was obtained from the products' manufacturers or sponsors, and NMPF has made no further attempt to validate or corroborate any of that information. NMPF urges producers to consult with their veterinarians before using any veterinary drug or test, including any of the products identified on the lists in this manual. In the event that there might be any injury, damage, loss or penalty that results from the use of these products, neither the manufacturer of the product nor the producer using the product shall be responsible. NMPF is not responsible for, and shall have no liability for, any injury, damage, loss or penalty.



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This manual is not a legal document and is intended for educational purposes only.
Dairy farmers are individually responsible for determining and complying with all requirements of local, state and federal laws and regulations regarding animal care.

Notice of Upcoming Changes:

Some Antimicrobials Moving from Over-The-Counter to Prescription by June 2023

Currently, 96 percent of medically important antimicrobials used in animals can only be administered under the supervision of a licensed veterinarian.

In June 2021, the U.S. Food and Drug Administration (FDA) released Guidance for Industry #263: “Recommendations for Sponsors of Medically Important Antimicrobial Drugs Approved for Use in Animals to Voluntarily Bring Under Veterinary Oversight All Products That Continue to be Available Over-the-Counter” (GFI #263).

Through GFI #263, FDA is working voluntarily with the animal pharmaceutical manufacturers to bring all forms of medically important antimicrobials approved for use in animals under veterinary oversight to only be administered under the supervision of a licensed veterinarian, and only when necessary for the treatment, control or prevention of specific diseases. This change should be completed by June 2023. This will impact such antimicrobials as penicillin, tetracycline and cephalixin. The complete list is available from FDA.

References

CVM GFI #263 Recommendations for Sponsors of Medically Important Antimicrobial Drugs Approved for Use in Animals to Voluntarily Bring Under Veterinary Oversight All Products That Continue to be Available Over-the-Counter. U.S. Food and Drug Administration. 2021. [fda.gov/media/130610/download](https://www.fda.gov/media/130610/download)

GFI #263: Frequently Asked Questions for Farmers and Ranchers. U.S. Food and Drug Administration. 2021. [fda.gov/animal-veterinary/judicious-use-antimicrobials/gfi-263-frequently-asked-questions-farmers-and-ranchers](https://www.fda.gov/animal-veterinary/judicious-use-antimicrobials/gfi-263-frequently-asked-questions-farmers-and-ranchers)

List of Approved New Animal Drug Applications Affected by GFI #263. U.S. Food and Drug Administration. 2022. [fda.gov/animal-veterinary/judicious-use-antimicrobials/list-approved-new-animal-drug-applications-affected-gfi-263](https://www.fda.gov/animal-veterinary/judicious-use-antimicrobials/list-approved-new-animal-drug-applications-affected-gfi-263)



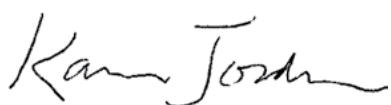
Foreword

The goal of our nation's dairy farmers is to produce the best tasting, safest and most wholesome milk possible. Our consumers demand the best from us and we strive, through continuous improvement, to not only meet their needs, but to exceed their expectations every day.

Day in and day out, dairy farmers provide the best in animal husbandry. As part of continuous improvement, we evaluate our best management practices and disease prevention protocols to keep our animals healthy and comfortable. There are occasions when animals may become sick or injured and need antibiotic therapy to overcome that challenge. As dairy farmers, we strategically and prudently use antibiotic therapy to help an individual animal threatened with a disease or injury. We take this responsibility of prudent antibiotic use seriously and take precautions to ensure that milk or meat from antibiotic-treated animals does not enter the food supply.

The avoidance of milk and meat residues takes an on-farm team effort that begins with the Veterinarian-Client-Patient Relationship (VCPR). Dairy farm owners, managers, and employees work with their veterinarians to develop treatment protocols that ensure that antibiotics are used correctly. Once a decision is made to use antibiotics, protocols, as part of a comprehensive herd health plan, are in place to guide employees on the safest way to handle the animal to prevent an inadvertent milk or meat residue from occurring. Proper identification of treated animals and accurate recording of drug use are essential to prevent residues.

For 30 years, the Milk & Dairy Beef Drug Residue Prevention Reference Manual has demonstrated the U.S. dairy industry's commitment to antibiotic stewardship and appropriate use of all medications. This year's revised manual is a quick resource to review those drugs approved for dairy animals and can also be used as an educational tool and resource for farm managers and employees to develop on-farm best management practices. I encourage all dairy farmers to sit down with their veterinarians and employees to review this manual as you will find the information useful, practical and easily applied to your farm.

A handwritten signature in black ink, reading "Karen Jordan". The signature is fluid and cursive, with a long horizontal line extending from the end.

Karen Jordan, DVM

Chair, National Milk Producers Federation Animal Health and Wellbeing Committee
Brush Creek Farm - Siler City, NC

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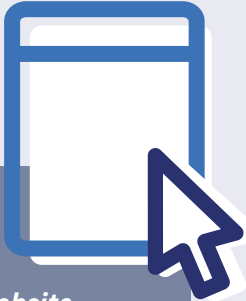
Introduction

The dairy industry is committed to producing the highest quality, safe, abundant and affordable milk and dairy beef. Healthy animals help make for safe food, and disease prevention is the key to keeping them healthy. When dairy animals get sick or injured and treatment is necessary, producers and veterinarians utilize antibiotics and other drugs prudently. All medications must be used appropriately under veterinary guidance to prevent residues from occurring in milk and dairy beef. The marketing of milk or dairy beef with drug residues, even unintentionally, is illegal and can result in financial and criminal penalties.

ANTIBIOTIC STEWARDSHIP

Antibiotic (and antimicrobial) stewardship extends across all livestock production and includes the use of antibiotics in companion animals, humans, and some types of crop production systems. Antibiotic resistance is one of the world's most pressing public health concerns. When animals or humans are given antibiotics, resistant bacterial subpopulations that exist can thrive and possibly lead to less effective drugs. As of April 30, 2021, The Food and Drug Administration Center for Veterinary Medicine (FDA CVM) has committed to antibiotic stewardship in animals through the following key initiatives in veterinary settings:

1. Align antimicrobial drug products with the principles of antimicrobial stewardship
2. Support efforts to foster stewardship of antimicrobials
3. Assess the impact of strategies intended to curb the emergence of antimicrobial resistance associated with the use of antimicrobial drugs



You can find out more information about these principles on the [FDA's website](#).

VETERINARY ORGANIZATIONS' POSITION ON ANTIBIOTIC USE FOR TREATMENT, CONTROL AND PREVENTION

The American Association of Bovine Practitioners (AABP) Policy:

Antimicrobial stewardship is the commitment to reducing the need for antimicrobial drugs by preventing infectious disease in cattle, and when antimicrobial drugs are needed, a commitment that antimicrobials are used appropriately to optimize health and minimize selection for antimicrobial resistance.

The AABP recognizes that antimicrobials remain necessary for animal health to treat, prevent and control infectious disease in beef and dairy cattle and emphasizes that preventive health programs can reduce the occurrence of disease and therefore the need for antimicrobials.

The American Association of Veterinary Medicine (AVMA) believes antimicrobial stewardship is achievable whether the intent of antimicrobial use is for prevention, control, or treatment. AVMA provides the following definitions for treatment, prevention, and control in the context of antimicrobial use in individual animals or populations of animals.

Antimicrobial prevention of disease (synonym: prophylaxis)

1. Prevention is the administration of an antimicrobial to an individual animal to mitigate the risk for acquiring disease or infection that is anticipated based on history, clinical judgement or epidemiological knowledge.
2. On a population basis, prevention is the administration of an antimicrobial to a group of animals, none of which have evidence of disease or infection, when transmission of existing undiagnosed infections, or the introduction of pathogens, is anticipated based on history, clinical judgement or epidemiological knowledge.

Antimicrobial control of disease (synonym: metaphylaxis)

1. Control is the administration of an antimicrobial to an individual animal with a subclinical infection to reduce the risk of the infection becoming clinically apparent, spreading to other tissues or organs or being transmitted to other individuals.
2. On a population basis, control is the use of antimicrobials to reduce the incidence of infectious disease in a group of animals that already has some individuals with evidence of infectious disease or evidence of infection.

Antimicrobial treatment of disease

1. Treatment is the administration of an antimicrobial as a remedy for an individual animal with evidence of infectious disease.
2. On a population basis, treatment is the administration of an antimicrobial to those animals within the group with evidence of infectious disease.

References

Definition of "VCPR". American Veterinary Medical Association (AVMA).

[avma.org/resources-tools/pet-owners/petcare/veterinarian-client-patient-relationship-vcpr](https://www.avma.org/resources-tools/pet-owners/petcare/veterinarian-client-patient-relationship-vcpr)

Judicious therapeutic use of antimicrobials. American Veterinary Medical Association.

[avma.org/resources-tools/avma-policies/judicious-therapeutic-use-antimicrobials](https://www.avma.org/resources-tools/avma-policies/judicious-therapeutic-use-antimicrobials)

AVMA definitions of antimicrobial use for treatment, control, and prevention. American Veterinary Medical Association.

[avma.org/resources-tools/avma-policies/avma-definitions-antimicrobial-use-treatment-control-and-prevention](https://www.avma.org/resources-tools/avma-policies/avma-definitions-antimicrobial-use-treatment-control-and-prevention)

American Association of Bovine Practitioners' Drug Use Guidelines for Bovine Practice.

[aabp.org/resources/aabp_guidelines/druguseguidelines_2015-4-8-1.pdf](https://www.aabp.org/resources/aabp_guidelines/druguseguidelines_2015-4-8-1.pdf)

Residue Prevention Best Practices

02

CAUSES OF ANTIBIOTIC RESIDUES IN MILK AND MEAT

Drug residues can be avoided with the implementation of a well-planned drug use program. Milk and meat residues can result from many on-farm situations. Reasons include, but are not limited to, the following:

- Lack of a valid Veterinarian-Client-Patient Relationship (VCPR).
- Failure to keep accurate, adequate and complete drug use records.
- Failure to follow the manufacturer or veterinarian prescribed label directions for treatment or the appropriate withdrawal time.
- Inadequate identification of all cattle, including bull calves.
- Mistakenly milking a treated cow into the bulk tank or not diverting milk from the bulk tank.
- Drugs with long withdrawal times which pose a higher risk for residues (i.e., treatment of youngstock with gentamycin resulting in a residue as an older animal).
- Use of medicated milk replacers for calves sold as veal.
- The use of prohibited drugs or extra-label use of aminoglycosides (i.e., gentamicin) in cattle. The AABP and the Academy of Veterinary Consultants (AVC) strongly discourage any use of aminoglycosides for the treatment of disease in all classes of cattle because of the significant risk of extremely long and unpredictable withdrawal times of these drugs from the kidneys of treated animals, resulting in great risk of generating violative tissue residues at harvest.
- Use of sulfonamides (i.e., Sustain III Calf Bolus) other than Sulfadimethoxine (i.e., ALBON® Bolus) in lactating dairy cattle. Extra-label use of sulfadimethoxine in lactating dairy cattle is prohibited by [FDA regulation](#).
- Reduced animal liver and kidney function, particularly in unhealthy animals where drug metabolism may be compromised, may result in poorly defined and significantly extended drug withholding times.
- Failure to extend the withdrawal period when a drug, not approved for use in lactating dairy animals, is used in an extra-label fashion.
- The use of multiple drugs requiring withholding without seeking veterinary guidance on appropriate extended withholding periods.



MINIMIZING DRUG RISK

Steps to Prevent Drug Residues

Dairy farmers realize the importance of reducing the risk of creating drug residues in milk and dairy beef. They can take the following steps to mitigate or lessen the chances of drug residues:

1. Establish a valid VCPR to ensure proper diagnosis and treatment of disease. The agreement should be reviewed at least annually with a Veterinarian of Record (VOR) who makes routine visits to the farm and is available for follow-up consultation in the event of an adverse drug event, including treatment failure.
2. Follow the treatment protocols as prescribed by the VOR. If the animal is showing signs of an illness for which there is no protocol, contact the VOR for guidance.
3. Work with the VOR to create treatment protocols and for follow-up consultations and visits.
4. Keep accurate records of all medication use and identify all treated animals. The VOR should review the treatment records regularly.
5. Implement a preventive herd health plan to reduce the incidence of disease.
6. Maintain milk quality and implement an effective mastitis management program to reduce the need for antibiotics.
7. Implement family and non-family employee training and awareness of proper animal drug use. Identify which family and non-family employees have access to medications and the authorization to treat animals.
8. Use drugs approved for specific disease indications according to label directions and withdrawal periods. If extra-label drug use is indicated by a veterinarian's prescription, that veterinarian must establish and document appropriate withdrawal periods.
9. Only use drugs that are approved for use in the specific class of cattle for the conditions to be treated (e.g., lactating, non-lactating, veal).
10. Segregate and milk treated animals after all non-treated animals or in a separate facility to ensure that milk is not accidentally commingled.
11. Use drug residue screening tests specific to the drug used before marketing milk or meat from treated animals. Ensure employee understanding of the test being used. Most tests are developed for use in bulk milk and are not designed for application with individual animals. Live animal tests of blood or urine do not detect residues at the postmortem target tissue level.
12. If in doubt about residue status, do not market milk or cull treated animals. Seek input from your veterinarian and/or milk marketer.

FOOD ANIMAL RESIDUE AVOIDANCE DATABANK (FARAD)

FARAD is a university-based national program that serves as the primary source for scientifically-based recommendations regarding safe withdrawal intervals of drugs and chemicals in food-producing animals. As such, FARAD is a key resource for protection of our nation's food supply, including meat, milk and eggs, against accidental contamination of animal-derived foods with violative residues of drugs, pesticides or other agents that could compromise food safety.

Modern animal agriculture relies heavily on the use of therapeutic drugs, pesticides and other agents that improve overall animal health and promote safe, efficient and humane production practices. Through the assimilation of a comprehensive drug database and the use of state-of-the-art pharmacokinetic modeling, FARAD scientists determine appropriate withdrawal periods for a wide array of chemical entities and provide this information to veterinarians, extension specialists and livestock producers through a toll-free call center as well as a publicly-accessible website ([FARMWeb](#)).

In addition, FARAD provides rapid response assistance regarding extra-label use of drugs in animal agriculture, and during food contamination emergencies which might arise from accidental exposure to environmental toxins, particularly pesticides, or intentional efforts to contaminate the food supply. Finally, FARAD provides assistance in trade matters related to foreign drug approvals and trains future veterinarians in the principles of residue avoidance.

FARAD is a USDA-funded university-based consortium that is overseen and operated by faculty and staff within the Colleges of Veterinary Medicine at the [University of California-Davis](#), the [University of Florida](#), [Kansas State University](#), [North Carolina State University](#) and [Virginia-Maryland College of Veterinary Medicine](#).

Source: FARAD



Record Keeping and Herd Health Protocols

Farmers should maintain permanent treatment records for all medications used. These records must be kept for a **minimum of two years after the treatment date or the animal leaves the farm**. The records system can be written or electronic but must be permanent. Records should be readily retrievable and reviewed regularly by the VOR to ensure compliance with protocols, establish preventive measures when necessary and evaluate the need to alter protocols. The treatment record should contain the following information:

Why Keep Drug Records?

- Prevent an accidental violative residue
- Ensure effective herd health plan
- Improve your veterinarian's effectiveness
- Reduce liability (drug records are required by law)
- Save money

- Date of treatment
- Animal treated identification
- Disease/condition being treated
- Name of treatment used
- Dosage administered
- Route of administration
- Duration of the treatment
- Specified withdrawal times for milk and meat to ensure food safety
- Name of person administering the treatment

7-STEP PLAN FOR KEEPING EFFECTIVE RECORDS

Step 1: Develop a Recommended or Approved Drug List

Work with your VOR to make a complete list of drugs to be used on your dairy. The intent of the drug list is to **only** include drugs you use. Make a specific list of drugs you use routinely and remove any you don't use to eliminate unnecessary risk. Include milk and meat withholding times.

Step 2: Establish an Animal Treatment Plan

When practicing preventive medicine or treating early symptoms of a disease or infection, it is important to be consistent. Establish a treatment plan and protocols for your herd health practices. Review it with your VOR. Treatment plans should be simple to follow and should list:

- Symptoms for the disease
- Medical treatments for the disease (antibiotics and other treatments)
- Dose, route and duration of the treatment
- Persons trained and responsible for the treatments and records

Within the treatment plan or in a separate document, it is advised to describe how treated animals are marked or segregated from other animals during their treatment and withholding time.

Any family or non-family employees with treatment responsibilities should be properly trained to:

- Examine animals for symptoms
- Follow the treatment protocol for the disease
- Properly administer the treatment
- Keep appropriate records
- Monitor the animals for the duration of the treatment and withholding period

Training of family or non-family employees should also be recorded.



Step 3: Establish Inventory Monitoring

Review drug inventory with your VOR and properly discard the following:

- All expired drugs
- Any drugs no longer used as part of a treatment protocol
- Any drugs not included on your approved drug list

Conduct an inventory of drugs along with your annual review of treatment plans and herd health protocols. Having an inventory will allow you to monitor and have products available on the approved list and treatment plans. Audit the amount purchased versus the amount used as a tracking tool for appropriate use and ensure that family and non-family employees follow treatment plans. Remember to record all products that are damaged, broken or discarded, and follow proper disposal protocols.

Step 4: Record Medicated Feed Purchases

Residues can occur from feeding practices in addition to injections or other medical treatments. Be sure to clean feed equipment between batches, especially when using medicated feeds. Avoid using leftover feed from feeder calves, hogs, etc., for lactating dairy cattle. Feeding medicated milk replacer or waste milk to calves intended for sale as veal can cause violative tissue residues. Records should be kept for all medicated feeds purchased, amounts used, disease treated and identification of animals treated.

Step 5: Record Drug Purchases

The FDA requires a paper trail of all drugs used on your dairy, so it is important to promptly record the purchase of drugs and maintain a running inventory.

Step 6: Maintain Permanent Daily Treatment Records

When a drug is used, record its use in a permanent daily treatment record (written or electronic). In hindsight, dairy farmers who have marketed milk or dairy beef containing violative residues state that keeping better treatment records and properly identifying treated animals could have prevented the residue. Develop good habits to monitor your daily treatment records and record all medications promptly. Remember to have a permanent record of all treatments, including calves, heifers and dry cows. A treatment record should contain the following information:

- Date of treatment
- Animal treated identification
- Disease/condition being treated
- Name of treatment used
- Dosage administered
- Route of administration
- Duration of the treatment
- Specified withdrawal times for milk and meat to ensure food safety
- Name of person administering the treatment

Step 7: Disposal

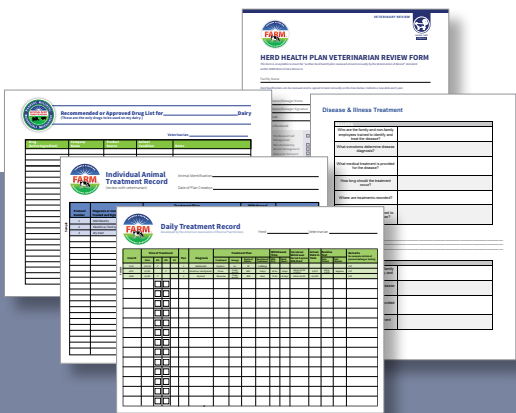
Conduct a periodic review of drugs in storage. Record and discard expired drugs following state and federal guidelines for disposal. By recording daily treatments and the disposal of any discarded drugs, you create a paper trail of all medication used on the farm.

HERD HEALTH PLAN

The dairy industry's commitment to antibiotic stewardship begins on the farm with coordinated animal health and care programs, including a herd health plan developed in consultation with the VOR that is reviewed at least annually. Even with the best prevention programs, animals can become sick or injured – prudent and responsible use of antibiotics and other medications under veterinary supervision may be necessary to improve an animal's health outcome.

An effective written herd health plan focuses on:

- Disease and injury
 - › Prevention
 - › Rapid diagnosis
 - › Necessary treatment
- Animal caretakers
 - › Training with documentation
 - › Defined expectations and responsibilities
- Annual review of plan with the VOR
 - › Periodic and timely updates to protocols and treatment plans
 - › Review of drug records



RECORD KEEPING, PROTOCOL AND ANTIBIOTIC STEWARDSHIP TEMPLATES

Visit nationaldairyfarm.com for free record keeping and drug management record forms and templates.



Food Armor, an organization dedicated to improving antimicrobial stewardship practices in food animal agriculture, teaches residue prevention, food safety principles, responsible drug use practices and antimicrobial stewardship.

A team of food industry professionals, ranging from farmers and veterinarians to packers, processors and food marketers, this broad stakeholder consensus works to deliver a program that translates solid framework into proven on-farm results.

Food Armor offers an online educational platform providing high-quality stewardship education to veterinarians and farmers. Through this self-paced program, learners work to develop habits and use tools to implement antimicrobial stewardship plans.

Visit foodarmor.org

References

“Step 7: Disposal” adapted from: *Where and How to Dispose of Unused Medicines*. U.S. Food & Drug Administration. fda.gov/consumers/consumer-updates/where-and-how-dispose-unused-medicines

Code of Federal Regulations 21 CFR 530.5. Food and Drug Administration. 2020.

ecfr.federalregister.gov/current/title-21/chapter-I/subchapter-E/part-530/subpart-A/section-530.5

04

Animal Health Product Administration



Types of Injection Administrations:

IM:

Intramuscular
in the muscle

IMM:

Intramammary
*in the mammary gland
and does not use a needle*

IV:

Intravenous
in the vein

SQ:

Subcutaneous
under the skin

BOE:

Base of ear
under the skin

SITES AND TECHNIQUES

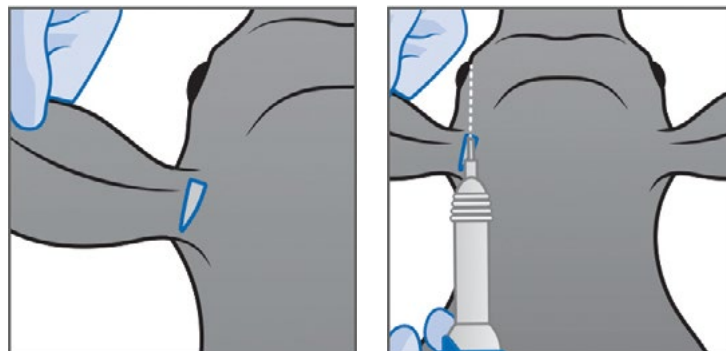
Administering animal health products in the appropriate site on the animal, at the labeled dose, and via the appropriate route indicated on the product label, is important for responsible product use.

Injections should be given in the neck to prevent costly damage to economically important beef cuts, such as the round or chuck. Appropriate administration is particularly important when administering intramuscular (IM) products. It also makes it easier for packers to identify lesions at the plant level, so the affected cuts do not inadvertently end up on a consumer's plate.

The preferred site for all injections has been reduced to the smaller injection area of the neck region in front of the shoulder slope (*Figure 3*) to lessen injection site defects. Injection site lesions found in the rounds of dairy animals fell to 15% in 2016, compared to 60% in 1998, in the National Beef Quality Audit. By reducing lesions, you're adding value to each animal after it leaves the dairy.

Some animal health products are approved for injection or administration into the ear of cattle. This location is excellent from a quality assurance perspective as ears are removed at harvest and do not enter the food chain. The exact location on the ear depends on the product. For lactating dairy cows, the base of the ear is the approved route. The ear must be very clean and care must be taken to avoid blood vessels. Always read product labels carefully. Withdrawal times may vary depending on type of injection method used.

Figure 1
BOE Injection Zone.



Illustrations courtesy of Zoetis

Figure 2
SQ Injection “Tent” Technique. The “tent” technique ensures that the product is being administered in the subcutaneous region.

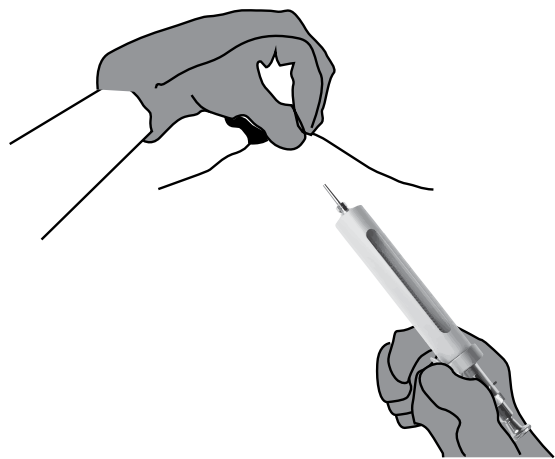
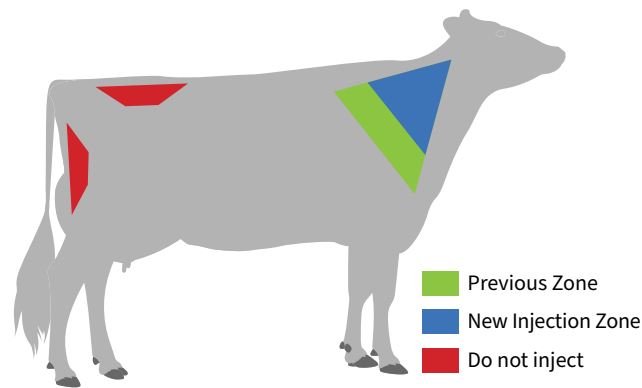


Figure 3
IM Injection Zone. The preferred injection site has been reduced to the smaller blue injection area shown in front of the shoulder slope to lessen injection site defects. This change has become necessary to ensure the quality of new value-added products from the chuck. Even in the absence of blemishes, case-ready packaging processes can cause discoloration of meat near an injection site.



Injectible Viscosity	Route of Administration via Needle								
	SQ (1/2 - 3/4" Needle)			IV (1 1/2" Needle)			IM (1 - 1 1/2" Needle)		
	Cattle Weight (lbs.)			Cattle Weight (lbs.)			Cattle Weight (lbs.)		
	<300	300-700	>700	<300	300-700	>700	<300	300-700	>700
THIN (gauge) Example: Saline	18	18-16	16	18-16	16	16-14	20-18	18-16	18-16
THICK (gauge) Example: Tetracycline	18-16	18-16	16	16	16-14	16-14	18	16	16
Select the needle to fit the cattle size (the smallest practical size without bending)									
Primary considerations in needle selections are:					Secondary considerations include:				
<ul style="list-style-type: none"> Route of administration Size of the animal Location or site of the injection 					<ul style="list-style-type: none"> Viscosity of the fluid (how thick and tenacious the fluid is) Volume injected 				

BEST PRACTICES

Cleaning Syringes and Needles

Disposable equipment is recommended and preferred to minimize contamination risk when administering drugs. If reusable syringes are used, they should be heat-sterilized by boiling. Consult your veterinarian before sterilizing equipment to ensure proper techniques. Improper sterilization of equipment can reduce effectiveness for future injections and lead to an infection at the injection site. If any disinfectants are used — including alcohol — they must be thoroughly rinsed from equipment because they can neutralize vaccines and chemically react with some medications.

Syringes should be thoroughly rinsed with sterile water (not distilled water) before use. Do not contaminate modified live virus products or antibiotics with disinfectants as it will decrease or eliminate effectiveness.

Needle Quality Control and Safety

Single-use needles are preferred to help prevent the spread of blood-borne diseases such as bovine leukosis and anaplasmosis, and to prevent tissue damage from using dull or damaged needles. If not using single-use needles, needles should be changed every 10 head at a minimum. If the needle bends, change it immediately – do not straighten it or use it again as it increases the risk of a broken needle. Obtain a new needle if it becomes contaminated with manure or an irritating chemical.

A broken needle is an emergency and time is essential as broken needles can migrate into the tissue. If not immediately handled, needles will be impossible to find. Under no circumstance should animals with broken needles be sold or sent to market. If a needle breaks in any injection site, contact your veterinarian to assist in determining how the animal should be handled.

When treating animals with any product, take the following precautions:

- ✓ Read both the product label and insert and consult your veterinarian before administering drugs or animal health products.
- ✓ Use the labeled dosage and method of administration least likely to create a drug residue.
- ✓ Discard milk from all four quarters even when treating only one quarter with an IMM infusion.
- ✓ Milk treated cows last or use a segregated facility (divert milk from bulk tank or saleable milk).
- ✓ Thoroughly wash all equipment (inflations, hoses, weigh jars, etc.) that has come in contact with milk from treated cows.
- ✓ Ensure that any procedure used to divert milk from treated cows cannot accidentally send contaminated milk into the pipeline.
- ✓ Confirm only the appropriate animals are receiving medicated feeds and are listed on the Veterinary Feed Directive (VFD) where required.
- ✓ Keep medicated feeds separated from non-medicated feeds and label appropriately.

- ✓ Ensure that calves fed antibiotic waste milk or medicated milk replacer are not sent to sale or slaughter until withdrawal times are met.
- ✓ Train employees on proper injection site selection and technique.
- ✓ Clean transfer needles regularly to avoid contamination.
- ✓ Do not put a needle into a vaccine bottle once it has been used for anything else.
- ✓ Use one needle per injection when using antibiotics.
- ✓ Make sure the injection site is clean. Injecting into a wet, muddy, or manure covered site increases the risk of spreading disease and increases the incidence of injection site lesions. It may also decrease the effectiveness of the injected product.

Vaccinations

- ✓ When vaccinating groups, change needles frequently (between every 10 animals at a minimum).
- ✓ When using killed vaccines, keep a saucer or sponge of alcohol or disinfectant nearby and wipe off the needle after each use and between animals. Do not disinfect needles between injections when using a modified live vaccine, as the disinfectant can destroy the vaccine.

Needle Storage and Disposal

Dispose of used needles in a protected area using these guidelines:

- Place in a puncture-resistant container with a secure lid
- Place container in a rigid container lined with plastic
- Dispose of as solid waste as recommended by state guidelines

Drug Storage

Maintain complete control over your dairy's drug inventory by limiting access to only authorized persons who are trained in proper drug use. Ensure all authorized persons are keeping complete records of every animal treatment.

Animal health products usually have specific storage requirements. All products should be stored in a clean place where they cannot become dirty or contaminated. Products should also be protected from temperature and sunlight exposure. Observe and obey the manufacturer's recommended storage instructions for each product. When refrigeration is necessary, ensure the product stays clean and is safely stored where it isn't likely to overheat or get contaminated by dirt or manure. Place a thermometer in the refrigerator to assure cold storage temperatures.

Animal health products should be stored away from feed ingredients or mixing areas unless regularly mixed with feed additives. Storage of partially used medication or vaccine bottles is discouraged because they may become contaminated and could cause infections or tissue reactions if reused.

Note: The [Grade "A" Pasteurized Milk Ordinance](#) requires drugs intended to treat non-lactating dairy animals be segregated from drugs used for lactating animals.

References

Evaluation of Milk Laboratories. 2019 Revision. U.S. Department of Health and Human Services. [fda.gov/media/137754/download](https://www.fda.gov/media/137754/download)

05

Culling of Cattle

Culling cattle should involve a decision-making process to ensure the animals are in appropriate health and condition to be sent to market, including avoidance of residues. Designate and train family and non-family employees to perform the decision-making process of when to cull and how to check for withdrawal times.

The risk of tissue residue violations should be minimized if:

- Treatment protocols and appropriate withdrawal times are carefully followed
- Approved animal drugs are used for the class of animal being treated
- Animals are identified and marked or segregated
- Treatment records are maintained
- Proper doses, routes and frequencies of administration are heeded

CULLING ANIMALS

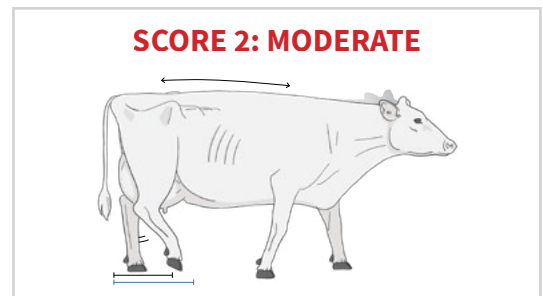
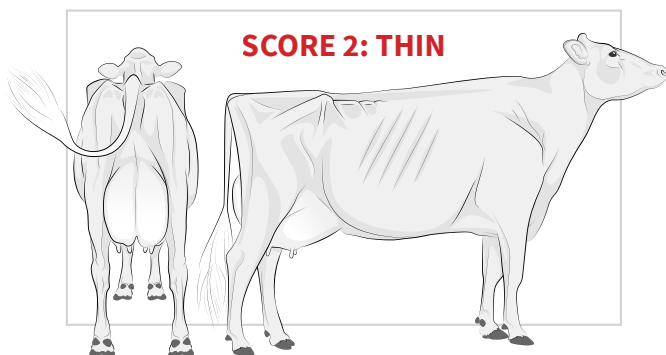
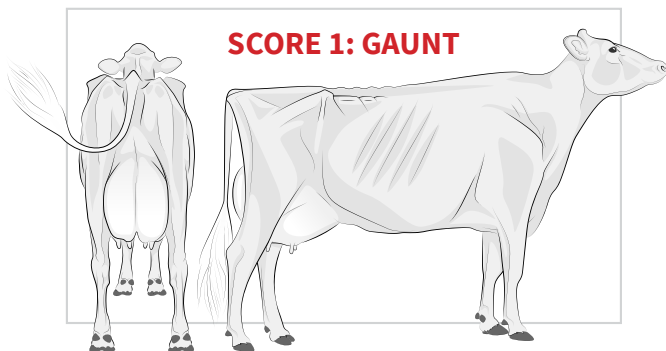


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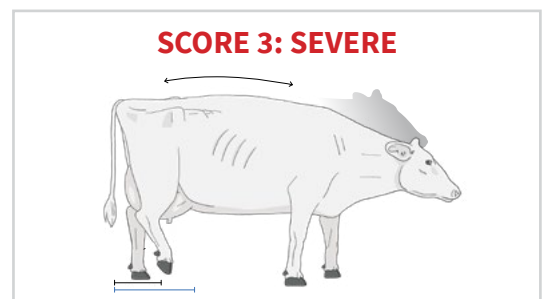
- Decide promptly to treat, cull or euthanize diseased, sick or injured animals.
- Use a Beef Quality Assurance Transportation (BQAT)-certified company that is knowledgeable about your animal care expectations and provides safe and comfortable transport for animals.
- Delay transport of animals that appear exhausted or dehydrated. Animals experiencing heat stress or exhaustion may exhibit open-mouth panting and be reluctant to move. Transport once the animal is rested, fed and rehydrated.
- Milk lactating cows just prior to transport.
- Consult with your veterinarian if you are unsure whether to transport or market an animal.

X Do Not Transport or Market Animals:

- That are non-ambulatory.
 - › Animals that require mechanical assistance to rise or walk should only be transported to receive veterinary treatment. When using any handling device, abuse is never tolerated.
- Until all proper milk and meat withdrawal times have been followed.
- With bone fractures of the limbs or injuries to the spine.
 - › Animals with recent fractures unrelated to mobility should be culled and transported directly to a packing or processing facility.
- In poor body condition, generally a body condition score of less than 2:
 - › With conditions that risk their well-being and are unlikely to pass pre-slaughter inspection, including but not limited to:
 - › Emaciated animals
 - › Cancer eye
 - › Blindness in both eyes
 - › Fever greater than 103°F
 - › Drug residues
 - › Peritonitis
 - › Visible open wounds
 - › Suspected central nervous system symptoms
 - › Fractures or lameness (a score greater than 2 using the FARM locomotion scoring system)



▶ View an animated example of score 2 here:
bit.ly/LocomotionScore2



▶ View an animated example of score 3 here:
bit.ly/LocomotionScore3

- › Unreduced prolapses
- › Heifers or cows that are calving or have a high likelihood of calving during transport
- › Distended udder causing pain and ambulatory issues

KNOW YOUR TRANSPORTER

Residue issues associated with animals sent to slaughter might occur after the animal leaves the farm if identification tracking is not recorded completely for comingled animals or if transporters decide to give treatments.

Use a transportation company that:

- Has a good reputation
- Knows your animal care expectations
- Keeps appropriate records
- Ensures farm traceability using animal identification
- Provides safety and comfort for the animals during transport

Communicate with the hauler about where the animals are destined to go, especially when selling bull calves. If medicated milk replacers have been fed, that animal must be withheld from sale, or the hauler should be informed that the animal has been treated and can affirm that the animal will not go to a terminal market.

When not selling animals directly to a terminal market, sell to intermediate owners who have instituted residue prevention programs consistent with those defined in this document. Carefully identify and document chain-of-custody for all animals, including bull calves, as you may be held responsible for residues caused outside of your facility.



Beef Quality Assurance Transportation (BQAT) Program

bqa.org/programs/bqa-transportation

Transportation quality assurance plays a critical role in the health and welfare of cattle. Proper handling and transport can reduce cattle illness, prevent bruising and improve meat quality from these animals. By using best practices, transporters can save producers millions of dollars each year. When transporters participate in the BQAT program, they show consumers they are ready to take every step possible to keep cattle as healthy and safe as possible.



Veal Quality Assurance (VQA) Program

vealfarm.com/certification-resources

VQA is a program using science-based best practices to ensure veal calves receive quality care through every stage of life. The program helps ensure veal calves are raised using production standards that result in a safe, wholesome, high-quality product that meets regulatory and customer expectations. The success of all calves entering the veal market is highly dependent on early care at the dairy farm. The same principles of calf care used for dairy heifers should be applied to bull calves, regardless of if they are entering the beef or veal market.



Calf Care & Quality Assurance (CCQA) Program

calfcareqa.org

The Calf Care & Quality Assurance (CCQA) program is a first-of-its-kind program for the U.S. dairy calf-raising sector. This program is meant for those raising many different breeds of male and female calves intended for dairy and/or beef production systems. CCQA promotes a mindset — a way of thinking — that prompts calf raisers to approach management decisions with thoughtfulness and an appreciation for the responsibility they have to their animals, consumers, the environment, and the broader cattle industries in the United State. Program assets include a animal care reference manual, facility self assessment, an audit tool and calf care-taker training.



To become certified
visit: bqa.org.

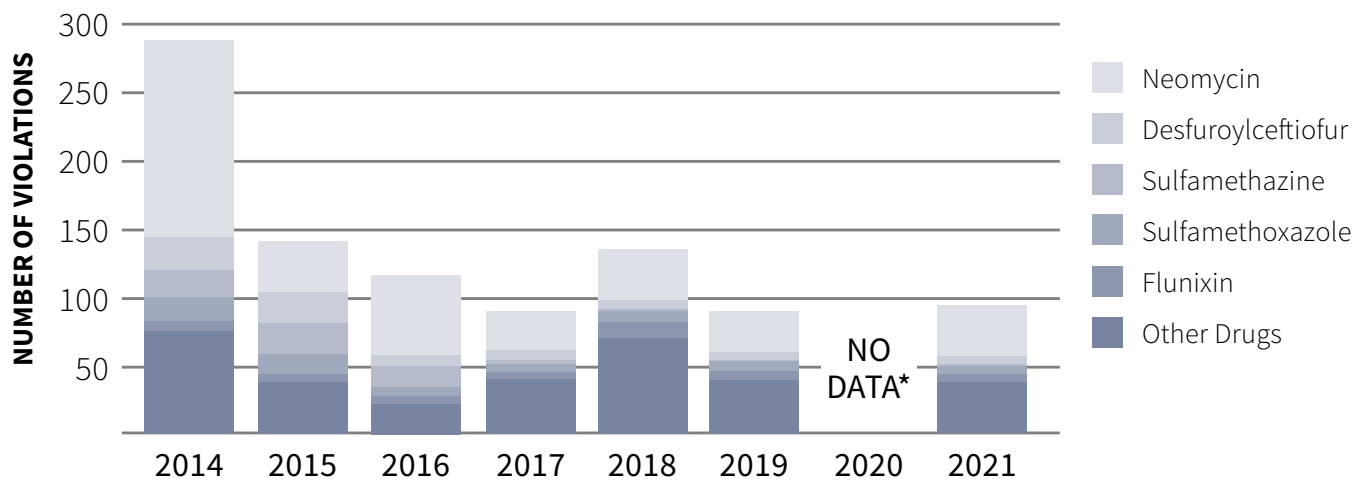
VEAL AND DAIRY BEEF CALVES

For veal and dairy beef calves that you plan to market prior to weaning, use only products that are approved in pre-ruminant calves. Avoid any products labeled with the statement: “Not for use in calves to be processed for veal.”

Bob veal is the meat from young calves up to 150 pounds, typically marketed directly from a dairy farm. About 15% of all veal processed in the U.S. is bob veal. According to USDA data, bob veal is the second largest category of tissue residue violations after cull cows. It represents 15% of all violations reported under the U.S. Department of Agriculture Food Safety Inspection Service (USDA FSIS) [inspector-generating sampling plan](#). USDA FSIS has reported a 70% decline in the number of tissue residues in bob veal since 2014 (see Figure 1). Feeding medicated milk replacer or milk from treated cows may be a source of antibiotic or drug residues in bob veal.

Figure 1

BOB VEAL TISSUE RESIDUE VIOLATIONS



*Data unavailable for 2020.

Even if a dairy farm follows all protocols to ensure marketed calves will not have any tissue residues, additional assurance measures can be taken. Proper identification of any animal that leaves the dairy can prevent misidentification at slaughter and strengthen food chain traceability.

Every calf should have a durable, permanent form of identification (i.e., ear tag). A written calf sales log on your dairy should be used to prevent errors. Include the following information:

- Identification – tag number with description (e.g., age, breed) or photo
 - › The FARM Program recommends using 840-RFID ear tags, which USDA recognizes as an official identification device for the lifetime of an animal. Other acceptable permanent individual animal identification include: brite tags, vaccination tags, dangle tags, button tags, tattoo or a ranch brand with cow number.
- Date of transaction
- Signature of calf hauler
- Intent/destination of hauling for each calf (e.g., is it going to a calf ranch or directly to slaughter?)

Make sure a family or non-family employee is present when the calf hauler picks up market calves. Obtain a receipt from the hauler. The receipt should include the following:

- Calf hauler's name
- Calf hauler business name
- Calf hauler driver's license number
- Number of calves received on that day
- Identification of each calf

These steps are important to verify the withholding times and identification of all animals leaving your farm. Even the slightest misstep in management could cause residue violations and potentially damage the dairy farm's reputation. Work with your herd veterinarian to help prevent residues in young calves leaving the dairy.

INDICATIONS FOR EUTHANASIA

The following conditions or situations may lead to an animal being compromised to such an extent that euthanasia should be performed immediately (instead of culling):

- Catastrophic fracture, trauma or disease of the limbs, hips or spine resulting in immobility or inability to stand
- Uncontrollable bleeding from a major blood vessel
- Inability to maintain sitting upright position with head held up
- Inability to move and raise front legs once lifted under assistance
- Disease conditions that produce a level of pain and distress that cannot be managed adequately
- Emaciation and/or debilitation from disease
- Age or injury that results in the animal being too compromised for transport or market
- Conditions with no effective treatment (e.g., Johne's disease, lymphoma)
- Diseases with a significant threat to human health (i.e., rabies)
- Chronic repeated bloating
- Chronic pneumonia and difficulty breathing/gasping for air
- Advanced ocular neoplastic conditions (i.e., cancer eye)
- Disease conditions with cost-prohibitive treatment
- Extended drug withdrawal time for clearance of tissue residue
- Poor prognosis or prolonged expected recovery

References

U.S. National Residue Program for Meat, Poultry and Egg Products. USDA Food Safety and Inspection Service. https://www.fsis.usda.gov/sites/default/files/media_file/2020-07/fy2019-red-book.pdf

Light, J. 2015. Zoetis. Prevent residues in market bull calves. dairywellness.com/authors/jessica-light/2015/prevent-residues-in-market-bull-calves.aspx#.X4mzhtBKg2x

U.S. Department of Agriculture, Animal and Plant Health Inspection Service. Animal Disease Traceability Framework, Official Eartags – Criteria and Options. 2013. aphis.usda.gov/aphis/ourfocus/animalhealth/traceability

Residue Testing

TOLERANCE LIMITS AND TARGET TESTING LEVELS

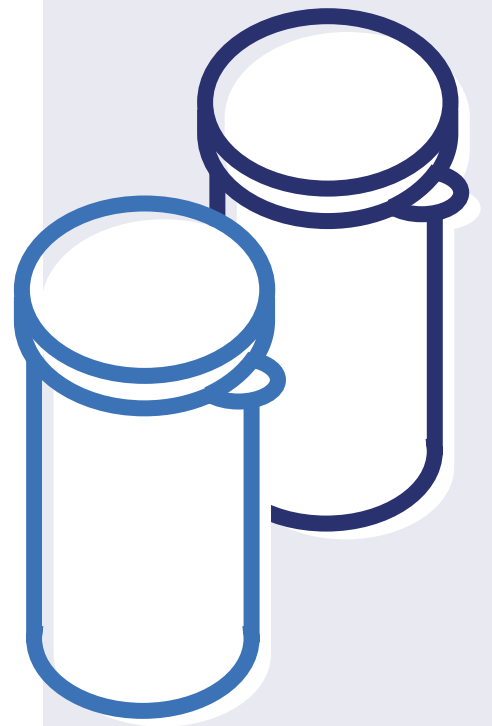
The regulatory tolerances for milk and tissue residues vary depending on the drug and whether it was found in milk, muscle (meat), liver or kidney. The withdrawal times are **only valid if a drug is used according to the label directions and in the animal class listed on the label**. When a drug does not have a tolerance, FDA and the National Council on Interstate Milk Shipments (NCIMS) have adopted target testing levels communicated in a milk guidance document ([M-I-18-19](#)). The document provides guidance levels for antibiotic detection and rejection in milk to prevent contaminated milk from entering the food chain.

If a drug is used in an animal production class **not** on the label, there is **NO TOLERANCE** for that drug – any detectable amount, even below the target testing/tolerance level for the labeled class, is a violation. Target testing levels are generally used for milk rejection decisions with the most commonly used drugs with no tolerance (i.e., penicillin).

Drugs not approved for use in lactating dairy cattle do not have FDA-established tolerances for residues in milk. Tissue tolerances for drugs approved for beef cattle do not apply to lactating dairy cattle. Extra-label drug use in unapproved classes of animals is discouraged and, if used, must be prescribed and supervised by a veterinarian. A complete list of the tolerances can be found in the [FDA Green Book](#), which lists all approved animal drugs. If you have questions or concerns about potential residues or withdrawal times, contact your veterinarian.

MALICIOUS CONTAMINATION

Dairy farmers should recognize and remember that drug residues in milk can occur because of intentional, malicious contamination. Ensure that medications and other potential contaminants are stored securely and monitor your farm for any suspicious activity.



MILK DRUG RESIDUE TESTING

Grade “A” Pasteurized Milk Ordinance (PMO)

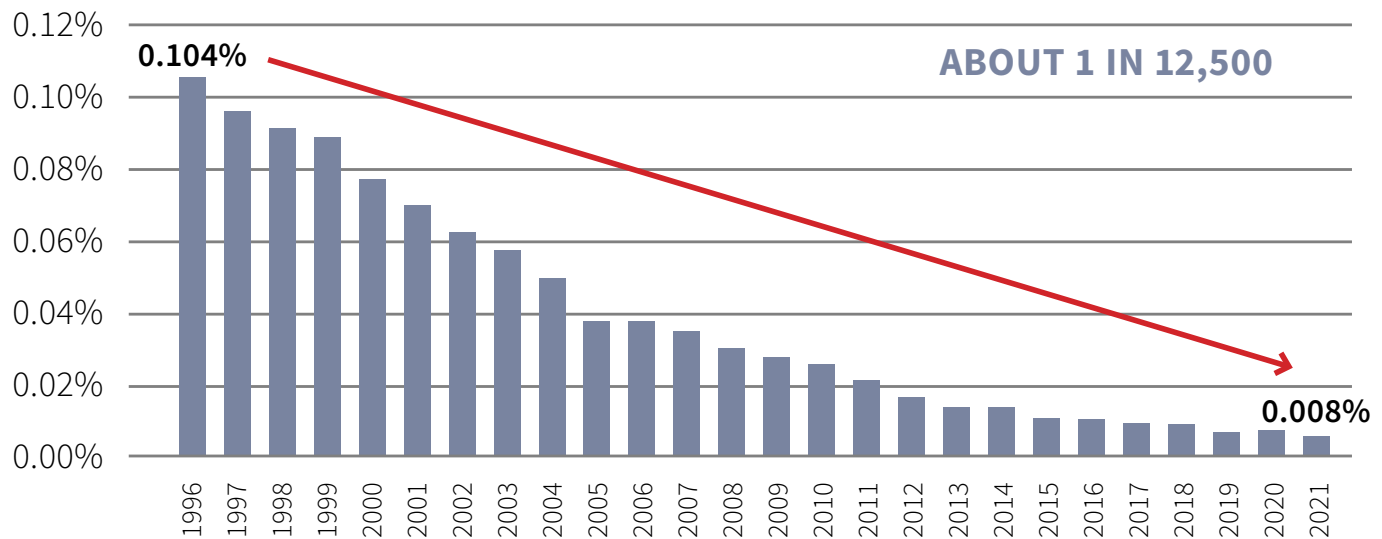
The PMO is a set of rules that state regulatory agencies use to implement their Grade “A” milk programs. It requires all bulk milk tankers to be sampled and analyzed for beta-lactam drug residues before the milk is processed.

States are also required to test farm-level milk samples at least four times every six months for antibiotics (Section 6 testing). Most states use an inhibitor test, which shows sensitivity to any antibiotic in milk. Customers (i.e., processors) may require additional testing for quality assurance purposes. Any tanker found positive for any drug residue is rejected for human consumption.

In 1996, of the 3,384,779 bulk milk tankers tested, 0.104% tested positive. Through increased education and industry advancements, of the 3,894,704 bulk milk tankers tested by industry and state regulatory agencies from October 2019 to September 2021, 0.008% tested positive for drug residues. This reduction signifies a dramatic decrease from an already low level of occurrence. See *Figure 1*.

Figure 1

PERCENT OF BULK MILK TANKERS POSITIVE FOR ANTIBIOTIC RESIDUES



MULTI-DRUG SCREENING TEST FOR BULK TANK MILK

In 2010, the FDA developed a multi-class, multi-residue liquid chromatography/tandem mass spectrometry (LC-MS/MS) screening and confirmation method for drug residues in milk. The procedure is detailed in [FDA Laboratory Information Bulletin #4443](#). The purpose of this method is to screen milk samples to determine if a residue is present at a level of interest (e.g., target testing/tolerance levels or established levels of detection) and to confirm the identity of the compound. An exact quantitative determination of any residue is not addressed with this procedure and is obtained using other methodology. Milk cooperatives and dairy processors are not required to perform this test, but it may be performed for additional knowledge about potential milk residues.

THIS METHOD TESTS FOR THE FOLLOWING DRUGS:

Ampicillin	Penicillin G	Cloxacillin
Cephapirin	Sulfamethazine	Sulfadiazine
Sulfadimethoxine	Sulfathiazole	Sulfaquinoxaline
Sulfapyridine	Sulfachloropyridazine	Sulfamerazine
Oxytetracycline	Tetracycline	Chlortetracycline
Doxycycline	Tylosin	Tilmicosin
Erythromycin	Sarafloxacin	Enrofloxacin
Ciprofloxacin	Flunixin	Bacitracin
Thiabendazole	Virginiamycin	Tripelennamine
Some testing laboratories have modified this method to include additional drugs.		

TISSUE (MEAT) RESIDUE TESTING

The USDA FSIS conducts tests for chemicals – including antibiotics and other drugs, pesticides and environmental chemicals – in meat, poultry and egg products destined for human consumption under two programs. The first is an annual sampling program that tests for these chemicals through a scheduled random sampling of tissue from healthy-appearing food animals. The development of the plan includes:

- Determining the compounds that are of food safety concern
- Using algorithms to rank the selected compounds
- Pairing these compounds with appropriate production classes
- Establishing the number of samples to be collected

The second is the USDA FSIS Hazard Analysis and Critical Control Point (HACCP) program implemented at slaughter facilities. This program identifies the animals most likely to have drug residues and targets them for testing. Animals that display lameness, injection site lesions or signs of illness are targeted for testing, furthering the importance of good decision making when culling animals. See [chapter 5](#) for more information on culling animals.

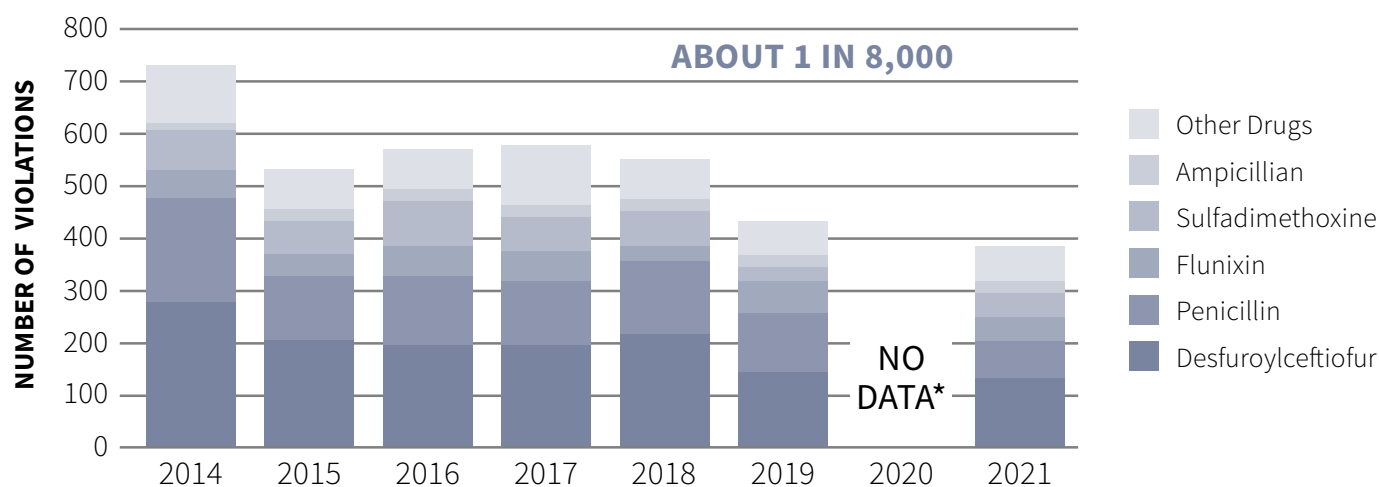
Factors that can contribute to a higher risk of residues are found in Figure 2 and can be useful in determining if animals should be culled. If there is any doubt about the potential for drug residues in an animal, the animal should be withheld from market.

When animals are selected at slaughter for drug screening, they are first tested with a broad inhibition test called a Kidney Inhibition Swab (KIS) test. Positive KIS animal tissues, kidney, muscle and liver, are then sent to FSIS laboratory for a specific multi-drug analysis (LC-MS-MS). The LC-MS-MS is used for drug identification and quantification. When tissues have drugs identified above tolerance levels, they are reported positive in the yearly USDA database called the [Red Book](#).

Each year, about 3.25 million adult dairy cows are slaughtered for beef. Only a small percentage tests positive for a residue. USDA FSIS has reported a 45% decline in the number of tissue residues in market dairy cows since 2014. However, market dairy cows represent 68% of all violations reported under the USDA FSIS inspector-generating sampling plan.

Figure 2

DAIRY CULL COW TISSUE RESIDUE VIOLATIONS



*Data unavailable for 2020.

CONDITIONS THAT WARRANT ADDITIONAL TESTING AT USDA SLAUGHTER FACILITIES

The following list contains USDA descriptions of conditions that may warrant testing of carcasses for drug residues:

Mastitis: Signs of mastitis can vary based on the severity and duration of infection. Cows might show varying degrees of clinical signs, from pus-like or discolored discharge from the teats, and redness and swelling of the udder, to no visible change in the udder.

Metritis: USDA inspectors will look for this postmortem indication. Signs of metritis may include high fever, major drops in milk production, or eye or nasal discharge.

Peritonitis and Surgery: Signs of recent surgical procedures or findings of surgical devices (e.g., suture, toggles, fistula devices) are only significant if they are associated with active peritoneal or subcutaneous inflammation.

Injection Sites: Live animals and carcasses with lesions or abscesses associated with injections on any part of the animal are of potential concern.

Other Disease Symptoms: Any signs of the following diseases or conditions can lead to an animal being tested for potential chemical residues or to determine fitness for harvest:

- Depression
- Elevated or subnormal body temperature
- Hyperemic skin
- Congested mucous membranes
- Dehydration
- Poor body condition in association with an injury or inflammatory condition (e.g., abscesses, arthritis, pneumonia, mastitis, metritis)

Signs of Treatment: Indicated by leakage around jugular veins, subcutaneously, intramuscularly or intraperitoneally (within the abdomen), or clinical signs indicative of treatment by mouth, such as discoloration from particles found in any part of the digestive tract. Inspectors are aware of common industry practices that could indicate an animal was recently treated. Dairy cows arriving for slaughter with fetlock or ankle bands indicate that the animal likely had previously received treatment for a medical condition. When observed, inspectors are instructed to determine the appropriateness of additional testing or removal from the food supply.

USDA FSIS RESIDUE REPEAT VIOLATOR LISTS

The USDA FSIS maintains a [Residue Repeat Violator List](#) for use by FSIS inspection personnel. The list contains the names and addresses of producers who have more than one meat residue violation in a 12-month period in animals presented for slaughter. Specific information about the violation can also be found in this list, including the plant where the violation was determined, the drug residues identified and their concentrations and tolerances. Violators listed may have had multiple violations documented in the same processing facility or in separate facilities. This list is intended to aid inspectors in discovering residue tolerance violations before they reach consumers. The USDA FSIS provides a user guide that explains the information contained in the list.

The USDA FSIS also maintains a [Residue Repeat Violator List](#) for use by livestock markets and establishments that contains similar information to assist plant owners and operators in identifying residue history of livestock suppliers. This list documents only the source name and address information of repeat violators, so that livestock marketers and buyers may use precaution when marketing and processing animals from listed suppliers. The USDA FSIS provides a user guide that explains the information contained in the list.



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2019 Annual Report. National Milk Drug Residue Data Base. [fda.gov/media/144100/download](https://www.fda.gov/media/144100/download)

1996 Annual Report. National Milk Drug Residue Data Base. [nmdrd.com/fy-96.pdf](https://www.nmdrd.com/fy-96.pdf)

Approved Animal Drug Products (Green Book). U.S. Food & Drug Administration.
[fda.gov/animal-veterinary/products/approved-animal-drug-products-green-book](https://www.fda.gov/animal-veterinary/products/approved-animal-drug-products-green-book)

Tolerance And/Or Target Testing Levels Of Animal Drug Residues In Milk (M-I-18-9)
[idfa.org/wordpress/wp-content/uploads/2020/03/tolerance-and-or-target-testing-levels-of-animal-drug-residues-in-milk-replaces-m-i-05-5-september-27-2005-and-identifies-it-as-inactive.pdf](https://www.idfa.org/wordpress/wp-content/uploads/2020/03/tolerance-and-or-target-testing-levels-of-animal-drug-residues-in-milk-replaces-m-i-05-5-september-27-2005-and-identifies-it-as-inactive.pdf)

Residue Repeat Violator Lists. USDA Food Safety and Inspection Service.
[fsis.usda.gov/news-events/publications/residue-repeat-violators-list](https://www.fsis.usda.gov/news-events/publications/residue-repeat-violators-list)

Red Book. USDA Food Safety and Inspection Service.
[fsis.usda.gov/news-events/publications/residue-sampling-results-fiscal-year-2019-red-book](https://www.fsis.usda.gov/news-events/publications/residue-sampling-results-fiscal-year-2019-red-book)

CLASSES OF ANIMAL DRUGS		
Over-the Counter (OTC)	Prescription (Rx)	Veterinary Feed Directive (VFD)
Can be sold by any person or establishment without a veterinary prescription	Can only be sold to the producer by a veterinarian or pharmacist	A drug intended for use in or on feed, which is limited by an approved application to use under the professional supervision of a licensed veterinarian

ANTIBIOTICS ADMINISTERED THROUGH FEED OR WATER

In 2015, the FDA finalized the Veterinary Feed Directive (VFD), which mandates the rules and responsibilities of licensed veterinarians in prescribing and administering medically important antibiotics in feed. A licensed veterinarian must have an established VCPR to write a VFD. The final VFD rules also prohibits any extra-label drug use, so a VFD must conform exactly to the drug manufacturer's label indications, including the specific disease or condition being treated and class of cattle. At the same time, FDA made all medically important antibiotics administered through water as prescription only.

There are no legal extra-label uses of VFD drugs.

There are no VFD drugs approved for use in lactating dairy cattle.

Medically important antibiotics subject to the VFD when administered in feed or requiring prescription if administered through water include:

- Aminoglycosides
- Streptogramins
- Lincosamides
- Sulfonamides
- Macrolides
- Tetracyclines
- Penicillins

Ionophores, like monensin and lasalocid, are not affected by the guidance since they have no human medical relevance. Thus, the actions have no effect on the use of ionophore additives in lactating and dry cows or as coccidiostats in growing heifers.

DRUGS NOT APPROVED FOR USE IN FOOD-PRODUCING ANIMALS

The following drugs are **not approved for use in any species of food-producing animal**:

- Chloramphenicol
- Clenbuterol
- Diethylstilbestrol (DES)
- Dipyrone
- Gentian violet
- Glycopeptides (example vancomycin)
- Nitrofurans (including topical use)
- Nitroimidazoles (including metronidazole)

Following a thorough literature review, the AVMA, AABP and AVC recommend veterinarians refrain from using aminoglycosides (Amikacin, Gentamicin, Kanamycin and Neomycin) in cattle except where approved for use by the FDA, as these antibiotics can cause very prolonged tissue residues.

EXTRA-LABEL DRUG USE

“Federal law restricts this drug to use by or on the order of a licensed veterinarian.”

This statement is on every prescription drug sold. Any use of a drug not specifically listed on the label is considered extra-label drug use and is regulated by the FDA under the Animal Medicinal Drug Use Clarification Act (AMDUCA) of 1994. Using a prescription or over-the-counter drug in an extra-label manner is illegal unless it is specifically prescribed with extended withdrawal times by a veterinarian working in the context of a valid VCPR. As a first line of therapy, a veterinarian must always use drugs approved within the class of animal to which the drug is being administered.

Any extra-label use of drugs requires a prescription which must include written instructions for the specific condition to be treated, including dose, route of administration, frequency of use and withdrawal times for milk and/or meat. All extra-label use requires an extended withdrawal time. A list of animal drugs prohibited for use in food animals, including extra-label use, can be found on [Page 27](#).

Examples of extra-label drug use:

- Changing the dose, such as giving more penicillin per dose than listed on the label
- Changing the route of administration, such as giving flunixin intramuscularly (IM) or subcutaneously (SQ) instead of intravenously (IV)
- Giving a drug to a different production class of animal, such as using florfenicol in a lactating dairy cow when it should only be used in calves under 20 months of age or non-lactating animals
- Giving a drug for an indication (disease) not listed on the label, such as using ceftiofur for diarrhea
- Changing the withholding times, such as not following milk withholding times for fresh cows after dry treatment administration
- Changing the amount of drug per injection site, such as giving the whole dose of penicillin in one injection site rather than splitting the dose so that no more than 10 cc is given at any one injection site
- Changing the duration of therapy, such as using ampicillin for seven days

TIPS FOR EXTRA-LABEL DRUG USE IN DAIRY CATTLE

- Always use drugs approved for the class of animal it is being administered to as the first line of therapy.
- It is irresponsible to give a drug with a high risk of residue to an animal that has a poor chance of recovery. Animals that are suffering and have a poor chance of recovery should be euthanized. Animals healthy enough for slaughter and poor candidates for treatment should be culled/marketed instead of being treated with an unapproved drug that has a higher risk of creating a milk/meat residue.
- Record all treatments in your treatment records and keep them for a minimum of two years.
- Regularly review treatment protocols and treatment records with your VOR.

POTENTIAL RESIDUE VIOLATIONS WILL LIKELY OCCUR FROM EXTRA-LABEL DRUG USE WHEN:

- Any detectable level is found for a drug not approved for lactating dairy cattle.
- Current on-farm or bulk tank milk tests at processing facilities cannot detect levels low enough to assure the absence of residues.
- Animals that are sick or compromised may metabolize drugs at a slower rate than healthy animals, which may result in a significantly extended withdrawal time for both meat and milk.
- The labeled withdrawal times do not apply to unapproved production classes. While FARAD (see [Page 5](#)) can provide withdrawal recommendations, they generally do not have enough information to project a “zero detectable level,” particularly with the sensitivity of current testing methodologies. Veterinarians and dairy farmers should exercise extreme caution using drugs not approved for that production class of animal and consider avoiding such use due to unknown withdrawal times.

DRUGS PROHIBITED FROM EXTRA-LABEL USE IN ANIMALS (21 CFR SEC. 530.41)

The following drugs, families of drugs and substances are prohibited for extra-label drug use in food-producing animals*:

- Chloramphenicol
- Clenbuterol
- Diethylstilbestrol (DES)
- Dimetridazole
- Iprnidazole
- Other nitroimidazoles
- Furazolidone
- Nitrofurazone
- Sulfonamide drugs in lactating dairy cattle (except approved use of sulfadimethoxine, sulfabromomethazine and sulfaethoxypyridazine)
- Fluoroquinolones (e.g., ciprofloxacin, enrofloxacin)
- Glycopeptides
- Phenylbutazone in female dairy cattle 20 months of age or older
- Cephalosporins (excluding cephapirin):
 - › For disease prevention purposes
 - › At unapproved doses, frequencies, durations or routes of administration
 - › If the drug is not approved for that species and production class

**This list is subject to change. Consult the current version of 21 CFR Sec. 530.41 for the most up-to-date list.*

CEPHALOSPORIN EXTRA-LABEL
USE PROHIBITIONS

The FDA prohibits certain extra-label or unapproved uses of the cephalosporin class of antibiotics in cattle (excluding cephalixin). This went into effect in 2012 under FDA’s Order of Prohibition of Cephalosporins.

Prohibited uses of cephalosporins in dairy animals include:

- Drugs at unapproved dose levels, frequencies, durations or routes of administration
- Drugs in cattle that are not approved for use in that species (e.g., cephalosporin drugs intended for humans, companion animals or a different species or class of food animal)
- Drugs for disease prevention

Exceptions to the prohibition:

- Use to treat or control an extra-label disease indication, as long as this use adheres to a labeled dosage regimen (e.g., dose, route, frequency and duration of administration) approved for that particular species and production class.
- Cephalixin drug products are excluded from the prohibition order. Cephalixin is currently only approved for use in food-producing animals as an intramammary infusion formulation for dairy cattle. All cephalixin given to dairy animals must be used for specific disease indications according to label recommendations and withdrawal periods.
- In dairy animals, cephalosporins can be used in an extra-label manner only for disease indication and only under the recommendation of a veterinarian for which the farm has a current VCPR. Any use of cephalixin in a manner not listed on the label without a VCPR is illegal.

Cephalosporins Examples

- ➔ Cephalixin:
 - › ToMORROW®
 - › ToDAY®
- ➔ Ceftiofur:
 - › EXCEDE®
 - › SPECTRAMAST® DC
 - › EXCENEL® RTU EZ
 - › SPECTRAMAST® LC
 - › Naxcel® Sterile Powder
 - › Ceftiflex®
 - › Cefenil® RTU

References

CVM GFI #152 Evaluating the Safety of Antimicrobial New Animal Drugs with Regard to Their Microbiological Effects on Bacteria of Human Health Concern. U.S. Food and Drug Administration. 2003. [fda.gov/regulatory-information/search-fda-guidance-documents/cvm-gfi-152-evaluating-safety-antimicrobial-new-animal-drugs-regard-their-microbiological-effects](https://www.fda.gov/regulatory-information/search-fda-guidance-documents/cvm-gfi-152-evaluating-safety-antimicrobial-new-animal-drugs-regard-their-microbiological-effects)

Code of Federal Regulations Title 21. CFR 530.41. U.S. Food and Drug Administration. 2019. [accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/cfrsearch.cfm?fr=530.4](https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/cfrsearch.cfm?fr=530.4)

Approved Drugs and Screening Tests

National Milk Producers Federation (NMPF) and the Farmers Assuring Responsible Management (FARM) Program do not endorse any of the veterinary drugs or tests identified on the lists in this manual. The lists of veterinary drugs and tests are provided only to inform dairy farmers what products are available. Dairy farmers, with the guidance of their veterinarian, are responsible for determining whether to use any of the veterinary drugs or tests.

All information regarding the veterinary drugs or tests was obtained from the products' manufacturers or sponsors – NMPF and the FARM Program have not made any further attempt to validate or corroborate any of this information. We urge dairy farmers to consult with their veterinarians before using any veterinary drug or test, including any of the products identified on the lists in this manual.

Data provided by the manufacturer or marketer is current as of July 2022. Veterinarians needing extra-label information should consult the [FDA Green Book](#) or contact FARAD at 888-873-2723 or [FARAD.org](#).



FDA-APPROVED DRUGS FOR INJECTABLE USE NON-LACTATING CATTLE**

ACTIVE INGREDIENT	DRUG TYPE	MEAT WITHHOLDING TIME	PRODUCT NAME	MANUFACTURER/MARKETER
Ampicillin trihydrate	Rx	6 days	Polyflex®	Boehringer Ingelheim Vetmedica, Inc.
Ceftiofur crystalline free acid	Rx	13 days	EXCEDE®	Zoetis, Inc.
Ceftiofur hydrochloride	Rx	4 days	EXCENEL® RTU EZ	Zoetis, Inc.
Ceftiofur sodium	Rx	4 days	Naxcel® Sterile Powder	Zoetis, Inc.
Cloprostenol sodium	Rx	None	Estrumate®	Merck Animal Health
	Rx	None	SynchSure	Boehringer Ingelheim Animal Health, USA Inc.
Dinoprost tromethamine	Rx	None	Lutalyse® Sterile Solution	Zoetis, Inc.
	Rx	None	ProstaMate	Bimeda, Inc.
Doramectin	OTC	35 days	Dectomax® Injectable	Zoetis, Inc.
Enrofloxacin	Rx	28 days	EnroMed	Bimeda, Inc.
	Rx	28 days	Enroflox® 100	Norbrook Laboratories, Ltd.
	Rx	28 days	Baytril® 100	Elanco Animal Health
Florfenicol	Rx	28 or 38 days** (See label)	Nuflor® Injectable Solution	Merck Animal Health
	Rx	33 day SubQ / 28 days IM	Norfenicol® Injectable Solution	Norbrook Laboratories, Ltd.
	Rx	28 days IM / 38 days SC	Loncor 300	Elanco Animal Health
Florfenicol and Flunixin meglumine	Rx	38 days	Resflor Gold®	Merck Animal Health
Flunixin meglumine	Rx	4 days	Banamine®	Merck Animal Health
	Rx	4 days	Flu-Nix	Huvepharma
Gamithromycin	Rx	35 days	Zactran	Boehringer Ingelheim Animal Health, USA Inc.
Gonadorelin diacetate tetrahydrate	Rx	None	Cystorelin	Boehringer Ingelheim Animal Health, USA Inc.
	Rx	None	Fertagyl®	Merck Animal Health
	Rx	None	OvaCyst	Bimeda, Inc.
Gonadorelin hydrochloride	Rx	None	Factrel®	Zoetis, Inc.
Gonadotropin (chorionic)	Rx	None	Chorulon®	Merck Animal Health
Isoflupredone acetate	Rx	7 days	Predef® 2x"	Zoetis, Inc.
Ivermectin*	OTC	35 days	Bimectin Injection	Bimeda, Inc.
	OTC	35 days	AGRI-MECTIN® 1%	Huvepharma
	OTC	35 days	IVOMEK 1% Injection for Cattle	Boehringer Ingelheim Animal Health, USA Inc.
	OTC	35 days	Noromectin® Injection for Cattle and Swine	Norbrook Laboratories, Ltd.
Ivermectin/Clorsulon	OTC	21 days	Bimectin Plus Injection	Bimeda, Inc.
	OTC	21 days	Noromectin® Plus Injection	Norbrook Laboratories, Ltd.
Ketoprofen	Rx	2 days	Ketofen®	Zoetis, Inc.
	Rx	18 days	DRAXXIN®KP	Zoetis, Inc.
Moxidectin	OTC	21 days	Cyductin Injectable	Elanco Animal Health

ACTIVE INGREDIENT	DRUG TYPE	MEAT WITHHOLDING TIME	PRODUCT NAME	MANUFACTURER/MARKETER
Oxytetracycline	Rx	28 days	300 PRO® LA	Norbrook Laboratories, Ltd.
	OTC	28 days	AGRIMYCIN® 200	Huvepharma
	Rx	28 days	Bio-Mycin® 200	Boehringer Ingelheim Vetmedica, Inc.
	Rx	28 days	Liquamycin® LA-200®	Zoetis, Inc.
	OTC	28 days	Noromycin® 300 LA	Norbrook Laboratories, Ltd.
	OTC	28 days	Oxytetracycline Injection 200	Norbrook Laboratories, Ltd.
Oxytetracycline hydrochloride	OTC	22 days	Oxytet 100	Norbrook Laboratories, Ltd.
Penicillin G (benzathine)	OTC	30 days	Combi-Pen™-48	Bimeda, Inc.
Penicillin G (procaine)	OTC	14 days	Norocillin	Norbrook Laboratories, Ltd.
	OTC	4 days	Pro-Pen-G™ Injection	Bimeda, Inc.
Plasmid DNA	Rx	21 days	Zelnate	Elanco Animal Health
Selenium (sodium selenite) and Vitamin E	Rx	30 days	BO-SE®	Merck Animal Health
Sulfadimethoxine	Rx	5 days	Di-Methox Injection 40%	Huvepharma
	OTC	5 days	Sulfamed Injection	Bimeda, Inc.
Tilidipirosin	Rx	21 days	Zuprevo 18%®	Merck Animal Health
Tilmicosin phosphate	Rx	42 days	Micotil Injection	Elanco Animal Health
Tulathromycin	Rx	18 days	Arovyn™	Merck Animal Health
	Rx	22 days	DRAXXIN 25®	Zoetis, Inc.
	Rx	18 days	DRAXXIN®	Zoetis, Inc.
	Rx	18 days	DRAXXIN®KP	Zoetis, Inc.
	Rx	18 days	Increxxa	Elanco Animal Health
	Rx	18 days	Macrosyn	Bimeda, Inc.
Tylosin	OTC	21 days	Tylan Injection 50/200	Elanco Animal Health
	OTC	21 days	BiloVet Injection	Bimeda, Inc.
Vitamin E	OTC	None	Vitamin E 300	Huvepharma

** The term non-lactating cattle is defined as dairy bulls, dairy calves, and replacement heifers. Read label indications carefully. Some products are not approved for non-ruminating calves and female dairy cattle 20 months of age and older. Some products cannot be used with veal calves. Carefully consult the labels.

* Withholding times depend upon labeled dosage used.

* Ivermectin is not approved for female dairy cattle of breeding age.

" Discontinued product; some may still be in market.

FDA-APPROVED DRUGS FOR ORAL USE NON-LACTATING CATTLE**

ACTIVE INGREDIENT	DRUG TYPE	MEAT WITHHOLDING TIME	PRODUCT NAME	MANUFACTURER/MARKETER
Albendazole	OTC	27 days	Valbazen® Suspension	Zoetis, Inc.
Amprolium	OTC	24 hours	Corid 20% Powder	Huvepharma
	OTC	24 hours	Corid 9.6%	Huvepharma
	OTC	1 day	AmproMed for Calves	Bimeda, Inc.
Chlortetracycline hydrochloride	Rx	1 day	Pennchlor 64 Soluble Powder	Pharmgate Animal Health
Citric acid	OTC	None	Re-Sorb® Powder	Zoetis, Inc.
Decoquinat	OTC	None	Deccox-M	Zoetis, Inc.
Dextrose	OTC	None	Re-Sorb® Powder	Zoetis, Inc.
Fenbendazole	Rx	8 days	Panacur 10% Suspension	Merck Animal Health
	OTC	8 days	Safe-Guard 10% Paste	Merck Animal Health
	OTC	8 days	Safe-Guard 10% Suspension	Merck Animal Health
Glycine	OTC	None	Re-Sorb® Powder	Zoetis, Inc.
Levamisole hydrochloride	OTC	48 hours	Prohibit Soluble Drench	Huvepharma
	OTC	2 days	LevaMed	Bimeda, Inc.
Monensin (sodium)	OTC	None	Rumensin 90	Elanco Animal Health
Neomycin sulfate	Rx	1 day	NeoMed 325 Soluble Powder	Bimeda, Inc.
	Rx	1 day	Neosol 50	Huvepharma
Oxfendazole	OTC	7 days	Synanthic® Bovine Dewormer Suspensions, 22.5 % and 9.06%	Boehringer Ingelheim Vetmedica, Inc.
Oxytetracycline hydrochloride	Rx	None	Oxy 500 Calf Bolus	Boehringer Ingelheim Vetmedica, Inc.
	Rx	5 days	Pennox 343 Soluble Powder	Pharmgate Animal Health
	Rx	7 days	Terramycin® Scours Tablets	Zoetis, Inc.
Potassium citrate	OTC	None	Re-Sorb® Powder	Zoetis, Inc.
Potassium dihydrogen phosphate	OTC	None	Re-Sorb® Powder	Zoetis, Inc.
Sodium chloride	OTC	None	Re-Sorb® Powder	Zoetis, Inc.
Streptomycin sulfate		2 days	Strep Sol 25%	Huvepharma
Sulfadimethoxine	Rx	7 days	Albon® Concentrated Solution 12.5%	Zoetis, Inc.
	Rx	12 days	Albon® S.R. a(Sustained Release Bolus)	Zoetis, Inc.
	Rx	7 days	Di-Methox 12.5% Oral Solution	Huvepharma
	Rx	7 days	Di-Methox Soluble Powder	Huvepharma
Sulfamethazine	OTC	12 days	Sustain III - Calf	Bimeda, Inc.
	OTC	12 days	Sustain III - Cattle	Bimeda, Inc.
Sulfamethazine (sodium)	Rx	10 days	SMZ-Med	Bimeda, Inc.
Tetrachlorvinphos	OTC	None	Rabon 7.76 Oral Larvicide	Elanco Animal Health
Tetracycline hydrochloride	Rx	5 days	Tetrabac 324	Huvepharma
	Rx	5 days	TetraMed 324 HCA	Bimeda, Inc.

FDA-APPROVED DRUGS FOR INTRAMAMMARY USE NON-LACTATING CATTLE**

ACTIVE INGREDIENT	DRUG TYPE	MILK WITHHOLDING TIME	MEAT WITHHOLDING TIME	V NAME	MANUFACTURER/MARKETER
Ceftiofur hydrochloride	Rx	None	16 days	SPECTRAMAST® DC	Zoetis, Inc.
Cephapirin (benzathine)	OTC	72 hours	42 days	Tomorrow® Infusion	Boehringer Ingelheim Vetmedica, Inc.
Cloxacillin (benzathine)	Rx	None	30 days	Dry-Clox®	Boehringer Ingelheim Vetmedica, Inc.
	Rx	None	28 days	Orbenin-DC™	Merck Animal Health
Penicillin G (procaine)/ Novobiocin	OTC	72 hours Postcalving	30 days	AlbaDry® Plus Suspension	Zoetis, Inc.

FDA-APPROVED DRUGS FOR TOPICAL USE NON-LACTATING CATTLE**

ACTIVE INGREDIENT	DRUG TYPE	MEAT WITHHOLDING TIME	PRODUCT NAME	MANUFACTURER/MARKETER
Cyfluthrin	OTC	None	CyLence	Elanco Animal Health
Diflubenzuron & permethrin	OTC	None	Clean-Up II	Elanco Animal Health
Doramectin	OTC	45 days	Dectomax® Pour-On	Zoetis, Inc.
Eprinomectin	OTC	None	EPRINEX Pour-On for Beef and Dairy Cattle	Boehringer Ingelheim Animal Health, USA Inc.
	OTC	None	Eprizero™ Pour-On for Beef and Dairy Cattle	Norbrook Laboratories, Ltd.
	Rx	48 days	LongRange®	Boehringer Ingelheim Animal Health, USA Inc.
Flunixin meglumine	Rx	8 days	Banamine® Transdermal Pour-On	Merck Animal Health
Ivermectin*	OTC	48 days	Bimectin Pour-On	Bimeda, Inc
	OTC	48 days	Agrimectin Pour-On	Huvepharma
	OTC	48 days	IVOMEC (Ivermectin) Pour-On	Boehringer Ingelheim Animal Health, USA Inc.
	OTC	48 days	Noromectin® Pour-On	Norbrook Laboratories, Ltd.
Moxidectin	OTC	None	Cydectin Pour-On	Elanco Animal Health
Oxytetracycline hydrochloride/ Polymyxin B sulfate	Rx	None	Terramycin® Ophthalmic Ointment with Polymyxin	Zoetis, Inc.
Permethrin & piperonyl butoxide	OTC	None	Permethrin CDS Pour-On	Elanco Animal Health

** The term non-lactating cattle is defined as dairy bulls, dairy calves, and replacement heifers. Read label indications carefully. Some products are not approved for non-ruminating calves and female dairy cattle 20 months of age and older. Some products cannot be used with veal calves. Carefully consult the labels.

* Ivermectin is not approved for female dairy cattle of breeding age.

FDA-APPROVED DRUGS FOR FEED ADDITIVE USE NON-LACTATING CATTLE**

ACTIVE INGREDIENT	DRUG TYPE	MEAT WITHHOLDING TIME	PRODUCT NAME	MANUFACTURER/MARKETER
Amprolium	OTC	24 hours	Corid 1.25% Type C	Huvepharma
	OTC	24 hours	Corid 2.5% Type B	Huvepharma
	OTC	24 hours	Corid 25% Type A	Huvepharma
Chlortetracycline	VFD	None	Aureomycin G	Zoetis, Inc.
	VFD	1 day	ChlorMax 50	Zoetis, Inc.
Chlortetracycline calcium	VFD	None	Pennchlor™	Pharmgate Animal Health
	VFD	None	Deracin®	Pharmgate Animal Health
Chlortetracycline hydrochloride	VFD	0-10 days	CLTC® 100 MR	Phibro Animal Health
Decoquinat	OTC	None	Deccox	Zoetis, Inc.
Fenbendazole	OTC	13 days	Safe-Guard 0.5% Top Dress Pellets	Merck Animal Health
	OTC	13 days	Safe-Guard 1.96% Free-Choice Mineral	Merck Animal Health
	OTC	13 days	Safe-Guard 20% Salt Free-Choice Mineral	Merck Animal Health
Lasalocid	OTC	None	Bovatec Premix	Zoetis, Inc.
Monensin	OTC	None	Monovet 90	Huvepharma
Monensin (sodium)	OTC	None	Rumensin 90	Elanco Animal Health
Morantel tartrate	OTC	14 days	Rumatel® 88	Phibro Animal Health
Neomycin-oxytetracycline	VFD	5 days	Neo-Oxy 100/100 MR	Pharmgate Animal Health
	VFD	0-5 days [#]	Neo-Oxy 50/50	Pharmgate Animal Health
	VFD	0-5 days [#]	Neo-Terramycin® 100/100	Phibro Animal Health
	VFD	0-5 days [#]	Neo-Terramycin® 100/100D	Phibro Animal Health
	VFD	0-5 days [#]	Neo-Terramycin® 50/50	Phibro Animal Health
	VFD	0-5 days [#]	Neo-Terramycin® 50/50D	Phibro Animal Health
Oxytetracycline (quaternary salt)	VFD	0-5 days [#]	Pennox™	Pharmgate Animal Health
Oxytetracycline dihydrate	VFD	None	Terramycin® 100	Phibro Animal Health
	VFD	None	Terramycin® 100MR	Phibro Animal Health
	VFD	None	Terramycin® 200	Phibro Animal Health
	VFD	None	Terramycin® 50	Phibro Animal Health
Poloxalene	OTC	None	Bloat Guard® Liquid Type A Medicated Article	Phibro Animal Health
	OTC	None	Bloat Guard® Medicated Top Dressing	Phibro Animal Health
	OTC	None	Bloat Guard® Type A Medicated Article	Phibro Animal Health
Tetrachlorvinphos	OTC	None	Rabon 7.76 Oral Larvicide	Elanco Animal Health
Virginiamycin	VFD	None	V-Max®	Phibro Animal Health
	VFD	None	V-Max® 50	Phibro Animal Health

** The term non-lactating cattle is defined as dairy bulls, dairy calves, and replacement heifers. Read label indications carefully. Some products are not approved for non-ruminating calves and female dairy cattle 20 months of age and older. Some products cannot be used with veal calves. Carefully consult the labels.

[#] Withholding times depend upon labeled dosage used.

FDA-APPROVED DRUGS FOR INJECTABLE USE LACTATING CATTLE

ACTIVE INGREDIENT	DRUG TYPE	MILK WITHHOLDING TIME	MEAT WITHHOLDING TIME	PRODUCT NAME	MANUFACTURER/MARKETER
Ampicillin trihydrate	Rx	48 hours	6 days	Polyflex®	Boehringer Ingelheim Vetmedica, Inc.
Ceftiofur crystalline-free acid	Rx	None	13 days	EXCEDE®	Zoetis, Inc.
Ceftiofur hydrochloride	Rx	None	4 days	EXCENEL® RTU EZ	Zoetis, Inc.
Ceftiofur sodium	Rx	None	4 days	Naxcel® Sterile Powder	Zoetis, Inc.
Cloprostenol sodium	Rx	None	None	Estrumate®	Merck Animal Health
	Rx	None	None	SynchSure	Boehringer Ingelheim Animal Health, USA Inc.
Dexamethasone	Rx	None	None	Dexamethasone Solution	Clipper Distributing Co., LLC
	Rx	None	None	Dexium	Bimeda, Inc.
Dinoprost tromethamine	Rx	None	None	Lutalyse® HighCon Injection	Zoetis, Inc.
	Rx	None	None	Lutalyse® Sterile Solution	Zoetis, Inc.
	Rx	None	None	ProstaMate	Bimeda, Inc.
Flunixin meglumine	Rx	36 hours	4 days	Banamine®	Merck Animal Health
	Rx	36 hours	4 days	Flu-Nix™ - D	Huvepharma
	Rx	36 hours	4 days	Flunazine	Bimeda, Inc.
	Rx	36 hours	4 days	Flunixin Injection	Norbrook Laboratories, Ltd.
Gonadorelin diacetate tetrahydrate	Rx	None	None	Cystorelin Injectable	Boehringer Ingelheim Animal Health, USA Inc.
	Rx	None	None	Fertagyl®	Merck Animal Health
	Rx	None	None	OvaCyst	Bimeda, Inc.
Gonadorelin hydrochloride	Rx	None	None	Factrel®	Zoetis, Inc.
Gonadotropin (chorionic)	Rx	None	None	Chorulon®	Merck Animal Health
Isoflupredone acetate	Rx	None	7 days	Predef® 2x"	Zoetis, Inc.
Oxytetracycline	OTC	96 hours	28 days	Agrimycin 200	Huvepharma
	OTC	96 hours	28 days	Bio-Mycin® 200	Boehringer Ingelheim Vetmedica, Inc.
	OTC	96 hours	28 days	Liquamycin® LA-200®	Zoetis, Inc.
	OTC	96 hours	28 days	Oxytetracycline Injection 200	Norbrook Laboratories, Ltd.
Oxytocin	Rx	None	None	Oxytocin Injection	Bimeda, Inc.
Penicillin G (procaine)	OTC	48 hours	14 days	Norocillin	Norbrook Laboratories, Ltd.
	OTC	48 hours	4 days	Pro-Pen-G™ Injection	Bimeda, Inc.
Sulfadimethoxine	Rx	60 hours	5 days	Di-Methox Injection 40%	Huvepharma
	OTC	60 hours	5 days	Sulfamed Injection	Bimeda, Inc.

" Discontinued product; some may still be in market.

FDA-APPROVED DRUGS FOR INTRAMAMMARY USE LACTATING CATTLE

ACTIVE INGREDIENT	DRUG TYPE	MILK WITHHOLDING TIME	MEAT WITHHOLDING TIME	PRODUCT NAME	MANUFACTURER/MARKETER
Amoxicillin trihydrate	Rx	60 hours	12 days	Amoxi-Mast®	Merck Animal Health
Ceftiofur hydrochloride	Rx	72 hours	2 days	SPECTRAMAST™ LC	Zoetis, Inc.
Cephapirin (sodium)	OTC	96 hours	4 days	Today®	Boehringer Ingelheim Vetmedica, Inc.
Hetacillin (potassium)	Rx	72 hours	10 days	PolyMast®	Boehringer Ingelheim Vetmedica, Inc.
Pirlimycin	Rx	36 hours	9 days*	Pirsue® Sterile Solution"	Zoetis, Inc.

* 9-day meat withhold following infusion twice at a 24-hour interval; 21-day meat withhold following any extended duration of therapy longer than 2 days and up to 8 consecutive days.

FDA-APPROVED DRUGS FOR ORAL USE LACTATING CATTLE

ACTIVE INGREDIENT	DRUG TYPE	MILK WITHHOLDING TIME	MEAT WITHHOLDING TIME	PRODUCT NAME	MANUFACTURER/MARKETER
Fenbendazole	OTC	None	8 days	Safe-Guard 10% Paste	Merck Animal Health
	OTC	None	8 days	Safe-Guard 10% Suspension	Merck Animal Health
Magnesium hydroxide	OTC	12 hours	None	Carmilax Bolus	Zoetis, Inc.
	OTC	12 hours	None	Carmilax Powder	Zoetis, Inc.
Poloxalene	OTC	None	None	Bloat Guard® Top Dressing	Phibro Animal Health
	OTC	None	None	TheraBloat® Drench Concentrate	Zoetis, Inc.
Sulfadimethoxine	Rx	60 hours	7 days	ALBON® Bolus	Zoetis, Inc.
Tetrachlorvinphos	OTC	None	None	Rabon 7.76 Oral Larvicide	Elanco Animal Health

FDA-APPROVED DRUGS FOR FEED ADDITIVE USE LACTATING CATTLE

ACTIVE INGREDIENT	DRUG TYPE	MILK WITHHOLDING TIME	MEAT WITHHOLDING TIME	PRODUCT NAME	MANUFACTURER/MARKETER
Fenbendazole	OTC	None	13 days	Safe-Guard 0.5% Top Dress Pellets	Merck Animal Health
	OTC	None	13 days	Safe-Guard 1.96%	Merck Animal Health
Monensin	OTC	None	None	Monovet 90	Huvepharma
Monensin (sodium)	OTC	None	None	Rumensin 90	Elanco Animal Health
Morantel tartrate	OTC	None	14 days	Rumatel® 88	Phibro Animal Health
Poloxalene	OTC	None	None	Bloat Guard® Liquid - Type A Medicated Article	Phibro Animal Health
	OTC	None	None	Bloat Guard® Medicated Top Dressing	Phibro Animal Health
	OTC	None	None	Bloat Guard® Type A Medicated Article	Phibro Animal Health
Tetrachlorvinphos	OTC	None	None	Rabon 7.76 Oral Larvicide	Elanco Animal Health

FDA-APPROVED DRUGS FOR INTRAVAGINAL USE LACTATING CATTLE

ACTIVE INGREDIENT	DRUG TYPE	MILK WITHHOLDING TIME	MEAT WITHHOLDING TIME	PRODUCT NAME	MANUFACTURER/MARKETER
Progesterone	OTC	None	None	EAZI-Breed™ CIDR® Cattle Insert^	Zoetis, Inc.

FDA-APPROVED DRUGS FOR TOPICAL USE LACTATING CATTLE

ACTIVE INGREDIENT	DRUG TYPE	MILK WITHHOLDING TIME	MEAT WITHHOLDING TIME	PRODUCT NAME	MANUFACTURER/MARKETER
Cyfluthrin	OTC	None	None	CyLence	Elanco Animal Health
Diflubenzuron & permethrin	OTC	None	None	Clean-Up II	Elanco Animal Health
Eprinomectin	OTC	None	None	EPRINEX Pour-On for Beef & Dairy Cattle	Boehringer Ingelheim Animal Health, USA Inc.
	OTC	None	None	Eprizero™ Pour-On for Beef and Dairy Cattle	Norbook Laboratories Limited
Moxidectin	OTC	None	None	Cyductin Pour on	Elanco Animal Health
Oxytetracycline hydrochloride/ Polymyxin B sulfate	Rx	None	None	Terramycin® Ophthalmic Ointment with Polymyxin	Zoetis, Inc.
Permethrin & piperonyl butoxide	OTC	None	None	Permethrin CDS Pour-On	Elanco Animal Health

^ Product is also approved for non-lactating cattle.

SERUM & URINE SCREENING TESTS | BY RESIDUES DETECTED

Screening Tests Available as of July 2022

Can be used in any dairy animal for detecting drug residues in serum and urine.\$

RESIDUES DETECTED	TEST NAME	SPONSOR	SPECIMEN	SENSITIVITY (PPB)
Amoxicillin®	Charm II Beta-lactam Test	Charm Sciences, Inc.	Serum	500
	Charm II Beta-lactam Test	Charm Sciences, Inc.	Urine	2000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	100
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	100
	Charm SL® Beta-lactam Test for Urine	Charm Sciences, Inc.	Urine	40
Ampicillin	Charm II Beta-lactam Test	Charm Sciences, Inc.	Serum	200
	Charm II Beta-lactam Test	Charm Sciences, Inc.	Urine	800
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	100
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	100
	Charm SL® Beta-lactam Test for Urine	Charm Sciences, Inc.	Urine	55
Ceftiofur	Charm II Beta-lactam Test	Charm Sciences, Inc.	Serum	500
	Charm II Beta-lactam Test	Charm Sciences, Inc.	Urine	2000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	1000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	1000
	Charm SL® Beta-lactam Test for Urine	Charm Sciences, Inc.	Urine	300
Cephalexin	Charm II Beta-lactam Test	Charm Sciences, Inc.	Serum	500
	Charm II Beta-lactam Test	Charm Sciences, Inc.	Urine	2000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	1000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	1000
	Charm SL® Beta-lactam Test for Urine	Charm Sciences, Inc.	Urine	300
	Charm SL® Beta-lactam Test for Urine	Charm Sciences, Inc.	Urine	1000
Cephapirin	Charm II Beta-lactam Test	Charm Sciences, Inc.	Serum	200
	Charm II Beta-lactam Test	Charm Sciences, Inc.	Urine	800
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	100
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	100
	Charm SL® Beta-lactam Test for Urine	Charm Sciences, Inc.	Urine	85
Chloramphenicol D	Charm II Amphenicol Test	Charm Sciences, Inc.	Serum	10
	Charm II Amphenicol Test	Charm Sciences, Inc.	Urine	10
	Charm II Chloramphenicol Test	Charm Sciences, Inc.	Serum	0.3
	Charm II Chloramphenicol Test	Charm Sciences, Inc.	Urine	10
Chlortetracycline	Charm II Tetracycline Test	Charm Sciences, Inc.	Serum	200
	Charm II Tetracycline Test	Charm Sciences, Inc.	Urine	3000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	10,000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	10,000
Cloxacillin	Charm II Beta-lactam Test	Charm Sciences, Inc.	Serum	2500
	Charm II Beta-lactam Test	Charm Sciences, Inc.	Urine	10,000

RESIDUES DETECTED	TEST NAME	SPONSOR	SPECIMEN	SENSITIVITY (PPB)
Cloxacillin	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	500
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	500
	Charm SL® Beta-lactam Test for Urine	Charm Sciences, Inc.	Urine	300
Dihydrostreptomycin	Charm II Streptomycin Test	Charm Sciences, Inc.	Serum	100
	Charm II Streptomycin Test	Charm Sciences, Inc.	Urine	2000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	5000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	5000
Enrofloxacin *	Charm Enrofloxacin Test (ROSA® Test)	Charm Sciences, Inc.	Urine	100
Erythromycin	Charm II Macrolide Test	Charm Sciences, Inc.	Serum	500
	Charm II Macrolide Test	Charm Sciences, Inc.	Urine	500
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	500
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	500
Florfenicol	Charm II Amphenicol Test	Charm Sciences, Inc.	Serum	400
	Charm II Amphenicol Test	Charm Sciences, Inc.	Urine	400
Gentamicin	Charm II Gentamicin and Neomycin Test	Charm Sciences, Inc.	Urine	2000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	600
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	600
	Charm II Gentamicin and Neomycin Test	Charm Sciences, Inc.	Serum	250
Hetacillin	Charm II Beta-lactam Test	Charm Sciences, Inc.	Serum	200
	Charm II Beta-lactam Test	Charm Sciences, Inc.	Urine	1000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	100
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	100
	Charm SL® Beta-lactam Test for Urine	Charm Sciences, Inc.	Urine	250
Kanamycin	Charm II Gentamicin and Neomycin Test	Charm Sciences, Inc.	Urine	2000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	5000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	5000
	Charm II Gentamicin and Neomycin Test	Charm Sciences, Inc.	Serum	>2000
Lincomycin	Charm II Macrolide Test	Charm Sciences, Inc.	Serum	2000
	Charm II Macrolide Test	Charm Sciences, Inc.	Urine	2000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	2000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	2000
Neomycin	Charm II Gentamicin and Neomycin Test	Charm Sciences, Inc.	Serum	50
	Charm II Gentamicin and Neomycin Test	Charm Sciences, Inc.	Urine	10,000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	1000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	1000

§ Inclusion of product names and associated information does not constitute an endorsement by the NMPF. Unless otherwise noted, all information contained herein was provided by the product's sponsor and no further attempts were made to validate or corroborate the sponsor's information. Neither the AVMA, NMPF, FDA, nor FARAD assumes any responsibility for penalties which may result from the use of this table or any of the products listed herein.

* Prohibited from use in any kind of lactating cattle.

RESIDUES DETECTED	TEST NAME	SPONSOR	SPECIMEN	SENSITIVITY (PPB)
Oxacillin	Charm II Beta-lactam Test	Charm Sciences, Inc.	Serum	2500
	Charm II Beta-lactam Test	Charm Sciences, Inc.	Urine	10,000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	1000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	1000
	Charm SL® Beta-lactam Test for Urine	Charm Sciences, Inc.	Urine	300
Oxytetracycline	Charm II Tetracycline Test	Charm Sciences, Inc.	Serum	100
	Charm II Tetracycline Test	Charm Sciences, Inc.	Urine	2500
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	3500
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	3500
Penicillin	Charm II Beta-lactam Test	Charm Sciences, Inc.	Serum	200
	Charm II Beta-lactam Test	Charm Sciences, Inc.	Urine	800
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	30
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	30
	Charm SL® Beta-lactam Test for Urine	Charm Sciences, Inc.	Urine	25
Pirlimycin	Charm II Macrolide Test	Charm Sciences, Inc.	Serum	3000
	Charm II Macrolide Test	Charm Sciences, Inc.	Urine	3000
Streptomycin	Charm II Streptomycin Test	Charm Sciences, Inc.	Serum	100
	Charm II Streptomycin Test	Charm Sciences, Inc.	Urine	2000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	5000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	5000
Sulfamethoxazole *	Charm II Sulfonamide Test	Charm Sciences, Inc.	Serum	120
	Charm II Sulfonamide Test	Charm Sciences, Inc.	Urine	300
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	5000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	5000
Sulfanilamide [ⓐ]	Charm II Sulfonamide Test	Charm Sciences, Inc.	Serum	1600
	Charm II Sulfonamide Test	Charm Sciences, Inc.	Urine	4000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	10,000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	10,000
Sulfapyridine *	Charm II Sulfonamide Test	Charm Sciences, Inc.	Serum	400
	Charm II Sulfonamide Test	Charm Sciences, Inc.	Urine	1000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	5000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	5000
Sulfaquinoxaline [ⓐ]	Charm II Sulfonamide Test	Charm Sciences, Inc.	Serum	150
	Charm II Sulfonamide Test	Charm Sciences, Inc.	Urine	500
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	5000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	5000
Sulfathiazole *	Charm II Sulfonamide Test	Charm Sciences, Inc.	Serum	300
	Charm II Sulfonamide Test	Charm Sciences, Inc.	Urine	1000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	250
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	2500
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	5000

RESIDUES DETECTED	TEST NAME	SPONSOR	SPECIMEN	SENSITIVITY (PPB)
Tetracycline	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	600
	Charm II Tetracycline Test	Charm Sciences, Inc.	Serum	40
	Charm II Tetracycline Test	Charm Sciences, Inc.	Urine	600
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	10,000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	10,000
Tilmicosin	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	1000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	1000
Tulathromycin	Charm II Macrolide Test	Charm Sciences, Inc.	Serum	500
	Charm II Macrolide Test	Charm Sciences, Inc.	Urine	500
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	500
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	500
Tylosin	Charm II Macrolide Test	Charm Sciences, Inc.	Serum	2000
	Charm II Macrolide Test	Charm Sciences, Inc.	Urine	2000
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Serum	200
	Charm Kidney Inhibition Swab Test	Charm Sciences, Inc.	Urine	200

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MILK SCREENING TESTS | BY RESIDUES DETECTED

Screening Tests Available as of July 2022 for Detecting Residues in Bulk Tank Milk

Not all of the tests listed below have been evaluated by FDA and accepted by the National Conference on Interstate Milk Shipments (NCIMS) for residue testing. Refer to [M-a-85](#) and [M-1-92-11](#) (latest revisions) or the other memorandums in the [FDA Grade "A" Milk Search \(GAMS\) System](#). These tests are believed to be reliable indicators of antibiotic contamination in milk and should be viewed as tools to screen bulk tank milk.

RESIDUES DETECTED	TOLERANCE (PPB)	TEST NAME	SPONSOR	SENSITIVITY (PPB)
Aflatoxin M1	0.5	Charm II Aflatoxin Test (Competitive)	Charm Sciences, Inc.	0.5
	0.5	Charm II Aflatoxin Test (Quantitative)	Charm Sciences, Inc.	0.02
	0.5	Charm II Aflatoxin Test (Sequential)	Charm Sciences, Inc.	0.5
	0.5	Charm MRL Aflatoxin M1 Quantitative Test	Charm Sciences, Inc.	0.05
	0.5	Charm SL® Aflatoxin M1 Quantitative Test	Charm Sciences, Inc.	0.5
	0.5	Reveal® Q+ for Aflatoxin M1 (Quantitative)	Neogen Corporation	0.5
	0.5	Reveal® Q+ HS for Aflatoxin M1 (Quantitative)	Neogen Corporation	0.05
Amoxicillin	10 #	Charm 3 SL3 Beta-lactam Test*	Charm Sciences, Inc.	8.4
	10 #	Charm <i>B. stearothermophilus</i> Tablet Disc Assay*	Charm Sciences, Inc.	7.5
	10 #	Charm ROSA® Beta-lactam 30-Second Test*	Charm Sciences, Inc.	5.8
	10 #	Charm Blue Yellow II Test	Charm Sciences, Inc.	3
	10 #	Charm Cowside® II Test	Charm Sciences, Inc.	4
	10 #	Charm HPLC-Receptogram	Charm Sciences, Inc.	10
	10 #	Charm II Beta-lactam Test* (Competitive)	Charm Sciences, Inc.	7.5
	10 #	Charm II Beta-lactam Test* (Quantitative)	Charm Sciences, Inc.	8.1
	10 #	Charm II Beta-lactam Test* (Sequential)	Charm Sciences, Inc.	8.1
	10 #	Charm MRL Beta-lactam 1-Minute Test	Charm Sciences, Inc.	4
	10 #	Charm MRL Beta-lactam 3-Minute Test	Charm Sciences, Inc.	5
	10 #	Charm MRL Beta-lactam and Tetracycline 2-Minute Test	Charm Sciences, Inc.	5
	10 #	Charm MRL Beta-lactam and Tetracycline Test	Charm Sciences, Inc.	4
	10 #	Charm MRL Beta-lactam RF Tetracycline 2-Minute Test	Charm Sciences, Inc.	4
	10 #	Charm MRL Beta-lactam Test	Charm Sciences, Inc.	4
	10 #	Charm QUAD®1 Test	Charm Sciences, Inc.	4
	10 #	Charm QUAD® Test	Charm Sciences, Inc.	4
	10 #	Charm SL® Beta-lactam Test*	Charm Sciences, Inc.	5.6
	10 #	Charm TRIO® Test	Charm Sciences, Inc.	3.5
	10 #	Delvotest® P-5 Pack*	DSM Food Specialties USA, Inc.	4.6
	10 #	Delvotest® P Mini*	DSM Food Specialties USA, Inc.	7.7
	10 #	Delvotest® SP NT	DSM Food Specialties USA, Inc.	2-3.0
	10 #	Delvotest® T	DSM Food Specialties USA, Inc.	4
	10 #	New SNAP Beta-lactam (Visual)	IDEXX Laboratories, Inc.	6.9
	10 #	New SNAP Beta-lactam*	IDEXX Laboratories, Inc.	7.3
	10 #	SNAP Beta-Lactam ST	IDEXX Laboratories, Inc.	4
	10 #	SNAP Beta-Lactam ST Plus	IDEXX Laboratories, Inc.	2
	10 #	SNAPduo ST Plus	IDEXX Laboratories, Inc.	3
	10 #	SNAP TRIO JAPAN	IDEXX Laboratories, Inc.	5

RESIDUES DETECTED	TOLERANCE (PPB)	TEST NAME	SPONSOR	SENSITIVITY (PPB)
Ampicillin	10 #	Charm 3 SL3 Beta-lactam Test*	Charm Sciences, Inc.	8.0
	10 #	Charm <i>B. stearothersophilus</i> Tablet Disc Assay*	Charm Sciences, Inc.	6.7
	10 #	Charm ROSA® Beta-lactam 30-Second Test	Charm Sciences, Inc.	5.9
	10 #	Charm Blue Yellow II Test	Charm Sciences, Inc.	3
	10 #	Charm Cowside® II Test	Charm Sciences, Inc.	4
	10 #	Charm HPLC-Receptogram	Charm Sciences, Inc.	2
	10 #	Charm II Beta-lactam Test* (Competitive)	Charm Sciences, Inc.	5.7
	10 #	Charm II Beta-lactam Test* (Quantitative)	Charm Sciences, Inc.	6.6
	10 #	Charm II Beta-lactam Test* (Sequential)	Charm Sciences, Inc.	6.6
	10 #	Charm MRL Beta-lactam 1-Minute Test	Charm Sciences, Inc.	4
	10 #	Charm MRL Beta-lactam 3-Minute Test	Charm Sciences, Inc.	4
	10 #	Charm MRL Beta-lactam and Tetracycline 2-Minute Test	Charm Sciences, Inc.	4
	10 #	Charm MRL Beta-lactam and Tetracycline Test	Charm Sciences, Inc.	4
	10 #	Charm MRL Beta-lactam RF Tetracycline 2-Minute Test	Charm Sciences, Inc.	4
	10 #	Charm MRL Beta-lactam Test	Charm Sciences, Inc.	4
	10 #	Charm QUAD®1 Test	Charm Sciences, Inc.	4
	10 #	Charm QUAD® Test	Charm Sciences, Inc.	4
	10 #	Charm SL® Beta-lactam Test*	Charm Sciences, Inc.	8.5
	10 #	Charm TRIO® Test	Charm Sciences, Inc.	8.5
	10 #	Delvotest® P-5 Pack*	DSM Food Specialties USA, Inc.	4.0
	10 #	Delvotest® P Mini*	DSM Food Specialties USA, Inc.	5.1
	10 #	Delvotest® SP NT	DSM Food Specialties USA, Inc.	2
	10 #	Delvotest® T	DSM Food Specialties USA, Inc.	3
	10 #	New SNAP Beta-lactam (Visual)	IDEXX Laboratories, Inc.	6.2
	10 #	New SNAP Beta-lactam*	IDEXX Laboratories, Inc.	5.8
	10 #	SNAP Beta-Lactam ST	IDEXX Laboratories, Inc.	4
	10 #	SNAP Beta-Lactam ST Plus	IDEXX Laboratories, Inc.	4
	10 #	SNAPduo ST Plus	IDEXX Laboratories, Inc.	4
	10 #	SNAP TRIO JAPAN	IDEXX Laboratories, Inc.	4
Bacitracin	500 #	Delvotest® P Mini	DSM Food Specialties USA, Inc.	>1000
	500 #	Delvotest® SP NT	DSM Food Specialties USA, Inc.	580
Cefoperazone	None √	Charm 3 SL3 Beta-lactam Test	Charm Sciences, Inc.	1
	None √	Charm <i>B. stearothersophilus</i> Tablet Disc Assay	Charm Sciences, Inc.	5
	None √	Charm ROSA® Beta-lactam 30-Second Test	Charm Sciences, Inc.	1
	None √	Charm Blue Yellow II Test	Charm Sciences, Inc.	30
	None √	Charm Cowside® II Test	Charm Sciences, Inc.	30
	None √	Charm II Beta-lactam Test (Competitive)	Charm Sciences, Inc.	20
	None √	Charm II Beta-lactam Test (Quantitative)	Charm Sciences, Inc.	20
	None √	Charm II Beta-lactam Test (Sequential)	Charm Sciences, Inc.	5
	None √	Charm MRL Beta-lactam 1-Minute Test	Charm Sciences, Inc.	3
	None √	Charm MRL Beta-lactam 3-Minute Test	Charm Sciences, Inc.	2

* Prohibited from use in any kind of lactating cattle.

RESIDUES DETECTED	TOLERANCE (PPB)	TEST NAME	SPONSOR	SENSITIVITY (PPB)
Cefoperazone	None [§]	Charm MRL Beta-lactam and Tetracycline 2-Minute Test	Charm Sciences, Inc.	3
	None [§]	Charm MRL Beta-lactam and Tetracycline Test	Charm Sciences, Inc.	8
	None [§]	Charm MRL Beta-lactam RF Tetracycline 2-Minute Test	Charm Sciences, Inc.	2
	None [§]	Charm MRL Beta-lactam Test	Charm Sciences, Inc.	9
	None [§]	Charm QUAD®1 Test	Charm Sciences, Inc.	3
	None [§]	Charm QUAD® Test	Charm Sciences, Inc.	3
	None [§]	Charm SL® Beta-lactam Test	Charm Sciences, Inc.	15
	None [§]	Charm TRIO® Test	Charm Sciences, Inc.	40
	None [§]	Delvotest® SP NT	DSM Food Specialties USA, Inc.	580
	None [§]	Delvotest® T	DSM Food Specialties USA, Inc.	40
	None [§]	SNAP Beta-Lactam ST	IDEXX Laboratories, Inc.	35
	None [§]	SNAP Beta-Lactam ST Plus	IDEXX Laboratories, Inc.	20
	None [§]	SNAPduo ST Plus	IDEXX Laboratories, Inc.	35
Cefquinome	None [§]	Charm 3 SL3 Beta-lactam Test	Charm Sciences, Inc.	50
	None [§]	Charm <i>B. stearothersophilus</i> Tablet Disc Assay	Charm Sciences, Inc.	100
	None [§]	Charm ROSA® Beta-lactam 30-Second Test	Charm Sciences, Inc.	50
	None [§]	Charm Blue Yellow II Test	Charm Sciences, Inc.	60
	None [§]	Charm Cowside® II Test	Charm Sciences, Inc.	60
	None [§]	Charm II Beta-lactam Test (Competitive)	Charm Sciences, Inc.	40
	None [§]	Charm II Beta-lactam Test (Quantitative)	Charm Sciences, Inc.	40
	None [§]	Charm II Beta-lactam Test (Sequential)	Charm Sciences, Inc.	10
	None [§]	Charm MRL Beta-lactam 1-Minute Test	Charm Sciences, Inc.	40
	None [§]	Charm MRL Beta-lactam 3-Minute Test	Charm Sciences, Inc.	25
	None [§]	Charm MRL Beta-lactam and Tetracycline 2-Minute Test	Charm Sciences, Inc.	25
	None [§]	Charm MRL Beta-lactam and Tetracycline Test	Charm Sciences, Inc.	20
	None [§]	Charm MRL Beta-lactam RF Tetracycline 2-Minute Test	Charm Sciences, Inc.	25
	None [§]	Charm MRL Beta-lactam Test	Charm Sciences, Inc.	20
	None [§]	Charm QUAD® Test	Charm Sciences, Inc.	20
	None [§]	Charm QUAD®1 Test	Charm Sciences, Inc.	15
	None [§]	Charm SL® Beta-lactam Test	Charm Sciences, Inc.	30
	None [§]	Delvotest® T	DSM Food Specialties USA, Inc.	40
	None [§]	SNAP Beta-Lactam ST	IDEXX Laboratories, Inc.	16
	None [§]	SNAP Beta-Lactam ST Plus	IDEXX Laboratories, Inc.	12
	None [§]	SNAPduo ST Plus	IDEXX Laboratories, Inc.	16
Ceftiofur	100 [£]	Charm 3 SL3 Beta-lactam Test*	Charm Sciences, Inc.	79
	100 [£]	Charm <i>B. stearothersophilus</i> Tablet Disc Assay*	Charm Sciences, Inc.	>100
	100 [£]	Charm Blue Yellow II Test	Charm Sciences, Inc.	100
	100 [£]	Charm Cowside® II Test	Charm Sciences, Inc.	>100
	100 [£]	Charm Flunixin and Beta-lactam Test*	Charm Sciences, Inc.	63
	100 [£]	Charm HPLC-Receptogram	Charm Sciences, Inc.	30-40

RESIDUES DETECTED	TOLERANCE (PPB)	TEST NAME	SPONSOR	SENSITIVITY (PPB)
Ceftiofur	100 [‡]	Charm II Beta-lactam Test* (Competitive)	Charm Sciences, Inc.	47
	100 [‡]	Charm II Beta-lactam Test* (Quantitative)	Charm Sciences, Inc.	8.0
	100 [‡]	Charm II Beta-lactam Test* (Sequential)	Charm Sciences, Inc.	58
	100 [‡]	Charm MRL Beta-lactam RF Tetracycline 2-Minute Test	Charm Sciences, Inc.	70
	100 [‡]	Charm MRL Beta-lactam 1-Minute Test	Charm Sciences, Inc.	100
	100 [‡]	Charm MRL Beta-lactam 3-Minute Test	Charm Sciences, Inc.	40
	100 [‡]	Charm MRL Beta-lactam and Tetracycline 2-Minute Test	Charm Sciences, Inc.	70
	100 [‡]	Charm MRL Beta-lactam and Tetracycline Test	Charm Sciences, Inc.	20
	100 [‡]	Charm MRL Beta-lactam Test	Charm Sciences, Inc.	20
	100 [‡]	Charm QUAD® Test	Charm Sciences, Inc.	40
	100 [‡]	Charm QUAD®1 Test	Charm Sciences, Inc.	70
	100 [‡]	Charm ROSA® Beta-lactam 30-Second Test	Charm Sciences, Inc.	73
	100 [‡]	Charm SL® Beta-lactam Test*	Charm Sciences, Inc.	77
	100 [‡]	Charm TRIO® Test	Charm Sciences, Inc.	50
	100 [‡]	Delvotest® P-5 Pack*	DSM Food Specialties USA, Inc.	>100
	100 [‡]	Delvotest® P Mini*	DSM Food Specialties USA, Inc.	>100
	100 [‡]	Delvotest® SP NT	DSM Food Specialties USA, Inc.	130
	100 [‡]	Delvotest® T	DSM Food Specialties USA, Inc.	80
	100 [‡]	New SNAP Beta-Lactam*	IDEXX Laboratories, Inc.	12
	100 [‡]	SNAP Beta-Lactam ST	IDEXX Laboratories, Inc.	50 - 80
	100 [‡]	SNAP Beta-Lactam ST Plus	IDEXX Laboratories, Inc.	9
	100 [‡]	SNAPduo ST Plus	IDEXX Laboratories, Inc.	8
	100 [‡]	SNAP TRIO JAPAN	IDEXX Laboratories, Inc.	20
Cephalexin	None [‡]	Charm 3 SL3 Beta-lactam Test	Charm Sciences, Inc.	3000
	None [‡]	Charm <i>B. stearothersophilus</i> Tablet Disc Assay	Charm Sciences, Inc.	85
	None [‡]	Charm ROSA® Beta-lactam 30-Second Test	Charm Sciences, Inc.	2000
	None [‡]	Charm Blue Yellow II Test	Charm Sciences, Inc.	100
	None [‡]	Charm Cowside® II Test	Charm Sciences, Inc.	50
	None [‡]	Charm II Beta-lactam Test (Competitive)	Charm Sciences, Inc.	45
	None [‡]	Charm II Beta-lactam Test (Quantitative)	Charm Sciences, Inc.	40
	None [‡]	Charm II Beta-lactam Test (Sequential)	Charm Sciences, Inc.	40
	None [‡]	Charm MRL Beta-lactam	Charm Sciences, Inc.	30
	None [‡]	Charm MRL Beta-lactam 1-Minute Test	Charm Sciences, Inc.	1000
	None [‡]	Charm MRL Beta-lactam 3-Minute Test	Charm Sciences, Inc.	1000
	None [‡]	Charm MRL Beta-lactam and Tetracycline Test	Charm Sciences, Inc.	2000
	None [‡]	Charm MRL Beta-lactam and Tetracycline 2-Minute Test	Charm Sciences, Inc.	2000
	None [‡]	Charm MRL Beta-lactam Test	Charm Sciences, Inc.	60
	None [‡]	Charm QUAD®1 Test	Charm Sciences, Inc.	80
	None [‡]	Charm QUAD® Test	Charm Sciences, Inc.	1000
	None [‡]	Charm SL® Beta-lactam Test	Charm Sciences, Inc.	50
	None [‡]	Charm TRIO® Test	Charm Sciences, Inc.	750

[‡] The tolerance was established for the marker residue, not the parent compound. The ceftiofur tolerance has been changed from 50 ppb ceftiofur (parent drug) to 100 ppb ceftiofur marker residue (DCA, desfuryleftiofur metabolite derivative).

RESIDUES DETECTED	TOLERANCE (PPB)	TEST NAME	SPONSOR	SENSITIVITY (PPB)
Cephalexin	None [§]	Delvotest® P-5 Pack*	DSM Food Specialties USA, Inc.	60-100
	None [§]	Delvotest® P Mini*	DSM Food Specialties USA, Inc.	60-100
	None [§]	Delvotest® SP NT	DSM Food Specialties USA, Inc.	5-6.0
	None [§]	Delvotest® T	DSM Food Specialties USA, Inc.	30
	None [§]	SNAP Beta-Lactam ST	IDEXX Laboratories, Inc.	>7500
	None [§]	SNAP Beta-Lactam ST Plus	IDEXX Laboratories, Inc.	40
	None [§]	SNAPduo ST Plus	IDEXX Laboratories, Inc.	30
Cephapirin	20 #	Charm ROSA® Beta-lactam 30-Second Test	Charm Sciences, Inc.	13
	20 #	Charm 3 SL3 Beta-lactam Test*	Charm Sciences, Inc.	20.0
	20 #	Charm <i>B. stearothersophilus</i> Tablet Disc Assay*	Charm Sciences, Inc.	11.7
	20 #	Charm Blue Yellow II Test	Charm Sciences, Inc.	6
	20 #	Charm Cowside® II Test	Charm Sciences, Inc.	10
	20 #	Charm HPLC-Receptogram	Charm Sciences, Inc.	2
	20 #	Charm II Beta-lactam Test* (Competitive)	Charm Sciences, Inc.	4.2
	20 #	Charm II Beta-lactam Test* (Quantitative)	Charm Sciences, Inc.	4.1
	20 #	Charm II Beta-lactam Test* (Sequential)	Charm Sciences, Inc.	4.1
	20 #	Charm MRL Beta-lactam 1-Minute Test	Charm Sciences, Inc.	20
	20 #	Charm MRL Beta-lactam 3-Minute Test	Charm Sciences, Inc.	30
	20 #	Charm MRL Beta-lactam and Tetracycline 2-Minute Test	Charm Sciences, Inc.	25
	20 #	Charm MRL Beta-lactam and Tetracycline Test	Charm Sciences, Inc.	8
	20 #	Charm MRL Beta-lactam RF Tetracycline 2-Minute Test	Charm Sciences, Inc.	20
	20 #	Charm MRL Beta-lactam Test	Charm Sciences, Inc.	10
	20 #	Charm QUAD®1 Test	Charm Sciences, Inc.	10
	20 #	Charm QUAD® Test	Charm Sciences, Inc.	30
	20 #	Charm SL® Beta-lactam Test*	Charm Sciences, Inc.	13.7
	20 #	Charm TRIO® Test	Charm Sciences, Inc.	14.5
	20 #	Delvotest® P-5 Pack*	DSM Food Specialties USA, Inc.	8.2
	20 #	Delvotest® P Mini*	DSM Food Specialties USA, Inc.	7
	20 #	Delvotest® SP NT	DSM Food Specialties USA, Inc.	4-6.0
	20 #	Delvotest® T	DSM Food Specialties USA, Inc.	5
	20 #	New SNAP Beta-lactam (Visual)	IDEXX Laboratories, Inc.	11.9
	20 #	New SNAP Beta-lactam*	IDEXX Laboratories, Inc.	11.7
	20 #	SNAP Beta-Lactam ST	IDEXX Laboratories, Inc.	25 - 35
	20 #	SNAP Beta-Lactam ST Plus	IDEXX Laboratories, Inc.	25
	20 #	SNAPduo ST Plus	IDEXX Laboratories, Inc.	30
	20 #	SNAP TRIO JAPAN	IDEXX Laboratories, Inc.	10
Chloramphenicol D	None [§]	Charm <i>B. stearothersophilus</i> Tablet Disc Assay	Charm Sciences, Inc.	20,000
	None [§]	Charm HPLC-Receptogram	Charm Sciences, Inc.	1
	None [§]	Charm II Amphenicol Test*	Charm Sciences, Inc.	1
	None [§]	Charm II Chloramphenicol Test*	Charm Sciences, Inc.	0.1

RESIDUES DETECTED	TOLERANCE (PPB)	TEST NAME	SPONSOR	SENSITIVITY (PPB)
Chloramphenicol D	None [✓]	Charm QUAD® Test	Charm Sciences, Inc.	0.3
	None [✓]	Charm Amphenicol Test	Charm Sciences, Inc.	0.1
	None [✓]	Charm Chloramphenicol Test	Charm Sciences, Inc.	0.15
	None [✓]	Delvotest® SP NT	DSM Food Specialties USA, Inc.	2500
	None [✓]	Delvotest® T	DSM Food Specialties USA, Inc.	3080
Chlortetracycline	300 #	Charm <i>B. stearothersophilus</i> Tablet Disc Assay	Charm Sciences, Inc.	1000 [†]
	300 #	Charm Blue Yellow II Test	Charm Sciences, Inc.	200
	300 #	Charm Cowside® II Test	Charm Sciences, Inc.	100
	300 #	Charm HPLC-Receptogram	Charm Sciences, Inc.	15
	300 #	Charm II Tetracycline Drug Test* (Competitive Assay)	Charm Sciences, Inc.	257
	300 #	Charm MRL Beta-lactam and Tetracycline 2-Minute Test	Charm Sciences, Inc.	100
	300 #	Charm MRL Beta-lactam and Tetracycline Test	Charm Sciences, Inc.	100
	300 #	Charm MRL Beta-lactam RF Tetracycline 2-Minute Test	Charm Sciences, Inc.	10
	300 #	Charm QUAD®1 Test	Charm Sciences, Inc.	70
	300 #	Charm QUAD® Test	Charm Sciences, Inc.	6
	300 #	Charm ROSA® Tetracycline-SL (Dilution Confirmation) Test	Charm Sciences, Inc.	292
	300 #	Charm TRIO® Test	Charm Sciences, Inc.	34
	300 #	Delvotest® P-5 Pack	DSM Food Specialties USA, Inc.	250-300
	300 #	Delvotest® P Mini	DSM Food Specialties USA, Inc.	200
	300 #	Delvotest® SP NT	DSM Food Specialties USA, Inc.	250-300
	300 #	Delvotest® T	DSM Food Specialties USA, Inc.	150
	300 #	SNAP Tetracycline	IDEXX Laboratories, Inc.	60
	300 #	SNAP Tetracycline (Dilution confirmation)	IDEXX Laboratories, Inc.	600
	300 #	SNAPduo ST Plus	IDEXX Laboratories, Inc.	40
Clindamycin	None [✓]	Charm II Macrolide Test	Charm Sciences, Inc.	50
Cloxacillin	10 #	Charm 3 SL3 Beta-lactam Test*	Charm Sciences, Inc.	8.6
	10 #	Charm <i>B. stearothersophilus</i> Tablet Disc Assay*	Charm Sciences, Inc.	48 [◊]
	10 #	Charm ROSA® Beta-lactum 30-Second Test	Charm Sciences, Inc.	8.1
	10 #	Charm Blue Yellow II Test	Charm Sciences, Inc.	20
	10 #	Charm Cowside® II Test	Charm Sciences, Inc.	25
	10 #	Charm HPLC-Receptogram	Charm Sciences, Inc.	10
	10 #	Charm II Beta-lactam Test* (Competitive)	Charm Sciences, Inc.	70 [◊]
	10 #	Charm II Beta-lactam Test* (Quantitative)	Charm Sciences, Inc.	8.5
	10 #	Charm II Beta-lactam Test* (Sequential)	Charm Sciences, Inc.	50 [◊]
	10 #	Charm MRL Beta-lactam 1-Minute Test	Charm Sciences, Inc.	20
	10 #	Charm MRL Beta-lactam 3-Minute Test	Charm Sciences, Inc.	30
	10 #	Charm MRL Beta-lactam and Tetracycline 2-Minute Test	Charm Sciences, Inc.	20
	10 #	Charm MRL Beta-lactam and Tetracycline Test	Charm Sciences, Inc.	35

* Prohibited from use in any kind of lactating cattle.

[†] The sensitivity of the test method was determined by independent research at Virginia Polytechnic Institute and State University.

RESIDUES DETECTED	TOLERANCE (PPB)	TEST NAME	SPONSOR	SENSITIVITY (PPB)
Cloxacillin	10 #	Charm MRL Beta-lactam RF Tetracycline 2-Minute Test	Charm Sciences, Inc.	20
	10 #	Charm MRL Beta-lactam Test	Charm Sciences, Inc.	35
	10 #	Charm QUAD®1 Test	Charm Sciences, Inc.	25
	10 #	Charm QUAD® Test	Charm Sciences, Inc.	30
	10 #	Charm SL® Beta-lactam Test	Charm Sciences, Inc.	50 °
	10 #	Charm TRIO® Test	Charm Sciences, Inc.	8.5
	10 #	Delvotest® P Mini	DSM Food Specialties USA, Inc.	25 °
	10 #	Delvotest® P-5 Pack	DSM Food Specialties USA, Inc.	30 °
	10 #	Delvotest® SP NT	DSM Food Specialties USA, Inc.	11
	10 #	Delvotest® T	DSM Food Specialties USA, Inc.	5
	10 #	New SNAP Beta-Lactam	IDEXX Laboratories, Inc.	50 °
	10 #	SNAP Beta-Lactam ST	IDEXX Laboratories, Inc.	6
	10 #	SNAP Beta-Lactam ST Plus	IDEXX Laboratories, Inc.	3
	10 #	SNAPduo ST Plus	IDEXX Laboratories, Inc.	4
	10 #	SNAP TRIO JAPAN	IDEXX Laboratories, Inc.	6
Danofloxacin	None √	Charm QUAD®1 Test	Charm Sciences, Inc.	20
	None √	Charm Quinolone Test	Charm Sciences, Inc.	10
Dapson	None √	Charm Cowside® II Test	Charm Sciences, Inc.	2
	None √	Charm II Sulfa Drug Test (Competitive)	Charm Sciences, Inc.	2
	None √	Charm II Sulfa Drug Test (Sequential)	Charm Sciences, Inc.	2
	None √	Delvotest® T	DSM Food Specialties USA, Inc.	40
Dicloxacillin	None √	Charm 3 SL3 Beta-lactam Test	Charm Sciences, Inc.	7
	None √	Charm <i>B. stearothersophilus</i> Tablet Disc Assay	Charm Sciences, Inc.	40
	None √	Charm ROSA® Beta-lactum 30-Second Test	Charm Sciences, Inc.	7
	None √	Charm Blue Yellow II Test	Charm Sciences, Inc.	30
	None √	Charm Cowside® II Test	Charm Sciences, Inc.	10
	None √	Charm HPLC Receptogram	Charm Sciences, Inc.	10
	None √	Charm II Beta-lactam Test (Competitive)	Charm Sciences, Inc.	45
	None √	Charm II Beta-lactam Test (Quantitative)	Charm Sciences, Inc.	5
	None √	Charm II Beta-lactam Test (Sequential)	Charm Sciences, Inc.	45
	None √	Charm MRL Beta-lactam 1-Minute Test	Charm Sciences, Inc.	15
	None √	Charm MRL Beta-lactam 3-Minute Test	Charm Sciences, Inc.	25
	None √	Charm MRL Beta-lactam and Tetracycline 2-Minute Test	Charm Sciences, Inc.	20
	None √	Charm MRL Beta-lactam and Tetracycline Test	Charm Sciences, Inc.	30
	None √	Charm MRL Beta-lactam RF Tetracycline 2-Minute Test	Charm Sciences, Inc.	20
	None √	Charm MRL Beta-lactam Test	Charm Sciences, Inc.	30
	None √	Charm QUAD®1 Test	Charm Sciences, Inc.	20
	None √	Charm QUAD® Test	Charm Sciences, Inc.	30
	None √	Charm SL® Beta-lactam Test	Charm Sciences, Inc.	50
	None √	Charm TRIO® Test	Charm Sciences, Inc.	10

RESIDUES DETECTED	TOLERANCE (PPB)	TEST NAME	SPONSOR	SENSITIVITY (PPB)
Dicloxacillin	None [✓]	Delvotest® P-5 Pack	DSM Food Specialties USA, Inc.	15
	None [✓]	Delvotest® P Mini	DSM Food Specialties USA, Inc.	20
	None [✓]	Delvotest® SP NT	DSM Food Specialties USA, Inc.	6
	None [✓]	New SNAP Beta-lactam	IDEXX Laboratories, Inc.	50
	None [✓]	SNAP Beta-Lactam ST	IDEXX Laboratories, Inc.	6
	None [✓]	SNAP Beta-Lactam ST Plus	IDEXX Laboratories, Inc.	4
	None [✓]	SNAPduo ST Plus	IDEXX Laboratories, Inc.	4
	None [✓]	SNAP TRIO JAPAN	IDEXX Laboratories, Inc.	6
Dihydrostreptomycin	125 [#]	Charm II Gentamicin and Streptomycin Test	Charm Sciences, Inc.	75
	125 [#]	Charm QUAD®3 Test	Charm Sciences, Inc.	100
	125 [#]	Charm Neomycin and Streptomycin Test	Charm Sciences, Inc.	125
	125 [#]	Charm Streptomycin Test	Charm Sciences, Inc.	75
	125 [#]	Delvotest® P Mini	DSM Food Specialties USA, Inc.	5000
	125 [#]	Delvotest® SP NT	DSM Food Specialties USA, Inc.	680
	125 [#]	Delvotest® T	DSM Food Specialties USA, Inc.	800
Enrofloxacin	None	Charm Enrofloxacin Test (ROSA® Test)	Charm Sciences, Inc.	7
	None	Charm QUAD®1 Test	Charm Sciences, Inc.	15
	None	Charm Quinolone Test	Charm Sciences, Inc.	10
	None	Delvotest® SP NT	DSM Food Specialties USA, Inc.	1000-1500
Erythromycin	50 [^]	Charm <i>B. stearothersophilus</i> Tablet Disc Assay	Charm Sciences, Inc.	400 [†]
	50 [^]	Charm Blue Yellow II Test	Charm Sciences, Inc.	150
	50 [^]	Charm Cowside® II Test	Charm Sciences, Inc.	100
	50 [^]	Charm II Macrolide Test	Charm Sciences, Inc.	30
	50 [^]	Charm QUAD®2-G Test	Charm Sciences, Inc.	30
	50 [^]	Delvotest® P-5 Pack	DSM Food Specialties USA, Inc.	250
	50 [^]	Delvotest® P Mini	DSM Food Specialties USA, Inc.	500
	50 [^]	Delvotest® SP NT	DSM Food Specialties USA, Inc.	90
	50 [^]	Delvotest® T	DSM Food Specialties USA, Inc.	150
Florfenicol	None	Charm Amphenicol Test	Charm Sciences, Inc.	6
	None	Charm Florfenicol and Thiamphenicol Test	Charm Sciences, Inc.	1
Gentamicin	30 [^]	Charm <i>B. stearothersophilus</i> Tablet Disc Assay	Charm Sciences, Inc.	100
	30 [^]	Charm Blue Yellow II Test	Charm Sciences, Inc.	100
	30 [^]	Charm Cowside® II Test	Charm Sciences, Inc.	100
	30 [^]	Charm Gentmicin Test	Charm Sciences, Inc.	24
	30 [^]	Charm II Gentamicin and Neomycin Test	Charm Sciences, Inc.	24
	30 [^]	Charm II Gentamicin and Streptomycin Test	Charm Sciences, Inc.	30
	30 [^]	Charm QUAD®2-G Test	Charm Sciences, Inc.	150
	30 [^]	Delvotest® P Mini	DSM Food Specialties USA, Inc.	1000
	30 [^]	Delvotest® SP NT	DSM Food Specialties USA, Inc.	100
	30 [^]	Delvotest® T	DSM Food Specialties USA, Inc.	80
	30 [^]	SNAP Gentamicin	IDEXX Laboratories, Inc.	30 [†]

^{*} Prohibited from use in any kind of lactating cattle.

[^] 90/95% concentrations were not determined for sensitivities significantly above the tolerance/safe level.

RESIDUES DETECTED	TOLERANCE (PPB)	TEST NAME	SPONSOR	SENSITIVITY (PPB)
Hetacillin	None [✓]	Charm <i>B. stearothersophilus</i> Tablet Disc Assay	Charm Sciences, Inc.	7.5
	None [✓]	Charm 3 SL3 Beta-lactam Test	Charm Sciences, Inc.	8
	None [✓]	Charm ROSA® Beta-lactam 30-Second Test	Charm Sciences, Inc.	3
	None [✓]	Charm Blue Yellow II Test	Charm Sciences, Inc.	3
	None [✓]	Charm Cowside® II Test	Charm Sciences, Inc.	4
	None [✓]	Charm Flunixin and Beta-lactam Test	Charm Sciences, Inc.	5.9
	None [✓]	Charm II Beta-lactam Test (Competitive)	Charm Sciences, Inc.	7.5
	None [✓]	Charm II Beta-lactam Test (Quantitative)	Charm Sciences, Inc.	7.5
	None [✓]	Charm II Beta-lactam Test (Sequential)	Charm Sciences, Inc.	7.5
	None [✓]	Charm MRL Beta-lactam	Charm Sciences, Inc.	4
	None [✓]	Charm MRL Beta-lactam 1-Minute Test	Charm Sciences, Inc.	4
	None [✓]	Charm MRL Beta-lactam 3-Minute Test	Charm Sciences, Inc.	4
	None [✓]	Charm MRL Beta-lactam and Tetracycline 2-Minute Test	Charm Sciences, Inc.	4
	None [✓]	Charm MRL Beta-lactam and Tetracycline Test	Charm Sciences, Inc.	4
	None [✓]	Charm MRL Beta-lactam RF Tetracycline 2-Minute Test	Charm Sciences, Inc.	4
	None [✓]	Charm MRL Beta-lactam Test	Charm Sciences, Inc.	4
	None [✓]	Charm QUAD®1 Test	Charm Sciences, Inc.	4
	None [✓]	Charm QUAD® Test	Charm Sciences, Inc.	4
	None [✓]	Charm SL® Beta-lactam Test	Charm Sciences, Inc.	7.5
	None [✓]	Charm TRIO® Test	Charm Sciences, Inc.	4
	None [✓]	Delvotest® P-5 Pack	DSM Food Specialties USA, Inc.	5
	None [✓]	Delvotest® P Mini	DSM Food Specialties USA, Inc.	5
Kanamycin	None [✓]	Charm <i>B. stearothersophilus</i> Tablet Disc Assay	Charm Sciences, Inc.	1000
	None [✓]	Charm II Gentamicin and Streptomycin Test	Charm Sciences, Inc.	1000
	None [✓]	Charm QUAD®3 Test	Charm Sciences, Inc.	100
	None [✓]	Delvotest® SP NT	DSM Food Specialties USA, Inc.	5000
	None [✓]	Delvotest® T	DSM Food Specialties USA, Inc.	1310
Lincomycin	None [✓]	Charm Blue Yellow II Test	Charm Sciences, Inc.	150
	None [✓]	Charm Cowside® II Test	Charm Sciences, Inc.	150
	None [✓]	Charm II Macrolide Test	Charm Sciences, Inc.	100
	None [✓]	Charm QUAD®2 Test	Charm Sciences, Inc.	150
	None [✓]	Delvotest® P-5 Pack	DSM Food Specialties USA, Inc.	400-1000
	None [✓]	Delvotest® P Mini	DSM Food Specialties USA, Inc.	400-1000
	None [✓]	Delvotest® SP NT	DSM Food Specialties USA, Inc.	156
	None [✓]	Delvotest® T	DSM Food Specialties USA, Inc.	180
Neomycin	150 [#]	Charm Blue Yellow II Test	Charm Sciences, Inc.	150
	150 [#]	Charm Cowside® II Test	Charm Sciences, Inc.	150
	150 [#]	Charm II Gentamicin and Neomycin Test	Charm Sciences, Inc.	10
	150 [#]	Charm QUAD®3 Test	Charm Sciences, Inc.	250

[^] Values indicate the FDA-established target testing levels and do not represent official tolerance levels. Target testing levels are used by the FDA as guides for deciding whether or not to prosecute. They are not and cannot be transformed into tolerances that are established for animal drugs under section 512 (b) of the Federal Food, Drug & Cosmetic Act. They are not binding, do not dictate any result, do not limit the FDA's discretion in any way, and do not protect milk producers (or milk) from court enforcement action.

^{*} Prohibited from use in any kind of lactating cattle.

RESIDUES DETECTED	TOLERANCE (PPB)	TEST NAME	SPONSOR	SENSITIVITY (PPB)
Neomycin	150 [#]	Charm Neomycin and Streptomycin Test	Charm Sciences, Inc.	150
	150 [#]	Delvotest® P Mini	DSM Food Specialties USA, Inc.	1000-5000
	150 [#]	Delvotest® SP NT	DSM Food Specialties USA, Inc.	810
	150 [#]	Delvotest® T	DSM Food Specialties USA, Inc.	60
Novobiocin	100 [#]	Charm <i>B. stearothersophilus</i> Tablet Disc Assay	Charm Sciences, Inc.	1000
	100 [#]	Delvotest® P Mini	DSM Food Specialties USA, Inc.	600
	100 [#]	Delvotest® SP NT	DSM Food Specialties USA, Inc.	750-800
Oxytetracycline	300 [#]	Charm <i>B. stearothersophilus</i> Tablet Disc Assay	Charm Sciences, Inc.	1000 [†]
	300 [#]	Charm Blue Yellow II Test	Charm Sciences, Inc.	100
	300 [#]	Charm Cowside® II Test	Charm Sciences, Inc.	100
	300 [#]	Charm HPLC-Receptogram	Charm Sciences, Inc.	15
	300 [#]	Charm II Tetracycline Drug Test (Competitive Assay)	Charm Sciences, Inc.	119
	300 [#]	Charm MRL Beta-lactam and Tetracycline 2-Minute Test	Charm Sciences, Inc.	100
	300 [#]	Charm MRL Beta-lactam and Tetracycline Test	Charm Sciences, Inc.	100
	300 [#]	Charm MRL Beta-lactam RF Tetracycline 2-Minute Test	Charm Sciences, Inc.	10
	300 [#]	Charm QUAD®1 Test	Charm Sciences, Inc.	70
	300 [#]	Charm QUAD® Test	Charm Sciences, Inc.	6
	300 [#]	Charm ROSA® Tetracycline-SL (Dilution Confirmation) Test	Charm Sciences, Inc.	243
	300 [#]	Charm Tetracycline Test	Charm Sciences, Inc.	94
	300 [#]	Charm TRIO® Test	Charm Sciences, Inc.	53
	300 [#]	Delvotest® P-5 Pack	DSM Food Specialties USA, Inc.	400
	300 [#]	Delvotest® P Mini	DSM Food Specialties USA, Inc.	300
	300 [#]	Delvotest® SP NT	DSM Food Specialties USA, Inc.	235
	300 [#]	Delvotest® T	DSM Food Specialties USA, Inc.	80
	300 [#]	SNAP Tetracycline	IDEXX Laboratories, Inc.	18
	300 [#]	SNAP Tetracycline (Dilution confirmation)	IDEXX Laboratories, Inc.	180
	300 [#]	SNAPduo ST Plus	IDEXX Laboratories, Inc.	18
	300 [#]	SNAP TRIO JAPAN	IDEXX Laboratories, Inc.	60
Penicillin	5 [^]	Charm 3 SL3 Beta-lactam Test	Charm Sciences, Inc.	3.8
	5 [^]	Charm <i>B. stearothersophilus</i> Tablet Disc Assay	Charm Sciences, Inc.	3.8
	5 [^]	Charm ROSA® Beta-lactam 30-Second Test	Charm Sciences, Inc.	2.9
	5 [^]	Charm Blue Yellow II Test	Charm Sciences, Inc.	2
	5 [^]	Charm Cowside® II Test	Charm Sciences, Inc.	3
	5 [^]	Charm HPLC-Receptogram	Charm Sciences, Inc.	5
	5 [^]	Charm II Beta-lactam Test* (Competitive)	Charm Sciences, Inc.	3.0
	5 [^]	Charm II Beta-lactam Test* (Quantitative)	Charm Sciences, Inc.	3.4
	5 [^]	Charm II Beta-lactam Test* (Sequential)	Charm Sciences, Inc.	3.4
	5 [^]	Charm MRL Beta-lactam 1-Minute Test	Charm Sciences, Inc.	3

[#] Tolerance is the maximum legally allowable level or concentration of a drug or chemical in a food product at the time milk is marketed or the animal is slaughtered.

[^] No official tolerance or target testing levels have been established by the FDA.

[†] The sensitivity of the test method was determined by independent research at Virginia Polytechnic Institute and State University.

RESIDUES DETECTED	TOLERANCE (PPB)	TEST NAME	SPONSOR	SENSITIVITY (PPB)
Penicillin	5 ^	Charm MRL Beta-lactam 3-Minute Test	Charm Sciences, Inc.	3
	5 ^	Charm MRL Beta-lactam and Tetracycline 2-Minute Test	Charm Sciences, Inc.	3
	5 ^	Charm MRL Beta-lactam and Tetracycline Test	Charm Sciences, Inc.	3
	5 ^	Charm MRL Beta-lactam RF Tetracycline 2-Minute Test	Charm Sciences, Inc.	2.5
	5 ^	Charm MRL Beta-lactam Test	Charm Sciences, Inc.	3
	5 ^	Charm QUAD®1 Test	Charm Sciences, Inc.	4
	5 ^	Charm QUAD® Test	Charm Sciences, Inc.	3.0
	5 ^	Charm SL® Beta-lactam Test*	Charm Sciences, Inc.	3.6
	5 ^	Charm TRIO® Test	Charm Sciences, Inc.	2
	5 ^	Delvotest® P-5 Pack	DSM Food Specialties USA, Inc.	2.1
	5 ^	Delvotest® P Mini	DSM Food Specialties USA, Inc.	3.1
	5 ^	Delvotest® SP NT	DSM Food Specialties USA, Inc.	1.5
	5 ^	Delvotest® T	DSM Food Specialties USA, Inc.	2
	5 ^	New SNAP Beta-lactam (Visual)	IDEXX Laboratories, Inc.	3.1
	5 ^	New SNAP Beta-lactam	IDEXX Laboratories, Inc.	3
	5 ^	SNAP Beta-Lactam ST	IDEXX Laboratories, Inc.	3
	5 ^	SNAP Beta-Lactam ST Plus	IDEXX Laboratories, Inc.	2
	5 ^	SNAPduo ST Plus	IDEXX Laboratories, Inc.	2
	5 ^	SNAP TRIO JAPAN	IDEXX Laboratories, Inc.	3
Pirlimycin	400 #	Charm <i>B. stearothermophilus</i> Tablet Disc Assay	Charm Sciences, Inc.	100
	400 #	Charm Blue Yellow II Test	Charm Sciences, Inc.	100
	400 #	Charm Cowside® II Test	Charm Sciences, Inc.	50
	400 #	Charm II Macrolide Test	Charm Sciences, Inc.	80
	400 #	Charm QUAD®2 Test	Charm Sciences, Inc.	100
	400 #	Charm Pirlimycin Test	Charm Sciences, Inc.	250
	400 #	Delvotest® P-5 Pack	DSM Food Specialties USA, Inc.	80
	400 #	Delvotest® P Mini	DSM Food Specialties USA, Inc.	80
	400 #	Delvotest® SP NT	DSM Food Specialties USA, Inc.	20-80
	400 #	SNAP TRIO JAPAN	IDEXX Laboratories, Inc.	80
Polymixin B	None √	Delvotest® P Mini	DSM Food Specialties USA, Inc.	30
Rifaximin	None √	Delvotest® T	DSM Food Specialties USA, Inc.	40
Spectinomycin	None √	Charm <i>B. stearothermophilus</i> Tablet Disc Assay	Charm Sciences, Inc.	1000 †
	None √	Charm Cowside® II Test	Charm Sciences, Inc.	1000
	None √	Charm QUAD®3 Test	Charm Sciences, Inc.	200
	None √	Delvotest® T	DSM Food Specialties USA, Inc.	1850
Streptomycin	None √	Charm <i>B. stearothermophilus</i> Tablet Disc Assay	Charm Sciences, Inc.	1000 †
	None √	Charm Cowside® II Test	Charm Sciences, Inc.	1000
	None √	Charm II Gentamicin and Streptomycin Test	Charm Sciences, Inc.	20 †
	None √	Charm QUAD®3 Test	Charm Sciences, Inc.	175

^ Values indicate the FDA-established target testing levels and do not represent official tolerance levels. Target testing levels are used by the FDA as guides for deciding whether or not to prosecute. They are not and cannot be transformed into tolerances that are established for animal drugs under section 512 (b) of the Federal Food, Drug & Cosmetic Act. They are not binding, do not dictate any result, do not limit the FDA's discretion in any way, and do not protect milk producers (or milk) from court enforcement action.

* Prohibited from use in any kind of lactating cattle.

RESIDUES DETECTED	TOLERANCE (PPB)	TEST NAME	SPONSOR	SENSITIVITY (PPB)
Streptomycin	None [§]	Charm Neomycin and Streptomycin Test	Charm Sciences, Inc.	150
	None [§]	Charm Streptomycin Test	Charm Sciences, Inc.	75
	None [§]	Delvotest® P Mini	DSM Food Specialties USA, Inc.	4000
	None [§]	Delvotest® SP NT	DSM Food Specialties USA, Inc.	1200
	None [§]	Delvotest® T	DSM Food Specialties USA, Inc..	400
Sulfachlorpyridazine *	10 [^]	Charm HPLC Receptogram	Charm Sciences, Inc.	10
	10 [^]	Charm II Sulfa Drug Test	Charm Sciences, Inc.	5
	10 [^]	Charm QUAD®1 Test	Charm Sciences, Inc.	20
	10 [^]	Charm ROSA® Sulfa Test	Charm Sciences, Inc.	2
	10 [^]	Charm TRIO® Test	Charm Sciences, Inc.	1
	10 [^]	Charm Blue Yellow II Test	Charm Sciences, Inc.	50
	10 [^]	Charm Cowside® II Test	Charm Sciences, Inc.	50
Sulfadiazine *	10 [^]	Charm Blue Yellow II Test	Charm Sciences, Inc.	50
	10 [^]	Charm Cowside® II Test	Charm Sciences, Inc.	50
	10 [^]	Charm HPLC-Receptogram	Charm Sciences, Inc.	5
	10 [^]	Charm II Sulfa Drug Test (Competitive Assay)	Charm Sciences, Inc.	4.9
	10 [^]	Charm QUAD®1 Test	Charm Sciences, Inc.	20
	10 [^]	Charm ROSA® Sulfa Test	Charm Sciences, Inc.	4
	10 [^]	Charm TRIO® Test	Charm Sciences, Inc.	3
	10 [^]	Delvotest® SP NT	DSM Food Specialties USA, Inc.	50
	10 [^]	Delvotest® T	DSM Food Specialties USA, Inc.	50
Sulfadimethoxine	10 [#]	Charm <i>B. stearotheophilus</i> Tablet Disc Assay	Charm Sciences, Inc.	10,000
	10 [#]	Charm Cowside® II Test	Charm Sciences, Inc.	25
	10 [#]	Charm HPLC-Receptogram	Charm Sciences, Inc.	5
	10 [#]	Charm II Sulfa Drug Test (Competitive Assay)	Charm Sciences, Inc.	4.0
	10 [#]	Charm ROSA® Sulfa Test	Charm Sciences, Inc.	7.7
	10 [#]	Charm TRIO® Test	Charm Sciences, Inc.	7.6
	10 [#]	Delvotest® SP NT	DSM Food Specialties USA, Inc.	100
	10 [#]	Delvotest® T	DSM Food Specialties USA, Inc.	40
Sulfadoxine *	None [§]	Charm Blue Yellow II Test	Charm Sciences, Inc.	100
	None [§]	Charm Cowside® II Test	Charm Sciences, Inc.	100
	None [§]	Charm II Sulfa Drug Test	Charm Sciences, Inc.	7
	None [§]	Charm QUAD®1 Test	Charm Sciences, Inc.	100
	None [§]	Charm ROSA® Sulfa Test	Charm Sciences, Inc.	18
	None [§]	Charm TRIO® Test	Charm Sciences, Inc.	20
	None [§]	Delvotest® SP NT	DSM Food Specialties USA, Inc.	110
Sulfamerazine *	10 [^]	Charm Blue Yellow II Test	Charm Sciences, Inc.	100
	10 [^]	Charm Cowside® II Test	Charm Sciences, Inc.	100
	10 [^]	Charm HPLC-Receptogram	Charm Sciences, Inc.	5
	10 [^]	Charm II Sulfa Drug Test	Charm Sciences, Inc.	4.0 [†]
	10 [^]	Charm QUAD®1 Test	Charm Sciences, Inc.	40

^{*} Tolerance is the maximum legally allowable level or concentration of a drug or chemical in a food product at the time milk is marketed or the animal is slaughtered.

[§] No official tolerance or target testing levels have been established by the FDA.

[†] The sensitivity of the test method was determined by independent research at Virginia Polytechnic Institute and State University.

RESIDUES DETECTED	TOLERANCE (PPB)	TEST NAME	SPONSOR	SENSITIVITY (PPB)
Sulfamerazine *	10 ^	Charm ROSA® Sulfa Test	Charm Sciences, Inc.	4
	10 ^	Charm TRIO® Test	Charm Sciences, Inc.	4
	10 ^	Delvotest® SP NT	DSM Food Specialties USA, Inc.	50-100
Sulfamethazine	10 ^	BetaStar S for Sulfonamides	Neogen Corporation	30
	10 ^	Charm Blue Yellow II Test	Charm Sciences, Inc.	100
	10 ^	Charm Cowside® II Test	Charm Sciences, Inc.	100
	10 ^	Charm HPLC-Receptogram	Charm Sciences, Inc.	5
	10 ^	Charm II Sulfa Drug Test (Competitive Assay)	Charm Sciences, Inc.	9.4
	10 ^	Charm QUAD®1 Test	Charm Sciences, Inc.	20
	10 ^	Charm ROSA® Sulfa Test	Charm Sciences, Inc.	7.8
	10 ^	Charm TRIO® Test	Charm Sciences, Inc.	9.2
	10 ^	Delvotest® SP NT	DSM Food Specialties USA, Inc.	150
	10 ^	Delvotest® T	DSM Food Specialties USA, Inc.	150
Sulfamethizole *	10 ^	Charm Blue Yellow II Test	Charm Sciences, Inc.	50
	None [✓]	Charm Blue Yellow II Test	Charm Sciences, Inc.	50
	10 ^	Charm Cowside® II Test	Charm Sciences, Inc.	20
	None [✓]	Charm Cowside® II Test	Charm Sciences, Inc.	50
	10 ^	Charm HPLC-Receptogram	Charm Sciences, Inc.	5
	None [✓]	Charm HPLC-Receptogram	Charm Sciences, Inc.	5
	None [✓]	Charm II Sulfa Drug Test	Charm Sciences, Inc.	20 [†]
	10 ^	Charm II Sulfa Drug Test	Charm Sciences, Inc.	6.0 [†]
	10 ^	Charm QUAD®1 Test	Charm Sciences, Inc.	50
	None [✓]	Charm QUAD®1 Test	Charm Sciences, Inc.	50
	10 ^	Charm ROSA® Sulfa Test	Charm Sciences, Inc.	1
	10 ^	Charm TRIO® Test	Charm Sciences, Inc.	1
	None [✓]	Charm TRIO® Test	Charm Sciences, Inc.	2
	None [✓]	Delvotest® SP NT	DSM Food Specialties USA, Inc.	50 [†]
Sulfamethoxazole *	None [✓]	Charm ROSA® Sulfa Test	Charm Sciences, Inc.	3
Sulfanilamide *	10 ^	Charm Blue Yellow II Test	Charm Sciences, Inc.	200
	10 ^	Charm Cowside® II Test	Charm Sciences, Inc.	200
	10 ^	Charm HPLC-Receptogram	Charm Sciences, Inc.	10
	10 ^	Charm II Sulfa Drug Test	Charm Sciences, Inc.	20
	10 ^	Charm ROSA® Sulfa Test	Charm Sciences, Inc.	1000
	10 ^	Charm TRIO® Test	Charm Sciences, Inc.	1000
	10 ^	Delvotest® SP NT	DSM Food Specialties USA, Inc.	100
Sulfapyridine *	10 ^	Charm Blue Yellow II Test	Charm Sciences, Inc.	100
	10 ^	Charm Cowside® II Test	Charm Sciences, Inc.	100
	10 ^	Charm HPLC-Receptogram	Charm Sciences, Inc.	5
	10 ^	Charm II Sulfa Drug Test	Charm Sciences, Inc.	10
	10 ^	Charm QUAD®1 Test	Charm Sciences, Inc.	20

[^] Values indicate the FDA-established target testing levels and do not represent official tolerance levels. Target testing levels are used by the FDA as guides for deciding whether or not to prosecute. They are not and cannot be transformed into tolerances that are established for animal drugs under section 512 (b) of the Federal Food, Drug & Cosmetic Act. They are not binding, do not dictate any result, do not limit the FDA's discretion in any way, and do not protect milk producers (or milk) from court enforcement action.

[†] Prohibited from use in any kind of lactating cattle.

RESIDUES DETECTED	TOLERANCE (PPB)	TEST NAME	SPONSOR	SENSITIVITY (PPB)
Sulfapyridine *	10 [^]	Charm ROSA® Sulfa Test	Charm Sciences, Inc.	10
	10 [^]	Charm TRIO® Test	Charm Sciences, Inc.	5
Sulfaquinoxaline *	10 [^]	Charm Blue Yellow II Test	Charm Sciences, Inc.	100
	10 [^]	Charm Cowside® II Test	Charm Sciences, Inc.	100
	10 [^]	Charm HPLC Receptrogram	Charm Sciences, Inc.	2
	10 [^]	Charm II Sulfa Drug Test	Charm Sciences, Inc.	3
	10 [^]	Charm QUAD®1 Test	Charm Sciences, Inc.	20
	10 [^]	Charm ROSA® Sulfa Test	Charm Sciences, Inc.	4
	10 [^]	Charm TRIO® Test	Charm Sciences, Inc.	3
Sulfathiazole *	10 [^]	Charm Blue Yellow II Test	Charm Sciences, Inc.	50
	10 [^]	Charm Cowside® II Test	Charm Sciences, Inc.	50
	10 [^]	Charm HPLC-Receptrogram	Charm Sciences, Inc.	5
	10 [^]	Charm II Sulfa Drug Test (Competitive Assay)	Charm Sciences, Inc.	7.3
	10 [^]	Charm QUAD®1 Test	Charm Sciences, Inc.	20
	10 [^]	Charm ROSA® Sulfa Test	Charm Sciences, Inc.	2
	10 [^]	Charm TRIO® Test	Charm Sciences, Inc.	1
	10 [^]	Delvotest® SP NT	DSM Food Specialties USA, Inc.	50
	10 [^]	Delvotest® T	DSM Food Specialties USA, Inc.	50
Sulfisoxazole *	None [‡]	Charm Blue Yellow II Test	Charm Sciences, Inc.	50
	None [‡]	Charm Cowside® II Test	Charm Sciences, Inc.	50
	None [‡]	Charm II Sulfa Drug Test	Charm Sciences, Inc.	6
	None [‡]	Charm QUAD®1 Test	Charm Sciences, Inc.	20
	None [‡]	Charm ROSA® Sulfa Test	Charm Sciences, Inc.	20
	None [‡]	Charm TRIO® Test	Charm Sciences, Inc.	15
Tetracycline	300 [#]	Charm <i>B. stearothersophilus</i> Tablet Disc Assay	Charm Sciences, Inc.	1000
	300 [#]	Charm Blue Yellow II Test	Charm Sciences, Inc.	100
	300 [#]	Charm Cowside® II Test	Charm Sciences, Inc.	100
	300 [#]	Charm HPLC-Receptrogram	Charm Sciences, Inc.	5.0
	300 [#]	Charm II Tetracycline Drug Test (Competitive Assay)	Charm Sciences, Inc.	67
	300 [#]	Charm MRL Beta-lactam and Tetracycline 2-Minute Test	Charm Sciences, Inc.	30
	300 [#]	Charm MRL Beta-lactam and Tetracycline Test	Charm Sciences, Inc.	30
	300 [#]	Charm MRL Beta-lactam RF Tetracycline 2-Minute Test	Charm Sciences, Inc.	10
	300 [#]	Charm QUAD®1 Test	Charm Sciences, Inc.	20
	300 [#]	Charm QUAD® Test	Charm Sciences, Inc.	6
	300 [#]	Charm ROSA® Tetracycline-SL (Dilution Confirmation) Test	Charm Sciences, Inc.	74
	300 [#]	Charm Tetracycline Test	Charm Sciences, Inc.	46
	300 [#]	Charm TRIO® Test	Charm Sciences, Inc.	42
	300 [#]	Delvotest® P-5 Pack	DSM Food Specialties USA, Inc.	300
	300 [#]	Delvotest® P Mini	DSM Food Specialties USA, Inc.	300

[#] Tolerance is the maximum legally allowable level or concentration of a drug or chemical in a food product at the time milk is marketed or the animal is slaughtered.

[‡] No official tolerance or target testing levels have been established by the FDA.

[†] The sensitivity of the test method was determined by independent research at Virginia Polytechnic Institute and State University.

RESIDUES DETECTED	TOLERANCE (PPB)	TEST NAME	SPONSOR	SENSITIVITY (PPB)
Tetracycline	300 #	Delvotest® SP NT	DSM Food Specialties USA, Inc.	270
	300 #	Delvotest® T	DSM Food Specialties USA, Inc.	75
	300 #	SNAP Tetracycline	IDEXX Laboratories, Inc.	30
	300 #	SNAP Tetracycline (Dilution confirmation)	IDEXX Laboratories, Inc.	292
	300 #	SNAPduo ST Plus	IDEXX Laboratories, Inc.	16
	300 #	SNAP TRIO JAPAN	IDEXX Laboratories, Inc.	80
Thiamphenicol ‡	None	Charm II Amphenicol Test	Charm Sciences, Inc.	50
	None	Charm Amphenicol Test	Charm Sciences, Inc.	5
	None	Charm Florfenicol and Thiamphenicol Test	Charm Sciences, Inc.	1
Tilmicosin ‡	None	Charm Cowside® II Test	Charm Sciences, Inc.	50
	None	Charm II Macrolide Test	Charm Sciences, Inc.	20
	None	Charm QUAD®2 Test	Charm Sciences, Inc.	40
	None	Delvotest® SP NT	DSM Food Specialties USA, Inc.	50
	None	Delvotest® T	DSM Food Specialties USA, Inc.	60
Trimethoprim ‡	None	Charm Cowside® II Test	Charm Sciences, Inc.	300
	None	Delvotest® T	DSM Food Specialties USA, Inc.	110
Tylosin	50 #	Charm Cowside® II Test	Charm Sciences, Inc.	30
	50 #	Charm II Macrolide Test	Charm Sciences, Inc.	50 †
	50 #	Charm QUAD®2 Test	Charm Sciences, Inc.	30
	50 #	Delvotest® P-5 Pack	DSM Food Specialties USA, Inc.	100
	50 #	Delvotest® P Mini	DSM Food Specialties USA, Inc.	100
	50 #	Delvotest® SP NT	DSM Food Specialties USA, Inc.	50
	50 #	Delvotest® T	DSM Food Specialties USA, Inc.	50

^ Values indicate the FDA-established target testing levels and do not represent official tolerance levels. Target testing levels are used by the FDA as guides for deciding whether or not to prosecute. They are not and cannot be transformed into tolerances that are established for animal drugs under section 512 (b) of the Federal Food, Drug & Cosmetic Act. They are not binding, do not dictate any result, do not limit the FDA's discretion in any way, and do not protect milk producers (or milk) from court enforcement action.

* Prohibited from use in any kind of lactating cattle.

Tolerance is the maximum legally allowable level or concentration of a drug or chemical in a food product at the time milk is marketed or the animal is slaughtered.

‡ No official tolerance or target testing levels have been established by the FDA.

† The sensitivity of the test method was determined by independent research at Virginia Polytechnic Institute and State University.

MILK SCREENING TESTS | BY TEST NAME

Screening Tests Available as of July 2022 for Detecting Residues in Bulk Tank Milk

Tests listed below have been evaluated by FDA and accepted by the National Conference on Interstate Milk Shipments (NCIMS) for residue testing. Refer to [M-a-85](#) or [M-1-92-11](#) (latest revisions) for current listing. These tests are believed to be reliable indicators of antibiotic contamination in milk and should be viewed as tools to screen bulk tank milk.

TEST NAME	RESIDUES DETECTED AT OR BELOW SAFE/TOLERANCE LEVELS
Charm II Amphenicol Test*	Chloramphenicol, Florfenicol, Thiamphenicol
Charm II Beta-lactam Test (Competitive)	Amoxicillin, Ampicillin, Ceftiofur, Cephapirin, Penicillin
Charm II Beta-lactam Test (Quantitative)	Amoxicillin, Ampicillin, Ceftiofur, Cephapirin, Cloxacillin, Penicillin
Charm II Beta-lactam Test (Sequential)	Amoxicillin, Ampicillin, Ceftiofur, Cephapirin, Penicillin
Charm II Sulfa Drug Test (Competitive Assay)	Sulfadiazine, Sulfadimethoxine, Sulfamethazine, Sulfathiazole
Charm II Tetracycline Test	Chlortetracycline, Oxytetracycline, Tetracycline
Charm 3 SL3 Beta-lactam Test	Amoxicillin, Ampicillin, Ceftiofur, Cephapirin, Cloxacillin, Penicillin
Charm <i>B. stearothersophilus</i> Tablet Disc Assay	Amoxicillin, Ampicillin, Cephapirin, Penicillin
Charm Flunixin and Beta-lactam Test	Amoxicillin, Ampicillin, Ceftiofur, Cephapirin, Cloxacillin, Flunixin, Penicillin
Charm ROSA® Beta-lactam 30-Second Test	Amoxicillin, Ampicillin, Ceftiofur, Cephapirin, Cloxacillin, Penicillin
Charm ROSA® Sulfa Test	Sulfadiazine, Sulfadimethoxine, Sulfamethazine, Sulfathiazole, Sulfachlorpyridazine, Sulfamerazine, Sulfamethizole, Sulfamethoxazole, Sulfapyridine, Sulfaquinoxaline
Charm ROSA® Tetracycline - SL (Dilution Confirmation) Test	Chloratetracycline, Oxytetracycline, Tetracycline
Charm SL® Beta-lactam Test	Amoxicillin, Ampicillin, Ceftiofur, Cephapirin, Penicillin
Charm TRIO® Test	Amoxicillin, Ampicillin, Ceftiofur, Cephapirin, Chlortetracycline, Hetacillin, Oxytetracycline, Penicillin, Sulfachlorpyridazine, Sulfadiazine, Sulfadimethoxine, Sulfamerazine, Sulfamethazine, Sulfamethizole, Sulfaquinoxaline, Sulfathiazole, Tetracycline
Delvotest® P-5 Pack	Amoxicillin, Ampicillin, Cephapirin, Penicillin
Delvotest® P Mini	Amoxicillin, Ampicillin, Cephapirin, Penicillin

MILK SCREENING TESTS | BY TEST NAME

Screening Tests Available as of July 2022 for Detecting Residues in Bulk Tank Milk

Tests listed below have been neither evaluated by FDA nor accepted by the National Conference on Interstate Milk Shipments (NCIMS) for residue testing. Refer to [M-a-85](#) or [M-1-92-11](#) (latest revisions) for current listing.

TEST NAME	RESIDUES DETECTED AT OR BELOW SAFE/TOLERANCE LEVELS
Charm II Aflatoxin Test	Aflatoxin M1
Charm II Beta-lactam Test (Competitive)	Hetacillin
Charm II Beta-lactam Test (Quantitative)	Hetacillin
Charm II Chloramphenicol Test*	Chloramphenicol
Charm II Gentamicin and Neomycin Test	Gentamicin, Neomycin
Charm II Streptomycin Test	Dihydrostreptomycin, Gentamicin
Charm 3 SL3 Beta-lactam Test w	Hetacillin
Charm Amphenicol Test	Chloramphenicol, Florfenicol, Thiamphenicol
Charm <i>B. stearotheophilus</i> Tablet Disc Assay	Hetacillin, Pirlimycin
Charm Blue Yellow II Test	Amoxicillin, Ampicillin, Ceftiofur, Cephapirin, Chlortetracycline, Hetacillin, Lincomycin, Neomycin, Oxytetracycline, Penicillin, Pirlimycin, Tetracycline, Tilmycosin, Tylosin
Charm Chloramphenicol Test	Chloramphenicol
Charm Cowside® II Test	Amoxicillin, Ampicillin, Cephapirin, Chlortetracycline, Hetacillin, Neomycin, Oxytetracycline, Penicillin, Pirlimycin, Tetracycline, Tilmycosin, Tylosin
Charm Enrofloxacin Test (ROSA® Test)	Enrofloxacin
Charm Florfenicol and Thiamphenicol Test	Florfenicol, Thiamphenicol
Charm Gentamicin Test	Gentamicin
Charm HPLC-Receptogram	Amoxicillin, Ampicillin, Ceftiofur, Cephapirin, Chlortetracycline, Cloxacillin, Penicillin, Sulfadiazine, Sulfadimethoxine, Sulfamethazine, Sulfachlorpyridazine, Sulfamerazine, Sulfamethizole, Sulfanilamide, Sulfapyridine, Sulfaquinoxaline, Sulfathiazole, Oxytetracycline, Tetracycline
Charm MRL Aflatoxin M1 Quantitative Test	Aflatoxin M1
Charm MRL Beta-lactam 1-Minute Test	Amoxicillin, Ampicillin, Ceftiofur, Cephapirin, Hetacillin, Penicillin
Charm MRL Beta-lactam 3-Minute Test	Amoxicillin, Ampicillin, Ceftiofur, Cephapirin, Hetacillin, Penicillin
Charm MRL Beta-lactam and RF Tetracycline 2-Minute Test	Amoxicillin, Ampicillin, Ceftiofur, Cephapirin, Chlortetracycline, Hetacillin, Oxytetracycline, Penicillin, Tetracycline
Charm MRL Beta-lactam and Tetracycline 2-Minute Test	Amoxicillin, Ampicillin, Ceftiofur, Cephapirin, Chlortetracycline, Hetacillin, Oxytetracycline, Penicillin, Tetracycline

TEST NAME	RESIDUES DETECTED AT OR BELOW SAFE/TOLERANCE LEVELS
Charm MRL Beta-lactam and Tetracycline Test	Amoxicillin, Ampicillin, Ceftiofur, Cephapirin, Chlortetracycline, Hetacillin, Oxytetracycline, Penicillin, Tetracycline
Charm MRL Beta-lactam Test	Amoxicillin, Ampicillin, Ceftiofur, Cephapirin, Hetacillin, Penicillin
Charm Pirlimycin Test	Pirlimycin
Charm QUAD® Test	Amoxicillin, Ampicillin, Cefquinome, Ceftiofur, Cephapirin, Chlortetracycline, Dihydrostreptomycin, Hetacillin, Oxytetracycline, Penicillin, Streptomycin, Tetracycline
Charm QUAD®1 Test	Amoxicillin, Ampicillin, Ceftiofur, Cephapirin, Chlortetracycline, Hetacillin, Oxytetracycline, Penicillin, Tetracycline
Charm QUAD®2 Test	Erythromycin, Lincomycin, Pirlimycin, Tilmicosin, Tylosin
Charm QUAD®2-G Test	Erythromycin, Lincomycin, Pirlimycin, Tilmicosin, Tylosin
Charm QUAD®3 Test	Dihydrostreptomycin, Neomycin
Charm Quinolone Test	Danofloxacin, Enrofloxacin
Charm SL® Aflatoxin M1 Quantitative Test	Aflatoxin M1
Charm SL® Beta-lactam Test	Hetacillin
Charm Streptomycin Test	Dihydrostreptomycin
Charm Tetracycline Test	Chlortetracycline, Oxytetracycline, Tetracycline
Delvotest® P-5 Pack	Pirlimycin, Tetracycline
Delvotest® P Mini	Pirlimycin, Tetracycline
IDEXX SNAP Beta-Lactam ST	Amoxicillin, Ampicillin, Ceftiofur, Cloxacillin, Penicillin
IDEXX SNAP Beta-Lactam ST Plus	Amoxicillin, Ampicillin, Ceftiofur, Cloxacillin, Penicillin
IDEXX SNAP Gentamicin Test	Gentamicin
IDEXX SNAP Tetracycline Test	Chlortetracycline, Oxytetracycline, Tetracycline
IDEXX SNAPduo ST Plus	Amoxicillin, Ampicillin, Ceftiofur, Chlortetracycline, Cloxacillin, Oxytetracycline, Penicillin, Tetracycline
Reveal® Q+ for Aflatoxin in M1	Aflatoxin M1
Reveal® Q+ HS for Aflatoxin in M1	Aflatoxin M1

Glossary

Distress: State in which an animal cannot escape or adapt to internal or external stressors, resulting in negative effects on well-being. Distress occurs when livestock are injured, sick or in pain.

Dry Cows: Non-lactating pregnant cows from the end of lactation until the next parturition. A pregnant cow is generally dry or non-lactating for 40 to 60 days before the next calving.

Herd Health Plan: An animal health management system developed with a veterinarian to prevent, diagnose, control and treat disease or injury of all dairy cattle on a farm.

Find the Herd Health Plan Veterinarian Review Form [here](#) or visit nationaldairyfarm.com.

Lactating Dairy Cow: Any dairy breed bovine female that is over 20 months of age.

Licensed Veterinarian: Veterinarian licensed by one or more state boards of veterinary medical examiners to practice veterinary medicine within the respective state(s).

Pain: An unpleasant physical sensation occurring in varying degrees of severity due to injury, disease, or medical or management procedure.

Protocols: Written processes that may include instructions provided by the Veterinarian of Record (VOR) for the management of dairy cows in various situations and under various conditions.

Find protocol templates [here](#) or visit nationaldairyfarm.com.

Veterinarian-Client-Patient Relationship (VCPR): The VCPR is the basis for veterinary care. To establish such a relationship the following conditions must be satisfied:

1. The licensed veterinarian has assumed the responsibility for making medical judgments regarding the health of the patient(s) and the need for medical therapy and has instructed the client on a course of therapy appropriate to the circumstance.
2. There is sufficient knowledge of the patient(s) by the veterinarian to initiate at least a general or preliminary diagnosis of the medical condition(s) of the patient(s).
3. The client has agreed to follow the licensed veterinarian's recommendations.
4. The licensed veterinarian is readily available for follow-up evaluation or has arranged for:
 - › i. Emergency or urgent care coverage, or
 - › ii. Continuing care and treatment has been designated by the veterinarian with the prior relationship to a licensed veterinarian who has access to the patient's medical records and/or who can provide reasonable and appropriate medical care.
5. The veterinarian provides oversight of treatment.
6. Such a relationship can exist only when the veterinarian has performed a timely physical examination of the patient(s) or is personally acquainted with the keeping and care of the patient(s) by virtue of medically appropriate and timely visits to the operation where the patient(s) is(are) kept, or both.
7. Patient records are maintained.

Both the licensed veterinarian and the client have the right to establish or decline a VCPR within the guidelines set forth in the AVMA Principles of Veterinary Medical Ethics.

A licensed veterinarian who in good faith engages in the practice of veterinary medicine by rendering or attempting to render emergency or urgent care to a patient when a client cannot be identified, and a VCPR is not established, should not be subject to penalty based solely on the veterinarian's inability to establish a VCPR.

Veterinarian of Record (VOR):

The VOR is the responsible veterinarian for providing appropriate and timely oversight of drug use on the farm. Such oversight is a critical component of establishing, maintaining and validating a VCPR. This oversight should include but may not be limited to establishing treatment protocols, training personnel, reviewing treatment records, monitoring drug inventories and assuring appropriate labeling of drugs.

Written Protocol: A document that provides specific instructions to cow-side personnel for performing a single, specific task. As a training tool, written protocols improve communication and work consistency.

Screen Testing Contact Information

COMPANIES MARKETING DRUG RESIDUE TESTS

Charm Sciences, Inc.

659 Andover St.
Lawrence, MA 01843
800-343-2170
info@charm.com
charm.com

IDEXX Laboratories, Inc.

One IDEXX Drive
Westbrook, ME 04092
800-548-9997
LPDCS@idexx.com
idexx.com/lpd

DSM Food Specialties USA, Inc.

620 Progress Ave.
Waukesha, WI 53187
414-750-2533
john.faragher@dsm.com
dsm.com/delvotest

Neogen Corporation

620 Leshner Place
Lansing, MI 48912
800-234-5333
foodsafety@neogen.com
neogen.com



**National Dairy
FARM Program**

2107 Wilson Blvd., Suite 600
Arlington, VA 22201

703-243-6111
dairyfarm@nmpf.org
nationaldairyfarm.com



Drug Company Contact Information

Bimeda, Inc.

One Tower Ln., Suite 2250
Oakbrook Terrace, IL 60181
888-524-6332
US-Info@Bimeda.com
bimedaus.com

Boehringer Ingelheim Animal Health, USA Inc.

3239 Satellite Blvd.
Duluth, GA 30096
888-637-4251
bi-vetmedica.com

Clipper Distributing Co., LLC.

1302 South 59th St.
St. Joseph, MO 64507
800-759-3644
info@clipperdist.com
clipperdist.com

Elanco Animal Health

1500 Innovation Way
Greenfield, IN 46140
877-352-6261
mcgrath_happeks@elanco.com
elanco.com

Huvepharma

525 Westpark Dr., Suite 230
Peachtree City, GA 30269
877-994-4883
customerservice@huvepharma.us
huvepharma.us

Merck Animal Health

10488 South 136th St.
Omaha, NE 68138
800-211-3573
uslivestockpv@merck.com
merck-animal-health-usa.com

Norbrook® Inc. USA

9733 Loiret Blvd.
Lenexa, KS 66219
866-591-5777
avetter@norbrookinc.com
norbrook.com

Pharmgate Animal Health, LLC.

1800 Sir Tyler Drive
Wilmington, NC 28405
800-380-6099
customerservice@pharmgate.com
pharmgate.com

Phibro Animal Health

Glenpointe Centre East 3rd Floor
300 Frank W. Burr Blvd., Ste. 21
Teaneck, NJ 07666
888-403-0074
Phibro.Dairy@pahc.com
pahc.com

Zoetis, Inc.

10 Sylvan Way
Parsippany, NJ 07054
888-963-8471
zoetisus.com
dairywellness.com



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dairyfarm@nmpf.org

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