

# On-Farm Screening Tests for Beta-Lactam Residues in Milk

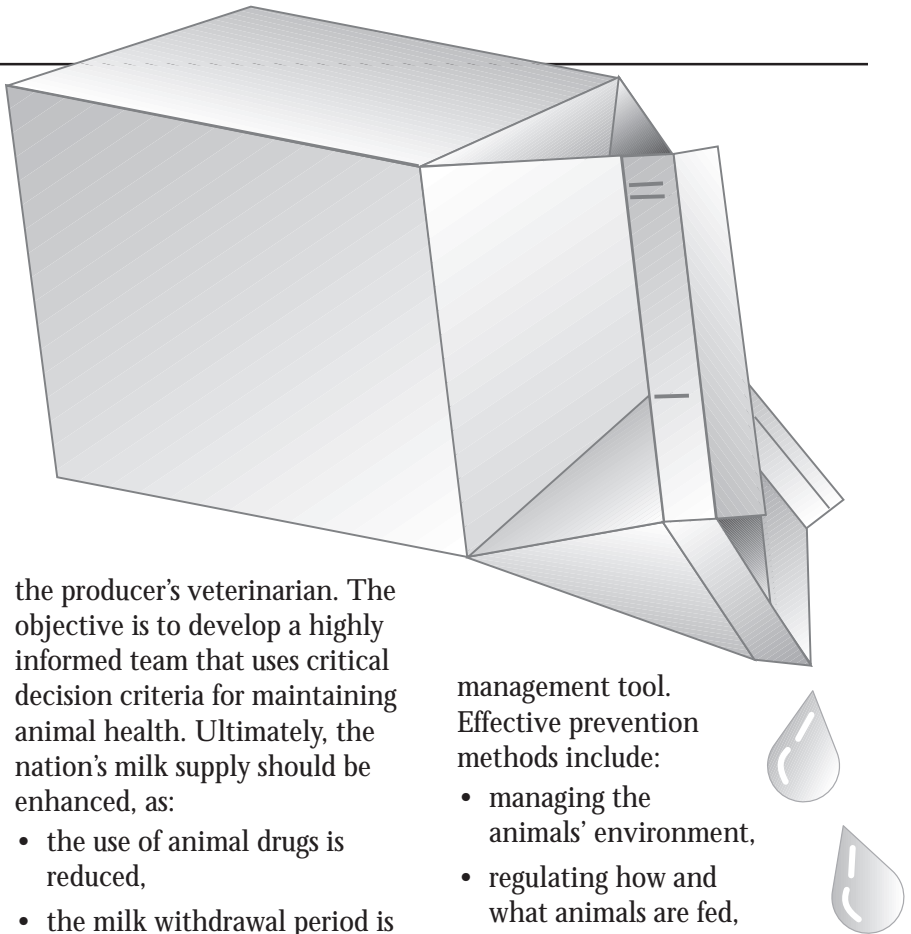
M. Gangwer, D. Hansen, and F. Bodyfelt

The public expects and deserves a safe food supply. This includes food free of antibiotic residues. Congress has empowered the Food and Drug Administration (FDA) to examine and closely monitor the use of animal drugs in dairy herds across the nation. This regulatory agency has the power of enforcement action.

The Pasteurized Milk Ordinance (PMO) is a set of guidelines, rules, and recommendations governing the production, storage, transport, processing, and distribution of fluid milk and other dairy foods. The PMO is used by producers and processors/handlers across the nation as a procedural reference for the interstate shipment of fluid milk and other dairy foods. The PMO is the set of instructions for the dairy industry to ensure and maintain high quality milk and dairy foods.

The Milk and Dairy Beef Quality Assurance Program (MDBQAP) was developed in 1991 by a Joint Liaison Committee of members from the American Veterinary Medical Association (AVMA) and the National Milk Producers Federation (NMPF).

The MDBQAP consists of 10 critical points that are practiced by dairy producers, along with family members, employees, and



the producer's veterinarian. The objective is to develop a highly informed team that uses critical decision criteria for maintaining animal health. Ultimately, the nation's milk supply should be enhanced, as:

- the use of animal drugs is reduced,
- the milk withdrawal period is understood and bulk tank milk is screened before entering commercial channels, and
- the withdrawal period for meat is understood and followed before products enter commercial channels.

During the past few years, the aforementioned agencies and programs have made an effort to teach dairy farmers the principals of disease prevention. Along with prevention, there is a need to reduce reliance on treatment as a

management tool. Effective prevention methods include:

- managing the animals' environment,
- regulating how and what animals are fed,
- controlling how animals are handled,
- maintaining good equipment, and
- providing vaccination and deworming programs.

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However, even in the best of herds, animals become sick and require medical treatment. Before committing to a course of treatment, consider these points:

- the value of the animal versus cost of treatment,
- the animal's suffering and pain,
- the animal's chances for a full recovery,
- the value of lost production during the course of treatment, and
- the withholding time for sale of milk or meat.

## Screening milk for antibiotics

According to Appendix N of the PMO, "Industry shall screen all bulk milk pick-up tankers for beta-lactam drug residues."

The beta-lactam group of antibiotics has a beta-lactam ring as part of its chemical configuration. This beta-lactam ring is found in two major classes of antibiotics: the penicillins and the cephalosporins.

The penicillins, which include penicillin, cloxacillin, ampicillin, amoxicillin, and hetacillin, are commonly used to treat disease. The cephalosporins—cephapirin, cephalixin, and ceftiofur—are divided into first, second, and third generations.

In view of the requirements of the Pasteurized Milk Ordinance (PMO) and the dairy farmers' desire to maintain a supply of safe milk for the consumer, several precautions should be taken before shipping a tank load of milk.

## Bulk-tank milk screening tests for beta-lactam drugs

Bulk-tank milk screening tests provide the dairy producer with a quick and relatively inexpensive method of identifying a tank of milk that contains no antibiotic residues above prescribed levels.

Here are five common bulk-tank milk screening tests available for on-farm testing of milk for beta-lactams.

### *Delvotest-P (Gist-brocades)*

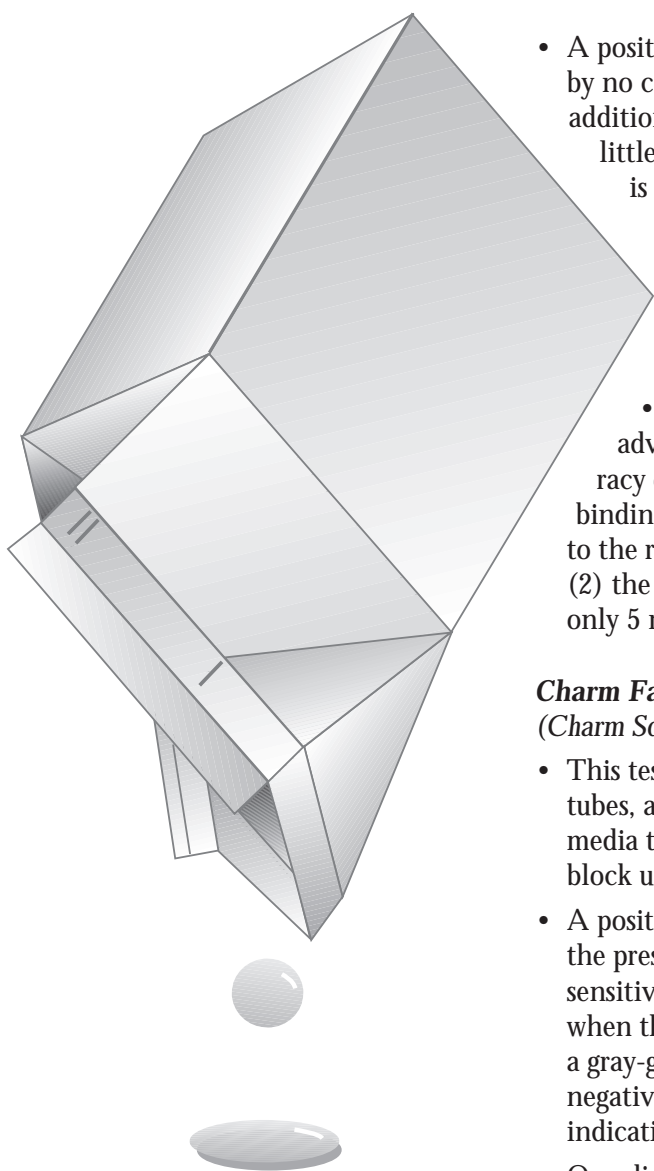
- Includes 25 ampuls containing *Bacillus stearothermophilus* var. *calidolactis* in a solid media, 25 tablets containing nutrients based in glucose, 25 disposable pipettes, and a dosing syringe. A block heater is required, and can be purchased initially.
- The test is conducted by placing one glucose nutrient into an ampul (containing the *B. stearothermophilus*), then adding 0.1 ml of the raw milk to be tested. The ampul is placed in the block heater at 65°C, and incubated for 2.5 hours.
- The presence of a beta-lactam antibiotic inhibits the growth of *B. stearothermophilus* bacteria.
- A positive test, (presence of beta-lactam antibiotic residues), is indicated if the ampul is purple.
- The Delvotest-P is extremely sensitive for the beta-lactams, especially the penicillins. Care must be taken that no contamination occurs. The temperature of the block

heater must be maintained at recommended levels.

- One disadvantage is the time requirement; dairy producers may not have 2.5 hours to screen the bulk tank before the milk truck arrives.

### *SNAP Beta-lactam (IDEXX)*

- The test kit comprises a test tube, a reagent tablet, a block heater, a snap device that fits into the block heater, and a pipette.
- The test is conducted by drawing into the pipette a sample of bulk tank milk and discharging it into the test tube containing a reagent tablet. After shaking the test tube and dissolving the reagent tablet, you incubate the tube in the block heater at 45°C for 5 minutes.
- Following the incubation period, you pour the sample into the sample well of the SNAP device. The sample flows across the results window toward the blue activation circle.
- When the blue activation circle begins to disappear, you snap the activator until it is flush with the body of the SNAP device. A positive test, indicating the presence of Beta-Lactams in excess of FDA tolerances, is indicated by a sample spot lighter than the control spot.
- One advantage of the SNAP test is the time requirement—about 10 minutes. Care must be taken to carefully read the two dots on the SNAP device.



Because it requires a subjective determination, the test may be read and interpreted differently by different persons.

#### **LacTek (Idetek)**

- This test kit includes test tubes containing enzyme tracers, antibodies and substrates. The LacTek test uses ELISA (Enzyme-Linked Immunosorbent Assay) technology for detection of beta-lactams.

- A positive sample is indicated by no color change. The addition of substrate results in little or no binding as there is a low percentage of enzyme bound to antibodies. This is due to the presence of measurable beta-lactams.
- This test has two advantages: (1) the accuracy of the ELISA test due to binding of only beta-lactams to the receptive antibodies, and (2) the time requirement of only 5 minutes per sample.

#### **Charm Farm Test (Charm Science)**

- This test kit is made up of test tubes, a microbial tablet, a media tablet, and an incubator block unit.
- A positive sample, revealing the presence of beta-lactams at sensitivity levels, is indicated when the test tube contents are a gray-green to purple color. A negative sample appears green, indicating bacterial growth.
- One disadvantage is the 3-hour incubation time. This is the minimum time for bacteria either to grow or be inhibited in the tube media.

#### **Penzyme (SmithKline Beecham)**

- This kit contains 25 enzyme glass vials in a plastic tray, 25 reagent tablets, a syringe with 25 disposable tips and plastic tweezers. An incubator block heater is required, and can be purchased initially.

- A positive test is yellow, indicating the lack of enzyme-reagent transformation. A negative test is orange. This occurs if insufficient beta-lactams are detected in the milk sample.
- One advantage of this enzymatic test is the time requirement of only 20 minutes.

### **When should I use a bulk-tank milk screening test?**

The simple answer to this question is: Use a milk screening test every time a bulk tank is pumped into a tanker truck on your farm. You should conduct a screening test for each type of antibiotic used on your farm.

Even though this publication concentrates on beta-lactam antibiotics, screening tests should match the antibiotics you are using for your herd health program—regardless of class. If you use beta-lactams, you should use one of the above discussed tests. If you use another class of antibiotics, you should use a screening test for those types. Remember, the overall goal is residue avoidance.

In compliance with the PMO, milk processing plants are required to test every tanker before unloading.

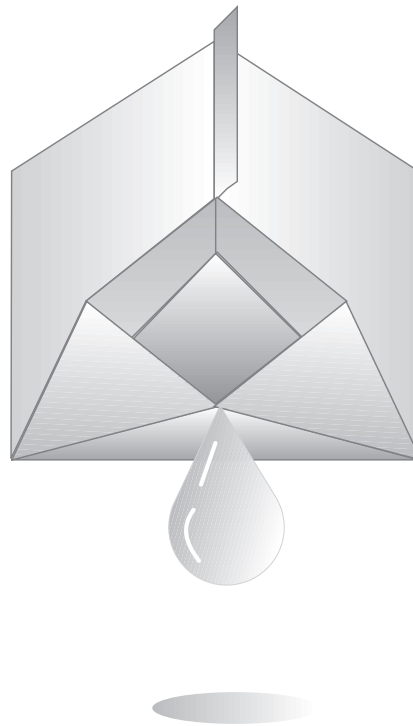
Screening tests represent an opportunity to check each load of milk before it leaves your farm. Because these are screening tests, more rigorous testing may be required if there is any doubt on sample results.

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## Summary

Milk safety is an important issue. It is critical to consumer health and to the health of the dairy industry. To ensure the safety and quality of your milk, follow these steps:

1. Provide the best possible environment for all your dairy cattle.
2. Use preventive management to minimize reliance on antibiotics and treatment programs.
3. Apply the principles of the MDBQAP. Read through and understand the elements of the 10-point program with all appropriate personnel on your farm. Review this program with your veterinarian, then sign and post the certificate.
4. Determine what classes of drugs you are using, then use an appropriate screening test on every tank of milk before you ship it. Recognize the seriousness of allowing an antibiotic-positive tank of milk to leave your farm.
5. If you have questions about the results of your on-farm screening tests, call your field person and obtain the best advice on how to proceed.
6. Rules and regulations change—stay informed. The implementation of the MDBQAP along with a changing PMO requires your awareness and follow-up.
7. Recognize these programs for what they are: an all-out effort by the dairy industry to keep its milk and meat supply free of drug residues. This helps safeguard the safety and wholesomeness of the nation's milk and meat supply, and the credibility of the dairy and beef industries.



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