Antibiotic Residues: Perception vs. Reality

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Introduction

Milk residues - just the mention of it creates fits of anger, anxiety, fear, confusion and distrust. There are many perceptions on how and why residues occur but in reality are they truely accurate or are they painstakingly misleading? My hope is that this paper can give you the facts and information to make sound decisions and recommendations for the dairies that you work on.

Preventing Violative Residues, Protecting Milk

Everyone involved in the dairy industry has a responsibility to prevent adulteration of milk supplies. Dairy producers, veterinarians, milk haulers and processors all play important roles in protecting the wholesomeness and safety of "nature's perfect food." No one wants adulterated milk in the marketplace. Thanks largely to improved educational efforts, upgraded testing standards and the availability of new drugs, violative drug residues in milk are at an all-time low. In fact, the National Milk Drug Residue Data Base reported the number of positive loads in 1960 >5% with 5 ppm as the limits of detection. In 1975, 7-15% positive loads with 5 ppb as the limits of detection; 1991, 0.10% positive loads with 2 ppb as the limits of detection, and 1995 - 0.06%.

However, with all these facts, the perception by consumers still remains that three out of four view drug residues in meat and milk products as a serious health hazard. Another one third consider them a possible hazard. That means 93 percent of American consumers are concerned about drug residues in their food supply.

Adverse publicity - whether it involves media coverage of contaminated foods and government investigations, or sensationalism, has left doubts in the minds of consumers nationwide. As a result, consumer activist groups, politicians, and other groups of concerned citizens have increasingly become involved in establishing public policy relating to food safety. Unfortunately, little concern is given to how expensive or difficult it is for the farmer to implement.

As a result, farmers and veterinarians are faced with two choices - regulate themselves with sensible standards, or live by the laws mandated by others.

It has been estimated that drug residues cost the dairy industry $10 million annually. Drug residues in milk and carcasses of cull cows and calves continue to be a problem to the dairy industry in terms of both cost and adverse publicity.

It was with those problems in mind that the Pasteurized Milk Ordinance (PMO) under the direction of the Federal Food and Drug Administration (FDA) established the "Milk and Dairy Beef Quality Assurance Program." The need is obvious - the dairy industry must become proactive in affirming the safety and purity of its products to counteract growing consumer perceptions that milk and meat products may be adulterated. If done properly it will educate the producer on how to avoid the "accident", which is the key to preventing contaminated milk.

The focus today should be on moving from consumer safety to producer profitability. Whether or not violative drug residues will enter the food supply is no longer a major concern. That problem has been virtually eliminated by new, more rigid testing regulations. Now we should be more interested in determining how we can prevent violations from happening in the first place, and avoid the waste that results from having to dump milk.

Screening Tests Inappropriate for Individual Animals

To prevent violative drug residues in milk, the obvious solution would seem to be testing the milk from individual cows to ensure a completely unadulterated product. Unfortunately, it is not that simple.

"Cow-side testing was a panacea when the dairy industry sharpened its focus on preventing violative drug residues in the early 1990's," says James Cullor, DVM, Ph.D., dairy food safety researcher at the University of California-Davis School of Veterinary Medicine.

Producers wanted to test individual cows, veteri-

Presented at the Minnesota Dairy Health Conference, May 22-23, 1996; Dr. Charles Casey, coordinator.

narians encouraged the practice, and the 10-Point Milk and Dairy Beef Residue Prevention Protocol endorsed it.

Yet when Cullor and fellow researchers undertook several studies examining the efficacy of testing individual cows, the results were disturbing. Rather than helping producers, the practice was unnecessarily costing them money, while providing little scientific value.

The problem with testing individual cows is that none of the 16 FDA accepted assays for screening milk for beta-lactam drugs were evaluated for use on individual cows. While none of the tests appear to produce a negative result on an antibiotic-spiked milk sample containing a violative residue, many produce "false positive" and "false violative" results when used to test milk samples from individual cows, Cullor's research reveals.

A false positive, he says, occurs when the test "makes a mistake". The test shows positive, but no drugs actually are present. Many properties of milk from individual cows, including protein inhibitors, somatic cell count, fat content and viscosity, can cause a false positive. These components do not affect the tests in the same way when diluted at the bulk tank or tanker truck level.

A "false violative" means that a test shows positive because it has detected drug residues in the milk, but the residues are below the FDA-established safe level for the drug. Improved technology that has enabled development of extremely sensitive milk screening tests has increased the likelihood of false violatives occurring.

Either way, the result is that the producer testing individual cow samples is forced to throw away milk that is perfectly salable.

Antibiotics approved for use in lactating dairy cattle are extremely safe when used according to label instructions.

The Food and Drug Administration (FDA) imposes tremendous scrutiny on the manufacturer of animal health pharmaceuticals.

Approved antibiotics, when used according to label, have the backing of both the manufacturer and FDA. There is more science behind the label directions and withdrawal times of approved dairy antibiotics than there is in the current validation of antibiotic residue assays.

Test The Tank, Not The Cow

If a tanker load of milk is contaminated with violative drug residues, it is a dairy producer who foots the bill. Often, this can cost the dairy farmer $5000 to $6000, a charge most insurance companies will cover only once. In some states, producers also may face civil fines, criminal prosecution and temporary or permanent loss of a Grade "A" permit to ship milk.

Clearly, dairy producers have a tremendous incentive to keep violative drug residues out of the milk they ship.

However, their concerns can backfire when they allow fear of residues to interfere with sound treatment decisions. Because they do not want to create violative residues, some producers have ceased treating mastitis and other bacterial diseases that should be addressed with antibiotics.

Testing milk from individual cows was the other way producers tried to avoid violations. But the accuracy of this practice is in serious question.

The other problem with testing individual cows is that the cows most likely to cause a violative residue usually are not the ones being tested. "Most drug contamination risk comes from three types of cows in a herd: (1) the recently treated dry cow; (2) the dry-treated cow that freshens early; and (3) the treated lactating cow during her milk discard time."

A cow recently treated with a dry-cow product might have 10,000 to 100,000 parts per billion (ppb) of drug or more in her milk. A cow with a short dry period would be in the 100 to 1,000 ppb range, depending on the length of the dry period. A dry cow with the proper length dry period at the label discard time would have zero to 100 ppb.

For lactating cows, milk from cows during treatment would have 10,000 to 100,000 ppb, while a cow at the end of her treatment time would be back to the zero to 100 ppb range. Cows at zero to 100 ppb are free of violative residues, and will not contaminate the bulk tank or tanker truck. Cows in the 10,000 to 100,000 range could easily contaminate a tanker load of milk.

The recently treated dry cows and cows in the middle of lactation would never be tested. Their milk would only get into the bulk tank and tanker truck by mistake. Meanwhile, testing individual cows at the end of their labeled milk discard time or normal dry period is an unnecessary expenditure of time and money.

Interest in testing milk from individually treated cows increased when the 1993 version of the Milk and Dairy Beef 10-Point Quality Assurance Program suggested in Point #8 that "milk from all treated cows should be tested if an appropriate test were available." What they did not explain was that none of the currently available tests were designed or validated for individual cow use and many would give incorrect results. Point #8 in the 1995 version of the program has been changed. "Milk from animals treated according to drug manufacturers label directions need not be tested." If the products are used extra-label, or combinations of two or more products are used, the milk should be tested if appropriate tests are available. Nevertheless, the label discard times for approved products used according to label are much more accurate than the currently available tests.

Instead of testing the milk from individual cows at the end of their label discard time, producers should test every bulk tank of milk before it is shipped, with the same or equivalent assay as used by their creamery. A positive bulk tank on the farm should be retested by the creamery, and, if confirmed violative, discarded.

This procedure allows producers to catch any mistakes before the milk is shipped and possibly contaminates a tanker. Compared with the several thousand dollars a producer would lose paying for a tanker, the $500 to $800 a year that it would cost most dairies to test every bulk tank is a minimal and worthwhile investment.

At the very least, dairy producers should evaluate their cost of testing each bulk tank before pickup.

Trouble-Shooting Drug Violations

Nearly all violative drug residues detected in the milk supply are caused by on-farm mistakes.

The causes of tanker-truck adulteration usually are traced to cows milked by mistake, such as:

* Cows recently dry-treated that are milked accidentally
* Cows treated with an antibiotic that has not reached the end of its discard time
* Cows that freshen early, with their short dry period going unnoticed

These cows have the high levels of antibiotic necessary to cause adulteration of large volumes of milk. One would recommend that the following checkpoints be explored on the farm when a violation occurs:

* Inventory all drugs used on the dairy, including dry cow treatments, lactating mastitis tubes, injectable antibiotics and all other therapeutic substances
* Review records of all treated lactating cows and the dry periods of recently fresh cows
* Interview all individuals who milked the cows during the time of the violation
* Determine if a dry cow could have accidentally reentered the milking string (jumped the fence, or a broken fence, etc.)
* Inspect all milking equipment to ensure that milk from treated cows is not inadvertently entering the bulk tank. Even a small amount of milk from a treated cow during her discard time could cause a violation.

The most important lesson learned from an on-farm violation is awareness of how mistakes can be prevented.

The 10-Point Plan of the Milk and Dairy Beef Quality Assurance Program can help dairy producers and veterinarians prevent violative drug residues. When producers and veterinarians work together to implement the 10-Point Plan, everything is in place to minimize the chance of an illegal antibiotic residue occurring in milk.

Veterinarians and milk plant sanitarians with knowledge of the 10-Point Plan can encourage and show dairy producers that there are ways to reduce the incidence of drug residue violation.

Among herds where this program has been used, lower somatic cell counts, higher rolling herd averages and fewer violations are documented.

In short, the program works for those who use it.

References

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