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Drug residue avoidance and quality assurance in beef from market dairy cattle

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I. Background

Beef from dairy cows is an important component of domestic U.S. food supply, accounting for approximately 15% of beef consumed.¹ A network of federal and state governments oversee beef food safety, which includes testing for drug residues that exceed the legal limit (violative residues). Overall, the occurrence of violative drug residues in U.S. beef is low (<0.1%), but the incidence in culled dairy cows remains an area that can improve. A study of USDA Food Safety Inspection Service (FSIS) residue data in beef between 1991-1993 found most of the violative residues (>80%) came from cull cows and bob veal.² In 2005, FSIS reported that 670 of the 94,570 (0.7%) suspect dairy cattle tested at slaughter had a violative residue, as detected by the Fast Antimicrobial Screening Test (FAST).³ Random drug screening in that same year found 62 violations out of 21,479 samples. This level of violative residues is far lower than was reported in the 1970s, where 9% of randomly tested beef was found to have antimicrobial residues.⁴

The decrease in incidence of antibiotic residues over the past 30 years can be credited to several factors, including improved detection methods, drugs labeled for food-producing animals with specific withdrawal periods, and penalties for producers who have repeat residue violations.⁵ The federal government has a “zero tolerance” of violative residues in all foods intended for human consumption, and so the beef and dairy industry must continue to work to reduce the levels of residue violations.

In addition to drug residue concerns, the prevalence of injection site lesions in outside round muscles of market dairy cows remains high: approximately 49% was reported in one study.⁶ This resulted in producer losses of nearly \$70 per cull cow due to product defects such as bruises, injection site lesions, and condemnations.⁷

There are very few published reports of measurable harm to individuals directly attributable to pharmaceutical residue exposure in beef. The most significant potential adverse effect is a potential allergic reaction to antimicrobial residue exposure.⁸ Penicillin has been implicated in a few cases when consumption of dairy products was followed by allergic-type symptoms, and only one case has been reported where an individual allergic to streptomycin had symptoms following consumption of beef. Toxicity, alteration of gut microflora, and development of resistant bacterial strains due to antimicrobial exposure are other potential issues surrounding human consumption of beef with violative drug residues. Aside from scientific arguments, the public perception of beef safety is an important factor which may have an impact on the price a producer receives for beef, or their ability to market dairy beef.^{1,9}

Because of the concern over antibiotic residues in dairy products, a few case-control studies have evaluated the farm factors that influenced occurrence of violative residues in milk. In one study of Michigan dairy farms that had milk residue violations, increasing size of the dairy herd, more

frequent use of medicated feeds, and attitude about adherence to labeled withdrawal period for pharmaceuticals was significantly associated with increased risk of residue violations.¹⁰ A similar study conducted on Ontario dairy herds found that use of antibiotic testing kits and understanding of how increasing a drug's dosage will affect the withdrawal time were associated with decreased risk of residue violations.¹¹ In both studies, increasing the number of employees was also a risk factor for having residue violations on the farms. A Wisconsin-based study found that there was an increased risk of violative antimicrobial residues in milk as a herd's Somatic Cell Count increased.¹²

Numerous surveys have pointed out a great need for more consistent record-keeping of drug treatments in dairy cattle.¹³⁻¹⁷ In a recent nationwide study of farms with more than 200 cows, it was found that 42% of farms did not keep complete written treatment records.¹⁶ A study which included large and small dairy farms in Pennsylvania found 47.6% of dairy producers did not consistently keep written treatment records.¹⁵ Keeping adequate treatment records is required by the Pasteurized Milk Ordinance in order to ship milk¹⁸ and by the Federal Food, Drug, & Cosmetic Act to market beef.¹⁹

Dairy farms or producers were found to be responsible for over 88% of beef residue violations.² Reviews of FSIS data find the most commonly detected residue in beef from dairy cattle is penicillin, which is available for purchase over-the-counter.^{3,20} This demonstrates a need to educate producers about proper use of antimicrobials that are given without veterinary supervision. Flunixin meglumine was second only to penicillin in detected drug residue violations by the FSIS in 2005,³ although the FAST screening assay used to identify potential residue violations by bacterial growth inhibition does not specifically detect non-steroidal anti-inflammatory drugs such as flunixin meglumine and the compound is only detected in secondary testing.²¹

It is also important to consider the role of the veterinarian in avoiding violative residues. Veterinarians are routinely cited by dairy producers as an important source of information about animal health products and food safety.^{1,10,22,23}

The following document is a summary of the collaborative efforts that are underway to promote dairy beef quality assurance practices in Minnesota. The University of Minnesota Extension Beef Team & Center for Animal Health & Food Safety formed a group with the Minnesota Beef Council, North Dakota State University, Texas A&M, and National Cattleman's Beef Association. Together, we have worked to better understand the issues at hand by carrying out two surveys: a survey of dairy practitioners throughout the U.S., and a survey of dairy producers in Minnesota, Wisconsin, and North Dakota. We are currently rolling out an educational campaign to improve awareness and discuss responsible use of antimicrobials in order to prevent injection site lesions and violative residues in dairy beef.

II. Veterinarian Survey¹

¹ Knust B, Nelson L, Schott L, Pedersen L, Fajt V. Drug Residue Avoidance and Beef Quality Assurance Practices in Dairy Cattle—Veterinarian Survey Results. *Bovine Practitioner* (accepted for publication), 2008.

As part of the development of an overall educational program, our team wanted to assess the knowledge, practices and attitudes of bovine veterinarians concerning dairy beef quality assurance, with particular emphasis on drug residue avoidance. A survey instrument was developed and sent to all members of the American Association of Bovine Practitioners (AABP) in the December 2006 member newsletter. Topics covered included respondent demographics, drug administration practices, record-keeping practices, impression of clients' attitudes and behaviors regarding drug residues, drug information sources, understanding of cull cattle marketing and processing, and interest in Dairy Beef Quality Assurance. Survey respondent demographics were similar to the general AABP membership.

While most respondents gave antibiotic injections in the neck, the primary injection site for vaccinations and reproductive drugs was significantly less often in the neck than in other sites ($p < 0.005$). Intramuscular flunixin meglumine was administered by 40% and prescribed by 60% of veterinarians although withholding times recommended by some veterinarians may not be sufficient for this extra label use. Florfenicol is also used in an extra label manner in lactating dairy cattle by 28% of respondents. While 62% of respondents recommended that dairy producers keep written treatment records, 45% never looked at such records. Survey results highlighted a need for better educational efforts for and by veterinarians regarding extra label drug use, drug residue avoidance, and general knowledge about market dairy beef processing.

III. Producer Survey

A survey was developed to assess the knowledge, attitudes, and behaviors surrounding dairy beef quality assurance and drug residue prevention among dairy producers. Topics covered included animal health practices, antibiotic use & impressions, knowledge about dairy beef and dairy beef quality assurance practices, and dairy operation demographics. The questionnaire was mailed to farms in Minnesota, Wisconsin, and North Dakota in February-March of 2007.

Responding producers indicated that handwritten records remained the most common type of record-keeping, with only about 12% of respondents using a computer. Only about 30% of the farms had diagnostic protocols in place, and closer to 40% have treatment protocols. Thirty-three percent of dairy farmers admitted that they sometimes, rarely, or never kept a record of antibiotics given. Dairy producers reported giving 21% of antibiotic injections, 28% of vaccinations, and 5% of reproductive drug injections in the neck. Veterinarians ranked as the most used source of information about animal health management and medications.

IV. Future Steps

Over the years, a great number of veterinarians and cattle health experts have dedicated themselves to promotion of dairy beef quality and safety. We have seen many improvements, but there are some persisting problems that need addressing. In particular, we need to constantly strive for complete and consistent record-keeping of all drugs that are used on dairy cattle, as required by law. We also should ensure that the withdrawal times for extra label drugs are correct, and that producers are aware that AMDUCA principles apply even when they are using an over-the-counter drug in an extra label fashion. Development of a record-keeping system that

is simple and adaptable to the individual producer, along with a farm-tailored treatment protocol is an important first step.

How can we work to change a cull dairy cow into a market dairy cow? This change in perception of a dairy cow as a beef animal starts with using proper injection sites, particularly when using drugs that are of a large volume or known to cause tissue damage. The decision of when and if to send a cow to slaughter is also a critical point, and we should be careful to review the treatment records and the overall health status before the cow gets on the truck. As the recent Westland/Hallmark beef recall shows, it only takes a few extreme examples to make an entire industry appear irresponsible. In order to protect their business, the beef packing industry may choose in the future to increase fines and reject cattle that show signs of sickness or an increased chance of a violative residue.

In Minnesota, the University will continue to work with the beef & dairy industries to educate dairy producers, but these efforts are dependent on the collaboration of herd veterinarians and dairy health professionals. Veterinarians, because of their close relationship with dairy producers, stand in an ideal position to be an advisor for on-farm food safety practices.²⁴ Take time to consider what you can do to make dairy beef the best it can be.

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