

ANTIBIOTIC USAGE AND FEEDLOT RESIDUE AVOIDANCE

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Story in Brief

The assurance that antimicrobial residues do not enter the food chain in beef products is a concern shared by Oklahoma cattle feeders, packers, food processors, veterinarians and consumers. The feedlot residue avoidance program is a tool to help assure the safety and wholesomeness of U.S. produced beef. It is a series of checks and balances to assure that antimicrobial residues do not enter the human food chain via cattle. The Live Animal Swab Test (LAST) is used to check for the presence of antimicrobial residues in the urine of live cattle. In the course of introducing live animal testing to the feedlot industry in the Oklahoma Panhandle, several facts have become apparent. First, the laboratory developed testing procedures for LAST may be readily conducted by lay feedlot personnel. In no case were tested animals that were found residue free using the live animal test ever found positive when slaughtered and tested in the packing plant with the Swab Test On Premises (STOP) test. Experience with a number of people conducting the live animal tests indicates that the tests are accurate, and errors made in conducting the tests lead to a false-positive rather than a false-negative result. The application phase of the new testing procedures clearly demonstrated the effectiveness of live animal testing.

(Key Words: Feedlot, Antibiotic Residue, Last Test, Quality Assurance.)

Materials and Methods

The procedure for preventing antimicrobial residues from entering the food chain via feedlot cattle is based on the following: (1) If antimicrobial compounds are used in the feed, or used for treatment of sickness at the feedlot, that the established withdrawal times are equalled or exceeded before the cattle go to slaughter, (2) Adequate records exist to identify any animals which, as a result of treatment, may be expected to have residues for a known period of time, and (3) Use of the LAST test on high risk cattle and random testing of low risk cattle. There is a real concern with both veterinarians and feedlot operators that some antimicrobial compounds used for treatment of feedlot cattle may not have clearly established or published withdrawal times. These antimicrobial compounds are only administered to cattle on a prescription basis by a veterinarian who has the proper veterinary-client-patient relationship. These special cases were extensively studied and tested in the course of setting up residue avoidance programs in commercial feedlots.

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Another phase of the testing involved cattle which the industry classifies as "realizer" or "chronic" cattle. The animals in this category consist of problem cattle that did not respond to medication or were treated for extended periods of time. Extra testing was conducted to determine if these "non-normal animals" cleared antibiotic residues as fast as the normal animals which were used in establishing withdrawal guidelines.

The animals studied were placed into two categories with no distinction between steers and heifers. The categories were as follows:

1. Grade and Yield -- feedlot animals that did not perform normally and were sorted from the pen and marketed on a grade and yield basis.
2. Emergency -- feedlot animals injured during the feeding period and immediately slaughtered because of the emergency. These animals most normally have suffered a fracture or, in the case of heifers, dystocia which necessitates salvage.

A key question regarding the adaptability of the laboratory LAST procedure (USDA/FSIS, 1983) as an industry tool was sample stability. Samples of urine were collected and were plated at times ranging from 0 to 24 hours post-collection. Another concern was the effect of freezing and thawing on sample stability, and whether it would be possible for samples to be frozen and then plated at a later date. A large number of feedlot cattle that had been on medical treatment were collected weekly following cessation of medical treatment to evaluate the amount of time necessary to assure a negative LAST test.

Results and Discussion

Management of samples collected for LAST analysis requires no special methods of operation. The urine samples were found to be stable for at least 24 hours post-collection at room temperature. Results were also repeatable when samples were frozen and thawed. Antibiotics used in the development of these data are listed in Table 1.

Feedlot animals in the grade and yield, and emergency designations were used for the collection of these data. These animals may have received extensive medical treatment or have fallen behind the performance of their penmates for reasons other than sickness.

Animals in the grade and yield category quite often have pathological conditions which preclude recovery and are marketed as they become suitable for slaughter. Label and extra-label withdrawal times and clearance for animals in this category are shown in Table 1. The data in Table 1 are listed for specific treatment protocols in cooperativer feedyards. The LAST test is an especially useful tool for the veterinarian in developing guidelines to be utilized in determining drug withdrawal times for specific treatment regimes. Biological variability and pathological conditions affects antibiotic clearance times. Some grade and yield animals which were documented to have received injectable neomycin in stocker programs were monitored for detectable antibiotic residues. The clearance time was as long as 240 days post-injection. Upson (1980) states that neomycin residues may persist in the kidneys of animals for at least 90 days post-injection. These results indicate that a feedyard may purchase drug stressed feeder animals with antibiotic residues (Gill et al., 1984).

Table 1. Relationship between antibiotic, dosage and label prescribed withdrawal time in grade and yield feedlot cattle.

Antibiotic	Withdrawal Time, Days						
	0	10	20	30	60	120	240
Ampicillin	00000						
Erythromycin	0000000000						
Oxytetracycline	0000000000000000						
Penicillin	00000000000000000000						
Sulfachloropyridazine	000000						
Sulfadimethoxine	000000						
Tylan	000000						
Lincomycin	eeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeee						
Spectinomycin	eeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeeee						

00000 = Approved drug, label dosages.
 xxxxxx = Approved drug, extra label dosages.
 eeeeeee = Extra label drug.

The data in Table 2 were generated from animals in the grade and yield population. It is essential to recognize that this was a very diverse group of animals with different pathological conditions. The animals may have been subjected to drug and/or steroid stress prior to arrival in the feedlot. Previous medical history may affect the clearance of antibiotic residues from the animal body. These data reflect what actually occurred in these evaluations.

Data was obtained on two classes of drugs: (1) approved antibiotics at extra-label dosages, and (2) extra-label drugs or drugs unapproved for use in beef food animals administered at prescription dosages. The approved drugs (Ampicillin, Erythromycin, Terramycin, Penicillin and Tylan), were eliminated from the animal tissues to levels below the biologically detectable range of the LAST (urine) test well within the withdrawal times specified by the FDA approved label. Consequently, since veterinary practitioners in VPC relationship commonly extend withdrawal times when prescribing extra-label dosages, strict adherence to the veterinary prescription, use of the LAST test and good record keeping will assure that antibiotic residues do not enter the food chain.

Spectinomycin has been used as a part of many regular prescription treatment protocols. Lincomycin, although only sporadically prescribed, has also seen some feedlot application. Residues drop below detectable levels rather quickly and, when considering that most Oklahoma Panhandle veterinary consultants place a 60 day withdrawal on the drugs, it appears that there is a margin of safety. However, LAST is not a highly sensitive test for spectinomycin and prudence should be used in interpreting results where treatment protocols involving this drug are concerned.

Lincomycin is in limited use and is often not a particularly effective antibiotic (Hollis, 1984). The data on ten animals was difficult to

Table 2. Time lapse from administration to elimination of detectable antibiotic residues in a selected bovine grade and yield population.

Drug ¹	Number of Animals	Drug		Clearance Time, Days ²	
		Label	Extra Label	Mean	Standard Deviation
Ampicillin	25	X		5.96	1.20
Erythromycin	22	X		7.27	1.69
Terramycin	23	X		12.30	3.21
Penicillin	20	X		15.45	2.64
Tylan	25	X		4.84	.74
Lincomycin	10		X	11.70	3.59
Spectinomycin	25		X	8.16	1.40

¹All drugs administered at extra label dosages. Clearance time is related to dose, number of injection sites, body weight and biological variability.

²LAST is a biological test and these data represent time for drug levels to drop below the detection limit. The detection limit varies from a few ppm to a few ppb.

obtain. A prescribed 60 day withdrawal for this drug, together with a record system and judicious use of the LAST test, will assure an animal is free of biologically detectable residues. No safe withdrawal time for injectable neomycin may be suggested. In the event an animal is suspected to have received injectable neomycin prior to arrival at a feedlot, the only safe method of assurance that the animal is free of detectable residues is a LAST test of each individual.

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