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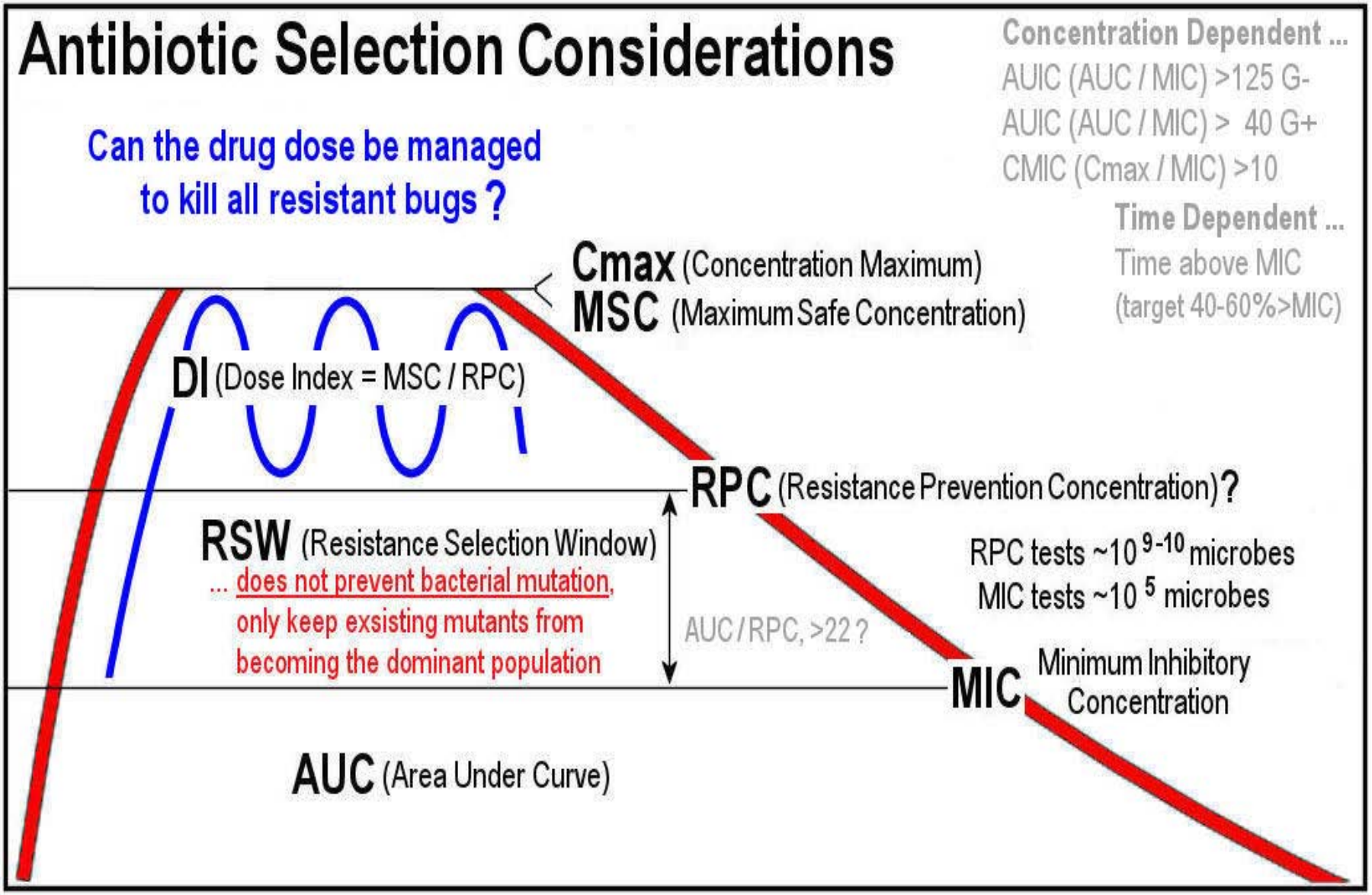
Antimicrobial groups approved for cattle:		
Antibiotic Class	**Antibiotic Within Class**	**Mechanism**
Aminocyclitols	Spectinomycin	PS
Aminoglycosides	Gentamicin, Neomycin	PS
Beta-lactams	Penicillin G, Ampicillin, Ceftiofur	CW
Chloramphenicol derivatives	Florfenicol	PS
Fluoroquinolones	Enrofloxacin, Danofloxacin	GR
Lincosamides	Lincomycin	PS
Macrolides	Erythromycin, Tilmicosin, Tulathromycin, Tylosin	PS
Sulfonamides	Sulfadimethoxine, Sulfamethazine, Sulfachlorpyridazine	MP
Tetracyclines	Oxytetracycline, Chlortetracycline	PS

CW	crippling production of the bacterial **cell wall** that protects the cell from the external environment
PS	interfering with **protein synthesis** by binding to the machinery that builds proteins, amino acid by amino acid
MP	wreaking havoc with **metabolic processes**, such as the synthesis of folic acid, that bacteria need to thrive
GR	blocking **genetic replication** by interfering with synthesis of DNA and RNA

Antibiotic Resistance Mechanisms
Decrease Cell Wall Uptake / Perm: ►Aminoglycosides
Efflux: ►Macrolides, fluoroquinolones, tetracyclines
Enzymes Induced: ►Aminoglycosides, florfenicol, beta-lactams
Altered Target Binding Sites: ►Ribosome …macrolides, Lincosamides ►Wall Protein … beta-lactams, glycopeptides ►DNA … fluoroquinolones
Gene Resistance: ►Plasmids (b-lact, tetra, macro, linco, fluro, sulfa), ►Transposons (b-lactams, glycopeptides), ►Chromosome (b-lactams, FQs)

PK / PD Relationships (See www.vads.org for more information)		
PK to PD Predictive Relationships	Antibiotic Class	Examples
T (50%) > MIC ... Gram + VS Gram -	Beta-lactams	Ampicillin, Amoxicillin, Ceftiofur, PenG
T (50 to 100%) > MIC ... Gram + VS Gram -	Macrolides	Erythromycin, Lincomycin, Tilmicosin?, Tylosin
T (100%) > MIC	Phenol, Lincosa, Tetracy, Sulfas	Florfenicol, Lincomycin, Oxytetracycline, Sulfas
Peak or Cmax (10x) / MIC	Aminoglycosides	Gentamicin, Neomycin
AUC/MIC (>100 x = efficacy) Cmax/MIC (< 4 to 8 x = resistance)	Fluoroquinolones	Danofloxacin, Enrofloxacin
AUC/MIC (>100 x)	Macrolides	Tulathromycin?
No Information Available ... PK / PD Not Predictive	Aminocyclitols	Spectinomycin


Antibiotic Selection Considerations
Concentration Dependent ...
AUIC (AUC / MIC) >125 G-
AUIC (AUC / MIC) > 40 G+
CMIC (Cmax / MIC) >10
Time Dependent ...
Time above MIC
(target 40-60%>MIC)
Can the drug dose be managed
to kill all resistant bugs ?
Cmax (Concentration Maximum)
MSC (Maximum Safe Concentration)
DI (Dose Index = MSC / RPC)
RPC (Resistance Prevention Concentration)?
RSW (Resistance Selection Window)
... does not prevent bacterial mutation,
only keep exsisting mutants from
becoming the dominant population
RPC tests ~10 9-10 microbes
MIC tests ~10 5 microbes
AUC / RPC, >22 ?
MIC
Minimum Inhibitory
Concentration
AUC (Area Under Curve)

Key Cattle Antibiotic Pharmacodynamic and Pharmacokinetic Parameters

Generic Name	NADA#	PK/PD	ACT	LS	Vd	TM	CM	AUC	T½	Dose	MIC90 Mh	MIC90 Pm	MIC90 Hs	WD
Ampicillin	055-030	T>MIC	C	L	L	*	10	*	1.2	10	32	8	4	6
Amoxicillin	055-089	T>MIC	C	L	L	*	10	*	5	5	16	16	8	25
Ceftiofur sodium	140-338	T>MIC	C	L	L	1.2	14	115	10	1	0.03 (0.2)[tt]	0.03 (0.2)[tt]	0.03 (0.2)[tt]	4
Ceftiofur hydrochloride	140-890	T>MIC	C	L	L	2.5	11	160	12	1	0.03 (0.2)[tt]	0.03 (0.2)[tt]	0.03 (0.2)[tt]	3
Ceftiofur crystalline acid	141-209	T>MIC	C	L	L	19	6.4	376	50	3	0.03 (0.2)[tt]	0.03 (0.2)[tt]	0.03 (0.2)[tt]	13
Chlortetracycline (feed)	048-761	T>MIC	S	M	M	10.2	0.21	4.3	15.7	10	12	12	12	0
Danofloxacin **	141-207	A^{UC}/M^{IC}	C	M?	H	3.2	1.3	9	4.5	2.7	0.06	0.02	0.06	4
Enrofloxacin **	141-068	A^{UC}/M^{IC}	C	M	H	5.8	1.8	19	6.4	5.7	0.06	0.03	0.03	28
Florfenicol	141-063	T>MIC	S	H	M	5.3	5.4	71	18.3	18	1	1	0.5	38
Gentamicin **	101-862	C^{Max}/M^{IC}	C	H	L	*	<8	*	2	1	8	4	16	>730?
Neomycin **	200-113	C^{Max}/M^{IC}	C	L	L	*	10	*	2.5	2	64	64	64	>730?
Oxytetracycline (LA)***	Many	T>MIC	S	M	M	1.8	3.6	72	21	9	12	12	12	36
Oxytetracycline (feed)	008-804	T>MIC	S	M	M	2	0.16	4	9	10	12	12	12	0
Pen G, Benzathine	Many	T>MIC	C	L	L	*	1.7	*	60	10k	16	8	16	>180?
Pen G, Procaine	Many	T>MIC	C	L	L	*	3.4	*	5.2	10k	16	8	16	>60?
Spectinomycin	141-077	?	S	L	L	1	20	77	1.8	5.5	96	96	96	11
Sulfa-diamethoxine (IV)	041-245	T>MIC	S	L	L	*	8.9	*	13.1	25	350	350	350	5
Sulfa-diamethoxine (oral)	093-107	T>MIC	S	L	L	*	8.9	*	13.1	62.5	350	350	350	21
Sulfa-methazine	140-270	T>MIC	S	L	L	*	16	*	12.9	200	350	350	350	12
Tilmicosin (Lung CM)	140-929	T>MIC	S	H	H	1.4	1 (9)	8	~24	4.5	16	32	8	28
Tulathromycin	141-244	A^{UC}/M^{IC}	*	H	H	.25	3.5	16	90	1.1	2	1	4	18
Tylosin	012-965	T>MIC	S	H	H	1.3	4.7	29	24	8	32	32	16	28

* No available data ** Not AMDUCA approved ELDU or BQA *** LA = long acting formulations designed for >72 hrs PTI
ACT: action listed as either (C) cidal or (S) static LS: lipid soluble (L = Low, M = Moderate, H = High)
Vd: Volume of distribution (L = <0.5, M = 0.5-1.0, H = > 1.0) see LS
Dose: refers to typical dose (mg/lb body weight) and is listed as the maximum label approval
TM: TMAX- Time corresponding to half life (T ½) CM: Cmax=Peak ppm concentrations (ppm=ug/Ml)
AUC: Area Under the Curve (mcg x hr / ml) T: Time, T½ Life: Half-life in hours (T½)

MIC listings are all for concentrations greater than the values listed as MIC 90% http:// www.vads.org [tt] therapeutic threshold
Ref: Dx lab data, Iowa State University 2000-2003 for 90% of isolates, FDA NADA FOI, & Shryock J Vet Diag Invest 8:337 (96)

WD: withdrawal days before marketing for food. The longest label WD is listed. ? is estimate from FARAD information.
AMDUCA ELDU requires the adjustment so that no violative residues would be detected.
? = WD adjustments of antibiotics for which ELDU has been practiced.

NOTE: Use the PHARMACOKINETICS, PHARMACODYNAMICS, & MIC information only as a starting guide.
Therapeutic regimen management requires response monitoring through accurate case definition, protocol adherence, record examination and outcome follow-up.

Http://WWW.VADS.ORG

Amphic

P. multocida (498)		
MIC	Incidence	Cumulative
0.25	90.56%	90.56%
0.5	3.01%	93.57%
1	1.20%	94.78%
2	0.60%	95.38%
4	0.60%	95.98%
8	1.41%	97.39%
16	0.40%	97.79%
32	2.21%	100.00%

M. haemolytica (481)		
MIC	Incidence	Cumulative
0.25	72.35%	72.35%
0.5	0.62%	72.97%
1	0.21%	73.18%
2	0.42%	73.60%
4	0.62%	74.22%
8	2.70%	76.92%
16	5.82%	82.74%
32	17.26%	100.00%

H. somni (208)		
MIC	Incidence	Cumulative
0.25	92.31%	92.31%
0.5	4.33%	96.63%
1	1.44%	98.08%
2	0.00%	98.08%
4	0.96%	99.04%
8	0.00%	99.04%
16	0.00%	99.04%
32	0.96%	100.00%

S. typhimurium (66)		
MIC	Incidence	Cumulative
0.25	1.52%	1.52%
0.5	0.00%	1.52%
1	7.58%	9.09%
2	1.52%	10.61%
4	4.55%	15.15%
8	0.00%	15.15%
16	0.00%	15.15%
32	84.85%	100.00%

E. coli (K99 pos) (173)		
MIC	Incidence	Cumulative
0.25	0.00%	0.00%
0.5	0.00%	0.00%
1	0.00%	0.00%
2	6.94%	6.94%
4	2.31%	9.25%
8	0.00%	9.25%
16	0.58%	9.83%
32	90.17%	100.00%

Ceftio

P. multocida (498)		
MIC	Incidence	Cumulative
0.5	99.20%	99.20%
1	0.40%	99.60%
2	0.20%	99.80%
4	0.00%	99.80%
8	0.00%	99.80%
16	0.20%	100.00%

M. haemolytica (481)		
MIC	Incidence	Cumulative
0.5	99.38%	99.38%
1	0.21%	99.58%
2	0.00%	99.58%
4	0.21%	99.79%
8	0.00%	99.79%
16	0.21%	100.00%

H. somni (208)		
MIC	Incidence	Cumulative
0.5	98.56%	98.56%
1	1.44%	100.00%
2	0.00%	100.00%
4	0.00%	100.00%
8	0.00%	100.00%
16	0.00%	100.00%

S. typhimurium (66)		
MIC	Incidence	Cumulative
0.5	75.76%	75.76%
1	21.21%	96.97%
2	1.52%	98.48%
4	0.00%	98.48%
8	0.00%	98.48%
16	1.52%	100.00%

. coli (K99 pos) (173)		
MIC	Incidence	Cumulative
0.5	48.55%	48.55%
1	1.73%	50.29%
2	0.00%	50.29%
4	7.51%	57.80%
8	25.43%	83.24%
16	16.76%	100.00%

Enroflox

P. multocida (498)		
MIC	Incidence	Cumulative
0.12	95.58%	95.58%
0.25	1.20%	96.79%
0.5	1.00%	97.79%
1	1.20%	99.00%
2	0.60%	99.60%
4	0.40%	100.00%

M. haemolytica (481)		
MIC	Incidence	Cumulative
0.12	92.93%	92.93%
0.25	1.66%	94.59%
0.5	2.29%	96.88%
1	1.25%	98.13%
2	0.42%	98.54%
4	1.46%	100.00%

H. somni (208)		
MIC	Incidence	Cumulative
0.12	99.52%	99.52%
0.25	0.48%	100.00%
0.5	0.00%	100.00%
1	0.00%	100.00%
2	0.00%	100.00%
4	0.00%	100.00%

S. typhimurium ((66)		
MIC	Incidence	Cumulative
0.12	98.48%	98.48%
0.25	1.52%	100.00%
0.5	0.00%	100.00%
1	0.00%	100.00%
2	0.00%	100.00%
4	0.00%	100.00%

E. coli (K99 pos) (173)		
MIC	Incidence	Cumulative
0.12	61.85%	61.85%
0.25	0.00%	61.85%
0.5	0.58%	62.43%
1	0.00%	62.43%
2	0.00%	62.43%
4	37.57%	100.00%

Florfen

P. multocida (498)		
MIC	Incidence	Cumulative
0.12	95.58%	95.58%
0.25	1.20%	96.79%
0.5	1.00%	97.79%
1	1.20%	99.00%
2	0.60%	99.60%
4	0.40%	100.00%

M. haemolytica (481)		
MIC	Incidence	Cumulative
0.12	92.93%	92.93%
0.25	1.66%	94.59%
0.5	2.29%	96.88%
1	1.25%	98.13%
2	0.42%	98.54%
4	1.46%	100.00%

H. somni (208)		
MIC	Incidence	Cumulative
0.12	99.52%	99.52%
0.25	0.48%	100.00%
0.5	0.00%	100.00%
1	0.00%	100.00%
2	0.00%	100.00%
4	0.00%	100.00%

S. typhimurium ((66)		
MIC	Incidence	Cumulative
0.25	0.00%	0.00%
0.5	0.00%	0.00%
1	1.52%	1.52%
2	25.76%	27.27%
4	54.55%	81.82%
8	3.03%	84.85%
16	15.15%	100.00%

E. coli (K99 pos) (173)		
MIC	Incidence	Cumulative
0.12	61.85%	61.85%
0.25	0.00%	61.85%
0.5	0.58%	62.43%
1	0.00%	62.43%
2	0.00%	62.43%
4	37.57%	100.00%

Oxytet

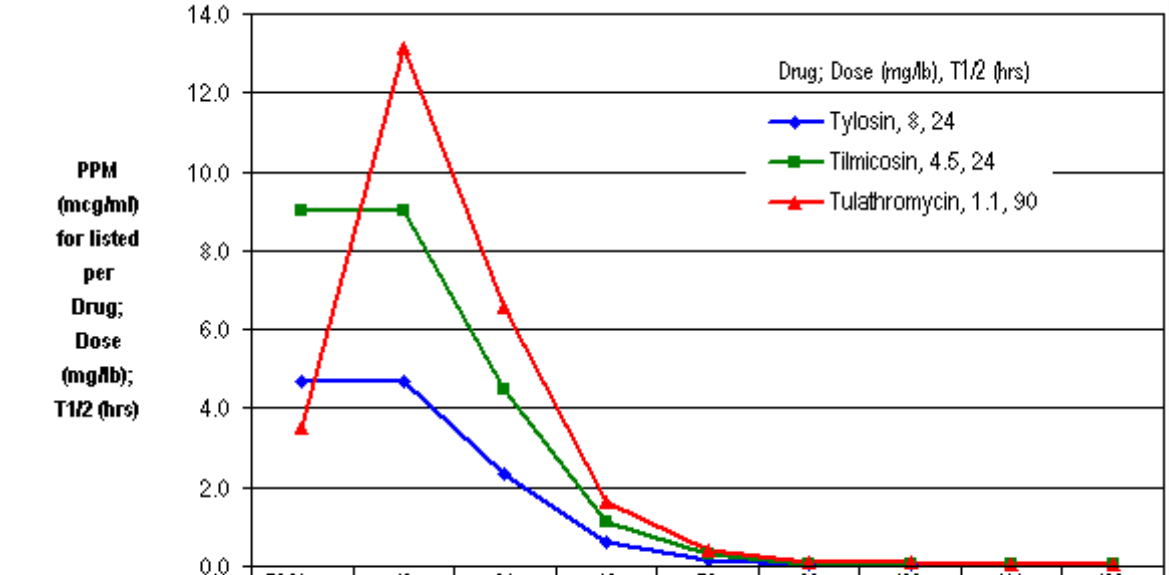
P. multocida (498)		
MIC	Incidence	Cumulative
0.25	15.46%	15.46%
0.5	30.52%	45.98%
1	10.44%	56.43%
2	3.01%	59.44%
4	1.41%	60.84%
8	2.81%	63.65%
16	36.35%	100.00%

M. haemolytica (481)		
MIC	Incidence	Cumulative
0.25	4.37%	4.37%
0.5	40.54%	44.91%
1	2.49%	47.40%
2	0.83%	48.23%
4	2.70%	50.94%
8	14.55%	65.49%
16	34.51%	100.00%

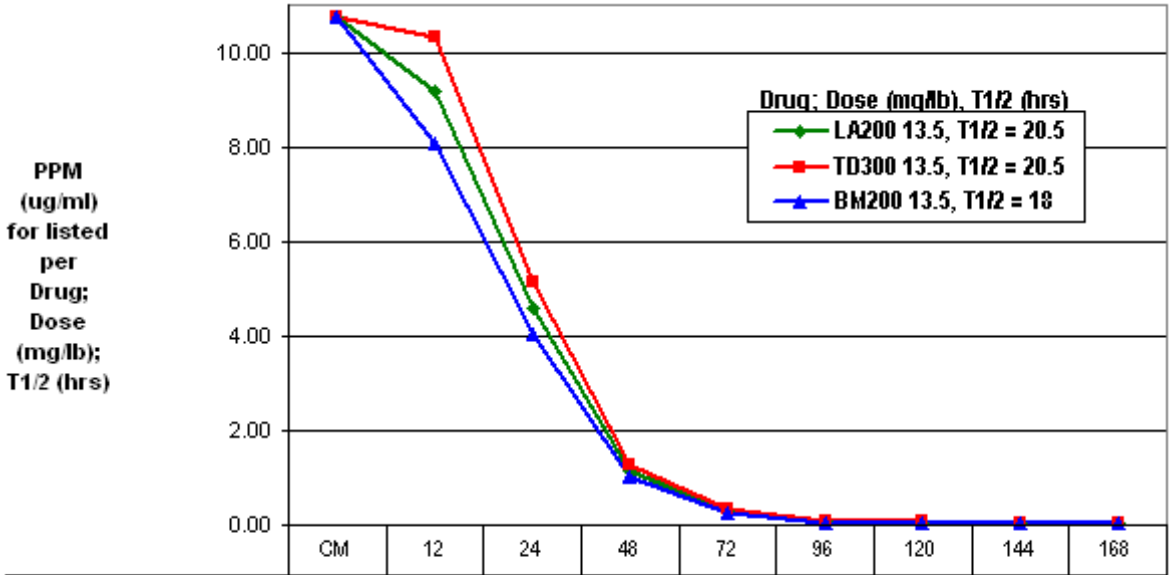
H. somni (208)		
MIC	Incidence	Cumulative
0.25	36.54%	36.54%
0.5	23.08%	59.62%
1	3.37%	62.98%
2	0.00%	62.98%
4	2.88%	65.87%
8	13.46%	79.33%
16	20.67%	100.00%

S. typhimurium (66)		
MIC	Incidence	Cumulative
0.25	0.00%	0.00%
0.5	1.52%	1.52%
1	0.00%	1.52%
2	13.64%	15.15%
4	3.03%	18.18%
8	0.00%	18.18%
16	81.82%	100.00%

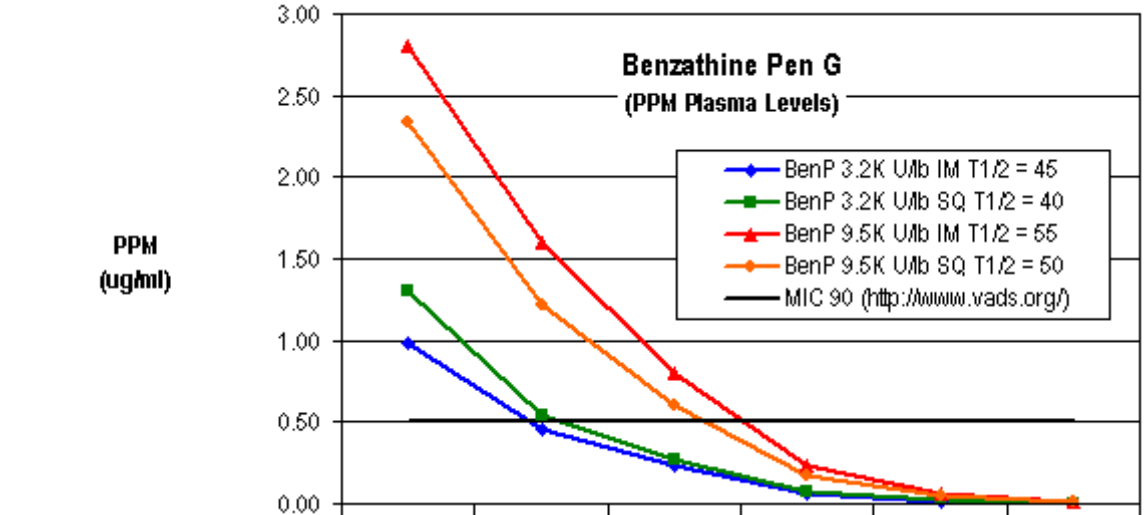
E. coli (K99 pos) (173)		
MIC	Incidence	Cumulative
0.25	0.00%	0.00%
0.5	0.00%	0.00%
1	0.58%	0.58%
2	2.31%	2.89%
4	0.00%	2.89%
8	0.00%	2.89%
16	97.11%	100.00%



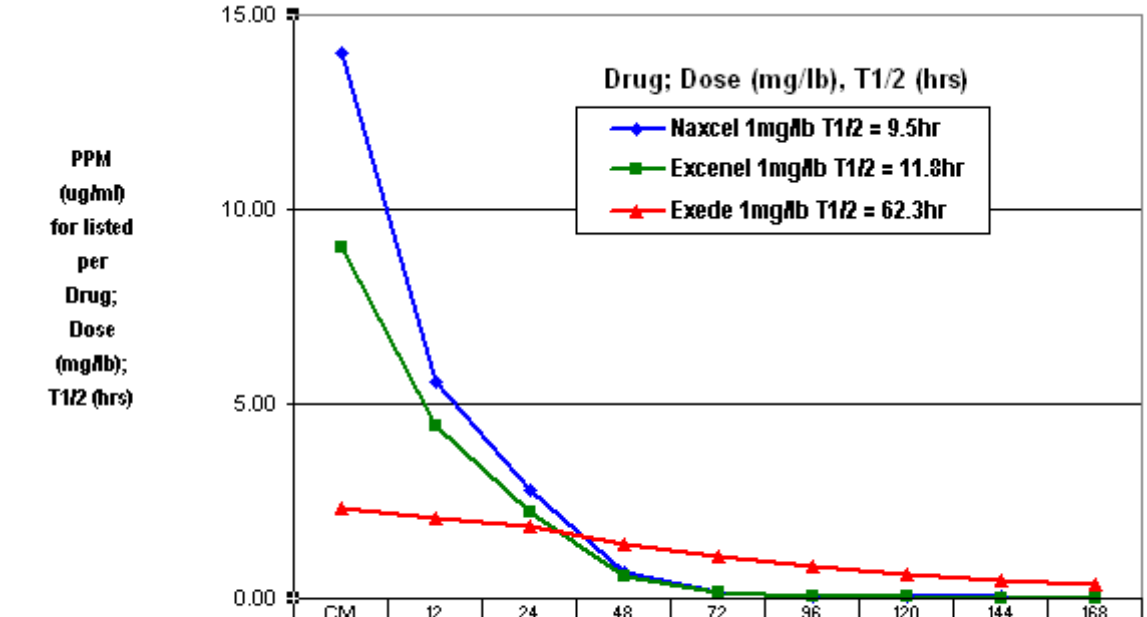
	CM Lung	12	24	48	72	96	120	144	168
Tylosin, 8, 24	4.7	4.700	2.350	0.588	0.147	0.037	0.029	0.024	0.021
Tilmicosin, 4.5, 24	9.0	9.000	4.500	1.125	0.281	0.070	0.056	0.047	0.040
Tulathromycin, 1.1, 90	3.5	13.125	6.563	1.641	0.410	0.103	0.082	0.068	0.059



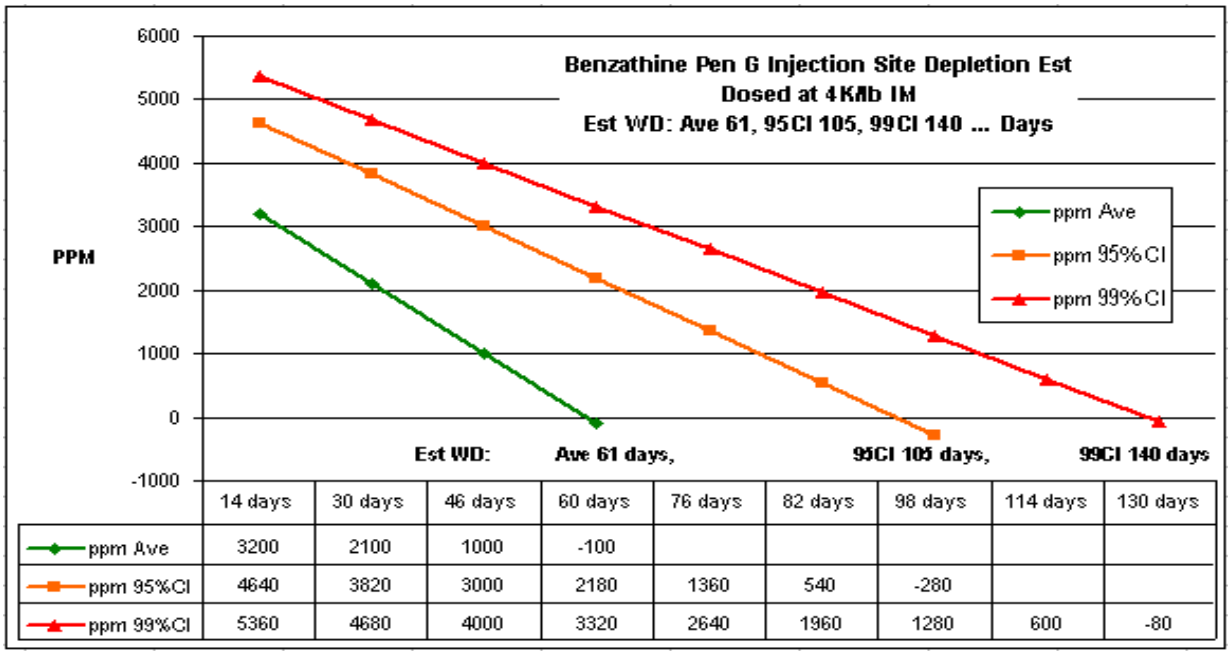
	CM	12	24	48	72	96	120	144	168
LA200 13.5, T1/2 = 20.5	10.75	9.182	4.591	1.148	0.287	0.072	0.057	0.048	0.041
TD300 13.5, T1/2 = 20.5	10.75	10.302	5.151	1.288	0.322	0.080	0.064	0.054	0.046
BM200 13.5, T1/2 = 18	10.75	8.063	4.031	1.008	0.252	0.063	0.050	0.042	0.036



	CM (ug/ml)	48	96	168	240	336
BenP 3.2K U/lb IM T1/2 = 45	0.98	0.459	0.230	0.066	0.017	0.004
BenP 3.2K U/lb SQ T1/2 = 40	1.30	0.542	0.271	0.077	0.020	0.005
BenP 9.5K U/lb IM T1/2 = 55	2.80	1.604	0.802	0.229	0.060	0.014
BenP 9.5K U/lb SQ T1/2 = 50	2.33	1.214	0.607	0.173	0.046	0.011
MIC 90 (http://www.vads.org/)	0.5	0.5	0.5	0.5	0.5	0.5



	CM	12	24	48	72	96	120	144	168
Naxcel 1mg/lb T1/2 = 9.5hr	14.00	5.542	2.771	0.693	0.173	0.043	0.035	0.029	0.025
Excenel 1mg/lb T1/2 = 11.8hr	9.00	4.425	2.213	0.553	0.138	0.035	0.028	0.023	0.020
Exede 1mg/lb T1/2 = 62.3hr	2.30	2.078	1.857	1.414	1.058	0.840	0.615	0.486	0.374



	14 days	30 days	46 days	60 days	76 days	82 days	98 days	114 days	130 days
ppm Ave	3200	2100	1000	-100					
ppm 95%CI	4640	3820	3000	2180	1360	540	-280		
ppm 99%CI	5360	4680	4000	3320	2640	1960	1280	600	-80

Cattle Antibiotic Residue Tolerance and FAST / PHAST (*Bm*) & STOP (*Bs*) Detection Estimates					
Generic Name	NADA#	Tolerance in Cattle Tissues	*Bm* Detect	*Bs* Detect	WD
Ampicillin	055-030	0.1ppm edible	0.2 [a]	>0.1 [b]	6
Amoxicillin	055-089	0.1ppm edible	0.2 [a]	>0.1 [b]	25
Ceftiofur sodium	140-338	0.4 ppm kidney, 1.0 ppm muscle	~0.1 [b]	>0.1 [b]	4
Ceftiofur hydrochloride	140-890	0.4 ppm kidney, 1.0 ppm muscle	~0.1 [b]	>0.1 [b]	3
Ceftiofur crystalline acid	141-209	0.4 ppm kidney, 1.0 ppm muscle	~0.1 [b]	>0.1 [b]	13
Chlortetracycline (feed)	048-761	12.0 ppm kidney, 2.0 ppm muscle	~0.1 [b]	>10 [b]	0
Danofloxacin **	141-207	0.2 ppm liver, 0.2 ppm muscle	>0.1 [b]	>0.1 [b]	4
Enrofloxacin **	141-068	0.1 ppm liver, 0.1 ppm muscle	>0.1 [b]	>0.1 [b]	28
Florfenicol	141-063	12.0 ppm kidney, 3.7 ppm liver	~5.0 [b]	>1 [b]	38
Gentamicin **	101-862	No residue tolerance	0.13 [a]	>1 [b]	>730?
Neomycin **	200-113	0.25 ppm edible	0.06 [a]	~10 [b]	>730?
Oxytetracycline (LA)***	Many	12.0 ppm kidney, 2.0 ppm muscle	0.8 [a]	>10 [b]	36
Pen G, Benzathine	Many	0.05 ppm edible	<0.01 [a]	>0.1 [b]	>180?
Pen G, Procaine	Many	0.05 ppm edible	<0.01 [a]	>0.1 [b]	>60?
Spectinomycin	141-077	4.0 ppm kidney, 0.25 ppm edible	6.2 [a]	>10 [b]	11
Sulfa-diamethoxine (IV)	041-245	0.1 ppm edible	~1 [b]	>100 [b]	5
Sulfa-diamethoxine (oral)	093-107	0.1 ppm edible	~1 [b]	>100 [b]	21
Sulfa-methazine	140-270	0.1 ppm edible	?	>100 [b]	12
Tilmicosin (Lung CM)	140-929	14.4 ppm kidney, 1.2 ppm liver	~5.0 [b]	>10 [b]	28
Tulathromycin	141-244	5.5 ppm liver, 18.0 ppm kidney	>0.1 [b]	>0.1 [b]	18
Tylosin	012-965	0.2 ppm kidney, 0.2 ppm liver	~5.0 [b]	>1 [b]	28

U.S. Tolerance: FDA permissible tolerance for the antibiotic in ppm (mg/kg) for target marker tissue listed
CODEX Tolerance (Max. Residue Limits (MRL)) @ http://www.codexalimentarius.net/mrls/vetdrugs/jsp/vetd_q-e.jsp

FAST (Fast Antibiotic Screening Test), a microbial inhibition test used by USDA-FSIS to screen for antibiotic residues
PHAST(Pre-Harvest Antibiotic Screening Test) utilizes the FAST test to screen cattle urine for antibiotic presence
Bm (*Bacillus megaterium*, ATCC 9885) is the microbe used in the FAST (meat) and PHAST (urine) antibiotic screening tests
Bs (*Bacillus subtilis*, ATCC 6633) is the microbe used in the STOP (meat) and LAST (urine) antibiotic screening tests
[a] =Korsrud, J Food Protect. 51:1 43-46, 1988.
[b] = Griffin, D.D. Univ of Neb, Great Plains Veterinary Educational Center, PO Box 148, Clay Center, NE 68933.
USDA-CSREES Grant: WBS # 25-6239-0098-011 (Develop Pre-Harvest Version of the USDA-FSIS Fast Antibiotic Screening Test & Education).
NOTE: Use the RESIDUE DETECTION information only as a starting guide.
WD (Withdrawal) days listed are the maximum from labeled products within the product class. ? = the FARAD published estimate.

Introduction to the PHAST (Pre-Harvest Antibiotic Screening Test)

The PHAST is a microbial inhibition test (substances in the urine that inhibit the growth of the test microbe, *Bacillus megaterium* for the PHAST/FAST). *Bacillus megaterium* (ATCC 9885) is classified by the USDA among bacteria that are generally accepted as safe (GAAS). The organism will not cause disease in humans or domestic animals.

Microbial inhibition tests are indirect assays that are dependent on a residue being passed in the urine in a chemical form that inhibit the growth of the test organism.

Because *Bacillus megaterium* is frequently more sensitive to target antibiotics than the FDA established tolerance for the target antibiotic and because there are a number of microbial inhibition substances that are not antibiotics, false positives are the most common problem with these types of tests. False negatives are thought to be rare, but are dependent on the sensitivity of the test organism to the antibiotic relative to the FDA tolerance to the target antibiotic. *Bacillus megaterium* is very sensitive to penicillin type antibiotics and intermediate to aminoglycosides and sulfa drugs. The reliability of the PHAST for detecting violative residues in cattle has not been investigated. The most common false positives should be associated with antibiotics, such as Oxytetracycline and Naxcel, which has an established FDA tolerance level above the level detectable in the kidney or cleared in the urine. Specific *Bacillus megaterium* sensitivities to commonly used antimicrobials and their relationship to FDA tolerance are listed in the USDA-FSIS Bioassay Residue Screening Test Evaluation table located at the end of this paper.

THE PHAST IS NOT A RELIABLE TEST TO EVALUATE THE RESIDUE STATUS OF AN ANIMAL WHICH HAS NOT MET THE WITHDRAWAL TIME SPECIFIED ON AN ANTIBIOTIC LABEL. Never use the PHAST test to evaluate the residue status of an animal, which has not met the withdrawal time specified on the label of an antibiotic.

The PHAST is useful in evaluating cattle that have: undergone prolonged treatment, been treated with multiple antibiotics, and/or have failed to perform normally following therapy or have suspected organ (kidney or liver) damage that might interfere with excretion and elimination of an antibiotic.

Avoiding violative residues is dependent on: 1) using FDA approved medications, 2) following label directions when possible, 3) ELDU must have withdrawal times appropriate for the dose, medication and route of administration, 4) not exceeding dose per injection site recommendations, and 5) screening cattle which may not have cleared the antibiotics normally.

PHAST TEST OUTLINE: A Muller-Hinton agar plate is streaked to carpet with *B. megaterium* spores. A sterile swab dipped in urine is placed on the inoculated agar plate along with a neomycin antibiotic sensitivity disc as a positive control. Incubate the test plate containing the test urine swab agar side down at 37° C for 12 to 24 hours. The zone of inhibition for the positive control antibiotic sensitivity disc must be within the limits set for the disc used. If there is any inhibition of bacterial growth around the urine swab the test is considered positive for urine antibiotic residues and the animal should be withheld from marketing

(See PHAST Sensitivity Table)

Note: From the USDA-FSIS Domestic Residue Plan "Blue Book" page 10. "beta-lactams (quantitated as penicillin-G; penicillins and cephalosporins are not differentiated within this category). **Therefore** ceftiofur will be false positive and not differentiated from penicillin. (last publication released 2005)

http://www.fsis.usda.gov/PDF/2005_Blue_Book_Vet_Drugs_%20Dom_Tables_1_thru_6B.pdf

Withdrawal (WD) Table for Common Cattle Animal Health Products

- ✓ All WD times must be figured from the last day of treatment and for the longest WD of the list of products used.
- ✓ If multiple doses of a single product is given the WD time should be the sum of the WD days for each administration. Example; Consider an antibiotic intended for a single application that has a 28 day WD. If a 2nd dose is given 3 days after the 1st dose, the WD would be (28 - 3) + (28) = 53 days from the last injection.
- ✓ Giving greater than 10 CC per IM site will increase the potential for a violative residue.
- ✓ Off label use of non-feed medications requires as veterinary prescription and the withdrawal time must be extended to insure no violative residues will be found.
- ✓ Generally, the extended withdrawal a veterinarian may assign will be at least an additional 60 days above the label withdrawal.
- ✓ Off label use of feed additives violates federal law and is strictly forbidden.

Animal Health Product NA = Not Approved	Withdrawal		Animal Health Product NA = Not Approved	Withdrawal	
	Milk (hrs)	Meat (days)		Milk (hrs)	Meat (days)
All Non-Oil Adjuvant Vaccines	0	21	A180	NA	4
Oil Adjuvant Vaccines	0	60	Adspec	NA	11
			Albon Injectable & Albon SR boluses	60 / NA	5 / 21
All Growth Promotant Implants	NA	0	Amoxi-inject	96	25
Lutalyse (IM only in the neck)	0	0	Aureomycin	NA	1
MGA and Optaflexx	NA	0	Baytril 100	NA	28
			Bio-Mycin 200	96	28
Antihistamine	24	4	Draxxin	NA	18
Banamine (Flunixin)…Avoid IM, SubQ 10 days	36	IV = 4	Excede (ear route of administration)	0	13
Steroids (Azium or Predef)	0	0 or 7	Excenel RTU	0	3
Therabloat	0	0	Gentamicin (Never Inject) … 2 + years withdrawal !!!	NA	2+Yrs
Vit A,D,E,K & B complex (5 cc/site)	0	0	Liquamycin LA 200	96	28
			Micotil 300	NA	28
Corid (coccidia oral drench)	NA	1	Naxcel	0	4
Curatrem (fluke oral drench)	NA	8	Neomycin, ONLY ORAL, Never Inject	NA	1
Cydectin (pour on)	0	0	Polyflex	48	6
Cydectin (injectable)	NA	21	Penicillin G, Procaine … (off label 60+)	48	10
Dectomax (pour on)	NA	45	Penicillin G, Benzathine (Long Acting)…(off label 180+)	NA	30
Dectomax (injectable)	NA	35	Sulfamethazine	NA	12
Eprinex (pour on)	0	0	Terramycin Soluble Powder	NA	5
Ivomec (pour on)	NA	48	Tetradure	NA	28
Ivomec (injectable)	NA	35	Tylan 200	NA	21
Ivomec Plus (Injectable)	NA	49	Vetisulid	NA	7
Levasole (injectable)	NA	7			
Levasole (oral)	NA	2	Co-Ral	0	0
Safeguard (oral)	0	8	Atroban, Boss, Cylence, Durasect	0	0
Syanthic (oral)	NA	7	Saber, Permectrin, Ultra Boss	0	0
Valbazen	NA	27	Elector	0	2
Spectramast LC	72	0	ToDAY / Cefa-Lak	96	4
Spectramast DC	720+	16	ToMORROW / Cefa-Dri	72	42
Quarter Master	96	60	Pirsue	36	9
Albadry	72	30	Dry-Clox	0	30
Biodry	720+	30	Hetacin-K	72	10

Antibiotic Residue Avoidance Strategy

1. Identify all animals treated.
2. Record all treatments: Date; animal' ID; dose given; route of administration; person administering treatment; withdrawal time (WD).
3. Strictly follow label directions for product use.
4. Use newer technology antibiotics when possible.
5. Select antibiotics with short WD when equivalent.
6. Never give more than 10 cc per IM injection site.
7. Avoid Extra Label Drug Use (ELDU) of antibiotics.
8. Avoid using multiple antibiotics at the same time.
9. Don't mix antibiotics in the same syringe.
10. Check ALL medication/treatment records before marketing.

Antibiotic Residue Avoidance Strategy

1. Identify all animals treated.
2. Record all treatments: Date; animal' ID; dose given; route of administration; the person who administered the treatment; withdrawal time (WD).
3. Strictly follow label directions for product use.
4. Use newer technology antibiotics when possible.
    a. Reduce unwanted depot effect. Select low volume products when available.
    b. Select generic medications and vaccines with EXTREME CAUTION.
    c. Avoid inferior products. They may cause performance loss or damage quality.
5. Select with short WD when antibiotic choice is equivalent.
6. Never give more than 10 cc per IM injection site.
7. Avoid Extra Label Drug Use (ELDU) of antibiotics.
    a. Use label dose and route of administration.
8. Avoid using multiple antibiotics at the same time.
9. Don't mix antibiotics in the same syringe, especially if given IM or Sub-Q.
10. Check ALL medication/treatment records before marketing:
    a. Don't market cattle with less than 60 WD without examining the treatment history.
    b. Extend the WD time if the route or location of administration is altered.
        i. Example; the WD for ear route of administration ceftiofur will be over 120 days if given SQ in the neck.
        ii. Example; tissue irritation will cause the WD for Banamine to be over 30 days if given IM or Sub-Q instead of IV.
    c. Extend the withdrawal time for multiple medications given by summing their label recommended WD.
        i. Example; if the 1st medication has a 10 day WD and the 2nd medication has a 28 day WD, assign a 38 day. WD.
        ii. Example; if 1st medication has a 10 day WD and is repeated in three days, assign a 20 day WD.
    d. Extend the WD for all penicillin given at doses which exceed the label dose
        i. Example; the WD for Procaine Pen G given at 3 CC per CWT IM or Sub-Q is over 30 days
        ii. Example; the WD for Procaine Pen G given at 4 CC per CWT IM or Sub-Q is over 30 days
        iii. Example; the WD for Long Acting Pen G given at 3 CC per CWT IM or Sub-Q is over 120 days
        iv. Example; the WD for Long Acting Pen G given at 4 CC per CWT IM or Sub-Q is over 180 days
            1. Testing urine test may not detect injection site residues and will test positive by the USDA-FSIS.
    e. Never inject gentamicin or neomycin. The estimated WD is over 24 months
        i. Testing urine test may not detect a kidney that will test positive by the USDA-FSIS.
    f. Don't market cattle that have relapsed without examining the treatment history.
    g. Don't market cattle with suspected liver or kidney damage without examining the treatment history.
    h. Don't market cattle with antibiotic injection site knots without examining the treatment history.
    i. Screen the urine for antibiotics of all cattle identified in steps a-d above. It is best to use broad spectrum microbial inhibition test such as the Pre-Harvest Antibiotic Screening Test (PHAST), a microbial growth inhibition test which uses *B. megaterium* as the test organism. Test sensitivity relative to FDA-CVM violative residue tolerances (Maximum Residue Limit or MRL)

BQA: All injections should be given in front of the shoulder slope and if possible avoid products that require IM use

Intramuscular (IM) injections not only increase soreness compared to subcutaneous (SQ) injections. Many of the products given IM cause significant muscle damage which subsequently caused a significant amount of expensive carcass trim. Knot or blemishes from SQ injections are much easier to find, examine and remove at the packers. Because of these, the National Cattlemen's Beef Association's (NCBA) National Beef Quality Assurance (BQA) program adopted a policy that ALL injections (antibiotics, vaccines, parasiticides, vitamins, prostaglandins, hormones, and all other injectables) be given in front of the slope of the shoulder, that products with SQ labeling be selected in preference to products labeled for IM use only, and that IM injections if required, be limited to not more than 10 cc. These injection site guidelines have been adopted by all state BQA programs. Almost all of our pharmaceutical and biologic product suppliers and government agencies responsible for those product approvals have worked diligently to design and label products to meet the national BQA program injection guidelines. Every antibiotic developed and approved by the FDA-CVM for our use in the last two decades has included use approval other than for IM, including the development of injectables that may be given in the SQ space of the ear and around the head. It is important to remember the safety of the operator, other bystanders, the animal or the food supply must never be jeopardized.

Change the injection needle between every 15 animals or if it becomes contaminated, or damaged. Never, never, never straighten a bent needle and use it again. Animals that have an injection needle broken off in them CAN NOT be marketed.

A Producers Guide for Judicious Use of Antimicrobials in Cattle

(As Adopted by the NCBA.)

1. Prevent Problems: Emphasize appropriate husbandry and hygiene, routine health examinations, and vaccinations.

2. Select and Use Antibiotics Carefully: Consult with your veterinarian on the selection and use of antibiotics. Have a valid reason to use an antibiotic. Therapeutic alternatives should be considered prior to using antimicrobial therapy.

3. Avoid Using Antibiotics Important In Human Medicine As First Line Therapy: Avoid using as the first antibiotic those medications that are important to treating strategic human or animal infections.

4. Use the Laboratory to Help You Select Antibiotics: Cultures and susceptibility test results should be used to aid in the selection of antimicrobials, whenever possible.

5. Combination Antibiotic Therapy Is Discouraged Unless There Is Clear Evidence The Specific Practice Is Beneficial: Select and dose an antibiotic to affect a cure.

6. Avoid Inappropriate Antibiotic Use: Confine therapeutic antimicrobial use to proven clinical indications, avoiding inappropriate uses such as for viral infections without bacterial complication.

7. Treatment Programs Should Reflect Best Use Principles: Regimens for therapeutic antimicrobial use should be optimized using current pharmacological information and principles.

8. Treat the Fewest Number of Animals Possible: Limit antibiotic use to sick or at risk animals.

9. Treat for the Recommended Time Period: To minimize the potential for bacteria to become resistant to antimicrobials.

10. Avoid Environmental Contamination with Antibiotics: Steps should be taken to minimize antimicrobials reaching the environment through spillage, contaminated ground run off or aerosolization.

11. Keep Records of Antibiotic Use: Accurate records of treatment and outcome should be used to evaluate therapeutic regimens and always follow proper withdrawal times.

12. Follow Label Directions: Follow label instructions and never use antibiotics other than as labeled without a valid veterinary prescription.

13. Extralabel Antibiotic Use Must follow FDA Regulations: Prescriptions, including extra label use of medications must meet the Animal Medicinal Drug Use Clarification Act (AMDUCA) amendments to the Food, Drug, and Cosmetic Act and its regulations. This includes having a valid Veterinary-Client-Relationship.

14. Subtherapeutic Antibiotic Use Is Discouraged: Antibiotic use should be limited to prevent or control disease.