Appendix A
Antimicrobials Used in Livestock Production

Table A-1. Selected Antimicrobials Used in Beef Production for Feed Efficiency, Disease Prevention, and Growth Promotion

Drugs Approved for Use with Cattle	Stage and/or Animal Size	Indication for Use	Active Ingredient
bacitracin	feedlot	Reduction in the number of liver condemnations due to abscesses	bacitracin methylene disalicylate (BMD)
chlortetracycline	<250 lb	Increased rate of weight gain and improved feed efficiency	chlortetracyline
	250–400 lb	Increased rate of weight gain and improved feed efficiency	chlortetracyline
	>400 lb	Increased rate of weight gain, improved feed efficiency, and reduction of liver condemnation due to liver abscesses	chlortetracyline
	unspecified	Control of bacterial pneumonia associated with shipping fever complex	chlortetracyline
lasalocid (Bovatec)	cattle in confinement	Improved feed efficiency, increased rate of weight gain, reduction of incidence and severity of liver abscesses, and control of coccidiosis	lasalocid sodium
monensin	cattle in confinement	Improved feed efficiency	monensin sodium
	calves	Prevention and control of coccidiosis due to *Eimeria bovis* and *E. zuernii*	monensin sodium
oxytetracycline	>400 lb	Increased rate of weight gain, improved feed efficiency, and reduction of liver condemnation due to liver abscesses	oxytetracycline
	250–400 lb	Increased rate of weight gain and improved feed efficiency	oxytetracycline
tylosin	beef cattle	Reduction of incidence of liver abscesses caused by *Fusobacterium necrophorum* and *Actinomyces (Corynebacterium) pyogenes*	tylosin phosphate
chlortetracycline and sulfamethazine	beef cattle	Aid in the maintenance of weight gains in the presence of respiratory disease such as shipping fever	chlortetracycline calcium complex; sulfamethazine
amprolium (coccidiostat)	calves	Prevention of coccidiosis caused by *E. bovis* and *E. zuernii*	amprolium
erythromycin thiocyanate	feedlot	Feed efficiency and growth	erythromycin thiocyanate
decoquinate	veal and calves	Prevention of coccidiosis in ruminating and nonruminating calves and cattle caused by *E. bovis* and *E. zuernii*	decoquinate

Table A-1. Continued

Drugs Approved for Use with Cattle	**Average Antimicrobial per day** (mg)	**Duration of Use**	**CFR source**
bacitracin	70	continuously throughout feeding period	21CFR558.76
chlortetracycline	10–25	48-hour withdrawal time	21CFR558.128
	25–70	48-hour withdrawal time	21CFR558.128
	70	48-hour withdrawal time	21CFR558.128
	350	48-hour withdrawal time	21CFR558.128
lasalocid (Bovatec)	100–360	feed continuously	21CFR588.311
monensin	50–360	feed continuously	21CFR588.355
	0.14–1 mg per pound	unknown	21CFR588.355
oxytetracycline	75	feed continuously	21CFR588.450
	25	feed continuously	21CFR588.450
tylosin	60–90	feed continuously	21CFR588.625
chlortetracycline and sulfamethazine	700	28 days	21CFR588.140
amprolium (coccidiostat)	454 mg per 100 pounds	21 days	21CFR588.55
erythromycin thiocyanate	37	feed continuously	21CFR588.248
decoquinate	22.7 mg per 100 pounds	28 days	21CFR588.195

Table A-2. Selected Antimicrobials Approved for Use in Swine Production for Feed Efficiency, Disease Prevention, and Growth Promotion

Drugs Approved for Use with Swine	Stage and/or Animal Size	Indication for Use
chlortetracycline/ sulfathiazole/ penicillin (Aureozol ®)	starting and prestarting	Increased rate of weight gain and improved feed efficiency; maintenance of weight gains in the presence of atrophic rhinitis
	growing and finishing	Increased rate of weight gain and improved feed efficiency; maintenance of weight gains in the presence of atrophic rhinitis
chlortetracycline sulfamethazine penicillin (Aureomix 500)	starting and 1/2 feeding stage (up to 75 lb)	Maintenance of weight gains in the presence of atrophic rhinitis; growth promotion and increased feed efficiency
tylosin sulfamethazine (Tylan ® Sulfa-G Premix)	unspecified	Maintaining weight gains and feed efficiency in the presence of atrophic rhinitis; lowering the incidence and severity of *Bordetella bronchiseptica* rhinitis; prevention of swine dysentery (vibrionic); control of swine pneumonias caused by bacterial pathogens
carbadox (Mecadox ® Premix 10)	under 250 lb	Control of swine dysentery (vibrionic dysentery, bloody scours, or hemorrhagic dysentery); control of bacterial swine enteritis (salmonellosis or necrotic enteritis caused by *Salmonella choleraesuis*); increased rate of weight gain and improved feed efficiency
chlortetracycline	unspecified	Increased rate of weight gain and improved feed efficiency
	unspecified	Reducing the incidence of cervical lymphadenitis (abscesses) caused by Group E. Streptococci
	breeding	Control of leptospirosis caused by *Leptospira pomona*
tylosin	starting	Increased rate of weight gain and improved feed efficiency
	growing	Increased rate of weight gain and improved feed efficiency
	finishing	Increased rate of weight gain and improved feed efficiency
bacitracin	growing and finishing	Increased rate of weight gain and feed efficiency
virginiamycin	starting and feeding	Increased rate of weight gain and feed efficiency
	finishing	Increased rate of weight gain and feed efficiency

Table A-2. Continued

Drugs Approved for Use with Swine	Average Antimicrobial per Ton of Feed (g/ton)	Duration of Use	CFR source
chlortetracycline/ sulfathiazole/ penicillin (Aureozol ®)	250	up to 6 weeks post weaning	21CFR558.155
	250	7-day withdrawal period	21CFR558.155
chlortetracycline sulfamethazine penicillin (Aureomix 500)	250	only up to 75 pounds	21CFR558.145
tylosin sulfamethazine (Tylan ® Sulfa-G Premix)	200	15-day withdrawal	21CFR558.630
carbadox (Mecadox ® Premix 10)	50	42-day withdrawal	21CFR558.115
chlortetracycline	10–50	unknown	21CFR558.128
	50–100	unknown	21CFR558.128
	400	14 days	21CFR558.128
tylosin	20–100	feed continuously	21CFR558.625
	20–40	feed continuously	21CFR558.625
	10–20	feed continuously	21CFR558.625
bacitracin	10–30	feed continuously	21CFR558.76
virginiamycin	10	feed continuously	21CFR558.635
	5	feed continuously	21CFR558.635

Table A-2. Continued

Drugs Approved for Use with Swine	Stage and/or Animal Size	Indication for Use
arsanilic acid (source of arsenic)	feeding and finishing	Increased rate of weight gain and improved feed efficiency
	breeding	Aid in control of swine dysentery
bambermycin	growing and finishing	Increased rate of weight gain and improved feed efficiency
	breeding	Increased rate of weight gain and improved feed efficiency
oxytetracycline	no limitation	Increased rate of weight gain and improved feed efficiency
	breeding	Treatment of bacterial enteritis caused by *Escherichia coli* and *Salmonella choleraesius*
efrotomycin (Producil ®)	< 250 lb	Increased rate of weight gain
	growing and finishing	Increased rate of weight gain and improved feed efficiency
apramycin	starting	Control of porcine colibacillosis (weanling pig scours)
lincomycin	< 250 lb	Increased rate of weight gain

Table A-2. Continued

Drugs Approved for Use with Swine	Average Antimicrobial per Ton of Feed (g/ton)	Duration of Use	CFR source
arsanilic acid (source of arsenic)	45–90	5-day withdrawal	21CFR558.62
	90	5-day withdrawal	21CFR558.62
bambermycin	2–4	feed continuously	21CFR558.95
	2–4	feed continuously	21CFR558.95
oxytetracycline	10–50	unknown	21CFR558.450
	10 mg per lb body weight	7–14 days	21CFR558.450
efrotomycin (Producil ®)	3.6–14.5	feed continuously	21CFR558.235
	5–11.25	unknown	21CFR558.435
apramycin	150	14 days	21CFR558.59
lincomycin	20	feed continuously	21CFR558.325

Table A-3. Selected Antimicrobials Used in Poultry Production

Drugs Approved for Use with Poultry (Drug Type)	**Stage and/or Bird Size**	**Indication for Use**	**Average Antimicrobial per Ton of Feed** (g)
bambermycin (antibiotic)	growing and finishing	For increased rate of weight gain and improved feed efficiency	1–2
	turkeys	Improved feed efficiency	1–2
bacitracin (BMD) (antibiotic)	growing and finishing	Increased rate of weight gain and improved feed efficiency	4–50
	pheasant	Increased rate of weight gain and improved feed efficiency	4–50
	quail - < 5 weeks	Increased rate of weight gain and improved feed efficiency	5–20
	layers	Increased egg production, improved feed efficiency	10–25
	turkeys - growing	Increased rate of weight gain and improved feed efficiency	4–50
chlortetracycline (antibiotic)	chickens - broilers	Increased rate of weight gain and improved feed efficiency	10–50
	turkeys - growing	Increased rate of weight gain and improved feed efficiency	10–50
oleandomycin (antibiotic)	chickens - broilers	Increased rate of weight gain and improved feed efficiency	1–2
	turkeys - growing	Increased rate of weight gain and improved feed efficiency	1–2
penicillin (antibiotic)	chickens - growing	Increased rate of weight gain and improved feed efficiency	2.4–50
	turkeys - growing	Increased rate of weight gain and improved feed efficiency	2.4–50
	pheasants	Increased rate of weight gain and improved feed efficiency	2.4–50
	quail - < 5 weeks	Increased rate of weight gain and improved feed efficiency	5–20
tylosin (antibiotic)	chicken - broilers	Improved feed efficiency	4–50
	chicken - layers	Improved feed efficiency	20–50

Table A-3. Continued

Drugs Approved for Use with Poultry (Drug Type)	**Stage and/or Bird Size**	**Duration of Use**	**CFR source**
bambermycin (antibiotic)	growing and finishing	feed continuously	21CFR558.95
	turkeys	feed continuously	21CFR558.95
bacitracin (BMD) (antibiotic)	growing and finishing	no limitations	21CFR558.76
	pheasant	5 weeks only	21CFR558.76
	quail - < 5 weeks	5 weeks only	21CFR558.76
	layers	first 7 months of production	21CFR558.76
	turkeys - growing	no limitations	21CFR558.76
chlortetracycline (antibiotic)	chickens - broilers	no limitation	21CFR558.128
	turkeys - growing	no limitation	21CFR558.128
oleandomycin (antibiotic)	chickens - broilers	no limitation	21CFR558.435
	turkeys - growing	no limitation	21CFR558.435
penicillin (antibiotic)	chickens - growing	no limitation	21CFR558.460
	turkeys - growing	no limitation	21CFR558.460
	pheasants	no limitation	21CFR558.460
	quail - < 5 weeks	5 weeks only	21CFR558.460
tylosin (antibiotic)	chicken - broilers	no limitation	21CFR558.625
	chicken - layers	no limitation	21CFR558.625

Table A-3. Continued

Drugs Approved for Use with Poultry (Drug Type)	**Stage and/ or Bird Size**	**Indication for Use**	**Average Antimicrobial per Ton of Feed** (g)
virginiamycin (antibiotic)	chicken - broilers	Increased rate of weight gain and improved feed efficiency	5–15
	turkeys	Increased rate of weight gain and improved feed efficiency	10–20
lincomycin (antibiotic)	chicken - broilers	Increased rate of weight gain and improved feed efficiency	2–4
arsanilic acid (arsenic compound)	chicken - broilers	Increased weight gain, improved feed efficiency, and improved pigmentation	90
	turkeys - growing	Increased weight gain, improved feed efficiency, and improved pigmentation	90
roxarsone (arsenic compound)	chickens -growing	Increased weight gain, improved feed efficiency, and improved pigmentation	22.7–45.4
	turkeys -growing	Increased weight gain, improved feed efficiency, and improved pigmentation	22.7–45.4
carbarsone (arsenic compound)	turkeys - growing	Source of arsenics, an aid in the prevention of blackhead; increased rate of weight gain	227–340.5
salinomycin (ionophore coccidiostat)	chicken - broilers	Prevention of coccidiosis caused by *Eimeria tenella, E. necatrix, E. acervulina, E. maxima, E. brunetti,* and *E. mivati*	40–60
lasalocid (ionophore coccidiostat)	chicken - broilers	Prevention of coccidiosis caused by *E. tenella, E. necatrix, E. acervulina, E. brunetti, E. mivati,* and *E. maxima,* and increased rate of weight gain, and improved feed efficiency	68–113
narasin (ionophore coccidiostat)	chicken - broilers	Prevention of coccidiosis caused by *E. necatrix, E. tenella, E. acervulina, E. brunetti, E. mivati,* and *E. maxima*	54–72

Table A-3. Continued

Drugs Approved for Use with Poultry (Drug Type)	**Stage and/ or Bird Size**	**Duration of Use**	**CFR source**
virginiamycin (antibiotic)	chicken - broilers	no limitation	21CFR558.635
	turkeys	no limitation	21CFR558.635
lincomycin (antibiotic)	chicken - broilers	no limitation	21CFR558.325
arsanilic acid (arsenic compound)	chicken - broilers	5-day withdrawal	21CFR558.62
	turkeys - growing	5-day withdrawal	21CFR558.62
roxarsone (arsenic compound)	chickens - growing	continuous - 5-day withdrawal	21CFR558.530
	turkeys - growing	continuous - 5-day withdrawal	21CFR558.62
carbarsone (arsenic compound)	turkeys - growing	5-day withdrawal	21CFR558.120
salinomycin (ionophore coccidiostat)	chicken - broilers	feed continuously	21CFR558.550
lasalocid (ionophore coccidiostat)	chicken - broilers	no limitations	21CFR558.311
narasin (ionophore coccidiostat)	chicken - broilers	feed continuously	21CFR558.363

Table A-3. Continued

Drugs Approved for Use with Poultry (Drug Type)	**Stage and/or Bird Size**	**Indication for Use**	**Average Antimicrobial per Ton of Feed** (g)
monensin (ionophore coccidiostat)	chicken - >16 weeks	Prevention of coccidiosis caused by *E. necatrix, E. tenella, E. acervulina, E. brunetti, E. mivati,* and *E. maxima*	90–110
	turkey	Prevention of coccidiosis caused by *E. necatrix, E. tenella, E. acervulina, E. brunetti, E. mivati,* and *E. maxima*	54–90
	quail	Prevention of coccidiosis caused by *E. dispersa* and *E. Lettyae*	73
clopidol (coccidiostat)	chickens - broilers	Prevention of coccidiosis caused by *E. necatrix, E. tenella, E. acervulina, E. brunetti, E. mivati,* and *E. maxima*	113.5
sulfanitran—used in combination with nitromide (sulfonamide coccidiostat)	chickens - broilers	As an aid in the prevention of coccidiosis caused by *E. tenella, E. necatrix,* and *E. acervulina*	272
amprolium (coccidiostat)	chickens - growing	Prevention of coccidiosis; growth promotion and feed efficiency; improving pigmentation	113–227
nequinate (coccidiostat)	chickens - broilers	An aid in the prevention of coccidiosis caused by *E. tenella, E. necatrix, E. acervulina, E. maxima, E. brunetti,* and *E. mivati*	18.6
nicarbazin (coccidiostat)	chickens - broilers	An aid in the prevention of coccidiosis caused by *E. tenella, E. necatrix, E. acervulina, E. maxima, E. brunetti,* and *E. mivati*	113.5
robenidine (coccidiostat)	chickens - broilers	As an aid in the prevention of coccidiosis caused by *E. mivati, E. brunetti, E. tenella, E. acervulina, E. maxima,* and *E. necatrix*	30
zoalene (coccidiostat)	chickens - starting	Development of active immunity to coccidiosis	75.4–113.5
	chickens - growing	Development of active immunity to coccidiosis	36.3–75.4
	chickens - broilers	Prevention and control of coccidiosis	113.5

Table A-3. Continued

Drugs Approved for Use with Poultry (Drug Type)	**Stage and/or Bird Size**	**Duration of Use**	**CFR source**
monensin (ionophore coccidiostat)	chicken - >16 weeks	feed continuously	21CFR558.355
	turkey	feed continuously	21CFR558.355
	quail	feed continuously	21CFR558.355
clopidol (coccidiostat)	chickens - broilers	under 16 weeks of age	21CFR558.175
sulfanitran—used in combination with nitromide (sulfonamide coccidiostat)	chicken - broilers	5-day withdrawl	21CFR558.376
amprolium (coccidiostat)	chickens - growing	unknown	21CFR558.55
nequinate (coccidiostat)	chickens - broilers	feed continuously	21CFR558.365
nicarbazin (coccidiostat)	chickens - broilers	feed continuously	21CFR558.366
robenidine (coccidiostat)	chickens - broilers	feed continuously - 5-day withdrawal	21CFR558.515
zoalene (coccidiostat)	chickens - starting	no limitations	21CFR558.680
	chickens - growing	no limitations	21CFR558.680
	chickens - broilers	no limitations	21CFR558.680

Table A-3. Continued

Drugs Approved for Use with Poultry (Drug Type)	
For Treatment only	
sulfachloropyrazine	Treatment of coccidiosis
spectinomycin	Aid in the prevention or control of losses due to CRD associated with *Mycoplasma gallisepticum* (PPLO)
sulfamethazine	Control of infectious coryza *(Haemophilus gallinarum)*, coccidiosis *(E. tenella, E. necatrix)*, acute fowl cholera *(Pasteurella multocida)*, and pullorum disease *(Salmonella pullorum)*
sulfadimethoxine	Treatment of disease outbreaks of coccidiosis, fowl cholera, and infectious coryza
sulfaquinoxaline	Aid in the control of outbreaks of coccidiosis caused by *E. tenella, E. necatrix, E. acervulina, E. maxima,* and *E. brunetti*
buquinolate	Prevention of coccidiosis - most products are removed from *Green Book*

Table A-4. Representative Antimicrobial/Coccidiostat Combinations Used for Poultry Production

Combinations (Mixtures)	Antimicrobial Dose per Ton of Feed (g)	Average Dose per Mixture (g)	80% of Mixture Dose (g)
Starting Stage			
Combination #1			
bambermycin	2–3		
amprolium	113.5	154.2	123.36
ethopabate	3.6		
roxarsone	22.8–34.1		
Combination #2			
bacitracin (BMD)	10–25		
roxarsone	11.3–45.3	180.3	144.24
monensin	90–110		
Combination #3			
chlortetracycline	500	545.4	436.32
roxarsone	22.7–45.4		
Combination #4			
penicillin	2.4–50		
amprolium	113.5	167.1	133.68
ethopabate	3.6		
Combination #5			
lincomycin	2–4		
amprolium	113	166.5	133.2
ethopabate	3.6		
roxarsone	45.4		
Combination #6			
virginiamycin	5		
roxarsone	45.4	110.4	88.32
salinomycin	40–60		
Growing and Finishing Stage			
Combination #1			
bambermycin	1		
lasalocid	68–113	159.4	127.52
roxarsone	45.4		
Combination #2			
erythromycin	92.5		
arsanilic acid	90	296	236.8
zoalene	113.5		
Combination #3			
chlortetracycline	500		
roxarsone	22.7–45.4	655.4	524.32
monensin	90–110		
Combination #4			
penicillin	2.4–50		
roxarsone	22.7–45.4	208.9	167.12
zoalene	113.5		
Combination #5			
lincomycin	2		
lasalocid	68–113	160.4	128.32
roxarsone	45.4		
Combination #6			
virginiamycin	5–15		
monensin	90–110	147.7	118.16
roxarsone	22.7		

Appendix B
Estimated Nontherapeutic Antimicrobial Use in Livestock Production

Table B-1. Estimated Nontherapeutic Antimicrobial Use in Beef Production

Antimicrobial	Percent Cattle Treated	Average Days Fed	Average Antimicrobial per Day (mg)
Veal (up to 18 weeks): 1,457,835 cattle (1998)			
oxytetracycline	100	35	18.5
decoquinate - coccidiostat	20	28	70
monensin	40	28	100
Calves, Birth to 250 pounds (90 days): 29,281,319 cattle (1998)			
chlortetracycline	5	30	20
monensin	10	20	100
oxytetracycline	5	20	25
amprolium	5	15	600
250–500 pounds (140 days): 29,135,640 cattle (1998)			
chlortetracycline	30	50	60
monensin	40	20	200
oxytetracycline	15	12	30
Backgrounder or containment, 500–700 pounds (90 days): 28,990,687 cattle (1998)			
bacitracin	2	70	50
chlortetracycline	30	30	70
lasalocid	30	60	200
monensin	50	60	200
oxytetracycline	25	30	75
tylosin	30	70	70
chlortetracycline/ sulfamethazine	50	28	700
erythromycin thiocyanate	5	70	30

Table B-1. Continued

Antimicrobial	Total Antimicrobial per Animal Treated (mg)	Total Antimicrobial All Treated Animals (mg)
Veal		
oxytetracycline	647.5	943,948,163
decoquinate - coccidiostat	1,960	571,471,320
monensin	2,800	1,632,775,200
Total mgs		**3,148,194,683**
Total pounds		**6,941**
Calves, Birth to 250 pounds		
chlortetracycline	600	878,439,557
monensin	2,000	5,856,263,712
oxytetracycline	500	732,032,964
amprolium	9,000	13,176,593,353
Total mgs		**20,643,329,586**
Total pounds		**45,511**
250–500 pounds		
chlortetracycline	3,000	26,222,076,324
monensin	4,000	46,617,024,575
oxytetracycline	360	1,573,324,579
Total mgs		**74,412,425,478**
Total pounds		**164,051**
Backgrounder or containment, 500–700 pounds		
bacitracin	3,500	2,029,348,085
chlortetracycline	2,100	18,264,132,763
lasalocid	12,000	104,366,472,930
monensin	12,000	173,944,121,550
oxytetracycline	2,250	16,307,261,395
tylosin	4,900	42,616,309,780
chlortetracycline/ sulfamethazine	19,600	284,108,731,865
erythromycin thiocyanate	2,100	3,044,022,127
Total mgs		**644,680,400,495**
Total pounds		**1,421,277**

Table B-1. Estimated Nontherapeutic Antimicrobial Use in Beef Production

Antimicrobial	Percent Cattle Treated	Average Days Fed	Average Antimicrobial per Day (mg)
Feedlot, 700–1200 pounds (145 days): 28,903,975 cattle (1998)			
bacitracin	4	120	70
chlortetracycline	46	70	70
lasalocid	40	120	200
monensin	55	120	200
oxytetracycline	30	70	75
tylosin	43	120	80
chlortetracycline/ sulfamethazine	5	28	700
erythromycin thiocyanate	5	120	30

Table B-1. Continued

Antimicrobial	Total Antimicrobial per Animal Treated (mg)	Total Antimicrobial All Treated Animals (mg)
Feedlot, 700–1200 pounds		
bacitracin	8,400	9,711,735,600
chlortetracycline	4,900	65,149,559,650
lasalocid	24,000	277,478,160,000
monensin	24,000	381,532,470,000
oxytetracycline	5,250	45,523,760,625
tylosin	9,600	119,315,608,800
chlortetracycline/ sulfamethazine	19,600	28,325,895,500
erythromycin thiocyanate	3,600	5,202,715,500
Total mgs		**932,239,905,675**
Total pounds		**2,055,237**
Total Antimicrobial Use in the Cattle Industry (pounds)		**3,693,017**

Table B-2. Estimated Nontherapeutic Antimicrobial Use in Swine Production

Antibiotic	Percent Swine Treated	Feed per Day per Swine (lb)	Average Days Fed	Average Antimicrobial per Day (g per ton of feed)
Starter, 15–40 pounds (37 days average): 98,258,722 swine (1998)				
chlortetracycline sulfathiazole penicillin	20	2	35	200
chlortetracycline sulfamethazine penicillin	20	2	35	200
tylosin	40	2	35	50
virginiamycin	4	2	35	8
chlortetracycline	50	2	35	80
oxytetracycline	40	2	35	50
apramycin	10	2	14	130
Feeder, 40–100 pounds (40 days average): 94,479,540 swine (1998)				
chlortetracycline sulfathiazole penicillin	10	4	38	200
chlortetracycline sulfamethazine penicillin	7	4	15	200
tylosin sulfamethazine	5	4	38	180
carbadox	12	4	38	45
chlortetracycline	45	4	38	70
tylosin	30	4	38	35
bacitracin	55	4	38	30
virginiamycin	4	4	38	8
arsanilic acid	2	4	38	60
bambermycin	2	4	38	2
oxytetracycline	25	4	38	40
oleandomycin	2	4	38	8
lincomycin	4	4	38	16
efrotomycin	2	4	38	11

Table B-2. Continued

Antibiotic	Average Antimicrobial per Day (g per lb of feed)	Total Antimicrobial per Swine (g)	Total Antimicrobial All Treated Animals (g)
Starter, 15–40 pounds			
chlortetracycline sulfathiazole penicillin	0.1	7.00	137,562,211
chlortetracycline sulfamethazine penicillin	0.1	7.00	137,562,211
tylosin	0.025	1.75	68,781,105
virginiamycin	0.004	0.28	1,100,498
chlortetracycline	0.04	2.80	137,562,211
oxytetracycline	0.025	1.75	68,781,105
apramycin	0.065	1.82	17,883,087
Total grams			**569,232,428**
Total pounds			**1,254,943**
Feeder, 40–100 pounds			
chlortetracycline sulfathiazole penicillin	0.1	1.52	143,608,901
chlortetracycline sulfamethazine penicillin	0.1	0.42	39,681,407
tylosin sulfamethazine	0.09	0.684	64,624,005
carbadox	0.0225	0.4104	38,774,403
chlortetracycline	0.035	2.394	226,184,019
tylosin	0.0175	0.798	75,394,673
bacitracin	0.015	1.254	118,477,343
virginiamycin	0.004	0.02432	2,297,742
arsanilic acid	0.03	0.0912	8,616,534
bambermycin	0.001	0.00304	287,218
oxytetracycline	0.02	0.76	71,804,450
oleandomycin	0.004	0.01216	1,148,871
lincomycin	0.008	0.04864	4,595,485
efrotomycin	0.0055	0.01672	1,579,698
Total grams			**797,074,750**
Total pounds			**1,757,249**

Table B-2. Estimated Nontherapeutic Antimicrobial Use in Swine Production

Antibiotic	Percent Swine Treated	Feed per Day per Swine (lb)	Average Days Fed	Average Antimicrobial per Day (g per ton of feed)
Finishing, 100–260 pounds (90 days average): 92,627,000 swine (1998)				
chlortetracycline sulfathiazole penicillin	12	6.2	86	250
tylosin sulfamethazine	5	6.2	72	200
carbadox	15	6.2	45	50
chlortetracycline	55	6.2	86	70
tylosin	30	6.2	86	20
bacitracin	60	6.2	86	50
arsanilic acid	3	6.2	86	90
bambermycin	6	6.2	86	2
oxytetracycline	30	6.2	86	40
oleandomycin	5	6.2	86	11.25
efrotomycin	5	6.2	86	14.5
lincomycin	4	6.2	86	20
Breeding (25 days average): 6,957,000 swine (1998)				
chlortetracycline	85	5	20	80
arsanilic acid	5	5	20	90
bambermycin	25	5	20	2
oxytetracycline	25	5	14	10

Table B-2. Continued

Antibiotic	Average Antimicrobial per Day (g per lb of feed)	Total Antimicrobial per Swine (g)	Total Antimicrobial All Treated Animals (g)
Finishing, 100–260 pounds			
chlortetracycline sulfathiazole penicillin	0.125	7.998	740,830,746
tylosin sulfamethazine	0.1	2.232	206,743,464
carbadox	0.025	1.04625	96,910,999
chlortetracycline	0.035	10.2641	950,732,791
tylosin	0.01	1.5996	148,166,149
bacitracin	0.025	7.998	740,830,746
arsanilic acid	0.045	0.71982	66,674,767
bambermycin	0.001	0.031992	2,963,323
oxytetracycline	0.02	3.1992	296,332,298
oleandomycin	0.005625	0.1499625	13,890,576
efrotomycin	0.00725	0.193285	17,903,410
lincomycin	0.01	0.21328	19,755,487
Total grams			**3,301,734,756**
Total pounds			**7,279,080**
Breeding			
chlortetracycline	0.04	3.4	23,653,800
arsanilic acid	0.045	0.225	1,565,325
bambermycin	0.001	0.025	173,925
oxytetracycline	0.005	0.0875	608,738
Total grams			**26,001,788**
Total pounds			**57,324**
Total Antibiotic Use in the Swine Industry (pounds)			**10,348,596**

Table B-3. Estimated Nontherapeutic Antimicrobial Use in Poultry Production

Antimicrobial Combination Number	Drugs in Antimicrobial Combination	Percent Broilers Treated	Feed per Stage per Broiler (lb)	Average Antimicrobial per Stage (g/ton of feed)
Pre-starter and Starter: 7,800,000,000 broilers (1998)				
#1	bambermycin, amprolium, ethopabate, roxarsone	25	2.25	123.36
#2	BMD, roxarsone, monensin	25	2.25	144.24
#3	chlortetracycline, roxarsone	5	2.25	436.32
#4	penicillin, amprolium, ethopabate	5	2.25	133.68
#5	lincomycin, roxarsone, amprolium, ethopabate	15	2.25	132.8
#6	virginiamycin, roxarsone, salinomycin	25	2.25	88.32
Grower and Finisher: 7,800,000,000 broilers (1998)				
#1	bambermycin, lasalocid, roxarsone	28	6	127.5
#2	erythromycin, arsanilic acid, zoalene	10	6	236.8
#3	chlortetracycline, roxarsone, monensin	5	6	524.32
#4	penicillin, roxarsone, zoalene	5	6	167.12
#5	lincomycin, lasalocid, roxarsone	20	6	128.32
#6	virginiamycin, monensin, roxarsone	28	6	118.16

Table B-3. Continued

Antimicrobial Combination Number	Average Antimicrobial per Day (g per lb of feed)	Total Combination Used per Broiler (g)	Total Combination All Treated Animals (g)
Pre-starter and Starter			
#1	0.06168	0.034695	270,621,000
#2	0.07212	0.0405675	316,426,500
#3	0.21816	0.024543	191,435,400
#4	0.06684	0.0075195	58,652,100
#5	0.0664	0.02241	174,798,000
#6	0.04416	0.02484	193,752,000
Total grams			**1,205,685,000**
Total pounds			**2,658,081**
Grower and Finisher			
#1	0.06376	0.1071168	835,511,040
#2	0.1184	0.07104	554,112,000
#3	0.26216	0.078648	613,454,400
#4	0.08356	0.025068	195,530,400
#5	0.06416	0.076992	600,537,600
#6	0.05908	0.0992544	774,184,320
Total grams			**3,573,329,760**
Total pounds			**7,877,845**
Total Antimicrobial Use in the Poultry Industry (pounds)			**10,535,926**

Appendix C
Agricultural Use of Antimicrobials—Impact on Treatment of Human Diseases

Table C-1. Agricultural Use of Antimicrobials According to Impact on Treatment of Human Diseases

Animal Use Antimicrobial Drugs	Class I: Used to Treat Human Diseases, Few or No Alternatives	Class II: Used to Treat Human Diseases, Alternatives Exist	Class III: Not Currently Used to Treat Human Diseases
Aminopenicillins			
Ampicillin		X	
Amoxicillin		X	
Penicillins			
Pen. G procain		X	
Pen. G benzathine		X	
Cloxacillin		X	
Tetracyclines			
Tetratracyline		X	
Chlortetracycline		X	
Oxytetracycline		X	
Fluoroquinolones			
Enrofloxacin	X		
Sarafloxacin	X		
Cephalosporins			
Ceftiofur	X		
Streptogramins			
Virginiamycin	X		
Aminoglycosides			
Streptomycin		X	
Spectinomycin		X	
Gentamicin		X	
Apramycin		X	
Dihydrostreptomycin		X	
Kanamycin		X	
Chloramphenicols			
Chloramphenicol		X	
Florfenicol		X	
Flavosfolipols			
Bambermycin			X
Sulfonamides			
Sulfamethazine		X	
Sulfaquinoxaline		X	
Sulfadiazene		X	
Sulfadimethoxine		X	
Sulfisoxazole		X	
Sulfathiazole		X	
Sulfanitran		X	
Trimethoprim		X	
Ormentoprim		X	
Ionophores/Arsenicals			
Monensin			X

Table C-1. Continued

Animal Use Antimicrobial Drugs	Class I: Used to Treat Human Diseases, Few or No Alternatives	Class II: Used to Treat Human Diseases, Alternatives Exist	Class III: Not Currently Used to Treat Human Diseases
Narasin			X
Lasalocid			X
Carbasone			X
Roxarsone			X
Arsanilic acid			X
Macrolids			
Erythromycin	X		
Tylosin		X	
Lincosamides			
Lincomycin		X	
Peptides			
Bacitracin		X	
Quinones			
Novobiocin			X
Polyenes			
Nystatin		X	
Other Antimicrobials			
Amprolium			X
Efrotomycin			X
Oleandomycin			X
Tiamulin			X
Tilmicosin			X
Ethopabate			X
Salinomycin			X
Zoalene			X
Nequinate			X
Decoquinate			X
Carbadox			X
Clopidol			X
Nicarbazin			X
Robenidine			X