Table 7A. Distribution of MICs and Occurrence of Resistance for Top Serotypes Tested from Cattle, 2008

Antimicrobial	Serotype (# of Isolates)	%I[1]	%R[2]	95% CI[3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Aminoglycosides																					
Amikacin	Montevideo (104)	0.0	**0.0**	0.0-4.4							18.3	76.9	3.8	1.0							
	Dublin (53)	0.0	**0.0**	0.0-8.4						5.7	32.1	56.6	5.7								
	Newport (31)	0.0	**0.0**	0.0-13.7						12.9	54.8	25.8	6.5								
	Anatum (27)	0.0	**0.0**	0.0-15.5						11.1	81.5	7.4									
	Cerro (27)	0.0	**0.0**	0.0-15.5						3.7	40.7	44.4	11.1								
	Typhimurium (25)	0.0	**0.0**	0.0-16.6							60.0	40.0									
	Kentucky (22)	0.0	**0.0**	0.0-18.5							9.1	90.9									
	Muenster (18)	0.0	**0.0**	0.0-21.9							61.1	33.3	5.6								
	Agona (17)	0.0	**0.0**	0.0-22.9							82.4	17.6									
	Mbandaka (17)	0.0	**0.0**	0.0-22.9							11.8	64.7	17.6	5.9							
	Meleagridis (17)	0.0	**0.0**	0.0-22.9						5.9	76.5	17.6									
Gentamicin	Montevideo (104)	0.0	**0.0**	0.0-4.4					5.8	85.6	8.7										
	Dublin (53)	1.9	**11.3**	4.7-23.7					15.1	47.2	24.5			1.9	**5.7**	**5.7**					
	Newport (31)	0.0	**0.0**	0.0-13.7					38.7	58.1	3.2										
	Anatum (27)	0.0	**0.0**	0.0-15.5					59.3	40.7											
	Cerro (27)	0.0	**0.0**	0.0-15.5					22.2	63.0	14.8										
	Typhimurium (25)	0.0	**0.0**	0.0-16.6					40.0	60.0											
	Kentucky (22)	0.0	**0.0**	0.0-18.5					9.1	77.3	13.6										
	Muenster (18)	0.0	**0.0**	0.0-21.9					27.8	61.1	11.1										
	Agona (17)	0.0	**0.0**	0.0-22.9					5.9	88.2	5.9										
	Mbandaka (17)	0.0	**0.0**	0.0-22.9					5.9	52.9	41.2										
	Meleagridis (17)	0.0	**0.0**	0.0-22.9					64.7	35.3											
Kanamycin	Montevideo (104)	0.0	**0.0**	0.0-4.4										100.0							
	Dublin (53)	0.0	**58.5**	44.2-71.6										41.5			**1.9**	**56.6**			
	Newport (31)	0.0	**0.0**	0.0-13.7										100.0							
	Anatum (27)	0.0	**0.0**	0.0-15.5										100.0							
	Cerro (27)	0.0	**0.0**	0.0-15.5										100.0							
	Typhimurium (25)	0.0	**8.0**	1.4-27.5										92.0				**8.0**			
	Kentucky (22)	0.0	**0.0**	0.0-18.5										100.0							
	Muenster (18)	0.0	**0.0**	0.0-21.9										100.0							
	Agona (17)	0.0	**35.3**	15.3-61.4										64.7				**35.3**			
	Mbandaka (17)	0.0	**0.0**	0.0-22.9										100.0							
	Meleagridis (17)	0.0	**0.0**	0.0-22.9										100.0							
Streptomycin	Montevideo (104)	N/A	**1.0**	0.1-6.1												99.0	**1.0**				
	Dublin (53)	N/A	**79.2**	65.5-88.7												20.8		**79.2**			
	Newport (31)	N/A	**74.2**	55.1-87.5												25.8	**6.5**	**67.7**			
	Anatum (27)	N/A	**0.0**	0.0-15.5												100.0					
	Cerro (27)	N/A	**3.7**	0.2-20.9												96.3		**3.7**			
	Typhimurium (25)	N/A	**44.0**	25.0-64.7												56.0	**16.0**	**28.0**			
	Kentucky (22)	N/A	**4.5**	0.2-24.8												95.5	**4.5**				
	Muenster (18)	N/A	**5.6**	0.3-29.4												94.4		**5.6**			
	Agona (17)	N/A	**58.8**	33.4-80.6												41.2	**11.8**	**47.1**			
	Mbandaka (17)	N/A	**0.0**	0.0-22.9												100.0					
	Meleagridis (17)	N/A	**0.0**	0.0-22.9												100.0					

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity correction method

[4] The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

Table 7A (continued). Distribution of MICs and Occurrence of Resistance for Top Serotypes Tested from Cattle, 2008

Antimicrobial	Serotype (# of Isolates)	%I[1]	%R[2]	95% CI[3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
β-Lactam/β-Lactamase Inhibitor Combinations																					
Amoxicillin-Clavulanic Acid	Montevideo (104)	0.0	**0.0**	0.0-4.4							99.0			1.0							
	Dublin (53)	1.9	**56.6**	42.4-69.9							24.5	1.9	1.9	13.2	1.9	**7.5**	**49.1**				
	Newport (31)	6.5	**64.5**	45.4-80.2							22.6	3.2		3.2	6.5	**25.8**	**38.7**				
	Anatum (27)	0.0	**0.0**	0.0-15.5							100.0										
	Cerro (27)	0.0	**3.7**	0.2-20.9							96.3					**3.7**					
	Typhimurium (25)	8.0	**20.0**	7.6-41.3							52.0	4.0		16.0	8.0	**4.0**	**16.0**				
	Kentucky (22)	0.0	**0.0**	0.0-18.5							100.0										
	Muenster (18)	0.0	**0.0**	0.0-21.9							100.0										
	Agona (17)	0.0	**47.1**	23.9-71.5							52.9					**17.6**	**29.4**				
	Mbandaka (17)	0.0	**0.0**	0.0-22.9							100.0										
	Meleagridis (17)	0.0	**0.0**	0.0-22.9							100.0										
Cephems																					
Cefoxitin	Montevideo (104)	0.0	**0.0**	0.0-4.4							23.1	71.2	5.8								
	Dublin (53)	13.2	**47.2**	33.5-61.3							7.5	5.7	22.6	3.8	13.2	**5.7**	**41.5**				
	Newport (31)	0.0	**64.5**	45.4-80.2							6.5	22.6	6.5			**29.0**	**35.5**				
	Anatum (27)	0.0	**0.0**	0.0-15.5								3.7	92.6	3.7							
	Cerro (27)	0.0	**3.7**	0.2-20.9							14.8	66.7	14.8				**3.7**				
	Typhimurium (25)	4.0	**16.0**	5.3-36.9							8.0	60.0	12.0		4.0	**4.0**	**12.0**				
	Kentucky (22)	0.0	**0.0**	0.0-18.5								54.5	45.5								
	Muenster (18)	0.0	**0.0**	0.0-21.9								5.6	94.4								
	Agona (17)	0.0	**47.1**	23.9-71.5								5.9	47.1			**5.9**	**41.2**				
	Mbandaka (17)	0.0	**0.0**	0.0-22.9								29.4	70.6								
	Meleagridis (17)	0.0	**0.0**	0.0-22.9									94.1	5.9							
Ceftiofur	Montevideo (104)	0.0	**0.0**	0.0-4.4						63.5	35.6	1.0									
	Dublin (53)	1.9	**56.6**	42.4-69.9					7.5	17.0	11.3	5.7	1.9	**17.0**	**39.6**						
	Newport (31)	0.0	**64.5**	45.4-80.2						25.8	9.7				**64.5**						
	Anatum (27)	0.0	**0.0**	0.0-15.5						33.3	66.7										
	Cerro (27)	0.0	**3.7**	0.2-20.9						70.4	25.9				**3.7**						
	Typhimurium (25)	0.0	**20.0**	7.6-41.3						32.0	48.0				**20.0**						
	Kentucky (22)	0.0	**0.0**	0.0-18.5						36.4	63.6										
	Muenster (18)	0.0	**0.0**	0.0-21.9						16.7	83.3										
	Agona (17)	0.0	**47.1**	23.9-71.5							52.9				**47.1**						
	Mbandaka (17)	0.0	**0.0**	0.0-22.9						5.9	94.1										
	Meleagridis (17)	0.0	**0.0**	0.0-22.9							100.0										
Ceftriaxone[5]	Montevideo (104)	0.0	**0.0**	0.0-4.4					100.0												
	Dublin (53)	3.8	**54.7**	40.5-68.2					41.5			3.8	**1.9**	**9.4**	**30.2**	**11.3**	**1.9**				
	Newport (31)	0.0	**64.6**	45.4-80.2					35.5					**9.7**	**22.6**	**19.4**	**12.9**				
	Anatum (27)	0.0	**0.0**	0.0-15.5					100.0												
	Cerro (27)	0.0	**3.7**	0.2-20.9					96.3						**3.7**						
	Typhimurium (25)	0.0	**20.0**	7.6-41.3					80.0					**4.0**	**12.0**	**4.0**					
	Kentucky (22)	0.0	**0.0**	0.0-18.5					100.0												
	Muenster (18)	0.0	**0.0**	0.0-21.9					100.0												
	Agona (17)	0.0	**47.1**	23.9-71.5					52.9						**29.4**	**17.6**					
	Mbandaka (17)	0.0	**0.0**	0.0-22.9					100.0												
	Meleagridis (17)	0.0	**0.0**	0.0-22.9					100.0												

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity correction method

[4] The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

[5] In this report, the revised ceftriaxone breakpoints from the CLSI M100-S20 document, published in January 2010, were used (≥4µg/ml). In previous NARMS reports the ceftriaxone breakpoints from the CLSI M100-S19 were used (≥64µg/ml).

Table 7A (continued). Distribution of MICs and Occurrence of Resistance for Top Serotypes Tested from Cattle, 2008

Antimicrobial	Serotype (# of Isolates)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Folate Pathway Inhibitors																					
Sulfonamides	Montevideo (104)	N/A	**1.9**	0.3-7.4											40.4	53.8	2.9	1.0		**1.9**	
	Dublin (53)	N/A	**84.9**	71.8-92.8											15.1					**84.9**	
	Newport (31)	N/A	**74.2**	55.1-87.5												22.6	3.2			**74.2**	
	Anatum (27)	N/A	**0.0**	0.0-15.5											44.4	51.9	3.7				
	Cerro (27)	N/A	**3.7**	0.2-20.9											14.8	55.6	25.9			**3.7**	
	Typhimurium (25)	N/A	**48.0**	28.3-68.2											12.0	40.0				**48.0**	
	Kentucky (22)	N/A	**0.0**	0.0-18.5											4.5	81.8	13.6				
	Muenster (18)	N/A	**5.6**	0.3-29.4											5.6	66.7	22.2			**5.6**	
	Agona (17)	N/A	**82.4**	55.9-95.4											5.9	11.8				**82.4**	
	Mbandaka (17)	N/A	**0.0**	0.0-22.9											5.9	70.6	23.5				
	Meleagridis (17)	N/A	**0.0**	0.0-22.9											17.6	76.5	5.9				
Trimethoprim-Sulfamethoxazole	Montevideo (104)	N/A	**1.0**	0.1-6.1				89.4	9.6					**1.0**							
	Dublin (53)	N/A	**13.2**	5.9-25.9				17.0	58.5	11.3			**5.7**	**7.5**							
	Newport (31)	N/A	**12.9**	4.2-30.8				67.7	19.4					**12.9**							
	Anatum (27)	N/A	**0.0**	0.0-15.5				85.2	14.8												
	Cerro (27)	N/A	**0.0**	0.0-15.5				96.3	3.7												
	Typhimurium (25)	N/A	**0.0**	0.0-16.6				52.0	44.0	4.0											
	Kentucky (22)	N/A	**0.0**	0.0-18.5				86.4	13.6												
	Muenster (18)	N/A	**0.0**	0.0-21.9				83.3	16.7												
	Agona (17)	N/A	**29.4**	11.4-55.9				41.2	23.5	5.9				**29.4**							
	Mbandaka (17)	N/A	**0.0**	0.0-22.9				100.0													
	Meleagridis (17)	N/A	**0.0**	0.0-22.9				88.2	11.8												
Penicillins																					
Ampicillin		0.0	**1.0**	0.1-6.1							98.1	1.0					**1.0**				
	Dublin (53)	0.0	**73.6**	59.4-84.3							22.6	3.8					**73.6**				
	Newport (31)	0.0	**74.2**	55.1-87.5							25.8						**74.2**				
	Anatum (27)	0.0	**0.0**	0.0-15.5							96.3	3.7									
	Cerro (27)	0.0	**3.7**	0.2-20.9							92.6	3.7					**3.7**				
	Typhimurium (25)	0.0	**44.0**	25.0-64.7							44.0	8.0	4.0				**44.0**				
	Kentucky (22)	0.0	**0.0**	0.0-18.5							100.0										
	Muenster (18)	0.0	**0.0**	0.0-21.9							100.0										
	Agona (17)	0.0	**47.1**	23.9-71.5							52.9						**47.1**				
	Mbandaka (17)	0.0	**0.0**	0.0-22.9							94.1		5.9								
	Meleagridis (17)	0.0	**0.0**	0.0-22.9							100.0										

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity correction method

[4] The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.

Table 7A (continued). Distribution of MICs and Occurrence of Resistance for Top Serotypes Tested from Cattle, 2008

Antimicrobial	Serotype (# of Isolates)	%I[1]	%R[2]	[95% CI][3]	Distribution (%) of MICs (µg/ml)[4] 0.015	0.03	0.06	0.125	0.25	0.50	1	2	4	8	16	32	64	128	256	512	1024
Phenicols																					
Chloramphenicol	Montevideo (104)	1.0	**1.0**	0.1-6.1									51.9	46.2	1.0		**1.0**				
	Dublin (53)	5.7	**75.5**	61.5-85.8								1.9	13.2	3.8	5.7		**75.5**				
	Newport (31)	0.0	**64.5**	45.4-80.2									29.0	6.5			**64.5**				
	Anatum (27)	0.0	**0.0**	0.0-15.5									40.7	59.3							
	Cerro (27)	0.0	**3.7**	0.2-20.9									88.9	7.4			**3.7**				
	Typhimurium (25)	4.0	**36.0**	18.7-57.4									24.0	36.0	4.0		**36.0**				
	Kentucky (22)	0.0	**0.0**	0.0-18.5								4.5	54.5	40.9							
	Muenster (18)	0.0	**0.0**	0.0-21.9									22.2	77.8							
	Agona (17)	0.0	**47.1**	23.9-71.5									5.9	47.1			**47.1**				
	Mbandaka (17)	0.0	**0.0**	0.0-22.9									17.6	82.4							
	Meleagridis (17)	0.0	**0.0**	0.0-22.9									64.7	35.3							
Quinolones																					
Ciprofloxacin	Montevideo (104)	0.0	**0.0**	0.0-4.4	97.1	2.9															
	Dublin (53)	0.0	**0.0**	0.0-8.4	62.3	32.1	3.8		1.9												
	Newport (31)	0.0	**0.0**	0.0-13.7	100.0																
	Anatum (27)	0.0	**0.0**	0.0-15.5	92.6	7.4															
	Cerro (27)	0.0	**0.0**	0.0-15.5	100.0																
	Typhimurium (25)	0.0	**0.0**	0.0-16.6	88.0	12.0															
	Kentucky (22)	0.0	**0.0**	0.0-18.5	100.0																
	Muenster (18)	0.0	**0.0**	0.0-21.9	100.0																
	Agona (17)	0.0	**0.0**	0.0-22.9	88.2	5.9			5.9												
	Mbandaka (17)	0.0	**0.0**	0.0-22.9	100.0																
	Meleagridis (17)	0.0	**0.0**	0.0-22.9	88.2	11.8															
Nalidixic Acid	Montevideo (104)	N/A	**0.0**	0.0-4.4								80.8	19.2								
	Dublin (53)	N/A	**1.9**	0.1-11.4								52.8	45.3				**1.9**				
	Newport (31)	N/A	**0.0**	0.0-13.7								74.2	25.8								
	Anatum (27)	N/A	**0.0**	0.0-15.5								22.2	77.8								
	Cerro (27)	N/A	**0.0**	0.0-15.5								88.9	11.1								
	Typhimurium (25)	N/A	**0.0**	0.0-16.6								44.0	56.0								
	Kentucky (22)	N/A	**0.0**	0.0-18.5								59.1	36.4	4.5							
	Muenster (18)	N/A	**0.0**	0.0-21.9								5.6	94.4								
	Agona (17)	N/A	**5.9**	0.3-30.8								58.8	35.3				**5.9**				
	Mbandaka (17)	N/A	**0.0**	0.0-22.9								76.5	23.5								
	Meleagridis (17)	N/A	**0.0**	0.0-22.9								41.2	58.8								
Tetracyclines																					
Tetracycline	Montevideo (104)	0.0	**7.7**	3.6-15.1									92.3			**1.0**	**6.7**				
	Dublin (53)	0.0	**81.1**	67.6-90.1									18.9				**81.1**				
	Newport (31)	0.0	**74.2**	55.1-87.5									25.8				**74.2**				
	Anatum (27)	0.0	**14.8**	4.8-34.6									85.2			**11.1**	**3.7**				
	Cerro (27)	0.0	**7.4**	1.3-25.7									92.6			**3.7**	**3.7**				
	Typhimurium (25)	0.0	**44.0**	25.0-64.7									56.0			**12.0**	**32.0**				
	Kentucky (22)	0.0	**13.6**	3.6-35.9									86.4				**13.6**				
	Muenster (18)	0.0	**5.6**	0.3-29.4									94.4				**5.6**				
	Agona (17)	0.0	**88.2**	62.2-97.9									11.8			**5.9**	**82.4**				
	Mbandaka (17)	0.0	**0.0**	0.0-22.9									100.0								
	Meleagridis (17)	0.0	**0.0**	0.0-22.9									100.0								

[1] Percent of isolates with intermediate susceptibility

[2] Percent of isolates that were resistant

[3] 95% confidence intervals for percent resistant (%R) were calculated using the Wilson interval with continuity correction method

[4] The unshaded areas indicate the range of dilutions tested for each antimicrobial. Single vertical bars indicate the breakpoints for susceptibility, while double vertical bars indicate the breakpoints for resistance. Numbers in the shaded area indicate the percentages of isolates with MICs greater than the highest tested concentrations. Numbers listed for the lowest tested concentrations represent the percentages of isolates with MICs equal to or less than the lowest tested concentration. CLSI breakpoints were used when available. There are no CLSI breakpoints for streptomycin.