Supplemental Table 1. Interpretive criteria (minimum inhibitory concentrations [ug/ml]) for *Mannheimia haemolytica* susceptibility testing using broth microdilution

Antimicrobial	Susceptible	Intermediate	Resistant	Reference
Amikacin	≤16	32	≥64	*CLSI M100-S22, 2012
Ampicillin	≤0.5	-	-	CLSI M45-A2, 2010
Amoxicillin-Clavulanic acid	≤0.5/0.25	-	-	CLSI M45-A2, 2010
Cefoxitin	≤8	16	≥32	*CLSI M100-S22, 2012
Ceftiofur	≤2	4	≥8	CSLI M31-A4, 2013
Ceftriaxone	≤1	2	≥4	*CLSI M100-S22, 2012
Chloramphenicol	≤8	16	≥32	*CLSI M100-S22, 2012
Ciprofloxacin	≤1	2	≥4	*CLSI M100-S21, 2011
Gentamicin	≤4	8	≥16	*CLSI M100-S22, 2012
Kanamycin	≤16	32	≥64	*CLSI M100-S22, 2012
Nalidixic Acid	≤16	-	≥32	*CLSI M100-S22, 2012
Streptomycin	≤32	-	≥64	NARMS Executive Report 2009
Sulfisoxazole	≤256	-	≥512	*CLSI M100-S22, 2012
Tetracycline	≤2	4	≥8	CLSI M31-A4, 2013
Trimethoprim-Sulfamethoxazole	≤0.5/9.5	-	-	CLSI M45-A2, 2010

* Interpretive criteria for *E. coli* used in lieu of *M. haemolytica* since CLSI does not define breakpoints for *M. haemolytica* and these antimicrobial drugs. CLSI = Clinical and Laboratory Standards Institute.

Supplemental Table 2. Interpretive criteria (inhibition zone diameters [mm]) for *Mannheimia haemolytica* susceptibility testing using disk diffusion

Antimicrobial	[Disk] (µg)	Susceptible	Intermediate	Resistant	Reference
Ampicillin	10	≥27	-	-	CLSI M45-A2, 2010
Amoxicillin-Clavulanic acid	20/10	≥27	-	-	CLSI M45-A2, 2010
Ceftiofur	30	≥21	18-20	≤17	CLSI M31-A3, 2008
Danofloxacin	5	≥22	-	-	CLSI M31-A3, 2008
Enrofloxacin	5	≥21	17-20	≤16	CLSI M31-A4, 2013
Florfenicol	30	≥19	15-18	≤14	CLSI M31-A4, 2013
Gentamicin	10	≥15	-	≤12	Catry et al., 2007
Spectinomycin	100	≥14	11-13	≤10	CLSI M31-A3, 2008
Sulfisoxazole	300	≥17	13-16	≤12	CLSI M31-A3, 2008
Tetracycline	30	≥23	-	-	CLSI M45-A2, 2010
Tilmicosin	15	≥14	11-13	≤10	CLSI M31-A4, 2013
Trimethoprim-Sulfamethoxazole	1.25/23.75	≥24	-	-	CLSI M45-A2, 2010
Tulathromycin	30	≥18	15-17	≤14	CLSI M31-A4, 2013

CLSI = Clinical and Laboratory Standards Institute.

Supplemental Table 3. Minimum inhibitory concentrations for *Mannheimia haemolytica* isolates recovered from deep nasopharyngeal swabs obtained from feedlot cattle (n=2,833 isolates)

MIC[a] (µg/ml)	Amikacin	[b]Amoxicillin-Clavulanate	Ampicillin	Cefoxitin	Ceftiofur	Ceftriaxone	Chloramphenicol	Ciprofloxacin	Gentamicin	Kanamycin	Naldixic Acid	Streptomycin	Sulfonamide	Tetracycline	[c]Trimethoprim-Sulfamethoxazole
0.016								2804 (99.0%)							
0.031								23 (0.8%)							
0.063								3 (0.1%)							
0.125					2781 (98.2%)			0 (0%)							2820 (99.5%)
0.25					21 (0.7%)	2805 (99.0%)		2 (0.1%)	30 (1.1%)						1 (0.04%)
0.5	30 (1.1%)			2493 (88%)	11 (0.4%)	16 (0.6%)		1 (0.04%)	6 (0.2%)		105 (3.7%)				4 (0.1%)
1	2 (0.1%)	2824 (99.7%)	2800 (98.8%)	318 (11.2%)	8 (0.3%)	9 (0.3%)		0 (0%)	216 (7.6%)		1600 (56.5%)				3 (0.1%)
2	5 (0.2%)	6 (0.2%)	6 (0.2%)	7 (0.2%)	6 (0.2%)	2 (0.1%)	2823 (99.6%)		2449 (86.4%)		1113 (39.3%)				0 (0%)
4	32 (1.1%)	0 (0%)	1 (0.04%)	9 (0.3%)	4 (0.1%)	0 (0%)	9 (0.3%)		132 (4.7%)		10 (0.4%)			2755 (97.2%)	5 (0.2%)
8	1753 (61.9%)	0 (0%)	3 (0.1%)	1 (0.04%)	1 (0.04%)	0 (0%)	1 (0.04%)		0 (0%)	2535 (89.5%)	0 (0%)			16 (0.6%)	0 (0%)
16	995 (35.1%)	0 (0%)	5 (0.2%)	0 (0%)	1 (0.04%)	0 (0%)	0 (0%)			189 (6.7%)	1 (0%)		1771 (62.5%)	13 (0.5%)	
32	13 (0.5%)	0 (0%)	13 (0.5%)	3 (0.1%)		0 (0%)				1 (0.04%)	1 (0%)	2714 (95.8%)	451 (15.9%)	47 (1.7%)	
64	3 (0.1%)	3 (0.1%)	5 (0.2%)	2 (0.1%)		1 (0.04%)				108 (3.8%)	3 (0.1%)	12 (0.4%)	423 (14.9%)	2 (0.1%)	
128	0 (0%)					0 (0%)						107 (3.8%)	88 (3.1%)		
256													88 (3.1%)		
512													12 (0.4%)		

[a] Minimum inhibitory concentration obtained from broth microdilution assays; smaller values represent greater susceptibility. Lowest MIC values represent the lowest concentration tested and actual MIC values could be at or below (≤) this value. Highest MIC values represent MIC results that were > than the 2nd highest value, and actual MIC values could be any value greater than the 2nd highest value. [b] Values for amoxicillin–clavulanate refer to amoxicillin concentrations (clavulanate was included in wells at half of the amoxicillin concentration). [c] Values for trimethoprim–sulfamethoxazole represent trimethoprim concentrations (sulfamethoxazole was included in wells at 19 times the concentration of trimethoprim).

Supplemental Table 4. Results of disk diffusion susceptibility testing of *Mannheimia haemolytica* isolates recovered from deep nasopharyngeal swabs obtained from feedlot cattle (n=1,789 isolates)

Diameter of Inhibition Zone (mm)[a]	Ampicillin	Amoxicillin-Clavulanate	Ceftiofur	Danofloxacin	Enrofloxacin	Florfenicol	Gentamicin	Oxytetracycline	Spectinomycin	Tilmicosin	Trimethoprim-Sulfamethoxazole	Tulathramycin
50 to 55	0 (0%)	0 (0%)	5 (0.3%)	0 (0%)	1 (0.1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
45 to 50	3 (0.2%)	0 (0%)	44 (2.5%)	4 (0.2%)	6 (0.3%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
40 to 45	67 (3.7%)	40 (2.2%)	366 (20.5%)	48 (2.7%)	52 (2.9%)	3 (0.2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	26 (1.5%)	0 (0%)
35 to 40	524 (29.3%)	552 (30.9%)	777 (43.4%)	275 (15.4%)	351 (19.6%)	80 (4.5%)	0 (0%)	8 (0.4%)	0 (0%)	0 (0%)	520 (29.1%)	1 (0.1%)
30 to 35	897 (50.1%)	903 (50.5%)	568 (31.7%)	775 (43.3%)	907 (50.7%)	557 (31.1%)	0 (0%)	311 (17.4%)	35 (2%)	2 (0.1%)	1016 (56.8%)	66 (3.7%)
25 to 30	285 (15.9%)	292 (16.3%)	28 (1.6%)	292 (16.3%)	469 (26.2%)	1022 (57.1%)	150 (8.4%)	1301 (72.7%)	663 (37.1%)	32 (1.8%)	218 (12.2%)	881 (49.2%)
20 to 25	1 (0.1%)	2 (0.1%)	1 (0.1%)	88 (4.9%)	2 (0.1%)	125 (7%)	1407 (78.6%)	29 (1.6%)	944 (52.8%)	1100 (61.5%)	6 (0.3%)	830 (46.4%)
15 to 20	2 (0.1%)	0 (0%)	0 (0%)	104 (5.8%)	0 (0%)	0 (0%)	232 (13%)	22 (1.2%)	32 (1.8%)	641 (35.8%)	1 (0.1%)	9 (0.5%)
10 to 15	5 (0.3%)	0 (0%)	0 (0%)	135 (7.5%)	0 (0%)	0 (0%)	0 (0%)	64 (3.6%)	29 (1.6%)	10 (0.6%)	1 (0.1%)	2 (0.1%)
6 to 10[b]	5 (0.3%)	0 (0%)	0 (0%)	68 (3.8%)	1 (0.1%)	2 (0.1%)	0 (0%)	54 (3%)	86 (4.8%)	4 (0.2%)	1 (0.1%)	0 (0%)

[a] Diameters of zones of inhibition for susceptibility measured with disk diffusion assays; larger values represent greater susceptibility. [b] Disks impregnated with antimicrobial drugs were 6 mm in diameter, which is therefore the minimum possible size of inhibition zones.