



1 **Table S1.** Antimicrobial-resistant pathogenic *Escherichia coli* isolates (%) from weaned piglets with
 2 diarrhea in northern, middle, and southern Korean farms before and after the ban on AGPs in feed.

Anti- microbial agents ¹	Northern farms (Gangwon, Gyeonggi, and Incheon)			Middle farms (Chungbuk, and Chungnam)			Southern farms (Chonbuk, Chonnam, Gyeonggi, and Gyeongnam)		
	Before	After	Total	Before	After	Total	Before	After	Total
	(2007- 2011) (n=61)	(2012- 2017) (n=74)	(2007- 2017) (n=135)	(2007- 2011) (n=74)	(2012 -2017) (n=216)	(2007- 2017) (n=290)	(2007- 2011) (n=83)	(2012- 2017) (n=182)	(2007- 2017) (n=265)
GM	45 (73.8)	38 (51.4)	83 (61.5)	50 (67.6)	78 (36.1)	128 (44.1)	55 (66.3)	68 (37.4)	123 (46.4)
S	48 (78.7)	62 (83.8)	110 (81.5)	64 (86.5)	185 (85.6)	249 (85.9)	72 (86.7)	158 (86.8)	230 (86.8)
N	52 (85.2)	43 (58.1)	95 (70.4)	64 (86.5)	125 (57.9)	189 (65.2)	69 (83.1)	105 (57.7)	174 (65.7)
CF	26 (42.6)	52 (70.3)	78 (57.8)	40 (54.1)	153 (70.8)	193 (66.6)	46 (55.4)	123 (67.6)	169 (63.8)
CZ	12 (19.7)	17 (23.0)	29 (21.5)	14 (18.9)	50 (23.1)	64 (22.1)	15 (18.1)	40 (22.0)	55 (20.8)
FEP	0 (0.0)	2 (2.7)	2 (1.5)	0 (0.0)	5 (2.3)	5 (1.7)	0 (0.0)	3 (1.6)	3 (1.1)
FOX	10 (16.4)	11 (14.9)	21 (15.6)	10 (13.5)	33 (15.3)	43 (14.8)	13 (15.7)	17 (9.3)	30 (11.3)
NA	46 (75.4)	55 (74.3)	101 (74.8)	57 (77.0)	146 (67.6)	203 (70.0)	60 (72.3)	122 (67.0)	182 (68.7)
CIP	33 (54.1)	36 (48.6)	69 (51.1)	39 (52.7)	86 (39.8)	125 (43.1)	36 (43.4)	65 (35.7)	101 (38.1)
NOR	29 (47.5)	34 (45.9)	63 (46.7)	38 (51.4)	81 (37.5)	119 (41.0)	35 (42.2)	61 (33.5)	96 (36.2)
AM	50 (82.0)	64 (86.5)	114 (84.4)	63 (85.1)	180 (83.3)	243 (83.8)	76 (91.6)	153 (84.1)	229 (86.4)
AMC	20 (32.8)	31 (41.9)	51 (37.8)	32 (43.2)	80 (37.0)	112 (38.6)	37 (44.6)	56 (30.8)	93 (35.1)
SXT	37 (60.7)	52 (70.3)	89 (65.9)	46 (62.2)	126 (58.3)	172 (59.3)	50 (60.2)	109 (59.9)	159 (60.0)
C	49 (80.3)	70 (94.6)	119 (88.1)	72 (97.3)	185 (85.6)	257 (88.6)	73 (88.0)	154 (84.6)	227 (85.7)
CL	2 (3.3)	7 (9.5)	9 (6.7)	7 (9.5)	27 (12.5)	34 (11.7)	7 (8.4)	18 (9.9)	25 (9.4)
TE	52 (85.2)	63 (85.1)	115 (85.2)	70 (94.6)	174 (80.6)	244 (84.1)	79 (95.2)	160 (87.9)	239 (90.2)

3 ¹ GM: gentamicin, S: streptomycin, N: neomycin, CF: cephalothin, CZ: cefazolin, FEP: cefepime,
 4 FOX: ceftiofur, NA: nalidixic acid, CIP: ciprofloxacin, NOR: norfloxacin, AM: ampicillin, AMC:
 5 amoxicillin/clavulanic acid, SXT: trimethoprim/sulfamethoxazole, C: chloramphenicol, CL: colistin,
 6 TE: tetracycline
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8 **Table S2.** Multidrug-resistant pathogenic *Escherichia coli* isolates (%) from weaned piglets with
 9 diarrhea in northern, middle, and southern Korean farms before and after the ban on AGPs in feed.

Anti- microbial subclass ¹	Northern farms (Gangwon, Gyeonggi, and Incheon)			Middle farms (Chungbuk, and Chungnam)			Southern farms (Chonbuk, Chonnam, Gyeonggi, and Gyeongnam)		
	Before	After	Total	Before	After	Total	Before	After	Total
	(2007- 2011) (n=61)	(2012- 2017) (n=74)	(2007- 2017) (n=135)	(2007- 2011) (n=74)	(2012 -2017) (n=216)	(2007- 2017) (n=290)	(2007- 2011) (n=83)	(2012- 2017) (n=182)	(2007- 2017) (n=265)
0 subclass	4 (6.6)	0 (0.0)	4 (3.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
1 subclass	2 (3.3)	0 (0.0)	2 (1.5)	0 (1.4)	3 (1.4)	3 (1.0)	0 (0.0)	3 (1.6)	3 (1.1)
2 subclasses	1 (1.6)	0 (0.0)	1 (0.7)	1 (1.4)	3 (1.4)	4 (1.4)	3 (3.6)	7 (3.8)	10 (3.8)
3 subclasses	1 (1.6)	3 (4.1)	4 (3.0)	1 (1.4)	11 (5.1)	12 (4.1)	1 (1.2)	5 (2.7)	6 (2.3)
4 subclasses	4 (6.6)	3 (4.1)	7 (5.2)	4 (5.4)	23 (10.6)	27 (9.3)	6 (7.2)	18 (9.9)	24 (9.1)
5 subclasses	8 (13.1)	9 (12.2)	17 (12.6)	11 (14.9)	33 (15.3)	44 (15.2)	12 (14.5)	30 (16.5)	42 (15.8)
6 subclasses	8 (13.1)	12 (16.2)	20 (14.8)	16 (21.6)	32 (14.8)	48 (16.6)	16 (19.3)	26 (14.3)	42 (15.8)
7 subclasses	15 (24.6)	21 (28.4)	36 (26.7)	17 (23.0)	45 (20.8)	62 (21.4)	18 (21.7)	33 (18.1)	51 (19.2)
8 subclasses	5 (8.2)	13 (17.6)	18 (13.3)	8 (10.8)	26 (12.0)	34 (11.7)	10 (12.0)	37 (20.3)	47 (17.7)
9 subclasses	4 (6.6)	7 (9.5)	11 (8.1)	7 (9.5)	17 (7.9)	24 (8.3)	8 (9.6)	13 (7.1)	21 (7.9)
10 subclasses	9 (14.8)	4 (5.4)	13 (9.6)	8 (10.8)	22 (10.2)	30 (10.3)	9 (10.8)	9 (4.9)	18 (6.8)
11 subclasses	0 (0.0)	2 (2.7)	2 (1.5)	1 (1.4)	1 (0.5)	2 (0.7)	0 (0.0)	1 (0.5)	1 (0.4)
Multi- resistant (≥ 3subclasses)	54 (88.5)	74 (100.0)	128 (94.8)	78 (98.6)	210 (97.2)	283 (97.6)	80 (96.4)	172 (94.5)	252 (95.1)

10 ¹ Antimicrobial subclass are defined by the Clinical and Laboratory Standards Institute.

13 **Table S3.** Antimicrobial resistance genes (%) of pathogenic *Escherichia coli* from weaned piglets with diarrhea in
 14 northern, middle, and southern Korean farms before and after the ban on AGPs in feed.

Anti- microbial agents	Northern farms (Gangwon, Gyeonggi, and Incheon)			Middle farms (Chungbuk, and Chungnam)			Southern farms (Chonbuk, Chonnam, Gyeonggi, and Gyeongnam)		
	Before	After	Total	Before	After	Total	Before	After	Total
	(2007- 2011) (n=61)	(2012- 2017) (n=74)	(2007- 2017) (n=135)	(2007- 2011) (n=74)	(2012 -2017) (n=216)	(2007- 2017) (n=290)	(2007- 2011) (n=83)	(2012- 2017) (n=182)	(2007- 2017) (n=265)
<i>blaTEM</i>	36 (59.0)	38 (51.4)	74 (54.8)	55 (74.3)	102 (47.2)	157 (54.1)	60 (72.3)	92 (50.5)	152 (57.4)
<i>blaSHV</i>	2 (3.3)	5 (6.8)	7 (5.2)	1 (1.4)	16 (7.4)	17 (5.9)	2 (2.4)	8 (4.4)	10 (3.8)
<i>blaOXA</i>	7 (11.5)	5 (6.8)	12 (8.9)	8 (10.8)	14 (6.5)	22 (7.6)	9 (10.8)	27 (14.8)	36 (13.6)
<i>blaCTX-M</i> group 1	0 (0.0)	1 (1.4)	1 (0.7)	4 (5.4)	6 (2.8)	10 (3.4)	0 (0.0)	2 (1.1)	2 (0.8)
<i>blaCTX-M</i> group 2	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (1.4)	3 (1.0)	0 (0.0)	5 (2.7)	5 (1.9)
<i>blaCTX-M</i> group 9	0 (0.0)	1 (1.4)	1 (0.7)	4 (5.4)	9 (4.2)	13 (4.5)	0 (0.0)	4 (2.2)	4 (1.5)
<i>mcr-1</i>	0 (0.0)	1 (1.4)	1 (0.7)	0 (0.0)	3 (1.4)	3 (1.0)	1 (1.2)	3 (1.6)	4 (1.5)
<i>mcr-2</i>	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
<i>mcr-3</i>	0 (0.0)	1 (1.4)	1 (0.7)	2 (2.7)	3 (1.4)	5 (1.7)	1 (1.2)	1 (0.5)	2 (0.8)
<i>AmpC</i>	31 (50.8)	52 (70.3)	83 (61.5)	28 (37.8)	145 (67.1)	173 (59.7)	38 (45.8)	120 (65.9)	158 (59.6)
<i>tetA</i>	44 (72.1)	56 (75.7)	100 (74.1)	59 (79.7)	144 (66.7)	203 (70.0)	69 (83.1)	119 (65.4)	188 (70.9)

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17 Table S4. Primers for detection of antimicrobial resistance genes.

Resistance gene	Sequence (5' to 3') ¹	T _m ²	Product length	Reference
<i>mcr-1</i> FWD	CGGTCAGTCCGTTTGTTTC	55	309	[5]
<i>mcr-1</i> REV	CTTGGTCGGTCTGTAGGG			
<i>mcr-2</i> FWD	TGTTGCTTG TGCCGATTGGA	65	567	
<i>mcr-2</i> REV	AGATGGTATTGTTGGTTGCTG			
<i>mcr-3</i> FWD	TTGGCACTGTATTTTGCATT	55	542	
<i>mcr-3</i> REV	TTAACGAAATTGGCTGGAACA			
<i>tetA</i> FWD	GCGCGATCTGGTTCACCTCG	61	164	
<i>tetA</i> REV	AGTCGACAGYRGC GCCGC			
<i>AmpC</i> FWD	AATGGGTTTTCTACGGTCTG	55	191	
<i>AmpC</i> REV	GCGCAGCAAATGTGGAGCAA			
<i>bla</i> TEM FWD	CATTTCCGTGTCGCCCTTAATTC	60	800	
<i>bla</i> TEM REV	CGTTCATCCATAGTTGCCTGAC			
<i>bla</i> SHV FWD	AGCCGCTTGAGCAAATTAAC	60	713	
<i>bla</i> SHV REV	ATCCCGCAGATAAATCACCCAC			
<i>bla</i> OXA FWD	GGCACCAGATTCAACTTTCAAG	60	564	
<i>bla</i> OXA REV	GACCCCAAGTTTCCTGTAAGTG			
<i>bla</i> CTX-M group 1 FWD	TTAGGAARTGTGCCGTGYA	60	688	
<i>bla</i> CTX-M group 1 REV	CGATATCGTTGGTGGTRCCAT			
<i>bla</i> CTX-M group 2 FWD	CGTTAACGGCACGATGAC	60	404	
<i>bla</i> CTX-M group 2 REV	CGATATCGTTGGTGGTRCCAT			
<i>bla</i> CTX-M group 9 FWD	TCAAGCCTGCCGATCTGGT	60	561	
<i>bla</i> CTX-M group 9 REV	TGATTCTCGCCGCTGAAG			

18 ¹Y = T or C; R = A or G19 ² Annealing temperatures (°C)

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