Antimicrobial susceptibility of Finnish enterotoxigenic *E. coli* in pigs in years 2013–2016

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Introduction

Enterotoxigenic *Escherichia coli* can cause porcine neonatal and post weaning diarrhea, and potentiated sulfa drugs and aminopenicillins are recommended to be used for treatment of *E. coli* diarrhea. Due to quite commonly occurring antimicrobial resistance (AMR), diagnostic samples are sent to the laboratory to find out resistance profiles of enterotoxigenic *E. coli* on pig farms. As a part of the AMR-monitoring program, antimicrobial resistance is also tested for drugs that are not in clinical use for pigs in Finland.

Material and methods

Escherichia coli isolates from pig enteritis cases were obtained from faecal or post-mortem samples submitted to the laboratory. The enterotoxigenic *E. coli* were tested for antimicrobial susceptibility and isolates defined as resistant or non-wild type based on clinical breakpoints or epidemiological cutoff values, respectively. Isolates with decreased susceptibility to third generation cephalosporins were tested for AmpC and ESBL production. Only one isolate per herd was included.

Results

Decreased susceptibility to tetracycline, trimethoprim-sulfamethoxazole, ampicillin, streptomycin and quinolones were frequently observed. Also multiresistant isolates and one or a few AmpC producers were detected each year. Non-wild type isolates to colistin and gentamicin were not found.

Discussion and conclusion

The true AMR situation related to drugs in clinical use in Finnish pig herds might be better than these results indicate since the farms that frequently use antimicrobials and where the antimicrobial treatments are ineffective, are more likely to send samples. Also, the number of isolates tested each year was relatively low. However, decreased susceptibility is common and in case of recurrent antimicrobial use for diarrhea in pigs, the choice of the drug should be based on laboratory diagnostics and resistance profiles of enterotoxigenic *E. coli* on the farm.

Table 1. Distribution of MICs for *Escherichia coli* from porcine enteritis in 2013 (n=31), 2014 (n=26) 2015 (n=19) and 2016 (n=23).

Substance	Year	% non-wt	95% C.I.	Distribution (%) of MICs (mg l^{-1})																
				≤0.008	0.016	0.032	0.064	0.125	0.25	0.5	1	2	4	8	16	32	64	128	256	512
Ampicillin	2013	25,8	12.5-44.9								32,3	32,3	6,5	3,2		3,2			22,6	
	2014	26,9	12.4-48.1								42,3	23,1	3,8	3,8	3,8	7,7			15,4	
	2015	42.1	23.2-63.7								47.4	5,3		5,3	5.3	10,5	5,3	5,3	15,8	
	2016	26.1	11.1-48.7								56,5	13	4,3		4,3	13			8,7	
Cefotaxime	2013	3,2	0.2-18.5				61,3	32,3	3,2	3,2										
	2014	11,5	3.0-31.3				84,6	3,8		7,7	3,8									
	2015	21.1	8.5-43.3				52.6	15.8	5,3	15.8	5.3									
	2016	13.0	3.4-34.6		4,3	4,3	60,9	13	4,3	13										
Chloramphenicol	2013	6,5	1.1-22.8									29	61,3		3,2	6,5				
	2014	11,5	3.0-31.3									30,8	50.0	3,8	3,8	7,7	3,8			
	2015	0.0	0.0-20.9									26.3	52,6	5.3	15,8					
	2016	9.1	1.6-30.6									13,6	59,1	13,6	4,5	9,1				
Ciprofloxacin	2013	19,4	8.1-38.1			41,9	38,7	3,2	6,5		3,2	6,5								
	2014	26,9	12.4-48.1		57,7	7,7	7,7	3,8	15,4	3,8	3,8									
	2015	31.6	15.4-54.0		52.6	10.5	5,3	5.3	15,8	5,3		5,3								
	2016	21.7	8.3-44.2		17,4	56,5	4,3	8,7	8,7			4,3								
Enrofloxacin	2013	14.8	5.9-32.5					85,2	3,7	7,4		3,7								
	2014	30.8	16.5-50.0					69,2	3,8	15,4	11,5									
	2015	31.6	15.4-54.0					68,4	21,1	5,3				5,3						
	2016	21.7	9.7-41.9					78,3	13	4,3			4,3							
Florfenicol	2013	0.0	0.0-13.7										90,3	6,5	3,2					
	2014	0.0	0.0-16.0										53,8	42,3	3,8					
	2015	0.0	0.0-20.9										47,4	47,4	5,3					
	2016	4.3	0.2-23.9										47,8	47,8		4,3				
Kanamycin	2013	9,7	2.5-26.9											90,3	3,2	6,5				
	2014	7,7	1.3-26.6											92,3		7,7				
	2015	0.0	0.0-20.9											100						
	2016	0.0	0.0-17.8											100						
Nalidixic acid	2013	19,4	8.1-38.1									58,1	19,4	3,2		3,2	6,5	3,2	6,5	
	2014	26,9	12.4-48.1									65,4	7,7			3,8		19,2	3,8	
	2015	36.8	19.2-59.0									57,9	5,3			5.3	5,3	15,8	10,5	
	2016	26.1	11.1-48.7								4,3	47,8	21,7			13		4,3	8,7	
Streptomycin	2013	32,3	17.3-51.5									3,2	29	25,8	9,7	3,2	3,2	3,2	9,7	12,9
	2014	52.0	31.8-71.7									4.0	24.0	8.0	12.0		8.0	4.0	24.0	16.0
	2015	57.9	36.3-76.9									5,3	26.3	5,3	5,3	10.5	5,3	21,1	10,5	10,5
	2016	21,7	8.3-44.2									17,4	43,5	13	4,3	17,4				4,3
Trimethoprim/ sulfamethoxazole[1]	2013	15,4	5.0-35.7							80,8	3,8			15,4						
	2014	30,8	15.1-51.9							61,5	7,7			30,8						
	2015	42.1	23.2-63.7							57.9			5,3	36.8						
	2016	21.7	8.3-44.2							78,3				21,7						
Tetracycline	2013	29.0	14.8-48.2								58,1	12,9				9,7	9,7	9,7		
	2014	38,5	20.9-59.3								53,8	3,8		3,8	3,8	7,7	7,7	15,4	3,8	
	2015	68.4	46.0-84.6								21.1	10,5				10,5	10,5	31.6	15,8	
	2016	30.4	14.0-53.0								52,2	17,4					21,7	8,7		

Bold vertical lines indicate epidemiological cut-off values for microbial resistance (non-wt) (EUCAST 10.4.2018). Dotted lines indicate clinical cutt-off values (CLSI VET01S 3rd ed) in case available and differ from epidemiological values. Hatched fields denote range of dilutions tested. Values above the range denote MIC values greater than the highest concentration in the range. MICs equal to or lower than the lowest concentration tested are given as the lowest concentration.

[1]concentration of trimethoprim given, tested with sulfamethoxazole in concentration ratio of 1:20

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