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RISK FACTORS FOR ACQUIRED CEFTIOFUR RESISTANCE IN *E. COLI* FROM BROILERS

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INTRODUCTION

In a large scale Belgian survey in 2007-2008 on faecal *E.coli* from broiler chickens, an average level of 37% ceftiofur resistance was found (Persoons et al., 2009). This level ment a substantial increase compared to earlier Belgian data. To find out what triggers this emergence of ceftiofur resistance, a questionnaire among 32 farms, covering two production cycles per farm was conducted.

MATERIALS & METHODS

At each sampling occasion individual faecal swabs from 30 randomly selected broiler chickens were collected, as well as one questionnaire per visited farm. From the faecal samples, *E. coli* was isolated for the purpose of susceptibility testing to 14 different antimicrobials. The questionnaire was filled in on farm by means of a personal interview of the farmer. Hygiene scores were given by the interviewer himself without involvement of the farmer. The same questionnaire was used in all farms and on both sampling occasions. Information was gathered on 31 potential farm level risk factors. A multilevel logistic regression model with ceftiofur resistance as a outcome variable was fit to the data.

RESULTS & DISCUSSION

Table 1. Results of the multilevel multivariable analysis of co-variables and risk factors for ceftiofur resistance in 32 Belgian broiler farms.

Factor	Categories	Frequency of occurrence	OR	95% CI of OR		p-value
				Lower bound	upper bound	
<u>Bacterium level co-variables:</u>						
AMC susceptibility test result	Sensitive	87.7	ref.			
	Resistant	12.3	7.74	3.00	19.94	< 0.01
TMP-S susceptibility test result	Sensitive	43.8	ref.			
	Resistant	56.2	1.95	1.26	3.03	< 0.01
<u>Farm level risk factors:</u>						
Clean hygienic condition of the treatment reservoir	No	78.6	ref.			
	Yes	21.4	5.18	1.55	17.29	< 0.01
Acidification of drinking water	Yes	18.1	ref.			
	no	81.9	3.47	1.05	11.50	< 0.05
More than 3 feed changes/cycle	No	20.0	ref.			
	yes	80.0	8.25	1.39	48.80	< 0.01
Hatchery	A	23.8	ref.			
	B	44.0	15.60	0.82	297.33	0.08
	C	8.4	14.79	2.27	96.33	< 0.01
	D	8.8	50.60	5.55	461.68	< 0.01
	E	10.6	1.02	0.17	6.03	0.09
	F	1.4	2.40	0.29	19.88	0.35
	G	3.0	655.89	50.12	8582.84	< 0.01
Breed	Cobb	12.2	ref.			
	Ross	87.8	9.14	2.30	36.41	< 0.01
Litter material	wood curls	47.5	ref.			
	Straw	25.7	5.08	1.76	14.63	< 0.01
	Flax	26.8	8.04	2.00	32.41	< 0.01
Amoxicillin treatment	no	58.4	ref.			
	Yes	41.6	4.76	2.16	10.50	< 0.01

AMC= amoxicillin-clavulanic acid; TMP-S= trimethoprim-sulphonamide

Four co-variables and 14 risk factors were significant in the univariable analysis. The factors that remained significant in the multivariable analysis are presented in Table 1. The results of the current study indicate that many factors are associated with acquired ceftiofur resistance in faecal *E. coli*. Some are biologically explainable whereas others are unexpected and more difficult to interpret. The single most expected risk factor, namely the use of ceftiofur, is not present due to the absence of any record of ceftiofur use as a result of the ban on ceftiofur use in poultry since 2000. Yet possible off-label use cannot be ruled out. Even though several of the working mechanisms are not yet fully understood, the observed increase in resistance merits full attention. Since many factors are modifiable through management changes, broiler production should consider adaptations that avoid aforementioned risk factors for ceftiofur resistance from both an animal and public health point of view.

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Reference: Persoons et al. Prevalence and persistence of antimicrobial resistance in broiler indicator bacteria. Micr Drug Res. 2009, epub ahead of print.