

Competitive exclusion to intervene in the transmission of ESBL-*E. coli* in broilers?

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Aim

The aim of this study was to determine the effect of prolonged supply of competitive exclusion (CE) and pre/probiotic (PB) products on colonization and transmission of ESBL-producing *E. coli* after challenge with a low dose in broilers.

Material and Methods

- 10 isolators ($n=100$ broilers) in 2 replicates
- CE (Aviguard[®], MSD) or PB (Poultrystar[®], Biomin) supplied from day of hatch – day 14
- At day 5 in each isolator 5/10 I-broilers inoculated with 0.5 mL 10^2 *E. coli* with ESBL gene bla_{CTXM-1} on IncI1
- ESBL-*E. coli* detection in cloacal samples (day 5-21)
- Transmission rate (β) quantified using SI model comparing 3 models with expected n new cases (C):
 - 1) $E(C) = S * (1 - e^{-\beta * I / n * \Delta t})$
 - 2) $E(C) = S * (1 - e^{-\beta * \sum I_{excrtime} * \Delta t})$
 - 3) $E(C) = S * (1 - e^{-\beta * \sum I_{excrlevels} * \Delta t})$

Results

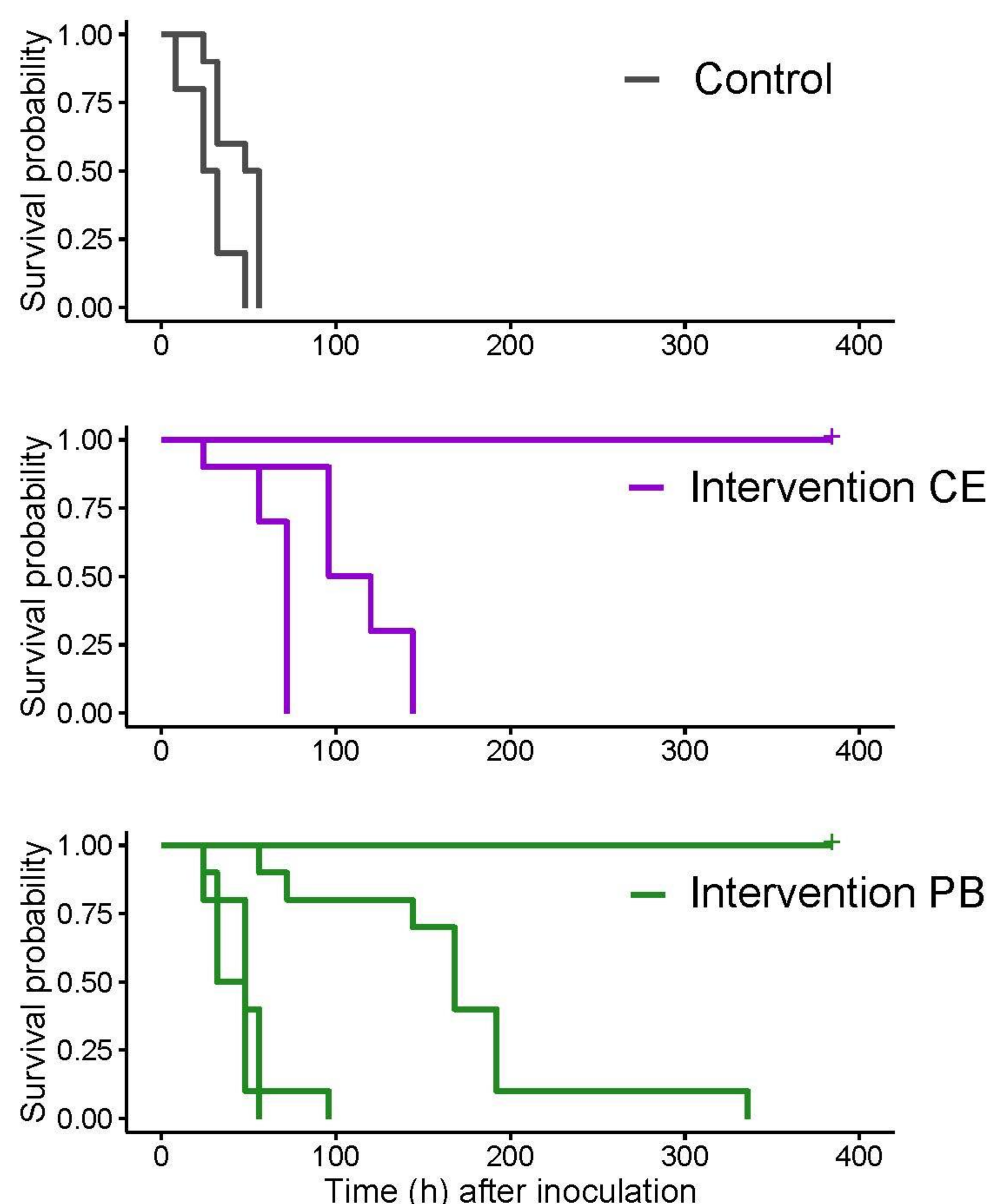


Figure 1 Survival curve of colonization of CTX-M-1-*E. coli* in broilers in the control, competitive exclusion (CE) and pre/probiotics (PB) group.

<i>n</i> I-broilers colonized with CTX-M-1- <i>E. coli</i> at t=24, 32, 48 h after inoculation										
	Control		Intervention CE				Intervention PB			
t=24	4/5	1/5	1/5	1/5	0/5	0/5	0/5	0/5	1/5	2/5
t=32	5/5	4/5	1/5	1/5	0/5	0/5	0/5	0/5	2/5	5/5
t=48	5/5	4/5	1/5	1/5	0/5	0/5	0/5	0/5	3/5	5/5

Table 1 Number of inoculated (I)-broilers colonized with CTXM-1-*E. coli* at t= 24, 32 and 48 hours after inoculation in the control, competitive exclusion (CE) and pre/probiotics (PB) group.

β (95% CI) of CTX-M-1- <i>E. coli</i> in control and intervention groups			
	Control	Intervention CE	Intervention PB
Model 1	0.11 (0.06 - 0.18)	0.07 (0.02 - 0.24)	0.06 (0.02 - 0.18)
Model 2	0.0006 (0.0003 - 0.001)	0.0002 (0.00005 - 0.0007)	0.0001 (0.00003 - 0.0003)
Model 3	0.008 (0.004 - 0.01)	0.003 (0.0009 - 0.01)	0.004 (0.001 - 0.01)

Table 2 Transmission rate (β) of CTX-M-1-*E. coli* between broilers in the control, competitive exclusion (CE) and pre/probiotics (PB) group for three different models. All models assume I-broilers not colonized at t=24 hours after inoculation are S-broilers. Model 1: β /hour, Model 2: β /hour², $\sum I_{excrtime}$ =cumulative sum of excretion time (hours), Model 3: β /hour², $\sum I_{excrlevels}$ =cumulative sum of excretion levels (10log cfu/g faeces)

Conclusions

- Treatment with CE and PB product leads to reduced risk of colonization and is even able to prevent colonization with CTX-M-1-*E. coli*.
- Transmission rate (β) is lower in the intervention groups, however transmission rate differs between isolators.
- If at least one I-broiler is colonized the whole flock can become colonized, indicating that the effect of intervention is mainly based on prevention of colonization of the I-broilers.

Acknowledgement

This work was funded by the 1Health4Food Public Private Partnership project: Reduction of ESBLs: evaluation of ESBL interventions (Grant number TKI-AF-14210).

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