Use of a two-part model to identify herd- and litter-level factors associated with *Isospora suis* occurrence in Greek finishing-pig herds.

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Background & Objective

Neonatal coccidiosis, caused by *Isospora suis (I.suis)*, occurs in all types of farrowing facilities and under all types of management systems (Mundt et al., 2005). In this study we identified herd- and litter-level factors associated with the odds and the level of *I.suis* oocyst excretion in Greek pig herds.

Farms, Sampling & Testing

Data were collected from 55 farrow-to-finish herds. From each herd and depending on the herd size, at least five litters, in their second week of life, were coprologically sampled. Each litter-sample comprised a pool of individually collected faeces from half of the piglets. Oocyst excretion, expressed as oocysts per gram of faeces (OPG), was determined, by a modified McMaster technique.

Questionnaire data

A standarized risk-factor questionnaire (available from the first author upon request) was used to collect information on the use of toltrazuril (BAYCOX® 5%) and other herd- and litter-level factors that could be associated with *I. suis* infection.

Modeling

OPGs are semi-continuous data (**Figure 1**). Thus, we used a two-part model (**Figure 2**) to simultaneously identify factors associated with the odds and/or the amount of litter-level oocyst excretion (Liu et al., 2008). Initially, all factors were screened one by one in univariable models. Following a backwards elimination procedure factors significant at P<0.05 were retained in the final model.

In all models random-effect were incorporated for herd in both parts. Further, a correlation term between the random-effects of the two parts (ρ_{CEC}) captured the biologically plausible fact that piglets and litters with higher odds of excretion also tended to excrete more oocysts.

Models were built in the aML software.

Table 1. Factors associated with the (I) risk and the (II) level of OPG excretion

Logistic part (I)		**Odds Ratio (95%C.I.)**	***P***
Toltrazuril	Yes No	0.2 (0.1 ; 0.5) 1	0.001
Clean entire farrowing room	Yes No	0.3 (0.1 ; 0.9) 1	0.039
Fostering after 1st day	Yes No	4 (1.0 ; 16) 1	0.045
Metallic pen floor*	Yes No	2.5 (1.1 ; 5.7) 1	0.034
Pens per room*	Continuous	0.93 (0.9 ; 0.97)	0.001
Number of employees	Continuous	0.6 (0.5 ; 0.97)	0.042
Linear part (II)		**Coefficients (95% C.I.)**	***P***
Toltrazuril	Yes No	-1.8 (-0.6 ; -2.9) ref.	0.004
Employees entering in pens	Yes No	2.1 (0.6 ; 3.6) ref.	0.009
Pens per room*	Continuous	-0.04 (-0.01;-0.08)	0.023
ρ_{CEC}		0.99	0.005

Figure 1. Frequency distribution of the oocysts per gram (OPG) of pooled faeces from litters, in their second week of life, from 55 farrow-to-finish herds

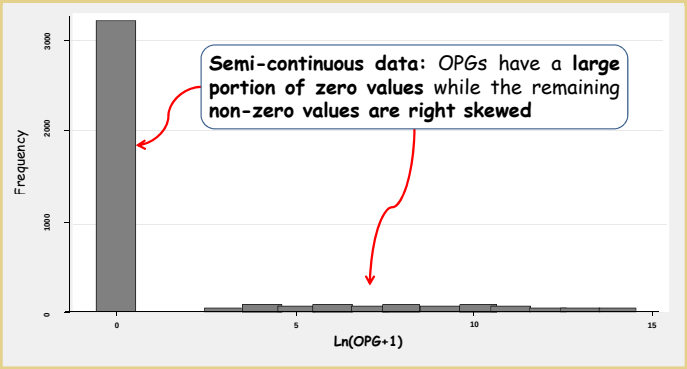
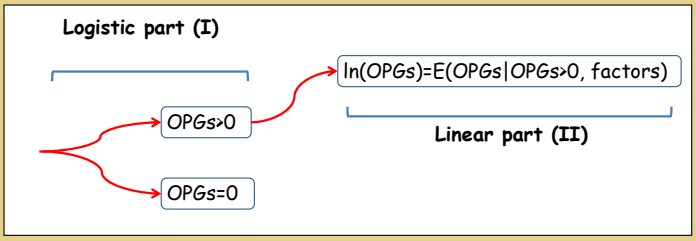


Figure 2. The two-part model accounts for the concentration of excessive zero-valued OPGs. It uses logistic regression to predict the probability of occurrence of a non-zero OPG and linear regression to predict the amount of the non-zero OPGs



Results

The odds of *I.suis* litter-level excretion were reduced when (i) piglets were treated with toltrazuril, (ii) the farrowing rooms were completely emptied and cleaned after weaning, (iii) piglets were not cross-fostered between litters after the 1st day of life and (iv) the flooring of the pens was plastic. Further, (v) larger farrowing rooms and (vi) more caretakers in the farrowing rooms reduced the odds of excretion.

The level of OPG decreased with (i) toltrazuril-treatment, (ii) larger farrowing rooms and (iii) caretakers avoiding walking into farrowing pens.

Discussion

Good managerial and hygiene-related practices, which affect between - pen transmission and environmental persistence of the parasite reduce the risk and the amount of oocyst excretion. Hence, control of neonatal coccidiosis can be the bettered by the identification and implementation of good-managerial-practice protocols, additionally to toltrazuril treatment.

References

1. Lindsay, D.S., Blagburn, B.L., 1994. Parasitol. Today 10, 214-219.
2. Meyer et al., 1999. Vet. Parasitol. 82, 277-284.
3. Mundt et al., 2005. J. Vet. Med. B 52, 93-97.
4. Liu et al., 2008. Stat. Med. 27, 3528-3539.
5. aML Multilevel Multiprocess Statistical Software: Version 2.0 (www.applied-ml.com).