

Sanitary aspects of pigs reared in a prototype farm free of in-feed antimicrobials: a case report

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Background

Phasing out prophylactic antimicrobial in pig production is strongly dependent on farm biosecurity. In Brazil, the production pyramid is usually organized in two or three specialized sites (multiple-site system). However, there is a large number of small herds in the first site, which implies that pigs from different origins have to be mixed to achieve standardized lots in the following sites. This point is a biosecurity bottleneck and makes the prophylactic antimicrobial withdrawal a costly and time-consuming process since it demands major structural changes in the system.

To achieve a production system free of antimicrobials in-feed Mores et al. (2013) and Wilbert et al. (2019) prototyped and described a model for pig rearing customized for farms operated by family labor under animal welfare conditions. This system showed to be zootechnical and sanitary comparable to a commercial and traditional swine production in the same region (Mores et al., 2013). The aim of this case report is to describe sanitary aspects, including zoonotic agents and antimicrobial resistance in commensal bacteria isolated from this pig farm prototype.

Materials and Methods

The prototype farm belongs to Embrapa Swine and Poultry; this farm produced around 462 finished pigs/year at the time the data were assessed. The feed was manufactured at the Embrapa Swine and Poultry's feed mill, where in-feed antimicrobials have not been used since 2008. Three basic principles of disease prevention were used in the farming practices: family labor production system; piglets from the same litter kept together from birth to slaughter (without mixture); reduction in animal density (both on the production scale and on the space provided for pigs from weaning to slaughter); use of diets formulated with highly digestible ingredients to reduce enteric disorders.

During three years, one out of three slaughter batches were evaluated, totaling 150 pigs being sampled for lungs lesions, serositis and *Mycoplasma hyopneumoniae* (Mh) presence. Mesenteric lymph nodes from a subset of 67 slaughtered pigs were sampled and submitted to *Salmonella enterica* isolation. In addition, sera from the same 67 pigs and 76 sows from the same farm were taken for antibodies detection against *Toxoplasma gondii*, Hepatitis E virus (HEV genotypes 1 and 3), *Salmonella*, and *Trichinella* by Elisa assay (PrioCHECK). Antimicrobial resistance (AMR) for the highest priority for critically important antimicrobials and screening for extended-spectrum β -lactamase (ESBL) producers were investigated in 45 strains of *Enterococcus* sp. and 47 strains of *Escherichia coli* isolated from rectal fecal samples collected on farm (32nd, 45th, 60th and 120th days of life). Antimicrobial susceptibility test and ESBL confirmation was conducted according to the Clinical and Laboratory Standards Institute (CLSI 2015; 2018a; 2018b).

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Results

The lungs lesions evaluation revealed a moderate level of pneumonia with Mh detection in 12 (8%) pigs; no animal was observed abscess or necrotic lesions. Four pigs (2.7%) had adherence in the pleura; one pig had pericarditis (0.7%) or peritonitis (0.7%).

None of the sows was positive to *T. gondii* and *Trichinella*, while 3% of the finishers presented antibodies against *T. gondii*. The seroprevalence for *Salmonella* was 25.4% in finishers and 97.6% in sows. All lymph nodes were negative for *Salmonella* isolation. Sows and finishers showed 90,3% and 91% of seropositives results for HEV. The test recognizes genotypes 1 and 3 in pigs, another study was performed to clarify de dynamic of infection in this herd.

Even without antimicrobial use, AMR was found against three classes considered highest priority for critically important antimicrobials in *Enterococcus* sp. and *E. coli* strains (Table 1) and none isolate was ESBL positive.

Table 1. Antimicrobial resistance against three classes considered highest priority for critically important antimicrobials in *Enterococcus* sp. and *E. coli* strains isolated from fecal samples.

Bacteria	Antimicrobial class	Antimicrobial agent	Resistant strains (n)	Susceptible strain (n)	Total strains (n)
<i>E.coli</i>	Cephalosporins (3 rd , 4 th and 5 th generation)	Cefotaxime	4	43	47
		Ceftazidime	0	47	47
	Polymyxins	Colistin	24	22	46
	Quinolones	Ciprofloxacin	5	42	47
		Nalidixic acid	28	19	47
<i>Enterococcus</i> sp.	Glycopeptides	Vancomycin	0	45	45
	Macrolides and ketolides	Erythromycin	24	21	45
	Quinolones	Ciprofloxacin	7	38	45

Isolates from this prototype farm had higher number of fully susceptible isolates, lower number of phenotypic resistance markers and multidrug-resistant strains compared to those isolated from commercial farms that used antimicrobial in feed in the same region and time point (Pissetti et al., 2021). Interestingly, frequencies of colistin resistance were high (52.17%), although the presence of *mcr1.1* gene was low (4.25%).

Despite antimicrobial resistance being lower in this prototype farm as well as respiratory lesions in slaughtered pigs, it is necessary to monitor and control zoonotic pathogens; *Salmonella* is still a problem that should not be neglected.

Conclusions

It is possible to produce pigs free of prophylactic antimicrobials without jeopardizing the production performance under specific farming practices. The in-feed antimicrobial withdrawal reduces the occurrence of multi-resistant fecal bacteria; however, the zoonotic pathogens control still needs to be specifically addressed.

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