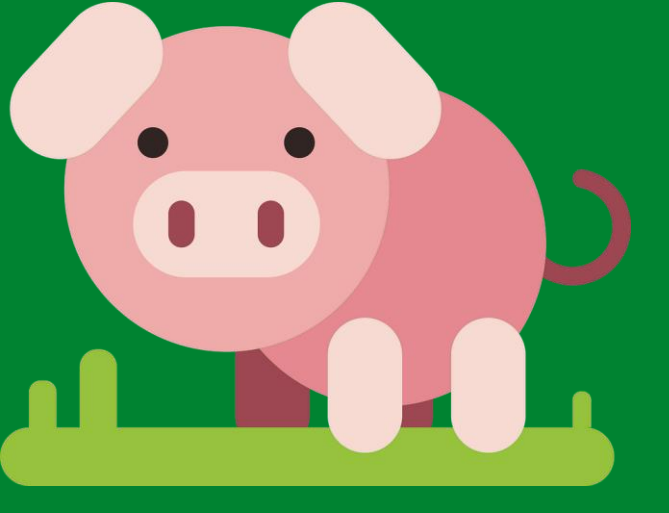# Effective biosecurity measures for the control of *Salmonella* in European pig farms

Jones, H.,[1] • Smith, R.P.,[1] • Burow, E.[2] *on behalf of the BIOPIGEE consortium*

[1] APHA – Weybridge, UK   [2] BfR, Berlin, Germany

Introduction

The **BIOPIGEE** project ('Biosecurity practices for pig farming across Europe') is a OHEJP studying the most effective biosecurity measures for the control of *Salmonella* and Hepatitis E Virus in European pig farms. *Salmonella* is a zoonotic pathogen which is often subclinical in pigs, but can cause serious infections in humans. Biosecurity can control *Salmonella* in two ways; firstly, by preventing the introduction onto the farm, and secondly to minimise the spread of infection within a farm.

Methods

- Nine countries were involved (UK, BG, CZ, DE, IT, PL, AT, NL, EE).
- Farm types included: breeder, farrow-to-finish and finisher
- Excluded small-holdings, nucleus/multiplier herds, and Specific Pathogen Free herds
- Farms completed a questionnaire on current biosecurity practices.
- 20 pooled floor faecal samples collected per farm from sows, gilts and finishers (dependent on farm type). Each sample consisted of 10 pinches of faeces.
- EE and NL used surveillance data in replacement of new samples.
- Samples tested for *Salmonella* using traditional bacteriology methods in accordance with ISO 6579-1:2017.
- Samples from younger finisher pigs and gilts were weighted based on their sample results to ensure a consistent appraisal of risk per farm type.
- Farms designated as high/low risk for *Salmonella* based on a 20% sample prevalence cut-off
- Forwards step-wise logistic regression used to estimate the association between biosecurity practices and *Salmonella* risk status
- Principal components analysis (PCA) was also undertaken to assess multicollinearity using all variables P<0.25 at univariable analysis stage.

Results

- 264 farms recruited; 250 provided *Salmonella* results (18-38 per country)
- 120 farrow-to-finish (48.0%); 47 breeding (18.8%); 83 (33.2%) finisher farms
- Five outdoor farms (4 from UK, 1 from IT)
- 41/250 (16.4%) farms were high risk for *Salmonella*
- PCA identified 127 components, with 12 explaining 65% of the variation (1.6-32.1% each).

Table 1: Results of multivariable logistic regression of *Salmonella* risk categorisation on pig farms (n=250)

Variable	Category	% High risk	Odds Ratio	P-value	95% Confidence Interval
No. of sows	0	27.7%	1.000		
	1-400	4.7%	0.099	0.001	0.026 - 0.371
	401-1000	18.9%	0.686	0.574	0.184 - 2.558
	1000+	17.4%	1.407	0.680	0.278 - 7.124
	Not known	20.0%	0.539	0.305	0.165 - 1.757
Are rodent baits used in the surroundings of the farm enclosures?	No	28.6%	1.000		
	Yes	13.0%	0.265	0.005	0.105 - 0.668
	NA	5.6%	0.151	0.133	0.013 - 1.778
Are stay-behinds always isolated from the healthy ones (in physically separated hospital area/or by euthanasia)?	No	25.7%	1.000		
	Yes	12.5%	0.280	0.006	0.112 - 0.7
	N/A	14.3%	0.338	0.381	0.03 - 3.815
Is the floor in each anteroom/hygiene lock even/ without damages and thereby easy to clean and to disinfect?	Yes	18.4%	1.000		
	No	8.2%	0.156	0.007	0.04 - 0.601
Are all farm buildings/ fields surrounded by a perimeter fence?	Single or double fenced	20.1%	1.000		
	No	12.3%	0.191	0.004	0.062 - 0.589
	Partly interrupted	4.3%	0.093	0.036	0.01 - 0.853
Is there a minimum downtime period of at least 3 days in between batches the farrowing area?	No	20.7%	1.000		
	Yes	8.1%	0.252	0.020	0.079 - 0.803
What kind of flooring system is in the barn sections for fatteners?	Any other flooring	25.8%	1.000		
	Only solid floor	9.4%	0.209	0.057	0.042 - 1.047
	Only full slats	11.5%	0.293	0.021	0.103 - 0.833
	Not present/ missing	11.8%	0.352	0.098	0.102 - 1.214

Conclusion

- Multivariable analysis indicated important biosecurity factors for *Salmonella*, however some may be a proxy or present a combination of factors. Further analysis will be undertaken to understand these results in more depth.
- PCA provided useful context in defining the correlation in the variance structure of selected variables in the model, and indicated that a multitude of biosecurity measures may be required to provide effective *Salmonella* control in European pig farms.