

SHORT TERM SCIENTIFIC MISSION (STSM) SCIENTIFIC REPORT

This report is submitted for approval by the STSM applicant to the STSM coordinator

Action number: CA15134

STSM title: Using experimental data to evaluate the effectiveness of tail biting outbreak management protocols

STSM start and end date: 10/03/2019 to 31/03/2019

Grantee name: Jen-Yun Chou

PURPOSE OF THE STSM:

(max.200 words)

This STSM project proposed to evaluate the effectiveness of different tail biting outbreak protocols and generate practical dissemination materials. It is important to reduce, predict and prevent the occurrence of tail biting among undocked pigs before it takes place, however, tail biting outbreaks can still occur. It is therefore crucial to investigate how to manage tail biting outbreaks when they happen. Currently no scientific literature was dedicated to evaluating the effectiveness of tail biting outbreak intervention protocols. This is primarily because biting outbreaks are unpredictable, which creates difficulty in terms of data collection. This STSM utilised tail biting outbreak data collected from two previously conducted experiments on undocked pigs, in which 40 outbreaks were recorded in detail with regard to commencement, intervention strategies, and duration of the outbreak. The work provided outbreak management advice based on experimental data, and generated results that could be incorporated into advisory information for producers, which will be disseminated through the COST action. For the grantee, it also provided an opportunity to learn new research and statistical skills with a prestigious research group and assisted her in adding information to her PhD thesis which focuses on reducing tail biting severity and incidence in slatted systems.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSMS

(max.500 words)

Since the STSM used data collected in previous experiments carried out by the grantee, the work began with discussions on how the data could be analysed, interpreted and presented, the scope of the project in terms of dissemination (academic publication and practical leaflet design), and the timeline of task management. The intervention protocols used in the study were: remove victims, remove biters or provide 3 ropes as additional enrichment materials. The order of the three intervention protocols used was assigned randomly for each outbreak pen without repetition. When a tail outbreak was identified, the first intervention out of the predetermined and randomised set of protocols was applied. If frantic tail biting behaviours continued within 72 hours after intervention, or fresh blood was observed on the same victim(s) or new victim(s), the protocol was regarded as FAILED and a second intervention was deployed. An intervention was considered SUCCESSFUL when no frantic tail biting behaviour was observed, or fresh blood observed within 72 hours. Up to a maximum of 3 interventions were deployed per pen. If the intervention was successful, the removed pigs (biters or victims) were reintroduced.

All discussions were recorded in detail as part of the process of manuscript writing. The main tasks carried out by the grantee were conducting relevant literature searches, cleaning the data, analyzing and

visualizing the data (using survival analysis, Kaplan-Meier curve, GLM, logistic regression and descriptive results) and organizing the results. During the STSM the grantee also visited the research farm of the host institute and participated in behavioural observation tests and brainstorming for an upcoming pig behaviour study. An induction tour of the farm was given, and the grantee also helped with pig handling techniques demonstration. Every Monday the grantee participated in the group meeting in the host institute to keep track of the working schedule. The grantee was invited to give a 30-min seminar in another institute (University of Natural Resources and Life Sciences in Vienna), in which she talked about her PhD project on controlling tail biting on fully-slatted floor. She also attended 2 symposiums during her stay, the animal gut health symposium in University of Veterinary Medicine and the opening symposium of the Vienna CogSciHub on social cognition in the brain and mind.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

Outbreaks were of shorter duration when the ropes were added in comparison to removing biters or victims (Figure 1). This is an obvious consequence of the time required for reintroduction of the earlier removed pigs as there was a three-day period in which the reintroduced pigs were monitored before the outbreak was marked as successful.

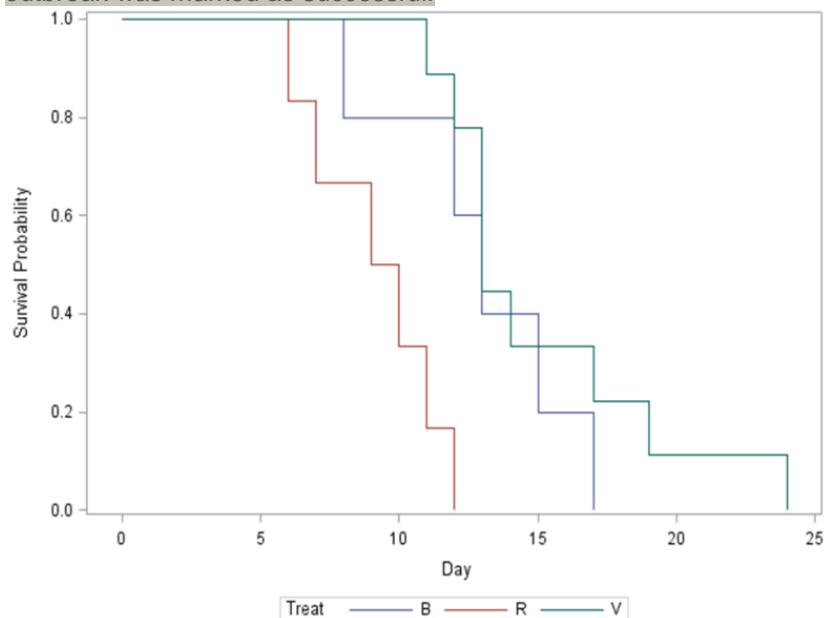


Figure 1. Survival probability of the tail biting outbreak over time. Blue line represents “remove biter,” red line represents “ropes as additional enrichment,” and green line represents “remove victims.”

One of the interesting findings during our discussions was that the outbreak control protocols used in the current study incorporated the reintroduction of the once-removed animals and only when reintroduction was successful that an outbreak intervention was considered successful. This is an important point since in practice no farm will have unlimited space for housing removed animals and the study has shown that animals could be reintroduced back to their home pen following a set of protocols.

Intervention success was not influenced by the actual intervention given at any stage. The proportion of success was 0.43 ± 0.11 for removing the biter, 0.43 ± 0.11 for providing ropes and 0.50 ± 0.10 for removing the victim ($P = 0.90$). The success of the different interventions may depend on the proportion of victims and biters in a pen (Figure 2). Figure 2 shows that the likelihood to successfully overcome an outbreak is lower when having more biters in the pen as compared to having the same amount of victims.

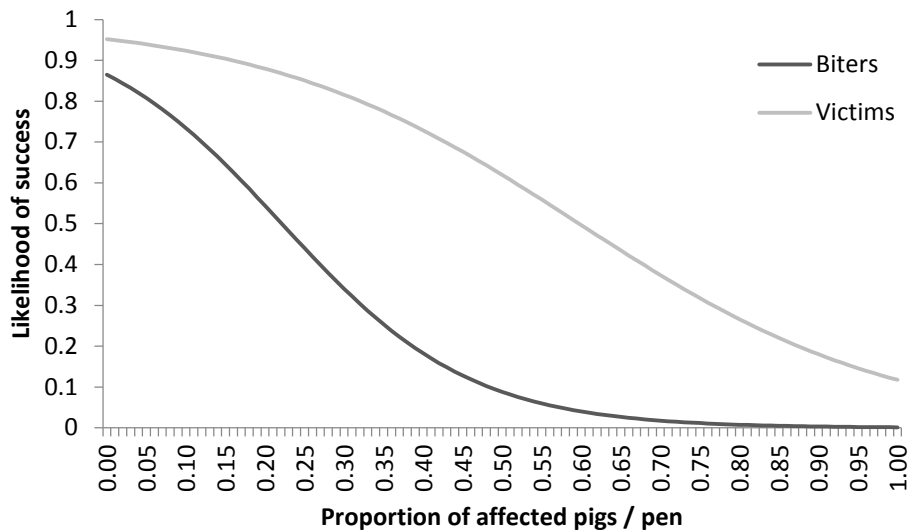


Figure 2. Likelihood of the success of the outbreak intervention against the proportion of biters or victims identified in the pens.

One of the complications of this study was the use of the three-stage method (Appendix 1). This makes it more difficult to predict in advance how many of the stages will be required per pen before the outbreak is successfully controlled. This complicated the statistical analyses, which would have benefitted from increased sample size for some of the intervention combinations. For this reason, the data of the repeated interventions was analysed predominantly by the successful intervention. However, this method is more in line with practice. In practice, farmers may employ various strategies to a single pen in order to stop the outbreak.

On average there were 2.8 ± 0.3 biters and 7.7 ± 0.4 victims per pen of 12-14 pigs. The average proportion of biters per pen was 0.21 ± 0.02 and the proportion of victims was 0.58 ± 0.03 . The outbreaks concentrated during 3-7 weeks post-weaning, and after pigs were transferred to the finishing accommodation at 7 weeks post-weaning, the outbreak stabilized but did not cease until 1-2 weeks before slaughter (Figure 3).

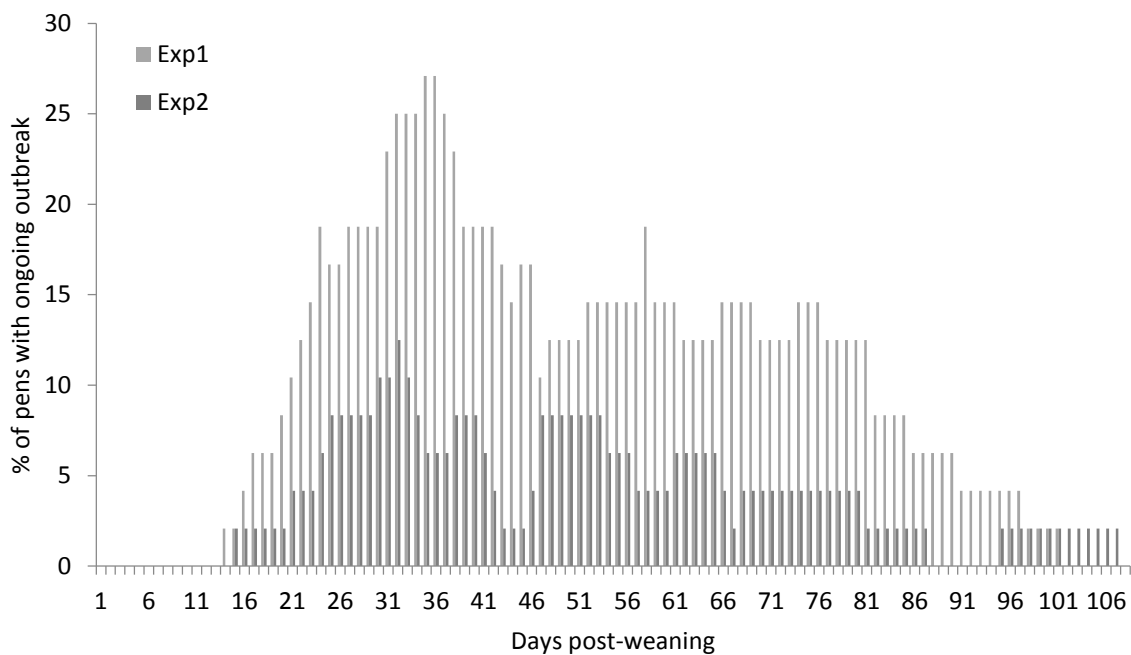


Figure 3. Porportion of pens (N = 48) with ongoing outbreak across time in two experiments.

Full results will be available in the manuscript planned to be published on an open access journal.

FUTURE COLLABORATIONS (if applicable)

The manuscript is under preparation and the current plan is to submit the manuscript by 31 July 2019, to *Animals* special issue on tail biting if possible. The grantee and the host plan to meet in person or via Skype in May to continue discussion on publication. The leaflet of practical message for dissemination is currently being designed and possible graphical collaborators were contacted.

Appendix 1. Actual application of the 3-step intervention strategies

1 st step	n		n	2 nd step	n		3 rd step	n			
Remove biter	14 (0.35)	Fail	9 (0.225)	Remove victim	7 (0.35)	Fail	Additional ropes	4 (0.4)	Fail	4 (0.4)	
										Success	0
										Success	3 (0.15)
											Fail
Additional ropes	2 (0.10)	Fail	Remove victim	1 (0.1)	Fail	Success	0	1 (0.1)			
								Success	0		
Remove victim	16 (0.40)	Fail	7 (0.175)	Remove biter	4 (0.20)	Fail	Additional ropes	2 (0.2)	Fail	2 (0.2)	
										Success	0
										Success	2 (0.10)
											Fail
Additional ropes	3 (0.15)	Fail	Remove biter	1 (0.1)	Fail	Success	0	1 (0.1)			
								Success	0		
Additional ropes	10 (0.25)	Fail	4 (0.100)	Remove biter	3 (0.15)	Fail	Remove victim	1 (0.1)	Fail	0	
										Success	1 (0.1)
										Success	2 (0.10)
											Fail
Remove victim	1 (0.05)	Fail	Remove biter	1 (0.1)	Fail	Success	0	1 (0.1)			
								Success	0		
Total	40	Fail	20 (0.5)		20	Fail		10	Fail	8 (0.8)	
										Success	2 (0.2)
										Success	6 (0.150)
											Success
Success	20 (0.5)	Success	10 (0.5)	Success	10 (0.5)	Success	2 (0.2)	2 (0.2)			
								Success	0		