

## 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: Lethal gang aggression in pigs**

**STSM start and end date: 21/10/2019 to 08/11/2019**

**Grantee name: Jen-Yun Chou**

### PURPOSE OF THE STSM:

(max.200 words)

Aggression between unfamiliar pigs is a natural behaviour to establish and maintain dominance relationships, which can result in skin lesions and occasionally lameness. In static groups, aggression is usually minimal and rarely has a lethal outcome. However, over the past 5 years, farmers have increasingly reported the occurrence of extreme aggression in stable groups, where a group attacks one individual and kill it. This excessive aggression has not been studied before. A survey was completed by 43 respondents reporting this issue on farm, with a focal farm providing records of 300 deaths, including 91 photos of the victims. This study analysed these survey data and assessed the victims' photos for skin lesions and body condition score to investigate possible causes for this extreme aggression in pigs. Additionally, it aims to disseminate this information into the wider research community (peer-reviewed publication) and also more importantly to practice (through a leaflet). For the applicant, this STSM appeared timely as she is completing her PhD on tail biting in pigs and aims to continue into research. Widening her scope of research into another important area of pig behaviour, aggression, collaborating with international network, and co-authoring an additional publication, directly contributed to her career opportunities.

### DESCRIPTION OF WORK CARRIED OUT DURING THE STSMS

(max.500 words)

In the first week, the project began with an extensive search of literature on similar aggression described in captive, wild, laboratory and companion animals. Some reports of similar aggression in mainly primates in the field of evolutionary ecology. The next step was to organise the data collected, including the survey (43 respondents) and the record (209 pigs) and photos (91 pigs) from the focal farm. After checking the quantitative and the qualitative answers, one respondent was excluded due to incomplete answers. 23 respondents were categorized as having lethal gang aggression (case) whilst 19 respondents were treated as normal aggression (control) to compare the characteristics of these two groups of farms. The photos of the victims on the focal farm were assessed for skin injuries (1-5 scale of severity depending on the coverage of skin lesions, on different parts of the body: face/neck and shoulder/middle/rear) and body condition score (on a 1-5 scale; 1: emaciated; 2: thin; 3: ideal; 4: fat; 5: obese). Duplicate copies or different angles on the same pig were excluded.

The task in the second week focused on statistical analyses, mainly using descriptive statistics, logistic regression and chi-square to compare case and control farms based on the survey data. Logistic regression and generalized linear mixed modelling were also used to analysed data from the photo scorings.

Following the statistical analyses, the manuscript was being prepared. The main parts of the manuscript were completed and are currently being revised. The targeted submission date is in spring 2020.

During the STSM, the applicant also assisted experimental work on the research farm, attended a lecture in the University of Vienna on eye tracking and EEG, and a workshop on improving academic publications, organized by Elsevier. The design of the leaflets for dissemination was completed. The results of the STSM were also presented in a meeting at the host institute, receiving helpful comments and feedback to improve the manuscript.

## DESCRIPTION OF THE MAIN RESULTS OBTAINED

(max.500 words)

Lethal gang aggression was reported in many countries, including North-America and various European countries, showing no geographical similarities. The mortality resulted from this type of extreme aggression was up to 6%. Most farms reported that lethal gang aggression occurred in phases (34.78%). The duration from the start of the attack until the victim was dead ranged from within one hour to a maximum of 24 h. Deep straw housing contributed to an increased likelihood of lethal gang aggression ( $P < 0.05$ ). One of the possible reasons is mycotoxin contamination which may cause changes in microbiota or directly behaviour of pigs. However, this result should be interpreted with caution, since the majority of the respondents had farms with a higher welfare standard, and they may therefore be more concerned about the issue of aggression in pigs. Therefore, there could be under-reporting in other housing systems. This aggression also tended to happen more in female-only groups ( $P = 0.08$ ). This could result from sudden changes in oestrus cycle. There was no effect of age, genetics, group size, feed type, home milling or season on the likelihood of having lethal gang aggression in pigs based on the survey results.

The photo scoring showed that the victims had good body condition (average body condition score  $3 \pm 0.5$ ) and were clinically healthy. The lesion scoring of the photos showed that skin injuries were mainly on the front part of the body (Figure 1;  $P < 0.001$ ), which means that they more often reciprocated the aggression rather than avoiding it. The likelihood of survival after an attack was higher when the body condition score of the pig was lower ( $P = 0.04$ ), which means smaller pigs had a higher chance of surviving. Some studies in primates suggested the victims may have died of shock, heart attack or exhaustion, which may explain why bigger pigs were more likely to die from the attack since they are not physically capable of dealing with extreme fighting.

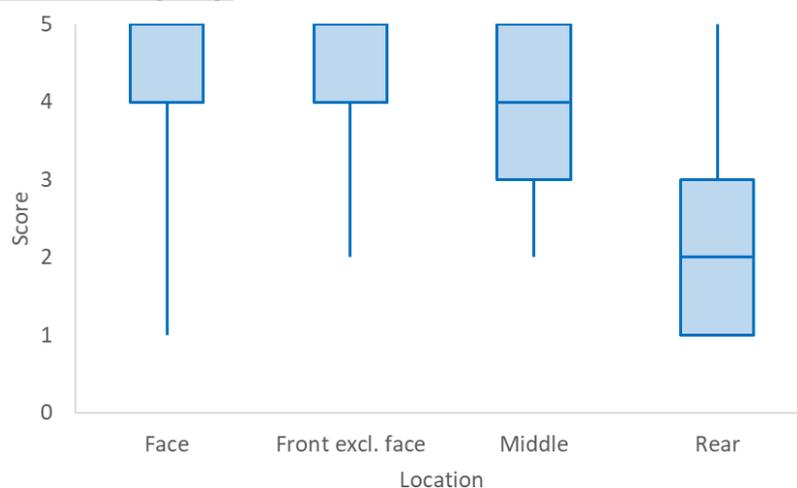


Figure 1. Lesion scores of victims (1-5 scale; 1: 0 – 10 lesions, mostly unaffected skin; 2: Approximately 1/3 of the body area is covered with lesions; 3: Approximately 1/2 of the body area is covered with lesions; 4: At least 3/4 of the body area is covered with lesions; 5: At least 1/2 of the body area is covered with lesions including patches of uncountable or deep lesions) on different parts of the body (face: face and ears until the cheek; shoulder: front region until the front leg, with exception of face; middle: back and belly; and rear: hind and hind leg). The scoring was done on photos of the victims.

Based on the literature review, besides mycotoxin contamination and changes in oestrus cycle in female pigs, other possible factors behind this type of extreme aggression are competition for dominance hierarchy, genetics, nutritional imbalance, and changes in olfactory signals (either internally due to change

in microbiota composition or externally due to ammonia or other air contamination). The investigation would have benefitted from tissue samples from victims/aggressors or post-mortem examination of the cause of death, which could be possible ideas for future investigation. As a pioneer step into exploring this behaviour, we thereby proposed a series of possible explanations in our manuscript in prep.

#### **FUTURE COLLABORATIONS (if applicable)**

The publication is being prepared now for submission in early 2020. Additionally, a leaflet to introduce this lethal gang aggression and possible steps to take to minimize the damage was produced and will be printed and disseminated. Through the dissemination of this project outcome, we hope that there could be more awareness of such extreme aggressive behaviours in pigs from farmers and consequently more case reports which will allow further follow-up investigation. The applicant is also currently applying for a postdoctoral fellowship with the host researcher to explore further aspects of social communication in pigs.