

Association between gastric lesions at the slaughterhouse and anti-inflammatory drugs use in Italian heavy pigs.

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1 Introduction

- Gastric lesions are a critical concern in the pig industry for their effect on animal health, welfare and productive performances¹.
- The development of gastric lesions pass through different stages, from an initial hyperparakeratosis of the mucosa, to erosions and finally deep ulceration with possible presence of hemorrhage².
- Several factors are involved in this process, such as nutrition, feed structure and housing³, but little is known about the impact that the usage of steroidal and non-steroidal anti-inflammatory drugs (NSAIDs) may have on their prevalence in fattening pigs.

The aim of this study was to explore the relationships between the estimated use of anti-inflammatory drugs at farm-level and the presence of gastric lesions in heavy pigs (slaughtered at ~170 kg live weight) at the slaughterhouse.

2 Material and methods

Sample collection and stomach classification

- Two high-throughput abattoirs located in the Northern Italy and receiving exclusively heavy pigs (slaughtered at ~170 kg live weight).
- Estimated transportation time was between 2 to 4.5 hours from the farm to the slaughterhouse.
- Batches and pigs within-batch were randomly selected.
- Stomach classification according to Robertson et al. (2002)² (Fig.1).

Use of anti-inflammatory drugs

- Data on the use of steroidal and not-steroidal drugs during the 2019 withdrawn via the Italian Electronic Prescription System
- Number of pigs/farm reared in the 2019 collected through the CLASSYFARM system
- Farm-level consumption of drugs estimated calculating a treatment index 1000 (TI₁₀₀₀), a standardized unit of measurements which can be interpreted as the number of pigs under treatment, on any given day, for each 1000 pigshoused in a farm, according to the following formula:

$$TI_{1000} = \frac{\text{active ingredient used (mg) per farm in 2019}}{\text{DDDAit (mg/kg/d)} \times \text{animals at risk} \times \text{weight at risk (kg)} \times \text{days at risk}} \times 1000$$

- DDDAit: defined daily dose animal for Italy, taking in account each prescribed medicinal product considering the amount, in mg, of its active ingredient that should be administered per kg of live weight;
- animals at risk: number of pigs reared in 2019;
- weight at risk: 100 kg;
- days at risk: 180

Statistical analysis

- Correlation analysis between anti-inflammatory drugs consumption (TI₁₀₀₀) and farm size through Spearman's rank correlation test.
- Calculation of a single farm-level score for gastric lesions by summing, within each farm, the weighted proportions of stomachs showing a given score, as follows:

$$\sum_{i=1}^n s_i \times p_i$$

- The variation in the farm-level scores was analyzed through a linear mixed model, including NSAIDs TI₁₀₀₀ and dexamethasone TI₁₀₀₀ as explanatory variables. The dependent variable was power-transformed (x2) to achieve normality of residuals (Shapiro-wilk test: W=0.98; p=0.88). Farm size was included as a random slope to account for the different size of sampled farms. Inclusion of the random term significantly improved the fit of the model (log-likelihood ratio test: $\chi^2_{11}=3.09$; p=0.039).

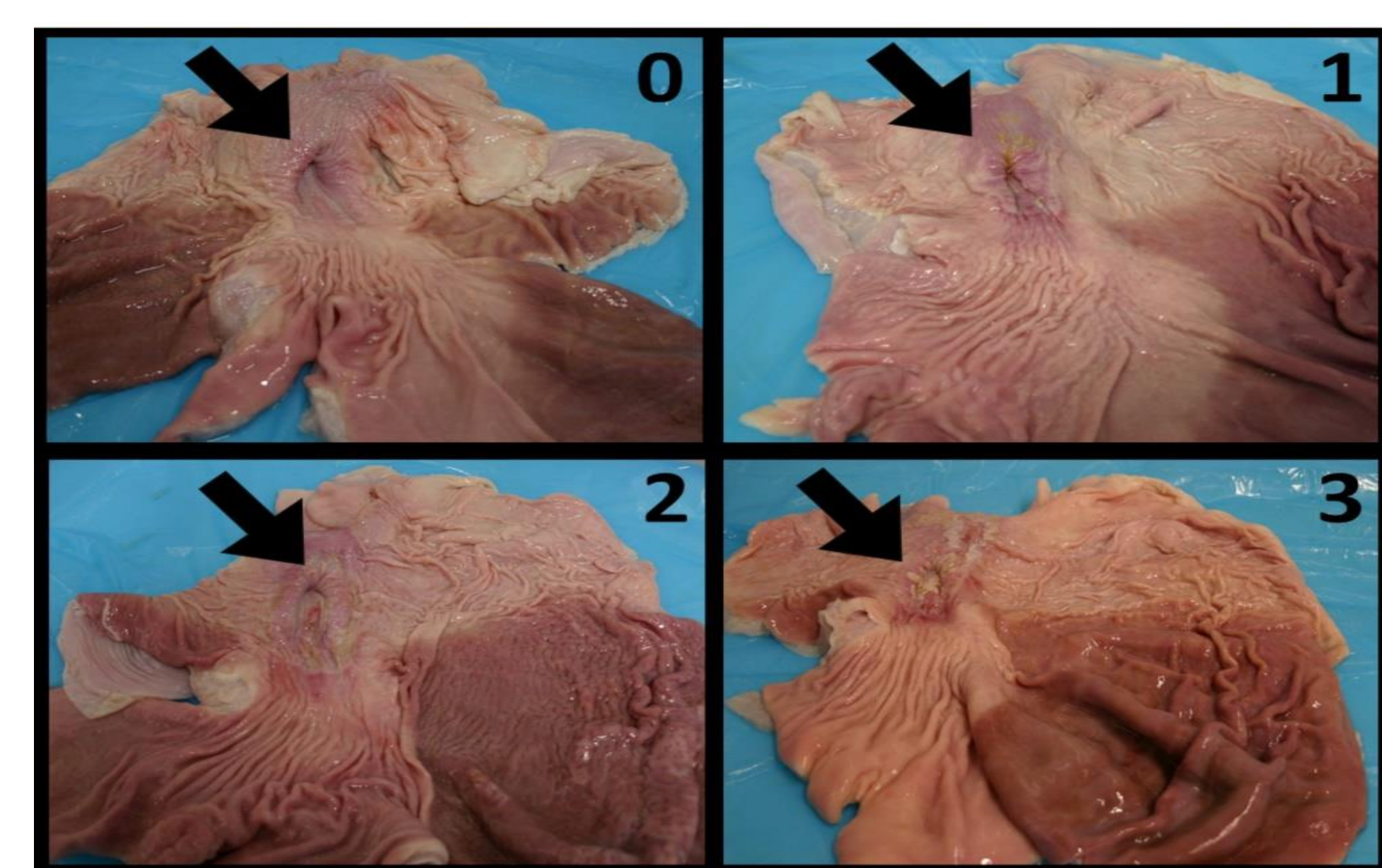


Figure 1: Gastric lesion scoring system. (0) No evidence of lesion; (1) Hyperkeratosis; (2) Erosion and/or mild ulcer; (3) Severe ulcer. The black arrows indicate the area of interest (the pars oesophagea).

3 Results

- The stomachs of **4184** pigs from **36** different farms with completed data on 2019 anti-inflammatory drugs usage were examined and scored for gastric lesions (range of examined stomachs/farm: 91–455).
- Mostly of the pigs presented erosions (**45,5%**) or ulcers (**5,6%**), as shown in Figure 2.
- At least **one prescription** of NSAIDs and/or dexamethasone was found in 29 out of 36 farms (80.6%).
- The median TI₁₀₀₀ of overall consumption was **0.45** (range: 0–31.6). The NSAIDs were used in 20 farms (55.6%) with a median TI₁₀₀₀ of **0.07** (range: 0–30.1). Dexamethasone was administered in 23 farms (**63.9%**) with a median TI₁₀₀₀ of **0.18** (range: 0–6.2) (Table 1).
- Neither NSAIDs nor dexamethasone consumption were correlated with farm size (Spearman's rho=0.09 and 0.12; p=0.61 and 0.49). The median farm-level ulcer score (n=36) was **1.42**, with values ranging from 0.46 to 1.97. As reported in Table 2, the variation in farm-level scores was **positively associated** with NSAIDs TI₁₀₀₀ (p=0.044), whereas dexamethasone consumption had **no significant relationship** to scores (=0.17).

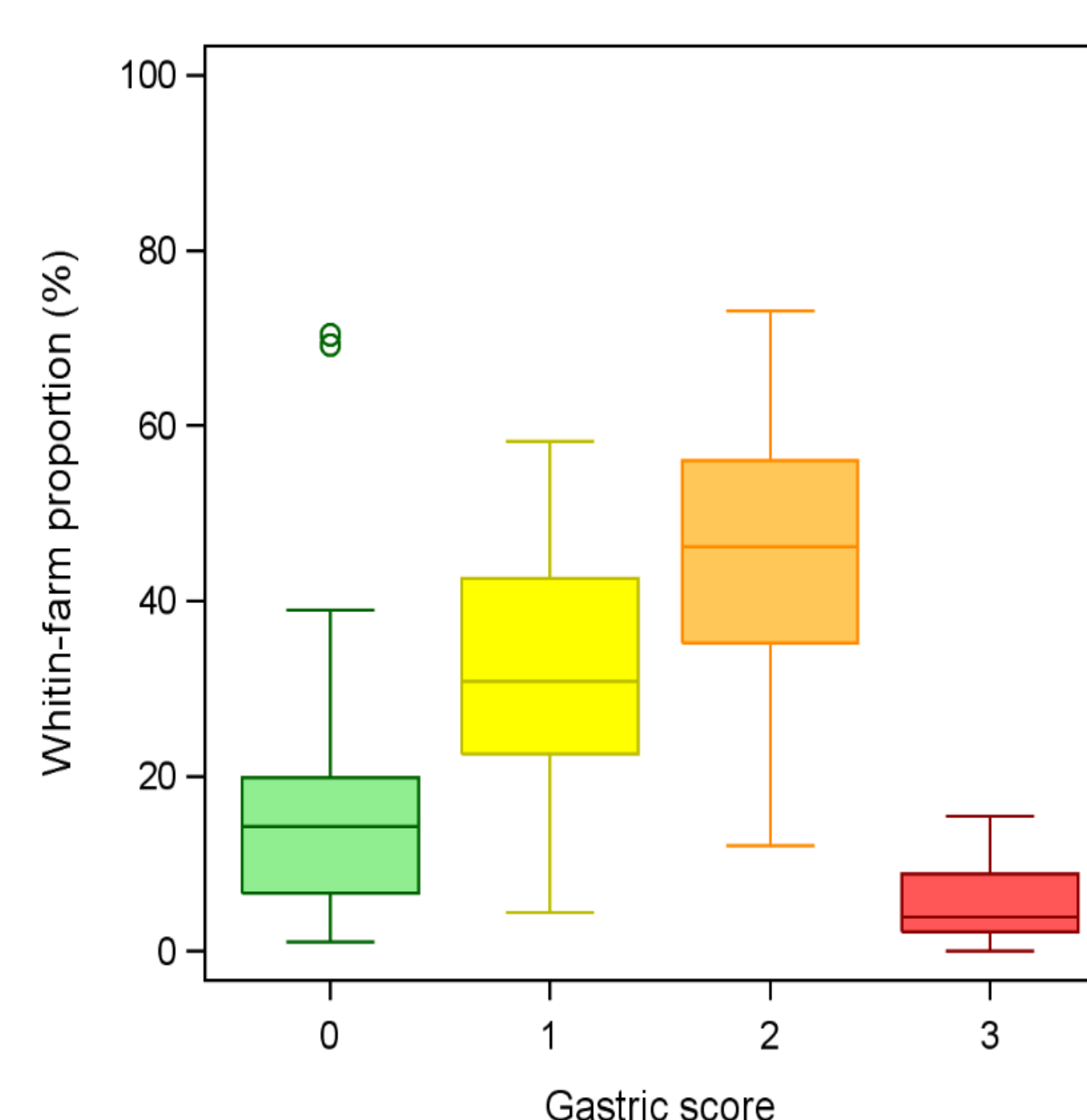


Figure 2: Distribution of the mean proportions of stomachs by gastric ulcer scores observed within pigs' farms (n=36).

	Overall use (%)	Farms with use > 0*	Median TI ₁₀₀₀ [†]	TI ₁₀₀₀ [†] Range
Dexamethasone	11.20	23	0.18	0–6.17
Nonsteroidal anti-inflammatory drugs	88.80	20	0.07	0–30.10
Acetylsalicylic acid	50.62	10	0	0–22.07
Ketoprofen	0.25	5	0	0–0.20
Meloxicam	0.04	2	0	0–0.07
Metamizole	0.11	3	0	0–0.13
Sodium Salicylate	37.76	5	0	0–30.01
Tolfenamic Acid	0.01	1	0	0–0.01

Table 1. Distribution, median and range of dexamethasone and nonsteroidal anti-inflammatory drugs (total and by active ingredient) use in 36 Italian pig fattening farms during 2019.

Explanatory variable	Parameter estimate ± SE	Statistic	p-value
NSAIDs TI ₁₀₀₀	0.032 ± 0.015	F _{1, 32} =4.38	0.044
dexamethasone TI ₁₀₀₀	-0.14 ± 0.10	F _{1, 32} =1.90	0.18

Table 2. Linear mixed model exploring the effect of anti-inflammatory drugs consumption on farm-level gastric ulcer scores (n=36) of pigs at the slaughterhouse. Farm size was included as a random slope.

4 Conclusions

- The results of this study have shown that NSAIDs should be carefully administered considering all the potential risk factors for gastric lesions.
- In regard to this, their use needs to be encouraged as possible strategy to reduce antimicrobial consumption and improve animal welfare in pig farms.

References

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