Abstract

Ascaris suum is a zoonotic parasite. The worldwide importance of Ascaris suum in swine production is known, not only because of its impact on swine health but also on slaughterhouse condemnations. To the knowledge of the authors, there are no studies in Portugal about Ascaris suum impact at slaughterhouse level. For that reason, the aim of this study was to estimate the economic impact of hepatic rejections during post mortem inspection caused by this parasite. For this purpose, the slaughter of swine (piglets and finishing pigs) from 32 farms (centre/south of Portugal) was attended. The average weight of the livers was estimated through the average of the livers' weights from five random farms: 0.3548 kg (piglets) and 1.218 kg (finishing pigs). Taking into consideration that the price per kg of liver was 2.23 euros (piglets) and 2.02 euros (finishing pigs), price per liver was estimated: 0.79 euros (piglets) and 2.46 euros (finishing pigs). During the slaughter of 14812 piglets and 6094 finishing pigs were rejected, respectively, 5507 and 1951 livers, 44.1% and 60.3% of these, by parasitic hepatitis caused by migrations of Ascaris suum larvae. From the 32 farms, only pigs from three didn’t present lesions, ranging the percentage of rejections/farms between 1.0% and 100.0%. Regarding the economic impact related exclusively to hepatic rejections by Ascaris suum, the total billing has been estimated in 7.362,15 euros in piglets (with a loss of 20.7%, 1.921,04 euros), and 10.193,27 euros in finishing pigs (with a loss of 28.4%, 2.898,30 euros). This parasite has multisystemic consequences that were not evaluated in this study, so the economic impact should be higher and not neglected. The results found in this study underline the economic impact of Ascaris suum at slaughterhouse level and points to the utility of data collection at slaughterhouse and meat inspection on disease management.

Introduction

Helminthic infections are frequent in domestic swine worldwide (Roepstorff et al., 2011), as well as its negative influence on health status and body weight gain of the animals (Knecht et al., 2012). These infections can cause fertility problems, as well as failures in vaccine protection against other infectious agents, and deterioration in the meat quality (Urquhart et al., 1996). Some parasites of swine, such as Ascaris suum, are zoonotic, thus constituting the infection not only a hazard to animals but also to humans (Zajac and Conboy, 2012). The worldwide importance of Ascaris suum in swine production is known, not only because of its impact on swine health but also on slaughterhouse condemnations, especially of livers and lungs (Foreyt, 2001). Pulmonary infection with Ascaris may also predispose to opportunistic infections namely by bacteria (Zajac and Conboy, 2012).

To the knowledge of the authors, there are no studies in Portugal about Ascaris suum impact at slaughterhouse level. For that reason, the aim of this study was to estimate the economic impact of hepatic rejections during post mortem inspection caused by this parasite.
### Material and Methods

The slaughter of swine (piglets and finishing pigs) from 32 farms in the centre and south of Portugal was attended. The number of swine slaughtered as well as the causes of hepatic rejections were registered, with special emphasis on parasitic hepatitis caused by migrations of *Ascaris suum* (Figure 1).

**Figure 1 – Parasitic hepatitis compatible with migrations of *Ascaris suum* (Original)**

The average weight of the livers was estimated through the average of the livers’ weights from five random farms: 0.3548 kg (piglets) and 1.218 kg (finishing pigs). Taking into consideration that the price per kg of liver was 2.23 euros (piglets) and 2.02 euros (finishing pigs), price per liver was estimated: 0.79 euros (piglets) and 2.46 euros (finishing pigs). The economic impact of hepatic rejections caused by *Ascaris suum* in swine during post mortem inspection at slaughterhouse was then calculated.

### Results

During the slaughter of 14812 piglets and 6094 finishing pigs were rejected, respectively, 5507 and 1951 livers, and 2423 (44.1%) and 1178 (60.3%) of these by parasitic hepatitis caused by migrations of *Ascaris suum* larvae (Figures 2 and 3).

**Figure 2 – Number of piglets slaughtered, total number of livers rejected and number of livers rejected by parasitic hepatitis caused by migrations of *Ascaris suum* larvae**

From the 32 farms, only pigs from three didn’t present lesions, ranging the percentage of rejections/farms between 1.0% and 100.0%. Regarding the economic impact related exclusively to hepatic rejections by *Ascaris suum*, the total billing has been estimated in 7.362,15 euros in piglets (with a loss of 20.7%, 1.921,04 euros), and 10.193,27 euros in finishing pigs (with a loss of 28.4%, 2.898,30 euros).

### Discussion

*Ascaris suum* has a truly global distribution, with infected pigs found in most production systems (Nejsum et al., 2012) and milk spots are healing lesions occurring when *Ascaris suum* larvae migrate through the liver (Sanchez-Vazquez et al., 2010). The aim of this study was to estimate the economic impact of hepatic rejections during post mortem inspection caused by *Ascaris suum*, and our results estimated that 27% of the total billing with swine livers was lost only with the rejections caused by this parasite. The economic impact is therefore not negligible. The results of our study also predict a poor effectiveness of deworming conducted, consistently with Knecht et al. (2011). Plus, those husbandry practices facilitating optimal levels of hygiene posed lower risk of milk spots in slaughtered pigs (Sanchez-Vazquez et al., 2010). As only three in 32 (9.4%) of the farms did not present lesions, it is suggested that in farms where access to pig manure is common, or pig manure is used as fertilizer, simple public health measures (as handwashing) should be encouraged (Nejsum et al., 2012). This parasite has multisystemic consequences that were not evaluated in this study, so the economic impact should be higher. Indeed, previous studies reported that parasitic infections may affect the meatiness causing meat quality decrease or lowering meat content in carcass (Knecht et al., 2011). In a study performed in Poland, finishing pigs with subclinical infections with *Ascaris suum*, their daily body mass gains were on average 80 g lower (Knecht et al., 2012).

The results found in this study underline the economic impact of *Ascaris suum* at slaughterhouse level and points to the utility of data collection at slaughterhouse and meat inspection on disease management and in a public health point of view.

### Conclusion

The economic impact of *Ascaris suum* at slaughterhouse level is not negligible. Swine farmers should be aware of the need of deworming and the economic advantages of it.
Material and Methods
The slaughter of swine (piglets and finishing pigs) from 32 farms in the centre and south of Portugal was attended. The number of swine slaughtered as well as the causes of hepatic rejections were registered, with especial emphasis on parasitic hepatitis caused by migrations of Ascaris suum (Figure 1).

The average weight of the livers was estimated through the average of the livers' weights from five random farms: 0.3548 kg (piglets) and 1.218 kg (finishing pigs). Taking into consideration that the price per kg of liver was 2.23 euros (piglets) and 2.02 euros (finishing pigs), price per liver was estimated: 0.79 euros (piglets) and 2.46 euros (finishing pigs). The economic impact of hepatic rejections caused by Ascaris suum was then calculated.

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During the slaughter of 14812 piglets and 6094 finishing pigs were rejected, respectively, 5507 and 1951 livers, and 2423 (44.1%) and 1178 (60.3%) of these by parasitic hepatitis caused by migrations of Ascaris suum larvae (Figures 2 and 3).

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The economic impact of Ascaris suum at slaughterhouse level is not negligible. Swine farmers should be aware of the need of deworming and the economic advantages of it.
Epidemiology and control of hazards in pork production chain – SAFEPORK
One health approach under a concept of farm to fork

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21. Relationship between pig carcass tail lesions and lung lesions
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Abstract
Tail biting is common on farms that are more prone to disease. Tail lesions can be associated with poor health either directly by providing a route of entry for pathogens or indirectly as conditions which trigger tail biting may also affect pig health. The aim of this study was to investigate the relationship between carcass tail lesion and lung lesion severity scores in Irish slaughtered pigs. Factory visits occurred over 5 days (Jan – March 2015) and tail lesion score (0 – 4) according to severity, sex, and kill number was recorded for every pig after scaling and dehairing. The lungs from each carcass were scored for lesions using an adapted version of the BPEx pig health scheme. Presence of pleuropneumonia (APP), abscesses and pyaemia was recorded. The severity of enzootic pneumonia (EP-like lesions) was recorded on a scale of 0 – 50 and grouped into none/mild (score 0 – 10), moderate (score 11 – 20) and severe (score 21 – 50). Severity of pleurisy was scored on a 0 – 2 scale with a separate variable for lungs that were attached to the chest wall (score 2). These lungs could not be assessed for other lung lesions and therefore a separate database was created for assessing the pleurisy lesions (n = 5,628) while the final database contained animals (n = 4,491) with records for tail lesions, EP-like lesion scores and pleurisy (level 0 + 1). Associations between tail lesions and sex and the different lung lesion outcomes were analysed using generalized linear mixed models (PROC GLIMMIX) with random effect for batch. EP-like lesions and pleurisy were the most common lesions, though large variation existed between batches. Pigs with severe tail lesions tended to have more severe pleurisy where the lungs remained attached to the chest wall than pigs with moderate tail lesions. No other associations between tail lesion scores and lung lesions were found. Although tail lesions on the carcass may not be an accurate predictor of lung health, tail lesions are important welfare indicators and respiratory disease is among the most significant infectious conditions affecting pigs. Thus, recording of tail and lung lesions at meat inspection provides valuable information regarding the on-farm health welfare of pigs.

Introduction
Surveillance tools assessing animal health and welfare are essential to assist the pig industry in monitoring and correcting problems associated with disease and poor welfare. Tail biting is an abnormal behaviour performed by pigs which reflects and causes poor welfare. Tail biting may also reflect poor health which could explain why it is more common on farms that are prone to disease (Moinard et al., 2003; van den Berg et al., 2005). There are two possible explanations for this link. Respiratory diseases (e.g. pleurisy/pneumonia) and other diseases have risk factors in common with tail biting which could explain why tail biting is thought to be more common on farms that are prone to disease (Moinard et al., 2003). For example, a higher prevalence of gastric lesions was observed in pigs coming from farms that showed signs of tail biting (van den Berg et al., 2005). Secondly, the damage resulting from tail biting provides a route of entry for pathogens which can then be haematogenously disseminated to different organs including the lungs leading to abscessation (Heinonen et al., 2010; Schröder-Petersen and Simonsen, 2001). Elbers et al., (1992) found moderate correlations between inflammation of the tail and pneumonia, lung abscesses and severe pleurisy. Pigs with moderate tail lesions had higher odds of having abscesses or lung lesions (pleuritis and embolic pneumonia) and this risk increased with more severe tail lesions (Marques et al., 2012). In contrast, Kritas and Morrison (2007) found no association between enzootic pneumonia and tail lesions but did find a relationship between severity of tail lesions and the occurrence of abscesses and pleuritic lesions in the lungs. Although tail damage is