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Current food chain information provides insufficient information for modern meat inspection of pigs

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ABSTRACT

Meat inspection now incorporates a more risk-based approach for protecting human health against meat-borne biological hazards. Official *post-mortem* meat inspection of pigs has shifted to visual meat inspection. The official veterinarian decides on additional *post-mortem* inspection procedures, such as incisions and palpations. The decision is based on declarations in the food chain information (FCI), *ante-mortem* inspection and *post-mortem* inspection. However, a smooth slaughter and inspection process is essential. Therefore, one should be able to assess prior to slaughter which pigs are suitable for visual meat inspection only, and which need more profound inspection procedures. This study evaluates the usability of the FCI provided by pig producers and considered the possibility for risk ranking of incoming slaughter batches according to the previous meat inspection data and the current FCI. Eighty-five slaughter batches comprising 8954 fattening pigs were randomly selected at a slaughterhouse that receives animals from across Finland. The mortality rate, the FCI and the meat inspection results for each batch were obtained. The current FCI alone provided insufficient and inaccurate information for risk ranking purposes for meat inspection. The partial condemnation rate for a batch was best predicted by the partial condemnation rate calculated for all the pigs sent for slaughter from the same holding in the previous year ($p < 0.001$) and by prior information on cough declared in the current FCI ($p = 0.02$) statement. Training and information to producers are needed to make the FCI reporting procedures more accurate. Historical meat inspection data on pigs slaughtered from the same holdings and well-chosen symptoms/signs for reporting, should be included in the FCI to facilitate the allocation of pigs for visual inspection. The introduced simple scoring system can be easily used for additional information for directing batches to appropriate meat inspection procedures. To control the main biological public health hazards related to pork, serological surveillance should be done and the information obtained from analyses should be used as part of the FCI.

1. Introduction

Meat inspection has four major objectives: public health, animal health, animal welfare and organoleptic meat quality (European Parliament and Council, 2004). Besides public health and animal health issues, meat is to be declared unfit for human consumption also if it indicates patho-physiological changes, anomalies in consistency or organoleptic anomalies (European Parliament and Council, 2004). If the change is local, partial condemnation is done and the abnormal tissue is removed by incision.

Meat inspection has been developed to incorporate a more risk-assessment based approach for protecting human health against meat-borne biological hazards. In regards to the most relevant pork-borne biological hazards of pig meat (*Salmonella* spp., *Yersinia enterocolitica*, *Trichinella* spp. and *Toxoplasma gondii*), only *Trichinella* spp. are detectable within the current post-mortem inspection (EFSA, 2011). A comprehensive pork carcass safety assurance system from 'farm to fork' is needed to ensure the

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effective control of meat-borne public health hazards, with the primary production stage playing an essential role in managing these risks (EFSA, 2011).

Moreover, the official *post-mortem* meat inspection of pigs shifted to visual meat inspection in EU (European Commission, 2014) in 2014. Techniques such as routine palpations and incisions are omitted from inspection procedures. This is because the risk of microbial cross-contamination is higher than the risk associated with any potential reduction in detection of conditions by not using these techniques. Current regulations allow the official veterinarian (OV) to decide on any additional *post-mortem* inspection procedures such as incisions and palpations. The decision can be based on one or any combination of the food chain information (FCI), *ante-mortem* inspection (including verification of animal welfare), *post-mortem* inspection or any other data regarding the animal that might in the OV's opinion indicate a possible risk to public health, animal health or animal welfare. Visual meat inspection is aimed to detect any observable abnormalities in carcasses. Palpation and incision procedures are carried out to fully inspect abnormal carcasses and offal to achieve a preliminary diagnosis and to decide on condemnations or if laboratory analysis are needed. The main deficiency, in these techniques, is that only conditions associated with gross lesions are detected while the most important pork-borne public health hazards are neglected (EFSA, 2011).

Slaughter batches of pigs with high frequency of lesions are not suitable for visual meat inspection. One should be able to identify which batches of slaughter pigs are suitable for visual meat inspection only, and which need more profound inspection procedures to ensure a more efficient slaughter and meat inspection process. To optimize procedures, meat inspectors should be able to focus on the examination of carcasses in which adverse conditions are suspected. Batches of pigs with high frequency of lesions should be slaughtered separately as they need a slower line speed and adequate human resources at trimming line. However, when based on *ante-mortem* inspection, such measures are often too late considering the practical arrangements at the slaughterhouse. On the day of slaughter it is possible, but laborious and impractical to change the slaughter order. In practice, the slaughter batches of pigs with high frequency of lesions should be recognized beforehand upon reliable and comprehensive FCI reporting.

EU-Regulation (EC) No. 853/2004 stipulates that adequate FCI must be presented to the slaughterhouse operator and to the OV no less than 24 h before the arrival of the animals at the slaughterhouse. In Finland, all the largest slaughterhouses use a uniform FCI-form, which is used by the pig producers to make the declarations, which include the following:

1) any relevant health status data regarding the holding or the animals in question (for example salmonellosis, trichinellosis, erysipelas, anthrax etc.),
2) any restrictions on the holding imposed by the authorities,
3) any drug residues or unauthorized substances detected in animals or at the holding during the last year,
4) any pigs in the slaughter batch that have been treated with veterinary medicinal products that have a withdrawal period within the three months prior to slaughter,
5) certain symptoms and signs detected in the slaughter batch (in detail in Table 1),
6) anything else relevant considering slaughter,
7) contact information of the veterinary practitioner for the holding.

In Finland, the FCI forms are usually sent to the slaughterhouses electronically, and they do not routinely include any *ante-* and *post-mortem* inspection data on previous batches of animals that had originated from the same holding. Typically the slaughterhouses keep such historical information in their own records, available to the OV (personal communication, Elias Jukola). Farmers have access to the meat inspection data concerning their farm via Sikava (Stakeholders health and welfare register for pig herds in Finland, www.sikava.fi).

The aims of this study were to assess the usability of the FCI provided by the pig holdings that sent the animals for slaughter and to evaluate the possibility of risk ranking of incoming slaughter batches according to the previous meat inspection data and the current FCI statements. As the risk of condemnation is mostly related to animal health and meat quality issues, serological testing were also included to emphasize the most relevant pork-borne public health hazards. The associations between the current and the historical meat inspection results, the FCI and the results from serological tests of slaughter batches of finishing pigs, were analyzed.

2. Materials and methods

2.1. Data

Eighty five slaughter batches of fattening pigs comprising 8954 animals were randomly selected at a slaughterhouse that receives animals from across Finland during the November 2012 to February 2013 period. Approximately 30% of the finishing pigs in Finland are slaughtered in this slaughterhouse. The slaughter batch sizes ranged from 20 to 271 pigs (a median of 87 pigs/batch). The mortality rate for each slaughter batch during last three months of finishing was provided by Sikava (Stakeholders health and welfare register for pig herds in Finland). The FCI, provided by the respective pig producers, and the meat inspection results were provided by the slaughterhouse. The holding of the pigs was traced by their slap marks. A total of 80 pig-production holdings were identified, that in all produce over 10% of the fattening pigs slaughtered annually in Finland. The meat inspection data that was used for the analyses concerned the slaughter batches that were sent from the same holdings during the previous year and covered more than 280 000 pigs. (Approximately 2 100 000 fattening pigs are slaughtered annually in Finland (http://statdb.luke.fi/PXWeb/pxweb/en/LUKE/).)

The meat inspection results collected from the slaughterhouse generally correspond well with the national meat inspection statistics for the same year (Table 1C). The only variation was observed for pleuritis rates as they were high in this particular slaughterhouse due to even the smallest lesions being reported, though those might not lead to condemnations.

For the purpose of this study, meat juice samples were collected from all the selected 85 slaughter batches (3–10 samples/batch). The meat juice was screened for antibodies for *Salmonella* spp., pathogenic *Yersinia* spp., *Trichinella* spp. and *T. gondii* by using the appropriate commercial enzyme linked immunosorbent assay (ELISA) kits. A batch was considered positive when antibodies were detected in one or more of the samples. The serological analyses are described in detail in another publication by the authors (Felin et al., 2015). Table 1 describes in detail the data collected on the selected slaughter batches.

None of the holdings declared salmonellosis, trichinellosis or any restrictions imposed by the authorities, and erysipelas was notified by only three holdings (Table 1) therefore this information was excluded from the analysis. The declaration on the occurrence of constant coughing during the three months prior to slaughter was coded for statistical analysis as the following: not declared = 0, a bit = 1, a lot = 2. None of the holdings declared a lot of constant coughing.