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A preliminary investigation of farm-level risk factors for cattle condemnation at the slaughterhouse: A case–control study on French farms

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ABSTRACT

The financial impact of condemnation for farmers and the importance of efficiency in the meat inspection process to guarantee food safety are well known. Identifying farm-level risk factors for condemnation are useful in order to find a way for farmers to potentially reduce their condemnation rates and to build a risk-based farm classification for veterinary services to target both meat inspection and farms inspections. To our knowledge, this has not yet been done, probably due to a lack of available meat inspection data.

A preliminary investigation was performed through a case–control study on 36 French farms, from a dairy production region to identify farm-level risk factors for high condemnation rates (i.e. more than 45% of cattle with at least one portion of the carcass condemned). Multivariable exact logistic regression was performed to take into account the small sample size. The final model identified two significant risk factors. The odds of having a high condemnation rate was at least twice as greater for farmers who did not adhere to the quality charter of an international retailer and was significantly higher when the most qualified worker on the farm had a degree in agriculture. This latter effect was unexpected and is reviewed in the discussion section. The protective effect of the quality charter could be explained by the annual control of farms performed to guarantee compliance with good farming practices in the adhering farms. It led us to believe that compliance with well known good farming practices could be a way for farmers to reduce their condemnation rates. This study is a preliminary investigation performed on a small sample size of farms that were mainly dairy farms. It is a first step for further investigations that need to be done on this topic at a larger scale to fill the current lack of knowledge.

1. Introduction

Cattle condemnations of whole or partial carcasses have a direct financial impact for farmers due to the amount of meat condemned and to reductions in the carcass price (INTERBEV, 2007). Obviously, farmers are interested in identifying farm-level condemnation risk factors for which preventive measures could be taken to decrease this financial impact. On the other hand, the meat inspection process, performed to guarantee food safety, is expensive due to the large number of inspectors needed and it can lack sensitivity (Dupuy et al., 2012a). In Europe, since 2011, all farmers must provide the slaughterhouse with a Food Chain

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Information (FCI), i.e. health information about their cattle in order to reinforce the inspection process (European Parliament, 2004). Since the nature and method of data transmission are not strictly defined at the European level, each country can define their own specifications. Identifying farm-level risk factors is therefore necessary if there is a will to perform a more in-depth inspection of cattle from the farms at risk to increase meat inspection efficiency as already suggested by Edwards et al. (1997).

Even if the importance of identifying farm-level risk factors for cattle condemnation for both farmers and public health authorities has clearly been identified, it was not until recently possible to go further due to a lack of meat inspection data availability. This issue is partly linked to logistical aspects (rapidity of the slaughtering process, high moisture level and temperature variations somewhat incompatible with IT equipment). In France, a pilot system named *Nergal-Abattoir* allowed the registration of meat inspection data in real time during the slaughtering process from 2005 to 2011 in ten cattle slaughterhouses (Dupuy et al., 2013). The implementation of a national meat inspection data collection is ongoing. Other countries such as Canada, Thailand, Finland, Denmark and Sweden had implemented meat inspection databases and started to use these data for surveillance purposes or to help farmers in their management practices (Kouvtanovitch et al., 2004; Tulayakul et al., 2008; Alton et al., 2010; Ruoho et al., 2010; Alton et al., 2012).

The use of meat inspection data for the identification of risk factors for condemnation at farm-level has already been done in poultry (Ansong-Danguah, 1987) and swine (Tuovinen et al., 1992; Merialdi et al., 2012) productions. In cattle, to our knowledge, no studies have been conducted to date at the farm-level except on specific diseases such as cysticercosis (Flutsch et al., 2008; Calvo-Artavia et al., 2013). However, we could hypothesize that management practices could have an impact on cattle condemnation rate as well as it has been identified for poultry or swine. At the animal level, Dupuy et al. (2012b) highlighted that the major risk factor of cattle condemnation was age, i.e. the risk for cattle to be condemned increases with age. Alton et al. identified that condemnation rates for cows were significantly higher (from 6 to 8 times) than for calves whereas heifers' condemnation rate was significantly lower than calves' one (from 1.4 to 3.2 times). Both studies were performed without taking into account condemnation reasons; the second one focused on whole carcass condemnation whereas the first one considered all types of condemnation (whole or partial condemnation). According to these results, the intra-farm proportion of slaughtered cattle among age category could be considered as a risk factor for condemnation.

The objective of this preliminary investigation was to evaluate if farm-level risk factors associated with a high condemnation rate in cattle could be identified.

2. Materials and methods

The rationale of the study was to compare farm-level risk hypotheses on farms with high and low levels of condemnation through a case–control study.

2.1. Study population

We selected farms from the *Rhône-Alpes* French administrative region. In France, since farmers do not send all their animals to a single slaughterhouse, we considered only farms which sent more than 60% of their animals to a slaughterhouse (called A) during the study period (from 23/11/2006 to 31/12/2010), with a minimum of 30 animals, in order to ensure a robust information regarding condemnation data for each farm. Data from the French national cattle identification register (BDNI) were used to identify farms that fit these inclusion criteria ($n = 182$).

2.2. Case definition

Condemnation rate, i.e. the proportion of cattle having at least one part of the carcass condemned at the farm-level, was the criterion used for case definition. This condemnation rate ranged from 1% to 65% and 80% of the farms had a rate lower than 45%. Case farms were randomly selected among the 80% ($n = 49$) with a condemnation rate higher than 45%, whereas control farms were selected among the 20% ($n = 133$) with condemnation rate lower than 45%. Information from the Nergal-Abattoir database on all cattle slaughtered from 23/11/2006 to 31/12/2010 at slaughterhouse A were used to identify farms that fit the case and control definitions. We planned to visit 20 control farms and 20 case farms. The number of farms was limited because of logistical and financial constraints.

2.3. Farm-level risk factor hypotheses

An initial list of farm-level risk factor hypotheses for cattle condemnation was created based on a scientific review and discussion among a group of both animal health and meat inspection experts. Due to both data availability (on farms or in existing databases) and the relevancy of certain risk factors as defined by the expert group, the list of risk factors was shortened. Farm-level risk factors included (1) general characteristics of the farm, e.g. farm size, number of workers per 100 cattle, professional breeding experience of workers on the farm, type of farm production, adherence to a quality charter, (2) management practices, e.g. cow housing, feeding management, field surface per animal, (3) slaughtering practices, e.g. number of different slaughterhouses to which the farmer sends its animals, slaughterhouse selection criteria. Breeding experience was based on the farm's duration of professional breeding activity.

2.4. Data collection

Farm data were collected through on-farm visits performed by a single interviewer between May and July 2012. A questionnaire was designed to investigate the list of farm-level risk factor hypotheses. It was previously tested to (1) evaluate the time needed to administer the questionnaire in real-life situations and (2) check the questionnaire's clarity and comprehension.

As farmers could refuse to participate in the survey or might be difficult to reach, the lists of control and case farms