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Health and welfare management of pigs based on slaughterline records

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Abstract

Health and welfare management of pigs are relevant issues to optimise productivity. Diseases and injuries are important elements when monitoring health and welfare. On farm, disease is assessed by observing symptoms and behavioural signs. Evaluation of injuries includes inspection of skin lesions and tail and ear wounds due to aggression or biting, respectively. However, these measures are taken in large groups, dirty animals or when insufficient light is available. These constraints may compromise sometimes reliability and feasibility.

At slaughter, carcass and viscera examination allow the evaluation of skin lesions, and tail and ear wounds, as well as the identification of diseases. As a result of infections, affected lymphatic nodes become swollen and abnormal in colour. Conditions such as pneumonia or porcine atrophic rhinitis have characteristic lesions. Validity and reliability are high. However, to be a feasible and valid method, carcass identification should be kept throughout the process.

Determination of acute plasma proteins (APPs) in blood after sticking gives valuable information on clinical and even subclinical disease on farms. Furthermore, several reports have suggested that APPs could be good indicators of animal welfare.

At the slaughterline, animals from several farms can be sampled on the same day, reducing the risk of disease transmission. However, to use the slaughterline records to improve health and welfare, a feedback system to the farm should exist.

Introduction

Society is increasingly concerned about health and welfare of farm animals. The origin of that concern seems to be a lack of transparency and reliable information about the way in which animal-based food products are actually produced. In order to include these aspects in animal production and achieve safe market products for human health resulting from welfare friendly systems (Main *et al.,* 2001), producers need to consider animal health and welfare management (von Borell, 2000).

On farm management may be assessed according to correct husbandry procedures and competent stockmanship, but also according to good records, written evidence of sanitary and welfare status of the animals (Scott *et al*., 2001). To be a valuable tool, the recording system need to monitor health and welfare in a valid, reliable and feasible way (Wemelsfelder *et al.*, 2001). The records need to collect information about the health and welfare of the animals in real time and be able to follow the evolution with continuous recording. Therefore, registrations should be carried out over several visits

to the herd to show development over time and seasonal changes in animal health and welfare.

Welfare

Raising animals intensively favours the occurrence of some welfare problems such as aggression and ear or tail biting. Aggression is a normal pattern of the pig social behaviour; however, if prolonged in time it impairs animal welfare due to two main reasons. First, aggressions may result in injuries, pain and in extreme cases, death of the animal. Second, aggressions lead to physiological stress, immunosupression and reduction of food intake (Fraser and Rushen, 1987). Potential sources of aggression are mixing of unacquainted animals, crowding or limited available space and access to a limited resource (e.g. feed).

Tail and ear biting are also considered a major welfare problem in pig production. It indicates pain and suffering of the bitten animal due to the biting itself and to possible secondary infections. Tail biting may also be stressful to the group and may indicate frustration of the biting animal (Schroder-Petersen and Simonsen, 2001).

Record of agonistic encounters either during feeding or in the pen, or tail and ear biting behaviours allows a valid evaluation of the welfare problems (Kelley *et al*., 1980; Ewbank and Bryant, 1972). If the observers are correctly trained, the inter observer reliability may be high. However, as it requires extensive and detailed observations and a large amount of time and work, its feasibility is low.

Clinical observations of wounds are valid indicators of these welfare problems (Leeb *et al.,* 2001). Several protocols have been developed to assess skin, ear and tail lesions. Wounds may be assessed according to number, location (head/neck, flank/back and hindquarters), nature (scratch or crust, opened wound, abrasion, blotch or haematomas), size and state of healing. Marks due to biting during fighting are scratches or cuts, 5–10 cm long, of comma shape and normally numerous and concentrated in a specific area (ScVC, 1997). Lesions on the head and shoulder area are caused by fights connected with social ranking (Jensen and Wood-Gush, 1984; Luescher *et al*., 1990, Barton Gade *et al*., 1996). Lesions on the rear part of the body may be caused by competition for food (Leeb at al., 2001) or by rough handling.

The incidence of injuries seems to be more reliable and feasible than behavioural observations, and therefore preferred. This is especially true when attention is focussed on the more severe wounds. However, when measures are taken in large groups, when insufficient light is available to inspect the pigs, dirty animals, when animals are lying, or if the lesion is underneath the animal (e.g. at udder) its reliability and feasibility may be compromised.

Health

Disease can be also regarded as an important welfare indicator, as it is associated with pain, discomfort or distress. Furthermore, diseased animals have very often difficulty in coping with their environment (von Borell, 2000).

Traditional health control consists in clinical examination, detecting behavioural changes or other clinical symptoms, and treating the affected animals (Rousing *et al*., 2000). Behavioural changes, such as abnormal lying (location, posture or duration) or loss of appetite, are in many cases the first evidence of the disease (Fraser and Broom, 1997). For example, depression and disorientation are features of Aujeszky's disease and encephalomyelitis. Other clinical symptoms include body condition, skin, ear, tail,

legs or feet lesions, lameness, laboured breathing, excessive salivation, vaginal discharge, frequent coughing, swollen joints, scouring and presence of external parasites (Fraser, 1984).

The early detection of the affected animals is crucial for the success of the management measures. To obtain valid and reliable records, the pigs must be inspected routinely at least daily, and the observer should be able to recognize the behavioural changes and clinical symptoms. Some signs of diseases, such as severe diarrhoea may be easy to appreciate, but other signs, that are not easy to observe, may be overlooked by the observer. In most of the cases, the examination of clinical symptoms needs the handling of the animals, or the animal to be forced to move. Pigs are not easy to handle and some detailed physical examination need to be deferred until the animal can be removed and inspected alone, delaying the inspection of the animal. For these reasons, clinical examination may be too time consuming, decreasing its feasibility.

The current intensively pig production favours the occurrences of subclinical diseases (Edwards *et al*., 1997). Environmental factors such as feeding, housing, husbandry and hygiene, play the most important role in the impact of the subclinical disease on the population (Edwards *et al*, 1997). Subclinical diseases compromise seriously productivity and profitability of farm animal production and impair meat safety. Pneumonia, atrophic rhinitis, arthritis, gastric ulcers, abscesses and zoonotic agents such as *Salmonella, Campylobacter* spp., *Clostridium perfringens*, and pathogenic serotypes of *Escherichia Coli*, for example E. coli O157:H7 have greatly increased in the pig population and are often present as subclinical diseases in apparently healthy pigs at slaughter (Vissier *et al*., 1992). Animals that are symptomless carriers of pathogens may not be detected by the classical clinical examination. When these animals arrive to the abattoir, they shed bacteria or virus that can infect other animals and cause cross contamination.

Logbook can also be used to record farm health and welfare. Attention should be paid on how the data can be verified. The reliability of registrations, both reproducibility (between observer variation) and repeatability (within observer variation) has to be considered very carefully. Furthermore, veterinary treatment records do not give a precise measure of diseases, and general data on growth and piglet production are not usually presented in a way which facilitates the identification of individuals with health problems. Therefore, animal health data are rarely easy to use (Sorensen *et al*, 2001).

Slaughterline records

At slaughter, carcass and viscera examination allow the evaluation of skin, tail and ear wounds, and the identification of diseases. Originally, post mortem inspection was designed to improve meat safety by detecting and removing cut or entire carcasses potentially hazardous to human health due to e.g. tuberculosis or cysticercosis (Edwards *et al*., 1997). Currently, post mortem inspection has gradually paid increasing attention to other areas that have no direct relevance for human health. This includes detection and eradication of certain diseases of livestock, assessment of animal welfare, and evaluation of productivity and meat and carcass quality (Van Logtestijn, 1993). Post mortem inspection involves visual examination, as well as palpation and incision of the carcass, viscera and certain lymph nodes following standardised methods.

Lesions

Skin damage and ear and tail wounds are assessed by visual inspection at the slaughterline. The assessment can be conducted as a whole or separately in different parts of the carcass, such as head/neck, flank/back and hindquarters. If the carcass is to be evaluated as a whole, the most common photographic scales used are the five point scale (from 1 = none to 5 = severe) provided by the Meat and Livestock Commission (1985) in the United Kingdom and the four point scale (from 1 = none to 4 = extreme) set up by the EU working group (Barton-Gade *et al*., 1996). The latter can also be used to score the incidence of blemishes in different parts of the carcass. Assessment of skin lesions at the slaughterline not only helps to determine number of marks on the carcass, but also may recognize the source (fighting, rough handling, overcrowding or poor facilities design) according to the anatomical location and damage type. Old wounds may be recognised as scars, and may be indicative of some animal welfare problem on the farm. Fresh wounds may indicate damage due to fighting during transport and lairage. However, the methodology to determine the time when the bruise occurred needs standardisation. If determination of the time can be achieved, the recording of skin lesions on the carcass may solve the difficulty of scoring skin lesions on farm (overcrowded pens, dirty animals, if the lesions are underneath the animal, if the animal is resting, poor light etc.) and increase its reliability and feasibility.

Catarrhal and fibrinous pneumonia, pleuritis, atrophic rhinitis, abscesses, ulceration, pericarditis and white spots in the liver are pathological findings that can be identified by postmortem inspection (Straw, 1986; Visser *et al*., 1992). These lesions are often present in asymptomatic carriers of pathogens. Therefore, post mortem inspection is needed to permit the identification of some subclinical diseases, which are impossible to assess with on farm clinical examination. However, this procedure will not reveal the presence of zoonotic agents such as *Salmonella* spp., *Yersinia enterocolitica*, *Campylobacter*, *Trichinella spiralis* or *Toxoplasma gondii*, as these infections may often be present without overt signs of illness and with no apparent macroscopic lesions. Therefore, in addition to carcass inspection, muscle, faecal samples, skin scrapings and blood samples taken during sticking could be useful tools to look for infections, parasites and viral diseases (Vissier *et al*., 1992).

As postmortem inspection procedure includes palpation and incision of lymph nodes and infected tissues, it can give rise to cross contamination. To avoid these problems, research has aimed at reducing the spread of any meat borne pathogens by minimizing carcass handling and number of incisions made during traditional meat inspection (Harbers *et al*, 1992). Following the same objectives, only visual inspection procedure, without any cutting or palpation of the carcass or organs, has been proposed by several authors as a replacement for traditional inspection (Willenberg *et al*., 1994; Harbers *et al*., 1992). They consider that with visual inspection alone, lesions can be detected with equal facility and, apparently, with no compromise (or lower compromise) for public health. It also reduces inspection cost. However, visual meat inspection will satisfactorily address some conditions but not all. Some lesions, such as those in the lymph nodes, may remain undetected following a change from traditional postmortem inspection to a visual system.

APPs

Blood or meat juice samples can also be used for the determination of acute plasma protein (APPs), that are produced in the liver and show a change in their plasma concentration after infection or inflammatory lesions (Eckersall, 2000; Petersen *et al*.,

2002; Geers *et al*., 2003). Haptoglobin is the most widely APPs used in pigs, mainly due to the availability of methods for its quantification (Piñeiro *et al*., 2003). The level of haptoglobin in serum has been recognised to be a valuable marker of clinical and even subclinical disease in farm animals (Knura-Deszczka, 2000). Petersen *et al*. (2001) were able to distinguish healthy, subclinically diseased and clinically diseased pigs by measuring levels of plasma haptoglobin. Lame pigs or pigs with tail or ear bite in Danish herds also showed elevated haptoglobin levels (Petersen *et al*., 2002).

The level of haptoglobin may act also as an integrative indicator for animal welfare related to tissue damage, indicating pain, fear, health or discomfort (Geers *et al*., 2003). APP has been used also to study the effects of transport and pre-slaughter handling on welfare (Manteca, 2003). The concentration of haptoglobin increases after stress induced by extreme temperatures or high stocking densities (Geers *et al*., 2003). Haptoglobin sampling in the slaughterline will be in the near future a relevant tool for integrative health and welfare assessment of slaughter pigs at individual level and for longitudinal monitoring at farm level.

Information regarding subclinical diseases and injuries can be more reliably and feasibly obtained from slaughterline records than on farm. If data are collected at the slaughterline, the visit to farms can be reduced, minimizing the risks of disease transmission. Furthermore, at the slaughterhouse, pigs from several farms can be sampled on the same day, reducing travelling costs. However, to be a feasible method, the carcass should be identified throughout the process.

Discussion

Systematic recording of several measures at slaughter can be regarded as an important complementary tool for the management of health and welfare (Christensen and Cullinane 1990; Elbers, 1991; Almond and Richards, 1992). Data collection at the slaughterhouse combined with information gathered on the farms (clinical signs, production and welfare indices) and at the laboratory, allow the development of a comprehensive database for health and welfare management. Such integrated systems have been proposed by several authors (Willeberg *et al*. 1984; Petersen *et al*. 1989; Ekesbo, 1992; Blocks *et al*. 1994). However, to be a valid, reliable and feasible tool, the slaughterline records should be taken at regular intervals, and a feedback system of information between the abattoirs and the farmers or their advisers should be in operation.

Effective health and welfare management depends on knowledge and information exchange between the various links of the production chain. The control of pathogenic microorganisms on meat must start on the farm. Abattoirs must have information about management and environmental factors of the farm of origin, for example disease history and medical treatments that might have an effect on its welfare and health status. This information would allow to differentiate, previous to inspection, animals that are unlikely to have any lesions and those that may, which will allow the meat inspector to give more time and effort to the examination of carcasses in which problematic conditions are suspected (Edwards *et al.,* 1997). In the current EC regulations, the owners of animals do not have to provide meat inspection authorities with any information that may be important for meat inspection, and they are not inclined to do so, because the disclosure may led to a more specific examination and the possibility that their animals may be condemned (Snijders *et al.,* 1989).

On the other hand, each farmer should receive feed back information, which means reports of the records with the prevalence of injuries and subclinical lesions, a hazard

analysis and, ideally, recommendations about how to solve the problems. Any effects of the transport such as the presence of Pale Soft Exudative (PSE) or Dark Firm Dry (DFD) meat or other defects such as fatigue or stress should be added to the previous information. Nowadays, data from the abattoirs are frequently not available to the farmers, or if available, are not in a form that allows their interpretation and use.

The success of the feedback system between the abattoirs and the farmers or their advisers, depends on the ability to trace foods of animal origin back to the production farm. The identification of live animals, either individually or at the farm level is becoming an increasingly important component of the health and welfare management.

Edwards *et al.* (1997) and von Borrel (2000) proposed the assessment of pig welfare and health according to the HACCP concept, as a basis for hazard analysis and quality-improvement programmes. Noordhuizen and Welpelo (1996) addressed also the principles of the HACCP concept in relation to animal health management strategy. According to these authors, the process control (expressed in terms of controlling both general and specific disease risk factors) and product control (expressed in terms of testing animals or animals products for specific disease agents) could be the basis for improving animal health. This involves the identification of risks during the whole production (on farm and at the slaughterline) so that they may be avoided, reduced or managed. If the whole production is continuously monitored, the control measures can be introduced promptly and effectively in response to either new hazards or altered risks, so that their impact can be eliminated or minimised before product safety and welfare are compromised. HACCP provides wide opportunity for preventive health action and risk management at a relatively low cost in terms of labour, finance and documentation expenditure, at both the farm and sector level. However, HACCP systems are not in general use on farms and other sites of primary production, although there is no reason why they should not be introduced to control the spread of pathogens and welfare problems.

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