

Pork safety and quality through livestock welfare: 1. Welfare of pigs on the farm

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Summary: In this paper the impact of animal welfare on commercial pig farms to pork safety and quality is widely discussed and analyzed. The variety of stressors associated with farm practices, such as animal health and nutrition, breeding and reproduction, housing and environment, their interactions, the inputs and outputs, is presented for both the determination of on-farm welfare indicators and the estimation of their effects on pork safety and quality. Risk analysis and HACCP principles are applied as a valuable adjunct to farm practice in order to organize the information and analyze the representation of physical processes in quantitative mathematical terms, so that welfare indicators can be evaluated and predictions can be made. Finally, this study concludes by supporting the decision making process at farm level oriented towards animal welfare and food safety and quality, with supporting farm experience and scientific literature.

Keywords: HACCP; indicators; assurance scheme; animal handling; food policy

Introduction: Welfare was defined by FAWC in the U.K. taking into consideration five freedoms: 1. Physiological freedom (absence of hunger and thirst) 2. Environmental freedom (adapted facilities) 3. Sanitary freedom (absence of diseases and fractures) 4. Behavioural freedom (the possibility to express normal behaviours) 5. Psychological freedom (absence of fear and anxiety). While this definition may be applied to a relatively long period of rearing (6 month for finishing pigs and 3 to 4 years for sows), enabling the animals to learn, it can hardly be applied before slaughter (e.g., fasting period, transport), especially in the last 24 h of the life of a pig, when the changes in the environment are many and fast. In these conditions, welfare of the pig may be defined as its state of stress (fear, anxiety) due to the new environmental factors to which is submitted. The safety and quality of animal products are strongly dependent on animal welfare (Pont and Maner, 1984). Animal welfare-related factors that may compromise the safety of raw products include microorganism contamination and product content in antibiotics, pesticide and other chemical residues, environmental pollutants (heavy metals), etc. In the fresh meat production poor welfare results both in loss of yield and sales through pork quality defects (P.S.E. and D.F.D meat). Despite the fact that field research in animal welfare on the farm has received considerable attention in recent years and considerable progress has been made, important and fundamental questions concerning the relationships between animal welfare and food safety and quality still remain open. Moreover, there is a lack of on-farm assurance indicators enabling the integration of behavioural, physiological and productivity parameters, so that their effects on the safety and quality of animal products could be estimated (Sossidou, 2002).

The purpose of this study is to identify the on-farm hazards, which potentially result in poorer safety and quality meat.

Materials and Methods: Hazard Analysis and Risk Analysis are used to identify the on-farm hazards (Mortimore and Wallace, 1994, Jensen and Unnevehr, 1999, OIE, 2002). The data were derived from the preliminary surveys of an Integrated Project submitted to the EC 6th Framework Programme for the Research and Technological Development in the thematic priority of Food Quality and Safety (FP6-2002-FOOD-1-Proposal No 506414), relevant literature and other sources, including expert opinions, personal interviews and farm experiences gained over the last year during a post-doctoral thesis

on Farm-Animal Welfare in Greece founded by the State Scholarships Foundation.

Results and Discussion:

I. Pork safety and quality can only be assured on farm by a holistic farm approach to managing animal well-being. This approach requires multidisciplinary inputs in order to be successful since it involves many aspects of veterinary and animal production science. The development of practical and reliable welfare measures for health and nutrition, breeding and reproduction, animal husbandry, housing and environment on pig farm are therefore required.

II. From our preliminary studies, it became evident that a strong link between husbandry factors exists, such as stocking rate, environmental stressors, sanitation, and meat safety although these factors are rather interactive than additive. Factors which have been demonstrated to be influential in improving health and performance and reducing risks include selection of high health stock, maintenance of health barriers, vaccination strategy, multi-site production, depopulation and cleaning of buildings, all-in all-out procedures within housing systems, appropriate cleaning and disinfection between batches to reduce carryover of infection, diet quality, air quality, thermal environment, airflow pattern, reduction in stress from overstocking, relocation, poor handling and social regrouping.

III. Like other areas of policy, assessment of farm animal welfare and food assurance policy must include considerations of legal, ethical, economic and technical aspects (Bennett, 1996, Sandoe and Simonsen, 1992). Science may be able to determine what constitutes better or worse welfare for animals from a biological point of view, but it is a collective decision of society that determines what is considered to be "good" or "bad" animal welfare from an ethical perspective, i.e. what is considered to be acceptable or unacceptable in relation to livestock production practices and handling of animals. On the other hand, concerns about farm animal welfare may also vary considerably throughout the European Union, as related to ethics, socio-economics, legislation, training and information. Statistical data on these differences are therefore of enormous importance.

IV. Pig enterprises pose additional problems because of their production cycle that tends to be more integrated and long term, making isolation of individual cohorts of animals less easier in practice. To introduce animal welfare considerations into the pig industry, it is necessary to face these challenges, in order to resolve uncertainties concerning the exact nature of pig welfare requirements and identify the ways these requirements can be fulfilled under commercial conditions as well as to provide scientific data to help ensuring that decisions are not taken on the basis of subjective or emotional considerations (Sossidou et al., 2003). Concepts for systematic product safety control have been developed and applied in the food industry [HACCP, SSM (Supportive Safety Measures)]. Such approaches can be readily modified for application on farm (Defra, 2003).

IV. Regarding the indicators already drawn up, a number of organizations (Cost Report, 2003), both national and international, have tried to produce an index depicting the fulfillment (or not) of the animal welfare issues on the farm and therefore the production of safe and high quality products. Anyway, across Europe, the objectives for Food Safety and Quality have already been adopted to the Regulation 178/2002/EC.

Conclusions :

- A holistic farm approach approach is required for the identification and the assessment of pig welfare on the farm and its effects on the safety and quality of pork meat.
- It is important to include considerations of legal, ethical and economic aspects in animal welfare research.
- The HACCP concept should be readily modified for on-farm implementation.
- The development of objective data is required for the assessment of on-farm welfare

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EFFECT OF PRE-SLAUGHTER HANDLING AND SEROLOGY ON *SALMONELLA* IN PIGS

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Summary: This study investigated the combined effect of herd sero-prevalence, time-off-feed prior to slaughter and transport distance to the abattoir on *Salmonella* spp. infection in slaughter pigs under Australian marketing scenarios. Ten herds situated either < 125 km or > 500 km from the abattoirs were monitored at slaughter over a 12-month period both serologically (Australian *Salmonella* spp. mix-ELISA) and by caecal culture. On 4 occasions (seasonally) each farm withdrew feed from three groups of slaughter pigs so they were off feed for 12-18 hours, 18-24 hours and >24 hours prior to slaughter, including transport and lairage times. For herds <125 km from the abattoirs, *Salmonella* spp. infection decreased significantly with an increase in the period between last feed and slaughter. For herds > 500 km from the abattoirs, *Salmonella* spp. infection increased significantly with an increase in the period between last feed and slaughter, other factors apparently overriding the protective effect of fasting. Herd sero-prevalence was not a significant risk factor for caecal positivity.

Keywords: Australia, time-off-feed, transport distance, sero-prevalence, caecal

Introduction: This study investigated the ecology of the major foodborne hazard, *Salmonella* spp. during the period immediately leading up to slaughter. The association between herd sero-prevalence and culture positivity at slaughter has already been established (Dahl and S. erensen, 2001). Rather than duplicating that work, this study aimed to evaluate the relative contribution