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HACCP-based program for on-farm food safety for pig production in Australia

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ABSTRACT

The standard Codex HACCP approach was modified to allow a hazard analysis and critical control point determination to be conducted at an industry level and then used to determine the appropriate on-farm food safety control measures for pig production in Australia. A detailed risk-based profile with hazard identification, hazard characterisation and levels of microbial contamination for production and primary processing was used as a major technical resource to inform HACCP determinations. The process resulted in the identification of Critical Control Points for control of a specific physical hazard (non-recovered broken needles) and prevention of violations of Maximum Residue Limits with agricultural and veterinary chemicals. In relation to the identified microbiological hazards, it was noted that there are numerous Good Agricultural Practices (GAP) to prevent and/or reduce their risk and these controls would also need to be a feature of any on-farm food safety program. By applying a HACCP-based approach it was determined that the application of a set of Good Agricultural Practices on-farm would be effective in ensuring low risk. It was, therefore, concluded that on-farm food safety programs may not warrant full (i.e. Codex compliant) HACCP plans at the individual enterprise level provided appropriate GAP is in place. The results provide pig producers and the Australian pig industry with the elements of a HACCP-based food safety system that are scientifically justifiable, understandable and realistic to apply. These features are essential elements that underpin successful implementation and compliance by industry.

1. Introduction

Until the early 1970s the size of the Australian national pig herd had remained fairly stable with most farms being farrow-to-finish i.e. the entire pork production cycle. However, since then the number of producers has dropped from approximately 39,000–1900 in 2007, with nearly an additional 500 producers growing out pigs that have been sourced from other pig production enterprises (Australian Pork Ltd, 2008). In 2007, there were 5.3 million pigs slaughtered for human consumption with pig meat production at approximately 377,000 t (Australian Pork Ltd, 2008). The estimated Gross Value of Production (GVP) for Australian pork production was $944 million for the period 2006–2007 (Australian Bureau of Statistics, 2008) decreasing to $895 million for the period 2007–2008 (Australian Bureau of Statistics, 2010). The Australian pork industry services the entire domestic fresh pork market and approximately 40% of the domestic processed market.

Australia is both an exporter and importer of pork, with Singapore, Japan and New Zealand being the main export markets. Canada, Denmark and the United States account for 99% of imported pork. With exports decreasing to 45,500 t (value $142.6 m) and imports increasing to 106,900 t (value $445 m) in 2008 (Australian Pork Ltd, 2008), Australian pork producers must ensure they remain competitive in the global market.

Generic frameworks for managing foodborne risks to human health have been proposed by the Codex Alimentarius Commission (2002). These principles are reflected in the Code of Hygienic Practice for Meat (Codex Alimentarius Commission, 2005). They require consideration of risk management of hazards prior to slaughter and during processing, based on the application of HACCP (Codex Alimentarius Commission, 2003b). Subsequently, in 2003, the Australian red meat industry undertook a risk profile (Codex Alimentarius Commission, 2003a) and a modified Codex HACCP approach to determine appropriate on-farm food safety controls and an underpinning of the industry's on-farm food safety programs (Horchner, Brett, Gormley, Jenson, & Pointon, 2006). Consistent with this approach, a risk-based profile of Australian pork products was developed to provide the background information (Pointon & Horchner, 2010) required to develop this on-farm HACCP plan. In this context the risk-based profile report provided technical rigour for the hazard analysis (Principle 1) of a HACCP-based system for the pork primary production sector.

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The purpose of this paper is to describe the application of HACCP at an industry level to determine appropriate on-farm food safety control measures applicable at the enterprise level for pig production. While the Australian Pig Industry Quality (AQIS, 2009) and PigPass quality assurance programs officially meet the requirements for on-farm control programs for chemical residues there is no formal package of controls for microbial hazards which has independent review or audit. Furthermore, in the current development of national Primary Production and Processing Standards for meat by Food Standards Australia New Zealand (FSANZ), *Salmonella* spp., *Yersinia enterocolitica*, *Campylobacter jejuni/coli* and *Toxoplasma gondii* have been identified as hazards associated with pork (FSANZ pers. comm.). This paper provides the technical basis for the national pork industry's primary production food safety program.

2. Methodology

2.1. HACCP approach

The term 'HACCP plan' implies that Codex HACCP methodology should be used (Codex Alimentarius Commission, 2003b) with the first step being the formation of a HACCP team. The HACCP team modified the conventional approach to preparation of a HACCP plan (Codex Alimentarius Commission, 2003b) in order to meet the needs of this project. Specifically, since HACCP had to apply to a large number of pork producing enterprises, its application was at an overall livestock sector level rather than an individual enterprise level. In addition, consideration was given to control measures and interventions further along the food chain that deal with hazards identified as being introduced on-farm, where applicable (Pointon & Horchner, 2010). The HACCP plan had to be broad enough to cover all enterprises and therefore, specific aspects may not necessarily pertain to a given enterprise. The team took a rigorous approach to the application of HACCP following the 'Logic Sequence for the Application of HACCP' (Codex Alimentarius Commission, 2003b).

The study addressed recognised and potential food safety hazards that can cause disease as a result of eating pork or pork products. Foodborne hazards considered included biological hazards, including attributes related to wholesomeness (microorganisms, gross carcase abnormalities), and physical (foreign objects and materials) and chemical agents (natural toxins, residues, heavy metals) with the potential to cause adverse health effects. Biological hazards included microbiological (e.g. *Salmonella*) and gross carcase lesions (i.e. abnormalities resulting from organisms or pathology associated with certain animal parasites and disease). Chemical hazards included heavy metals, biological toxins and residues from farm chemicals in the environment and/or in processing including those with an established Maximum Residue Limit (MRL) and/or Export Slaughter Interval (ESI) in place. Physical hazards considered were those which may enter during the production phase, especially broken needles. Potential hazards included those that may result in public health, social and/or economic impact but for which epidemiological evidence is lacking e.g. chemicals and toxins (OECD/WHO, 2003). Food safety threats to market access may or may not be valid hazards, but are potential technical barriers to trade (e.g. certain chemical residues that have no known adverse health effect). Stock feeds possibly containing genetically modified (GM) grains were not an issue at the time of conducting this study but were recognised by the HACCP team as an emerging issue which may need to be reconsidered in the future.

2.2. HACCP team (Step 1)

In order to develop the HACCP plan an experienced HACCP team of seven members with specialist training in HACCP methodology, veterinary public health, microbiology, epidemiology of foodborne diseases, pig production and pork processing was assembled. Members of the team were selected on the basis of having experience in the development of HACCP systems for a range of food and agricultural commodities, implementation of hazard prevention procedures, the application of risk assessment, associated food safety research, auditing food safety systems and livestock production including pigs.

2.3. Scope, product description and intended use (Steps 2 and 3)

The scope of this HACCP study was limited to production of pigs for Australian and international markets with the intended use of meat consumption by the general population. It covered the process from inputs (animals, feed, water, treatments, site, husbandry practices) through to dispatch from property (Fig. 1). It also covered diverse production systems with respect to bedding and housing. Transport is covered by sector specific programs and was not within the scope of this study. The hazards of interest were identified as well as potential foodborne hazards and threats to market access linked to the production of pigs intended for human consumption (Pointon & Horchner, 2010). The scope of the hazard analysis also included steps beyond the on-farm livestock production process including downstream processing operations as recommended by Codex (Codex Alimentarius Commission, 2003b). Account was taken of the existence, or otherwise, of effective downstream control/reduction measures for hazards identified on-farm, but did not include interventions available to consumers (e.g. cooking). The HACCP plan was intended to provide technical underpinning for on-farm food safety programs for the Australian pig industry.

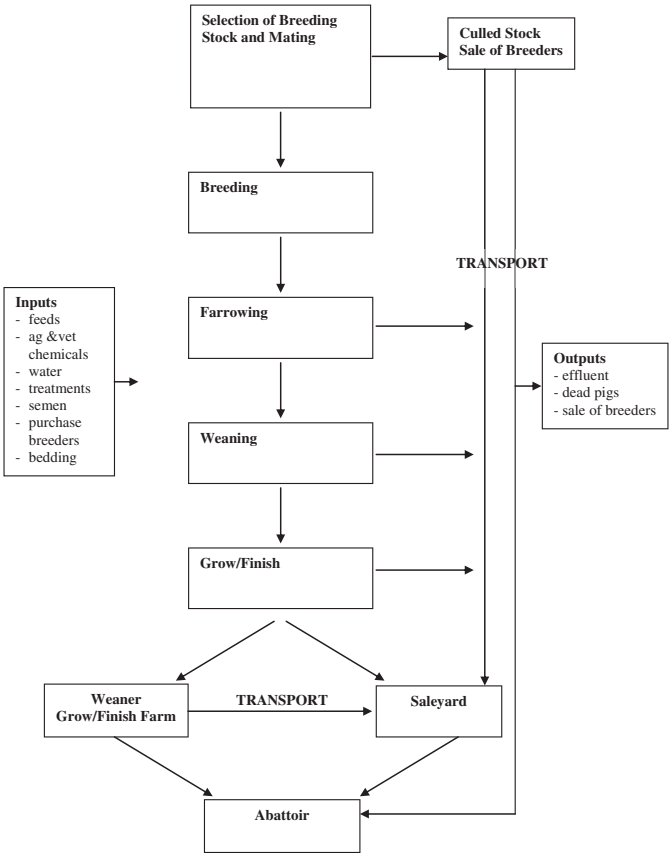

Fig. 1. Overview of pig production processes.