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Iberian pig raising: Animal health and food safety

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Abstract. Food safety – the ensuring that foods are safe, healthy and of high quality – is an essential feature of food manufacture, and animal health one of the most important features of stock-raising. The 2007-2013 strategy of the European Union promotes animal health via the prevention and/or reduction of the incidence of certain animal diseases with the aim of guaranteeing public health and food safety. The control of animal disease is therefore vital, especially of infections/infestations that are transmissible (either directly or indirectly) to humans (zoonoses). As part of the projects, “Saniberico 08/222” (Corporación Tecnológica de Andalucía, Consejería de Innovación, Ciencia y Empresa, Junta de Andalucía) and “IDI-20090414” (Spanish Ministerio de Ciencia e Innovación), we undertook the study “Assessment and improvement of Iberian pig health and food product safety” to determine the design needs for an animal health and food safety program based on HACCP, with special attention paid to Salmonella, Brucella, Toxoplasma and Trichinella. In this communication the results of this pioneering research project in our country are presented and shared with researchers from the international scientific community, with the final aim of promoting and spread information about food safety and quality excellence of products derived from the Iberian pig.

Keywords. Iberian pigs – Zoonoses – Animal health – Food safety.

Santé animale et sécurité alimentaire chez le porc Ibérique

Resumé. La sécurité alimentaire – la garantie que les aliments sont sûrs, sains et de haute qualité – est une caractéristique essentielle de la fabrication des aliments, et une des caractéristiques les plus importantes de l'élevage. La stratégie 2007-2013 de l'Union européenne favorise la santé animale par le biais de la prévention et / ou la réduction de l'incidence de certaines maladies animales dans le but de garantir la santé publique et la sécurité alimentaire. Le contrôle des maladies animales est donc essentiel, en particulier des infections / infestations qui sont transmissibles (soit directement ou indirectement) à l'homme (zoonoses). Dans le cadre des projets “Saniberico 08/222” (Corporación Tecnológica de Andalucía, Consejería de Innovación, Ciencia y Empresa, Junta de Andalucía) et “IDI-20090414” (Ministère de la Science et de l'Innovation de l'Espagne), nous avons entrepris une étude pour “l'évaluation et l'amélioration de la santé du porc Ibérique et la sécurité des produits alimentaires” pour déterminer les besoins de conception d'un programme de santé animale et de salubrité des aliments basé sur le HACCP, avec une attention particulière à Salmonella, Brucella, Toxoplasma et Trichinella. Dans cette communication, les résultats de ce projet de recherche, pionnier dans notre pays, sont présentés et partagés avec des chercheurs de la communauté scientifique internationale, dans l'objectif final de promouvoir et de diffuser des informations sur la sécurité alimentaire et l'excellence de la qualité des produits dérivés du porc Ibérique.

Mots-clés. Porc Ibérique – Zoonoses – Santé animale – Sécurité alimentaire.

Food safety – the ensuring that foods are safe, healthy and of high quality – is an essential feature of food manufacture, and animal health one of the most important features of stock-raising. The 2007-2013 strategy of the European Union promotes animal health via the prevention and/or reduction of the incidence of certain animal diseases with the aim of guaranteeing public health and food safety. The control of animal disease is therefore vital, especially of infections/infestations that are transmissible (either directly or indirectly) to humans (zoonoses).

Attempts to establish surveillance and control measures for zoonotic diseases in Iberian pigs could improve the safety of their products. For such systems to be put in place, information is required on the current disease status, as well as the risk factors for disease, the critical steps in

the food manufacturing chain, and the interactions of these variables. Practical, effective control strategies adapted to the peculiarities of Iberian pig production are also required.

The raising of Iberian pigs in the dehesa ecosystem (grassland plus Mediterranean oak), where acorns are a major part of the diet, exposes these animals to environmental conditions that favour the dissemination of pathogens, the control of which is difficult. In these extensive or semi-extensive systems the animals are in close contact with one another, with the environment, and with other animals, particularly rodents, peridomestic animals, and wild animals such as foxes, wild boar and birds. Together, these can play important roles in the epidemiology of *Salmonella* spp., *Campylobacter* spp., *Brucella* spp., Aujeszky's disease, classical swine fever (CSF), African swine fever (ASF), tuberculosis, etc. The recent outbreaks of ASF in Europe posed a serious threat to Iberian pig raising; if the disease had not been controlled it could have entered the dehesa system and been maintained among wild boar. Disease among pig stocks would have led to the sector suffering marketing restrictions.

Iberian pigs farms have different structures, ranging from small or family interests (sometimes with very deficient infrastructures) to exploitations with high zootechnic performance and very good infrastructures. Adequate perimeter fencing and 'health firebreaks' play a vital role in preventing the entry and dissemination of pathogens, yet only 35% of farms are thus protected.

The structural diversity of Iberian farms, and the many small exploitations that exist, is reflected in the diversity of animal health programs in operation. Some studies report that over 40% of farmers have no animal health program in place at all, vaccinating none of their stock against any disease. In the remaining farms, vaccinations against at least two diseases are provided, usually against erysipelas and pasteurellosis. The latter two diseases plus parvovirus, clostridiosis, colibacillosis, PRRS, Aujeszky's disease (officially included in the Spanish National Plan for the Eradication of Animal Diseases) and infection by *Mycoplasma* spp. form the range against which animals are usually protected.

Health status is one of the most important variable costs to affect the performance of exploitations; poor health prevents animals reaching their maximum productive potential since it influences their feed intake, daily weight gains and feed conversion indices. Clinical disease incurs direct costs associated with medicines and vaccines, etc., while subclinical infections generate indirect costs via the reduction in main daily weight gain, greater protein and energy needs, and poorer metabolism. In some cases it is also associated with losses occasioned by rejection at slaughter.

The wide infrastructural and health status diversity of Iberian pig farms renders it very difficult to determine the incidence of different diseases in this industry. However, some epidemiological data are available, showing that Aujeszky's disease is present on 15% of exploitations, and that at least 20% of Iberian pigs suffer erysipelas (the causal agent *Erysipelothrix rhusiopathiae* remaining latent in these animals' tonsils). The incidence of other infections/diseases can be estimated via the diagnosis of clinical processes in animals, although it should be remembered these data are available only when clinical episodes are recognised.

Clinical processes should be classified according to the clinical problems they cause, e.g., miscarriages, respiratory problems and intestinal problems. *P. multocida*, either alone or in conjunction with other pathogens, is the main agent involved in clinical respiratory problems. *E. coli* and *Cl. perfringens* type C are common causes of intestinal disease in piglets, while in fattening pig's parasites and porcine dysentery are the major problems. Underlying infection with porcine circovirus type 2 (PCV-2), an immunodepressing pathogen, can cause the incidence of respiratory and/or intestinal infections to increase. Reproductive problems in Iberian pigs are mainly caused by viruses, e.g., parvovirus. *Chlamydia* spp. and leptospirosis are also responsible for miscarriages.

The guts of animals are the main reservoir of *Salmonella*, although usually there are many carriers but few sufferers of disease. *Salmonella* is able to multiply over a wide range of

temperatures and to survive long periods in water and organic substrates such as manure. This persistence in the environment provides a source of contamination for birds, rodents and arthropods, etc., which then contribute to the indirect maintenance of the bacterium in farm animals and its circulation among them.

Within the framework of the project "Saniberico 08/222" (Corporación Tecnológica de Andalucía, Consejería de Innovación, Ciencia y Empresa, Junta de Andalucía), our group studied the prevalence of *Salmonella* in Iberian pig farms in southern Spain in 2008/09, making checks at slaughterhouses. The pigs involved came from 81 farms, 67 of which were free range (as classified by Spanish Royal Decree 1469/2007). A wide diversity of serotypes and phagotypes was detected. The prevalence data showed low infection indices (5.3% of animals positive), although 33% of the farms carried infected animals. The most common serotypes were Anatum and Typhimurium. A number of uncommon serotypes were also isolated, such as Hessarek and Mikawasima, associated with wild animal reservoirs such as foxes, rodents and wild birds (turtle doves, doves, corvids). The isolated strains were subjected to testing against 16 antimicrobial agents and showed only low-level resistance, except against streptomycin (46%), tetracycline (30%), sulphonamide (25%) and ampicillin (23%). The number of multi-resistant strains (i.e., resistant to ≥ 4 agents) was moderate (36%). The prevalence figures quoted above are similar to those reported by our group for intensively-raised white pigs, although with significant differences in terms of serotypes, phagotypes and microbial resistance.

During 2009-10, we examined 709 serum samples from 10 Iberian pig farms with different systems (acorn feed, mixed feed, and commercial feed). These samples were obtained at slaughter and kept at -20°C until their analysis using different commercial ELISA kits to detect *Brucella*, *Salmonella*, *Toxoplasma* and *Trichinella*. *Salmonella* infection and *Toxoplasma* infestation were found to be amply distributed among the studied farms (73% and 54%, respectively); no such findings were made for the other pathogens screened (e.g., *Brucella* 3.8% and *Trichinella* 0%).

Campylobacter spp. also causes zoonoses. The main reservoir for this pathogen is the digestive tract of wild and domestic mammals and birds, which, via their faeces, contaminate the ground and water sources. *Campylobacter* shows the ability to persist in water.

Other infections of Iberian pigs include those caused by mycobacteria, *Rhodococcus equi*, *Streptococcus* spp., *Staphylococcus* spp. and *Arcanobacterium* spp. All of these can cause chronic caseous or purulent lymphadenitis (granulomas/pyogranulomas), affecting the lymph glands and viscera. Signs of infection are also visible in carcasses after slaughter, leading to their rejection and economic losses. Although the prevalence of these processes can vary widely from one farm to another, it is estimated that up to 50% of all rejections are owed to this type of lesion. Infection by the above agents, which is considered very infrequent in commercial pigs, is facilitated in free range Iberian pigs by the conditions on extensive and semi-extensive farms, i.e., through contact with wild animals acting as reservoirs of these pathogens.

Many of the above diseases are zoonotic in nature, but while they may be subclinical in animals they can be of great public health importance. It is therefore important to understand the current disease status of each and to establish risk factors and identify critical points in the food manufacturing chain (farms, slaughterhouses and the meat industry).

As a primary health requirement, Iberian pig farms should aspire to be free of notifiable diseases such as swine flu, porcine dysentery, PRRS, and those caused by *Salmonella*, *Actinobacillus pleuropneumoniae*, *Mycoplasma hyopneumoniae*, *Leptospirosis*, PCV2, *Bordetella bronchiseptica*, *Pasteurella multocida*, *Chlamydiophila psittaci* and *Ascaris suum*, as well as porcine proliferative enteritis.

Finally, all forms of Iberian pig farms (acorn feed, mixed feed and commercial feed) should undertake the following:

In the area of animal health:

- 1.- The detection of common diseases and production deficits.
- 2.- The implantation of preventive medicine programs that guarantee animal health and profitability.
- 3.- The implantation of biosafety measures, including protocols to verify these measures, appropriate for the different types of farm, aimed at optimising mid-long term animal health.
- 4.- The selection of health-certified replacement animals.

In the area of public health:

- 1.- To determine the presence of zoonoses of particular interest to public health (salmonellosis, listeriosis, tuberculosis, brucellosis, campylobacteriosis, trichinellosis, toxoplasmosis, echinococcosis, cysticercosis), as well as pyrogranulomatous processes caused by *Archaeobacterium* and *Rhodococcus*. The diffusion of these problems in herds should be checked.
- 2.- To design a pre-slaughter program for the improvement of animal health and food safety based on descriptive epidemiological studies of potential zoonotic agents, hazard analysis and the identification of critical control points (HACCP), and the establishment good hygienic practice codes throughout the food production chain.

As part of the projects 'Saniberico 08/222' (Corporación Tecnológica de Andalucía, Consejería de Innovación, Ciencia y Empresa, Junta de Andalucía) and 'IDI-20090414' (Spanish Ministerio de Ciencia e Innovación), we undertook the study "Assessment and improvement of Iberian pig health and food product safety" to determine the design needs for an animal health and food safety program based on HACCP, with special attention paid to *Salmonella*, *Campylobacter*, *Listeria*, *Brucella*, *Toxoplasma* and *Trichinella*.