



Characterization of backyard poultry production systems and disease risk in the central zone of Chile

C. Hamilton-West^{a,*}, H. Rojas^b, J. Pinto^c, J. Orozco^a, L.P. Hervé-Claude^d, S. Urcelay^a

^a Department of Preventive Veterinary Medicine, Faculty of Veterinary Science, University of Chile, Santiago, Chile

^b CERES, Biosecurity and Food Quality Services, Santiago, Chile

^c Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases/Global Early Warning and Response System for Major Animal Diseases, Including Zoonoses (EMPRES/GLEWS), Animal Health Service, Food and Agriculture Organization of the United Nations, Rome, Italy

^d Department of Biometry, Epidemiology and Information Processing, WHO-Collaborating Centre for Research and Training in Veterinary Public Health, University of Veterinary Medicine, Hannover, Germany

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ABSTRACT

Backyard poultry production systems (BPS) are an important and widespread form of poultry production. There is a common perception that biosecurity standards in BPS are generally poor and BPS are usually associated with animal diseases and zoonoses. In this study BPS were identified in the vicinity of six wetlands, having these a higher risk of presenting and introducing avian diseases such as HPAI and Newcastle disease, as defined by the national veterinary services, in to Chile's main poultry production area.

BPS were characterized through a field questionnaire and the main areas covered by the survey were BPS structure, biosecurity and value chain. The BPS identified in this study share most characteristics on biosecurity, poultry management and product commercialization, but it was possible to identify a certain degree of variation within and among the study sites. BPS in Chile are similar to those in other regions, with a relatively small flock size (average 37 birds), a low level of biosecurity measures and lack of poultry disease management. Management findings include that most farmers used mixed/partial confinement, with low or no biosecurity and disease control measures in place. Eggs were the main output and were used mainly for home consumption or sale at local markets. Sick birds' treatment with drugs approved for other species or for human use could represent a risk to human health, owing to the possible presence of drug residues in poultry products.

Despite the different structures of the poultry sector worldwide, BPS can play a major role in disease maintenance and spread because its management conditions characteristics and the lack of animal health services adapted to these production systems. This should be an alert message to the veterinary authorities to improve coverage of veterinary assistance and surveillance activities in backyard poultry production.

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Backyard poultry production is the most widespread form of poultry keeping in the world (FAO-OIE-WorldBank, 2008), being an important component of small farmers' livelihoods and a tool for poverty alleviation (Dolberg, 2007; Sonaiya, 2007). Birds are kept in a low input/low output system, with the available scavenging feed base supplemented with food scraps and grains. Birds and their by-products are usually consumed by their owners, sold locally and used as gifts (FAO, 2005; FAO-OIE-WorldBank, 2008).

The issues described represent favorable conditions that make BPS more susceptible to receiving and spreading infectious

diseases such as HPAI and Newcastle disease (FAO-OIE-WorldBank, 2008), since they represent the interface where interaction between domestic backyard birds and wild birds occurs (Henning et al., in press). Furthermore, the majority of backyard poultry households do not apply basic hygiene and biosecurity measures, with a potential risk posed by animal diseases to humans. Sick birds may be handled, sold, slaughtered and consumed without considering that the infections that made the chicken sick may also potentially be harmful to man (Iqbal, 2009).

The Chilean poultry sector had improved its production and standards by the early 1990s, covering all internal demand and including exports of poultry products (APA-ASOHUEVO, 2006). This development relies on Chilean sanitary situation, where major avian diseases are absent. The last outbreak of a major avian disease in Chile occurred in 2002, when H7N3 HPAI affected two poultry farms in Valparaíso region. This event was successfully eradicated by the

* Corresponding author. Address: Department of Preventive Veterinary Medicine, Faculty of Veterinary Science, University of Chile, Santiago, Av. Santa Rosa 11735, La Pintana, Chile. Tel.: +56 2 978 5578; fax: +56 2 978 5659.

E-mail address: christopher.hamilton@veterinaria.uchile.cl (C. Hamilton-West).

coordinated action between public and private sectors (Rojas and Moreira, 2006).

Poultry production in Chile is highly integrated at both geographical and industrial level. For the poultry meat sub-sector there are only seven companies/industries covering the full market value chain (MVC), and operating with high biosecurity standards. Approximately 95% of poultry meat production is located in the central zone of Chile, including the regions of Valparaíso, Libertador General Bernardo O'Higgins (LGB O'Higgins) and Metropolitan. For the poultry layer sub-sector, there are 173 companies/industries involved, with over 75% located in the central zone of Chile (APA-ASOHUEVO, 2006). This broad geographical zone can, therefore, be considered as Chile's main poultry production area (MPPA). As opposed to the meat sub-sector, farm size within the poultry layer sub-sector is diverse, and not all farms incorporate the full MVC. It is also possible to find differences in biosecurity levels. BPS within the MPPA were estimated at 14,179 units and the population of backyard birds at 418,809 (Hamilton-West et al., 2007, 2009). However, there is no information available on the characteristics of this poultry sub-sector.

The aim of this study is to collect information to characterize the poultry flock structure, biosecurity conditions and market value chain of BPS present in the Chilean MPPA.

Six study sites were selected within Chile's MPPA, since were considered as priority risk zones avian disease introduction by the official veterinary service (SAG, 2006). The sites are mainly coastal wetlands where migratory birds arrive every year and share their habitat with local wild birds (Tala, 2006). Study sites spatial distribution is presented in Fig. 1.

All of the BPS were identified within a radius of at least 5 km from each wetland centroid or 3 km from its borders. Information regarding BPS structure, biosecurity and MVC was gathered by semi-structured interviews with smallholders. The interviews were performed between December 2007 and June 2008, by trained veterinary medicine students of the University of Chile.

Descriptive statistics were provided to characterize the BPS, taking into consideration structure, biosecurity and trade relation-

ships. Comparisons between categories of quantitative variables were made by analysis of variance tests and for categorical variables, significant differences were calculated at 5% error using the Chi-square test (Dohoo et al., 2010).

One hundred and seventy-five BPS were identified and all of them were surveyed, representing the total BPS in the proximity of the six study sites. The sites where it was possible to identify a greater proportion of BPS were 'Aconcagua-Mantagua' and 'El Yali' wetlands, together representing 64% of the BPS. The average BPS size was 37.4 birds (SD = 32.8), taking into account all the different species. There were no statistical differences between the number of birds bred in BPS belonging to different study sites ($P = 0.33$). The highest flock sizes were found in "Batuco" and "Aconcagua-Mantagua" areas, with an average of 52.3 and 40.7 birds, respectively. Most of the BPS owners declared that the number of birds on their premises was constant throughout the year (63.4%), followed by those who identified an increase in the bird population in spring–summer (32.6%) or in autumn–winter (4%).

Eighteen percent of BPS bred more than one bird species, including turkeys, ducks and geese. The most common species was domestic chickens present in 93% of the BPS. Wild birds, such as *Turdus falcklandii*, *Molothrus bonariensis*, *Curaeus curaeus* and *Diuca diuca*, were kept as pets in some BPS (3%).

Women managed the 68% of the BPS, men 18%, and in the remaining 14% the responsibilities were shared between men and women. All BPS had external fences and three types of bird confinement were identified: (a) permanent confinement, (b) free-range (no confinement), and (c) mixed confinement, with birds kept free-range during the day and in pens at night. The differences found in the proportion of those confinement strategies were significant ($P < 0.01$), where mixed confinement was the prevailing system (Table 1). In most of the BPS (97.7%) it was possible to identify that visitors could come into contact with backyard birds and that there were no disinfection procedures employed prior to entering or before leaving a farm. In BPS where visitors had no contact with birds, it was because birds were kept in permanent confinement; although also on those farms there were no entry or exit disinfection measures in place.

No BPS farmers had any formal training in disease recognition. Their knowledge was based purely on experience and shared knowledge among neighbors. In most BPS (72%), no health management of any type was performed and no treatment of sick birds or preventive procedures were applied. However, in the group practicing health management, 71.4% had had some sort of medical advice from veterinarians or veterinary technicians, without knowing in detail the type of treatment being performed. The remaining 28.6% treated birds with the use of medicinal plants and drugs registered for other animal species, including drugs intended for human use.

To manage mortalities at farm level (Table 1), the most common option was to dispose of carcasses off the farm (39%), followed by burning/burial of dead birds (35%). To a lesser extent, it was recognized that the carcasses were disposed of directly in the neighboring wetland area, a practice only reported on the "Aconcagua-Mantagua" site.

Official surveillance activities for detection of exotic diseases such as HPAI and Newcastle disease, performed by veterinary services personnel, were carried out in the 20% of the BPS identified.

Most BPS bred poultry as a 'family tradition', with more than 20 years of tenure (75%), while a lesser number of BPS had had poultry for a period ranging from 2 to 5 years, or less than 2 years (Table 1). The most common production objectives were: (i) household home-consumption; and (ii) household home-consumption and sale, representing together 97% of the BPS. The target markets for those farms which sold products were mostly neighbors/tourists. Just a few BPS (8%) sold their products to local markets



Fig. 1. Main Chilean poultry production areas (MPPA) and study sites for characterization of backyard poultry production systems (BPS) during 2007–2008.

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