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Description of an outbreak of highly pathogenic avian influenza in domestic ostriches (*Struthio camelus*) in South Africa in 2011

L.S. van Helden*, M. Sinclair, P. Koen, J.D. Grewar

Western Cape Veterinary Services, Private Bag X1, Elsenburg 7607, South Africa

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ABSTRACT

In 2011, the commercial ostrich production industry of South Africa experienced an outbreak of highly pathogenic avian influenza (HPAI), subtype H5N2. Surveillance using antibody and antigen detection revealed 42 infected farms with a between-farm prevalence in the affected area of 16%. The outbreak was controlled using depopulation of infected farms, resulting in the direct loss of 10% of the country's domestic ostrich population. Various factors in the ostrich production system were observed that could have contributed to the spread of the virus between farms, including the large number of legal movements of ostriches between farms, access of wild birds to ostrich camps and delays in depopulation of infected farms. Negative effects on the ostrich industry and the local economy of the ostrich-producing area were observed as a result of the outbreak and the disease control measures applied. Prevention and control measures applied as a result of avian influenza in South Africa were informed by this large outbreak and the insights into epidemiology of avian influenza in ostriches that it provided, resulting in stricter biosecurity measures required on every registered ostrich farm in the country.

1. Introduction

The ostrich industry of South Africa traditionally produces 80% of all ostrich products in the world and houses more than 60% of the world's ostriches (South African Ostrich Business Chamber, 2013). Prior to the 2011/12 outbreak of highly pathogenic avian influenza (HPAI), 90% of the local product was exported, the fresh meat mostly to the European Union (South African Ostrich Business Chamber, personal communication, 14 June 2013).

Ostrich farming in South Africa is primarily concentrated in the Western Cape Province, where it is focussed around two main areas: the Klein Karoo valley surrounding Oudtshoorn and the Southern Cape area surrounding Heidelberg (Fig. 1). Several other farms are located in the surrounding provinces, but at the beginning of 2011, the Western Cape housed about 70% of South Africa's total population of domestic ostriches and 80% of breeding stock. Approximately 350,000 ostriches were present in the country at this time; and the industry directly and indirectly provided 20,000 employment opportunities and contributed over two billion rand to the economy (South African Ostrich Business Chamber, personal communication, 14 June 2013).

Ostrich production is a multi-stage process. In most instances, eggs are collected from breeding ostriches (breeder birds) and transported to hatcheries. The day-old chicks hatched are raised to 10–14 months of age on raiser farms before reaching slaughter weight and being transported to an ostrich abattoir. Usually each of these stages occurs on a different property, often hundreds of kilometres away from each other. As a result, a vast number of ostrich movements occurred on a frequent basis in the country (Moore et al., 2014).

Ostriches are raised in extensive (free-ranging) production systems and are prone to close contact with Egyptian geese (*Alopochen aegypticus*)—an indigenous species of duck- and other wild bird species that can transmit avian influenza (AI) viruses. Several publications have demonstrated links between AI viruses carried by wild ducks and those infecting ostriches (Abolnik, 2007; Abolnik et al., 2009, 2012).

In the last decade, previous outbreaks of HPAI (H5N2) in ostriches occurred in 2004 in the Eastern Cape Province and in 2006 in the Western Cape Province of South Africa (Abolnik, 2007). The 2004 outbreak resulted in the destruction of 30,000 infected and in-contact ostriches and the suspension of exports of ostrich products (Abolnik, 2010). More than 7000 ostriches were destroyed during the 2006 outbreak and exports were again suspended. Initial concerns that the 2004 outbreak strain had not been eradicated from ostriches, or had been circulating in an unknown reservoir were

* Corresponding author.
E-mail address: lesleyvh@elsenburg.com (L.S. van Helden).

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refuted when molecular and phylogenetic characterization proved that although the 2004 and 2006 strains shared a common ancestor, the two outbreaks were not related (Abolnik, 2007).

As a result of the aforementioned outbreaks, several biosecurity measures were instigated on ostrich farms, including fencing dams and rivers to help prevent contact between ostriches and wild birds and changing feeding practises to avoid attracting wild birds.

In spite of these efforts, an outbreak of HPAI (H5N2) occurred in the Western Cape Province in 2011. We describe the outbreak, the control thereof and new insights gained regarding the epidemiology of HPAI in ostriches.

2. Methods

2.1. Initial events

Routine serological testing using the hemagglutination inhibition (HI) assay and designed to detect an AI prevalence of >10% with 95% confidence (DoA, 2006) detected antibodies to an H5 virus in the Southern Cape area of the Western Cape Province in May 2010. Additional seropositive farms were detected during the remainder of 2010 and early 2011, but no molecular evidence of the virus could be detected. In March 2011, five relatively unconnected and geographically distant farms in the Oudtshoorn valley tested seropositive for the H5 subtype of AI. These farms were quarantined and investigations were undertaken according to guidelines set in the Ostrich Protocol (DoA, 2006), designed to be read in conjunction with the South African Animal Diseases Act (Act 35 of 1984). This included the sampling of each epidemiological group (separated by management system and/or location) on these farms for detection of AI virus by polymerase chain reaction (PCR) using H5 and H7 specific primers, designed to detect >5% prevalence with 95% confidence, as well as sampling of tissues of any mortalities for virus isolation. In April 2011, a highly pathogenic strain of avian influenza subtype H5N2 was identified by the Onderstepoort Veterinary Institute (OVI) from a dead ostrich chick sampled by a private veterinarian on one of these seropositive properties, using real-time PCR and ribonucleic acid (RNA) sequencing (Abolnik et al., 2012).

2.2. Control

Four days after the first positive HPAI result, an outbreak operations centre was set up at the South African Ostrich Business Chamber (SAOBC) and attended by representatives from Western Cape Veterinary Services, the national Department of Agriculture, Forestry and Fisheries (DAFF) and the South African Ostrich Business Chamber. Within the first week of being established, representatives from the National Institute for Communicable Diseases (NICD), Oudtshoorn Disaster Management, Oudtshoorn

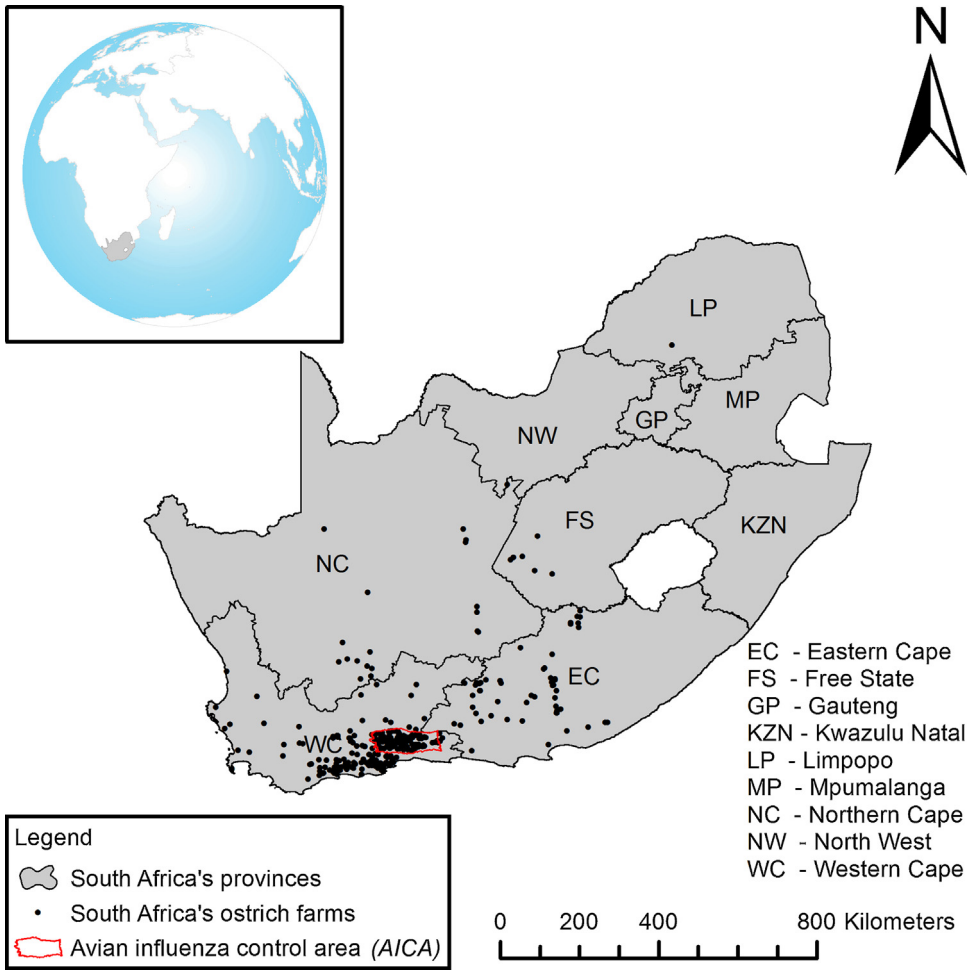

Fig. 1. South Africa and the spatial distribution of its ostrich farms. The majority of the industry exists within the Western Cape Province (WCP) with farms in this Province making up approximately 80% of the industry. The farms are further clustered in the WCP in the Oudtshoorn area where the outbreak took place as well as in the grain farming Southern Cape region.

Data Source: South African Ostrich Business Chamber and Western Cape Department of Agriculture.