

Avian influenza in Mexico

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Summary

The outbreak of highly pathogenic avian influenza (HPAI) H5N2 in Mexico in 1994 led to a clear increase in biosecurity measures and improvement of intensive poultry production systems. The control and eradication measures implemented were based on active surveillance, disease detection, depopulation of infected farms and prevention of possible contacts (identified by epidemiological investigations), improvement of biosecurity measures, and restriction of the movement of live birds, poultry products, by-products and infected material. In addition, Mexico introduced a massive vaccination programme, which resulted in the eradication of HPAI in a relatively short time in two affected areas that had a high density of commercial poultry.

Keywords

Avian influenza – Control – Emulsified vaccine – Eradication – Experience – H5N2 – Highly pathogenic avian influenza – Mexico – Recombinant vaccine.

Introduction

Mexico is the fourth largest producer of chicken meat in the world and the seventh largest egg producer. The poultry industry is the most developed of all the livestock industries in Mexico. In 2006, the production of poultry meat and eggs was 2.6 million and 2.3 million tons, respectively, which represents 35% of the country's Livestock Gross National Product. The country has 3,800 commercial poultry farms. The Jalisco and Guanajuato States and the Lagunera Region are the main poultry meat producers. Jalisco, Puebla and Sonora States are the main egg producers, but the other states also produce eggs. The annual per capita consumption is 22.1 kg of eggs and 25.97 kg of chicken meat (2).

Detection of avian influenza in Mexico

In Mexico, low pathogenicity avian influenza (LPAI) H5N2 virus was detected for the first time in March 1994. Thereafter, the situation throughout the country was

assessed by detecting serological evidence of the presence of H5N2 virus. As a result, positive flocks without apparent clinical signs were found in commercial poultry and backyard bird populations in half of the country. A repopulation programme began, which included a standstill period (empty barns) and cleaning and disinfection of facilities. In December 1994, clinical signs of highly pathogenic disease began appearing. The virus had mutated, affecting 2 million layers in Puebla State, a densely populated zone with 25 million layer chickens on 140 farms. Later, in January 1995, a similar virus appeared on broiler and breeder farms in Queretaro State, affecting 20 million chickens and 400,000 breeders.

Eradication of highly pathogenic avian influenza

The eradication activities introduced in these two states included control of the interstate movement of poultry and poultry products, depopulation of affected farms, standstill periods, cleaning and disinfection of facilities, improvement of biosecurity measures on farms, use of sentinel birds before repopulation, and vaccination of all

birds. In addition, vaccination of long-cycle layer farms was performed in states where cases of LPAI virus (LPAIV) were detected. Between January and December 1995, 383 million doses of vaccine were administered.

Highly pathogenic avian influenza (HPAI) was last isolated in May 1995, five months after the initiation of the emergency operation. In December 1995, the Government declared Mexico HPAI-free. The estimated cost of the emergency programme was US\$49 million, covering the operation, biosecurity, vaccination and the value of dead and destroyed birds (1). As there were no funds for compensation, the value of the culled poultry was covered by the affected enterprises. Highly pathogenic avian influenza in Mexico only affected poultry; no cases in humans or other species were identified. So far, the only subtype detected in poultry in Mexico has been H5N2. Since June 1995 all the isolated viruses have been identified as LPAI viruses.

Ongoing surveillance and control

Once HPAI had been eradicated, a control and eradication campaign for LPAIV began. The campaign included the following components:

- establishment of free farms
- replacement of positive flocks with negative flocks
- control of the movement of live birds and products
- sampling and laboratory diagnosis every three months at farms confirmed to be free of avian influenza (twice a year in sentinel birds at farms where vaccine had been used)
- vaccination of flocks in which LPAIV is detected in order to prevent mutation to HPAIV.

The campaign against LPAI is still in force. Regulation NOM-044-ZOO-1995 (National Campaign against Avian Influenza) continues to be implemented with the aim of monitoring and eradicating LPAIV, which is still present in some regions of the country and is affecting backyard birds as well as commercial flocks. These measures have been taken in order to prevent mutation of LPAIV to HPAIV. Mexico also has a national campaign for surveillance and prevention of HPAI, which is operated jointly by the government and the poultry industry.

Facing the threat of HPAIV H5N1 that is affecting Asia, Africa and several European countries, the Mexican veterinary and public health services regularly jointly update national plans for preparedness and response in

case of a human influenza pandemic, and for the surveillance and prevention of avian influenza. Any changes are made in accordance with the recommended guidelines for influenza prevention of international organizations such as the World Health Organization, the Food and Agriculture Organization of the United Nations and the World Organisation for Animal Health.

Currently, diagnosis is performed at four official reference laboratories and 19 authorised private laboratories. The laboratory tests used are mainly haemagglutination inhibition specific for H5, agar gel precipitation, virus isolation and subtyping, and nucleotide sequencing.

Vaccination is carried out (under the direct control of official veterinary emergency services) in all areas where LPAI exists in order to prevent the emergence of HPAIV strains. The vaccine that has been used since vaccination began in 1995 is the inactivated, emulsified LPAIV A/CK/México/CPA/232/94 (H5N2) vaccine, which has been highly efficient in preventing and eradicating HPAI. In laboratory trials and field experiments, vaccinated poultry challenged with field virus did not show signs of illness, but could infect other birds for several days, indicating that the vaccine did not prevent infection or virus excretion, even though it was effective in preventing clinical manifestations of disease.

Since 1998, use of a recombinant poxvirus-H5 vaccine has also been authorised in Mexico for use in broilers. Eight pharmaceutical companies are authorised to manufacture emulsified inactivated vaccine, and two others are authorised to sell recombinant vaccine. The inactivated, emulsified LPAI H5N2 vaccine continues to be efficient against HPAI and is currently also used in Asia against HPAIV H5N1. According to official records, the annual average number of vaccines used in Mexico is 300 million inactivated, emulsified LPAI H5N2 vaccines, and 220 million recombinant poxvirus-H5 vaccines.

Recently, the Mexican government has authorised the use of a new vaccine produced from recombinant virus (rNDV/LS-H5 N2/05), in which a vector based on a lentogenic vaccine virus of Newcastle disease, the La Sota strain (rNDV/LS), carries and expresses an exogenous HA gene. This gene originates from an LPAIV designated A/chicken/México/435/2005/DCV (H5N2). Following the manufacturer's recommendation, the vaccine is applied via eye drop or by spraying or in drinking water. The vaccine virus replicates in the respiratory tract and induces mucosal immunity, which is able to reduce replication and excretion of avian influenza virus and Newcastle disease virus. The vaccine started to sell in July 2008 and by October of that same year 32 million doses had been applied. Its performance under field conditions is being watched closely.

In order to maintain a homologous antigen to the LPAIV, which is still found in isolated areas in the country, the pharmaceutical industry and the Mexican government have initiated a project to develop an emulsified vaccine containing a recent LPAIV strain that does not result in viral excretion in poultry infected with LPAIV but prevents disease due to H5 HPAIV.

Discussion

In 1994, biosecurity measures in Mexico were deficient (1), and the HPAI outbreak forced producers and the government to implement a strong biosecurity programme. Currently, all poultry farms in Mexico have biosecurity levels ranging from good to excellent, with an official inspection programme.

Following the 1995 outbreak of HPAI in Mexico, strict biosecurity measures were adopted because it was found that separation of commercial poultry from wild birds was not adequate. It was also necessary to reduce other risk factors by implementing strict biosecurity measures, including systematic disinfection of equipment and vehicles, as well as showers and specific clothes for personnel and assigned workers for each production area. The effects of the disease in Mexico marked the beginning of a new era for poultry production, which now has high technological standards and high levels of biosecurity.

The decision to implement a vaccination programme in Mexico was based on a number of considerations. The outbreak occurred in areas with a high density of commercial poultry farms, which made it difficult to diagnose and cull birds rapidly enough to stop the spread of infection. In addition, the affected farms only produced for domestic consumption, so export markets did not have to be closed. Additionally, a vaccine was available that had been developed recently for use in areas affected by LPAI. Use of the vaccine was intensive in both affected and at-risk areas, covering approximately 55% of the Mexican territory and 70% of the commercial poultry population.

The presence of HPAIV H5N1 in wild birds and poultry in Africa, Asia and Europe has again highlighted the importance of monitoring, prevention and emergency plans. In the Americas, governments have set up

surveillance and rapid alert systems and emergency plans for outbreaks. In Mexico, emergency plans include consideration of the use of vaccination in the control and eradication of HPAI (3).

Conclusions

Highly pathogenic avian influenza virus was eradicated in Mexico in a relatively short time by the use of vaccination, increased biosecurity measures and control of the movement of live poultry, products and by-products. Vaccination can therefore be used for the prevention, control and eradication of HPAI. Vaccine against avian influenza does not prevent infection in vaccinated poultry, but it does reduce viral replication and prevent clinical disease.

Only LPAIV H5N2 has been detected in Mexico since June 1995. Thus, vaccination should be part of an integral programme of control and eradication of HPAI. However, it can also be used to reduce circulation of LPAIV, which could mutate towards HPAIV, in cases when immediate eradication is not possible.

Recommendations

Various factors should be assessed when considering the use of vaccination against avian influenza, as follows:

- farm-level factors: density of poultry farms, efficiency of active and passive surveillance, capacity to detect clinical signs in vaccinated birds, and levels of biosecurity
- capacity of official emergency services (quarantine, depopulation, clearing and disinfection, use of sentinel birds)
- capacity to control movement of birds, their products, by-products and contaminated material
- availability of compensation funds for producers
- presence of LPAIV and risk of mutation
- availability of vaccine.



L'influenza aviaire au Mexique

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Résumé

Depuis le foyer d'influenza aviaire hautement pathogène (IAHP) due au virus de sous-type H5N2 survenu en Mexique en 1994, ce pays a considérablement renforcé les mesures de biosécurité et procédé à l'amélioration des systèmes d'élevage intensif de volailles. Des mesures de contrôle et d'éradication ont été mises en place, dont la surveillance active, la détection de la maladie, la dépopulation des exploitations avicoles infectées et la prévention des contacts impliquant un risque (révélé par des études épidémiologiques), l'amélioration des mesures de biosécurité et les restrictions des mouvements de volailles vivantes et de produits aviaires, de sous-produits aviaires et de matières infectées. En outre, le Mexique a introduit un programme de vaccination massive qui a permis d'éradiquer l'IAHP en un temps relativement court dans deux zones affectées qui détiennent une forte densité de volailles commerciales.

Mots-clés

Éradication – Expérience – Influenza aviaire – Influenza aviaire hautement pathogène due au sous-type H5N2 – Lutte contre la maladie – Mexique – Vaccin à vecteur recombinant – Vaccin sous forme d'émulsion.



La influenza aviar en México

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Resumen

El brote causado por la cepa H5N2 del virus de la influenza aviar altamente patógena (IAAP) que afectó a México en 1994, trajo consigo un claro incremento en las medidas de bioseguridad y mejora de los sistemas de producción avícola intensiva. Las medidas de control y erradicación aplicadas se basaron en la vigilancia activa, la detección de la enfermedad, el sacrificio sanitario en las explotaciones infectadas y de los posibles contactos (determinados mediante investigaciones epidemiológicas), el incremento de las medidas de bioseguridad y la restricción de los movimientos de aves vivas, sus productos y subproductos, así como del material infectado. Además, el país puso en marcha un programa de vacunaciones masivas, lo que permitió erradicar la IAAP, en un plazo relativamente corto, en dos zonas afectadas con una elevada densidad de población avícola industrial.

Palabras clave

Control – Erradicación – Experiencia – Influenza aviar – Influenza aviar altamente patógena por H5N2 – México – Vacuna emulsionada – Vacuna recombinante.



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