Vaccination and Surveillance for High Pathogenicity Avian Influenza in poultry: Current Situation and Perspectives

October 22-23, 2024
WOAH, Paris

The uruguayan experience, on High Pathogenic Avian Influenza :

A highly pathogenic avian influenza outbreak (clade 2.3.4.4b H5N1) occurred in Uruguay from February 2023 to March 2024, primarily affecting migratory wild birds in the eastern lagoons of the country, which later interacted with backyard poultry in some areas, always in epidemiological relation to watercourses where they cohabitated. Subsequently, an outbreak was confirmed in an eco-park, affecting mammals (coatis - *Nasua nasua*), followed by a second wave of viral circulation, primarily affecting sea lions, fur seals, and wild birds during the spring, from September to December of the same year.

In total, there were 14 outbreaks in the first wave, all rapidly controlled by the health authority within the framework of the National Emergency Systems. During the second wave, in marine mammals, the cases were geographically distant from poultry farming areas, so no cases were reported in domestic poultry.During these outbreaks, there were no cases in commercial poultry establishments, so the country's health status remained unchanged.

Uruguay has a highly concentrated poultry industry around the capital, where layer farms, broiler farms, and both light and heavy breeder farms are located within a 30-kilometer radius. In this area, family-scale production coexists with integrated production systems. The primary market is domestic consumption, with no significant export flow.

Given this situation, a scientific-technical committee was formed, consisting of public and private specialists, to assess the possibility of vaccination and determine which vaccines were available. They selected vaccines based on efficacy and timing of application, ensuring they complied with DIVA (Differentiating Infected from Vaccinated Animals). Two vaccines were chosen: one vectorized with an HVT insert for HPAI, to be administered on the day of hatching, and another inactivated vaccine to be applied uniformly across the population of both layers and breeders, with a booster in the third week following the primary vaccination.

Later, in August 2024, the plan was modified to cover all newborns with the vectorized vaccine (another one with fowlpox as a vector was incorporated), and a booster with the inactivated vaccine was administered between the 8th and 10th week. This plan remains in place to date.

The distribution of the vaccines was free for producers at government expense, but their administration had to be supervised by a veterinary professional, previously accredited by the ministry, who would collect the vaccines and report the applied establishments and submit a biosecurity analysis of the premises through the official health platform.

Due to the emergency, family-run farms that were not previously authorized were allowed to withdraw vaccines under the same conditions, which added 15% more animals and 20% more producers to the surveillance system.

A post-vaccine monitoring plan was implemented in over 120 farms to date (35% of the total), with samples taken from 60 live birds via oropharyngeal and cloacal swabs, up to 10 dead birds, for rtPCR analysis for HPAI and Newcastle disease, along with evaluating protection levels by collecting 11 serum samples for hemagglutination inhibition testing. Good results were obtained in farms where vaccination, health, nutrition, and bird categories were appropriate, with lower levels seen in farms with less dedication. To date, no swab has tested positive for HPAI or Newcastle, with no viral circulation observed.

At the same time, efficacy trials for the proposed vaccination plan were conducted in layer and heavy breeder birds, from the application of the inactivated vaccine to the start of laying, showing an average protection level above 1:32 throughout the period. Currently, we are evaluating the same in light breeders and layers after molting to further support our plan.

> According to the processed information, a small number of layers (6-7%) do not respond, though this is a very low percentage. Most birds reach antibody levels compatible with protection, with very high titers at 4 weeks of age. In heavy breeders, the kinetics of the humoral response is similar to that observed in layers, but lower antibody titers are reached. No birds were observed that failed to respond to vaccination, with all showing responses, though with lower titers, still compatible with protection within the measured time frame.
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> It is clear that there is more variability in heavy breeders compared to layers, and breeders reach lower antibody levels. It will need to be analyzed whether this is due to how the vaccine was administered or due to the animals themselves.
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> It would be beneficial for both graphs to have the same scale and be shown side by side. The booster effect of applying Vaxigen is clearly seen in both groups, although the average value at 2 weeks would be higher, and the distribution of values more homogeneous in layers (we would need to review the statistics).

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Vaccination Plans

It is not evident that the prime-boost strategy (vectorized/inactivated) is better than another strategy, but it is clear that the vaccines would provide protection according to the antibody measurements performed. On the other hand, it seems that giving two doses of vaccine is better than giving just one dose, although more specific studies are needed to draw a firm conclusion.

It is evident that few animals reach titers of 1:128 or higher, with most having titers between 1:16 and 1:32. I believe that slightly adjusting the graphs and removing the "greater than" signs makes it interesting to show the overall kinetics of response to the prime-boost protocol and all protocols. I added a general graph that shows that, regardless of the plan applied, with all the errors and complications that cannot be controlled, considering all the recent sampling data, more than 50% of animals reach titers of 1:32, which is WOAH's protection threshold.

Depending on the epidemiological conditions and challenges this spring/summer with the arrival of migratory birds, the exit protocol for the vaccine for 2025 will be determined by considering the input of producers, private and official veterinarians, academia, and private laboratories.

The success of this plan lies in the use of an effective plan that brought peace of mind, protected a critical food supply industry, incorporated establishments previously outside the official radar, and especially, the collaborative work between private and government sectors, including inter-ministerial efforts, under the concept of ONE HEALTH.

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