Protection and Differentiation of Infected from Vaccinated Animals by an Inactivated Recombinant Newcastle Disease Virus/Avian Influenza H5 Vaccine

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Summary

Specific pathogen-free (SPF) chickens immunized at 14 days of age with either an inactivated recombinant LaSota Newcastle disease virus-avian influenza H5 (K-MDV/LSA/H5) vaccine or, a killed NDV/AV whole-virus vaccine (K-NDV/AV) 2, were fully protected from disease when challenged 14 days post-vaccination, with a highly pathogenic avian influenza virus (HPAI) strain isolated in Mexico in 1995, or a Mexican avian originates Newcastle disease virus (VNDV) strain isolated in Mexico in 1995, or a Mexican avian originates Newcastle disease virus (VNDV) strain. All non-vaccinated chickens challenged with VNDV or VNDV succumbed to disease. Both vaccines induced hemagglutination inhibition (HI) antibody responses against Newcastle disease virus (NDV) and avian influenza virus (AV). Antibodies against AV were not detected by ELISA in birds vaccinated with the inactivated AVD (LSA/LS) H5 vaccine. These chickens became positive by ELISA after challenge with HPAIV. Results clearly indicate that the inactivated AVD/LSA/H5 vaccine confers protection comparable to that of the conventional killed whole virus vaccine against both Newcastle disease (ND) and avian influenza (AV), while still allowing differentiation of infected from vaccinated chickens (DIVA) by ELISA tests.

Introduction

Influenza infections in poultry, primarily chickens and turkeys, may be asymptomatic, but often cause production losses and a range of clinical disease, from mild respiratory disease and drops in egg production, to severe systemic diseases, as near fatal hemorrhagic metritis (7). AI vaccines can be an effective tool in prevention of disease when used within a comprehensive control program. However, the use of AI vaccines alone can severely limit the effectiveness of an AI control program (8,9).

Since the 1970s, inactivated whole virus vaccines have been used in the US by turkey producers to protect against losses due to the infection with low pathogenic Av strains used in poultry (10). In 1998, an inactivated whole chicken-origin virus containing Newcastle disease virus (NDV), and H5N1, H9N2, and H11N2 AV was used in Italy to control multiple subtypes of APV (11). At this time, four broad categories of AI vaccines are recognized: inactivated whole-virus AV vaccines (most common vaccine used worldwide), in vivo-expressed hemagglutinin (under experimental research conditions), in vivo-expressed hemagglutinin (including five AI vaccines and five vaccines in non-influenza A virus), and DIVA vaccines (under experimental research conditions).

Materials & Methods

Vaccines. The hemagglutinin (HA) genes used to produce the K-MDV/LSA/H5, were obtained from MAVI Aviación Nacional, S.A. (Madrid, Spain) (K-MDV/LSA/H5) and isolated by Diagnósticos Clínicos Veterinarios, Mexico (GenBank accession number bank1200405 723686). The HA gene was obtained from standard procedures (12). The A/Indonesia/5/2005 (H5N1) isolate was obtained from first-line embryo passage. The baculovirus vector used was the LaSota strain of NDV. Viruses were propagated in 10-day-old SPF chicken embryos. Allantoic fluid was used as antigen for the HI test, and for the production of killed vaccines. The infected allantoic fluid was inactivated with formalin and emulsified in mineral oil. World Organization for Animal Health (OIE) procedures (13) were followed for the production of both inactivated vaccines.

Objective

The objective of this study was to determine the protection conferred by a killed recombinant Newcastle disease virus-avian influenza H5 vaccine (K-MDV/LSA/H5) against VNDV and HPAI, and serological responses that permit differentiation of infected from vaccinated (DIVA) animals (1).

Results

Serology. Before vaccination (at 14 days of age) antibodies against NDV and AV were not detected by the HI test or by ELISA. GM titers for NDV and for AV as well as ELISA GM titers at 21 days and 10 days PC in survival birds are presented in fig 1.

Protection to challenge: clinical signs maximum valued obtained in the on necropsy days were adjusted to 100% and protection to mortality (%) observed in the 10-day period post PC after the challenge with the VNDV are presented in fig 2, and results after the challenge with the HPAIV are presented in fig 3.

Materials & Methods


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Conclusion

The K-MDV/LSA/H5 vaccine prevented mortality, and clinical signs were minimal in chickens challenged with either VNDV or HPAIV H5N2. The protection was as good as that conferred by the conventional killed whole virus vaccine K-NDV/AV. Also, the K-MDV/LSA/H5 vaccine induced good HI responses to NDV and AV. In contrast, it permitted differentiation of infected from vaccinated birds, as AV antibodies are not detected by ELISA.

References