Vaccination: A Tool for the Control of Avian Influenza

Edited by Betty Dodet
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This book, volume 130 in the Developments in Biologicals series, is a collection of presentations from a conference that addressed the evolution of the outbreaks of avian influenza (H5N1) on 3 continents (Asia, Europe, and Africa), the strategies used to control the outbreaks, and the various aspects of vaccination of poultry against H5N1. The presentations were made at an international conference of avian influenza experts held in Verona, Italy, in March 2007. This book will be a useful resource for individuals with a strong interest in both the veterinary aspects of control of avian influenza as a zoonotic agent and the international aspects of public health. The book does not address human vaccination against avian influenza.

Influenza type A is grouped according to the subtypes of the surface antigens, hemagglutinin (H) and neuraminidase (N). Hemagglutinin is the major antigen on the surface of the virus and the key antigen in vaccines. Three type A influenza viruses have circulated in the human population at different times in the past century: H1N1, H2N2, and H3N2. H1N1 and H3N2 cocirculate at present; H2N2 has not circulated in the human population for nearly 40 years. The avian flu of major concern is caused by H5N1. Viruses of the H7 subtype (H7N7 and H7N3) have also caused outbreaks of highly pathogenic avian influenza in poultry and have infected humans. H9 viruses are widespread in Asian poultry, and there is concern that mutation may result in the acquisition of the highly pathogenic avian influenza phenotype.

Although the book has the limitation of timeliness, the avian influenza outbreak in poultry has not changed significantly since the conference was held. In 2006, 47 countries throughout Africa, Asia, and Europe reported highly pathogenic avian influenza H5N1 in poultry or wild birds; in 2008 (through August), 25 countries have filed reports with the World Organisation for Animal Health regarding H5N1 outbreaks. The debate is ongoing with regard to the contribution of migratory birds, live bird markets, ducks, and poultry to the outbreaks. Humans continue to be sporadically infected, with most cases occurring in Indonesia, Vietnam, and Egypt. The number of human cases is low but could become catastrophic if avian influenza is not properly controlled.

Several sections of this book include presentations made by representatives of the World Organisation for Animal Health and the Food and Agriculture Organization of the United Nations on the background of the epidemic, control strategies, and socioeconomic aspects of control. The main means of control has focused on biosecurity, surveillance, and culling of animals; this approach has been effective in quelling outbreaks in many countries. There is repeated emphasis that vaccination alone will not control avian influenza in poultry.

Reports are given by veterinary health experts from Indonesia and Vietnam who discuss the challenges of controlling H5N1 in developing countries with limited resources. The presence of many small household flocks adds to the difficulty of control, and the depopulation of flocks presents an economic hardship.

Extensive consideration is given to risk management and decision making with regard to the use of vaccines. Different approaches have been used to control H5N1, with some countries using blanket vaccination (Vietnam) and others focusing on “stamping out” H5N1 with vaccination prohibited (Thailand and Japan). With the appearance of H5N1 in a flock, several countries use targeted vaccination to control an outbreak.

In the section on “Vaccines and Research,” there are discussions on new developments in and current status of H5 highly pathogenic avian influenza vaccines. Other topics include the importance of Differentiating Infected from Vaccinated Animals vaccines, which include an antigen that allows the differentiation of infected from vaccinated animals, thus allowing the ongoing surveillance of activity of highly pathogenic avian influenza.

The target antigen for avian influenza vaccines is H5, and the goal of vaccination is to encourage development of antibodies to the hemagglutinin that “neutralize” the virus or render the virus noninfective. Vaccines that are currently available for vaccination of poultry prevent clinical disease but do not prevent infection; thus, vaccinated birds may be asymptomatic despite infection with circulating H5N1 but may shed infectious virus to other populations.

Inactivated H5N1 vaccines that are currently in use contain oil adjuvants and require injection. A live recombinant fowl poxvirus vaccine with an H5 insert has been in use in Central America against low pathogenicity avian influenza H5N2 for >10 years, but it also requires parental administration. Additional poultry vaccines need to be developed that allow for mass vaccination in water or feed to reduce the costs of vaccination and make widespread vaccination feasible in all countries.

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