April 2022

Characterisation of avian influenza viruses to support poultry vaccination (avian influenza vaccine antigen updates)

The Objective

To provide up-to date information to the poultry sector, governments, and poultry vaccine manufacturers on antigenic characteristics of circulating avian influenza viruses including comparisons with vaccine antigens. This information will facilitate selection of appropriate vaccines for poultry and updating of poultry vaccine antigens in places where vaccines are being used.

Main Output

The main output from this work will be an annual report comparing strains of avian influenza virus circulating in different regions with avian influenza vaccine antigens or representative reference and challenge strains.

Initially, the report will focus on goose/Guangdong/1/96-lineage high pathogenicity H5Nx viruses. Over a period of three years the scope will be expanded to cover other subtypes including H7 viruses, H9N2 and, any other strains for which vaccines are being used or contemplated.

The report will build on the information gathered already by OFFLU for the WHO zoonotic influenza vaccine composition meetings that are held twice per year (February and September). It will be supplemented by additional antigenic data relevant to avian vaccines. At present, the current report for the VCM assists in selecting candidate vaccine antigens for human influenza pandemic preparedness, not avian vaccines.

Background

Vaccination against high pathogenicity avian influenza is already being used in countries where these viruses remain endemic.

A range of vaccines is in use, predominantly killed antigen adjuvanted vaccines or similar subunit vaccines. Vector vaccines are also being used in some countries, including those based on herpesvirus of turkeys (HVT) with some usage of fowl pox and Newcastle disease viruses as vectors. Although all these vaccines can provide broad cross protection against a range of H5 viruses antigenic drift has occurred which can potentially reduce the effectiveness of vaccines in protecting against disease and shedding of virus from infected birds.

There is growing interest in vaccination in countries where HPAI is occurring epidemically due to wild bird introductions across Eurasia, Africa and into North America. Some of these countries have never previously considered vaccination as a tool for threat mitigation but due to ever increasing and ongoing threat are reviewing their prevention and control options. Vaccination, if used, will help to protect flocks of birds reared outdoors and may allow birds to be kept outdoors even in high-risk periods. Uptake of vaccination will depend on having appropriate well-matched vaccines available.

Some countries have established vaccine banks for emergency use in the past. These need to be kept up to date if in place.

Why is this analysis and reporting needed?

Usage of vaccination in poultry against avian influenza is expected to increase, especially if wild bird cycles of infection and introduction continue as experienced in 2020/21 and 2021/22.

Considerable antigenic change has occurred in avian influenza viruses in the past 25 years that can reduce effectiveness of vaccination programmes unless timely updates of vaccines occur.

At present, some countries using vaccines have programmes in place to assess antigenic changes in field strains, but this information is not always shared outside of the country or published. Better information on appropriate vaccine antigens will assist countries considering vaccination to select an appropriate vaccine antigen (or multiple antigens if more than one strain is circulating) and will also assist countries using vaccines to obtain information on potentially important changes in antigenic characteristics of circulating strains.

There is no one place where this information is available or analysed in a holistic manner with relevance to avian influenza vaccines used in different regions of the globe.

Currently, a similar programme is in place for foot-and-mouth disease in which recommendations are produced on appropriate vaccine antigens for use or vaccine banks, based on circulating strains of virus in different regions.

What information will the report include?

The report will contain the following information:

- Antigenic and genetic characteristics of avian influenza viruses known to be circulating in different parts of the world, including changes in known or putative antigenic sites
- Information on available vaccines and vaccine antigens (with the support of the vaccine industry). Note that if information on vaccine antigens is not available for commercial reasons a similar strain will be used as a substitute
- Information from studies conducted using comparative serology from vaccinated poultry, antigenic cartography or challenge trials in OFFLU partner laboratories
- Specific studies using reference chicken antisera conducted for the report
- Utilisation of harmonised approaches and methodology for broad relevance
- Data from recent peer-reviewed publications on avian influenza vaccines especially any that include challenge studies or information from field trials
- Provide warnings of antigenic variants with potential for global spread (e.g., current clade 2.3.4.4b strains) including suggestions for antigen banks

Note that this report will differ from the WHO vaccine composition meeting (VCM) in that the information provided is only advisory and will only flag the need for potential changes in vaccine antigens. It will not use human candidate vaccine viruses in genetic and antigenic analyses – rather it will define and use reference viruses pertinent to vaccination of poultry. It will not provide recommendations to use specific commercial products.

How will the data/information be gathered?

The process will be similar to that used by OFFLU for the WHO VCM, culminating in a summary report.

Who will lead the process?

OFFLU will lead the process. Through WOAH and FAO, a small team of technical experts will conduct this work.

This team will:

- collate and update information available on vaccines in use or available for use
- collect and prepare information on molecular and antigenic characteristics of circulating viruses from material collected for the WHO VCM report
- obtain information from laboratories that have conducted antigenic assessment (e.g., cross-HI tests) or vaccine challenge trials in poultry
- arrange for testing of selected viruses novel strains of local, regional or global significance for antigenic characteristics by WOAH/FAO reference laboratories
- arrange for production of reagents to support the programme (including reference antigens and prime chicken antisera)

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