Scientific Opinion on vaccination against avian influenza of H5 and H7 subtypes in domestic poultry and captive birds

Adopted on 11 May 2007

Dr. Oriol Ribó
Animal Health and Welfare (AHAW) Unit
European Food Safety Authority (EFSA) - Parma - Italy

13th Joint Meeting of the National Reference Laboratories for Newcastle Disease and Avian Influenza
Since the emergence of the HPAI H5N1, AI Prevention and Control Methods are under scrutiny.

Vaccination is moving to the forefront as a tool to control and prevent the disease propagation.

The new EC legislation provides use of emergency vaccination but also as a preventive tool.

An update of the previous opinion on AI on the aspects of vaccines and vaccination is crucial.

The opinion should provide an input in the Commission’s overall vaccination strategy and be a source of information to Member States when drawing up vaccination plans.
Terms of Reference

EFSA is requested to give scientific advice on the vaccination against AI, in particular to:

- give an update on the most recent development on vaccines against AI of H5 and H7 subtypes, both for domestic poultry and other captive birds, including experiences in the field and under laboratory conditions and, as well as future perspectives.

- evaluate laboratory testing methods for surveillance of vaccinated flocks in particular discriminatory tests used in the context of a DIVA strategy.
I. Update on the most recent development on AI vaccines

I.1. Aims and Principles of AI Vaccination:
   I.1.1. Prevention of disease in poultry and other captive birds
   I.1.2. Prevention of spill-over to wild bird populations
   I.1.3. Principles of vaccination
   I.1.4. Available vaccines (Inactivated adjuvanted, DIVA based, Recombinant live)
   I.1.5. Experimental vaccines
   I.1.6. Surveillance of poultry populations in relation to their vaccination status (Non-vaccinated, Vaccinated without/with DIVA)
I. Update on the most recent development on AI vaccines

I.2. Risk and benefits of AI vaccination:
I.2.1. Scenario’s for AI in different populations

Before vaccination

- No transmission
  - No disease

- No transmission
  - Disease

- Transmission
  - No disease

- Transmission
  - Disease

After vaccination

- No transmission
  - No disease

- No transmission
  - Disease

- Transmission
  - No disease

- Transmission
  - Disease
I. Update on the most recent development on AI vaccines

I.2.1. Scenario’s for AI in different populations

<table>
<thead>
<tr>
<th>#</th>
<th>Susceptibility before vaccin.</th>
<th>Susceptibility after vaccination</th>
<th>Example</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Transmission &amp; Disease</td>
<td>Transmission &amp; Disease</td>
<td>Possibly ostriches with chicken doses, H5)</td>
<td>Expert op. based on serological response (EFSA, 2007)</td>
</tr>
<tr>
<td>1b</td>
<td>Transmission &amp; Disease</td>
<td>Transmission &amp; No Disease</td>
<td>Pheasants (H7, 1 chicken dose)</td>
<td>Van Boven et al., 2005</td>
</tr>
<tr>
<td>1c</td>
<td>Transmission &amp; Disease</td>
<td>No Transmission &amp; No Disease</td>
<td>Chicken (H7, 1 chicken dose)</td>
<td>Van der Goot et al., 2005</td>
</tr>
<tr>
<td>2a</td>
<td>Transmission &amp; no disease</td>
<td>Transmission &amp; No Disease</td>
<td>Ducks (H5, 1 chicken dose)</td>
<td>Van der Goot et al., 2007</td>
</tr>
<tr>
<td>2b</td>
<td>Transmission &amp; no disease</td>
<td>No Transmission &amp; No Disease</td>
<td>Teals (H7, 1 chicken dose)</td>
<td>Van Boven et al., 2005</td>
</tr>
<tr>
<td>3a</td>
<td>No Transmission &amp; Disease</td>
<td>No Transmission &amp; Disease</td>
<td>Pigeons (H5, 2 chicken doses)</td>
<td>Swayne et al., Riems Group, J. Philippa</td>
</tr>
<tr>
<td>3b</td>
<td>No Transmission &amp; Disease</td>
<td>No Transmission &amp; No Disease</td>
<td>Humans/ferrets (?)</td>
<td>Expected results, Osterhaus (unpub.)</td>
</tr>
</tbody>
</table>
I.3. Public health implications of vaccination:

I.3.1. Current situation in East & South-East Asia

I.3.2. Potential benefits from poultry vaccination

I.3.3. Potential adverse consequences of poultry vaccination:

- Silent circulation of HPAI in sub-optimally vaccinated flocks
- Impact of Poultry Immunisation on surveillance for H5N1 in Humans

I.3.4. Summary of implications of poultry immunisation for human health
## I. Update on the most recent development on AI vaccines

Table 1. Impact from poultry immunisation to human health

<table>
<thead>
<tr>
<th>Table 1. Impact from poultry immunisation to human health</th>
<th>Poultry Vaccination Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Well</td>
</tr>
<tr>
<td>Food security &amp; income</td>
<td>Improved</td>
</tr>
<tr>
<td>Impact on viral evolution</td>
<td>Unknown</td>
</tr>
<tr>
<td>Spread of virus</td>
<td>Diminished</td>
</tr>
<tr>
<td>Animal disease control</td>
<td>Improved</td>
</tr>
<tr>
<td>Direct infection risk to humans</td>
<td>Probably lowered, more data needed</td>
</tr>
<tr>
<td>Human surveillance</td>
<td>Surveillance for single cases made more difficult</td>
</tr>
<tr>
<td>Pandemic risk</td>
<td>Unknown</td>
</tr>
</tbody>
</table>
I.4. International Experience:

I.4.1. Overview of AI vaccination programmes world-wide:

- Europe (Italy, The Netherlands)
- Asia (China, Hong-Kong, Vietnam, Indonesia, Pakistan)
- America

I.4.2. Messages from recent int. experiences:

- FAO/OIE/WHO Meeting on the Control of AI (Rome, 2004)
- Conference on AI Vaccination (Verona, 2007)
I.5. Current regulatory status of H5/H7 Avian Influenza vaccines in the EU:

I.5.1. Authorisation of vaccines and quality standards

I.5.2. Centrally authorised vaccines

I.5.2.1. Other vaccines currently available or under development (Inactivated vaccines; Recombinant live vaccines)

I.5.2.2 Future regulatory developments
II. Laboratory testing methods for surveillance of vaccinated flocks

II.1. Strategies to discriminate AI H5/H7-infected from non-infected vaccinated flocks: DIVA Strategy

II.1.1. Background

II.1.2. Surveillance

II.1.3. Inactivated conventional vaccines and accompanying diagnostic tests or systems to reveal field exposure

II.1.4. Engineered vaccines & accompanying tests

II.1.5. General characteristics that need to meet the diagnostic serology and virology tests
Conclusions

• Bio-security measures are the first line of protection against the introduction and spread of AI viruses for domestic poultry.

• Current EU authorised AI vaccines for poultry, such as chickens and ducks, meet the relevant quality standards and are thus, safe and effective.

• Effectiveness level of current AI vaccination is not sufficiently known in other poultry and captive birds.

• Poultry vaccination with EU authorised vaccines may reduce AI transmission amongst captive & wild birds.

• As silent spread of AI viruses can occur after vaccination, serological monitoring with DIVA based strategies (using sentinel birds), is required.
I. Update on the most recent development on AI vaccines

Conclusions

• **New generation vaccines** (including vectored and more updated vaccines), **may overcome the risks of sub-optimal AI vaccination**, which may be due to, e.g.:
  - impracticalities of administration
  - limited matching between vaccine and field strain
  - young age of the birds
  - range of species that can be successfully vacc.

• For controlling and stamping out any outbreaks of AI in the EU, private and public efforts should be dedicated to encourage the scientific development of new AI vaccines and obtain, without delay, EU authorisations.
Conclusions

- **Impact of AI vaccination of poultry on human health:**
  - Vaccination using EU authorised vaccines may **reduce the potential for human and other mammalian cases of HPAI** in such EU regions where the disease may become endemic.
  - The use of EU authorised vaccines **per se is safe and has no negative effect on poultry products for consumers**. Where the infection would become endemic in poultry, in a worst case scenario, the **well implemented and sustainable use of AI vaccines in poultry**, combined with other bio-security measures, is likely to **reduce the risk to humans**.

I. Update on the most recent development on AI vaccines
I. Update on the most recent development on AI vaccines

Recommendations

- The implementation of good AI vaccination practices using safe and effective EU authorised vaccines should be encouraged.
- Any use of AI vaccines in poultry should be defined in advance when there is no direct AI threat, dependant on the epidemiological situation, geographical area and overall risk perception.
- Conclusions can not be implemented in each specific emergency situation. MS should make an effort for modelling specific scenarios where emergency vaccination can be applied, supported by using risk assessment models.
I. Update on the most recent development on AI vaccines

Recommendations

- Additional data on the immunogenicity and effectiveness of current and future AI vaccines raised under field conditions should be generated.
- The exploitation of new scientific developments leading to a new generation AI vaccines for use in poultry, which can prevent silent spread of AI virus after exposure and can be applied more easily, should be developed.
- Dependant on the epidemiological situation, the use of bivalent H5/H7 vaccines instead of monovalent AI vaccines should be encouraged.
I. Update on the most recent development on AI vaccines

Recommendations

- The highly variable nature of AI viruses leads to the need to define vaccine strains that protect against circulating strains. The establishment of an international scientific vaccines strain selection body which advises (as done in human influenza) on the selection and use of seed viruses for AI vaccines, involving international organisations such as FAO, OIE and WHO, is recommended.

- To prevent delay in availability of AI vaccines during outbreaks, it is recommended that Community and National vaccine banks for the storage of Community reserves of AI vaccines are established and maintained.
Recommendations

- Preference should be given to the use of EU authorised vaccines, evaluated by appropriate EU regulatory authorities and meet the relevant quality, safety and efficacy standards.

- Since the scientific basis for the zootechnical potential of certain HPAI viral strains is not fully understood, public and animal health concerns should be considered in an integrated way.

- Continuous RA as recommended in the previous AI mandate on Migratory Birds, should be implemented.
II. Laboratory testing methods for surveillance of vaccinated flocks

Conclusions

- To date only conventional inactivated and recombinant live-vectored vaccines are available and can be coupled with a suitable diagnostic test.
- DIVA strategies can be based on selected vaccines and vaccination approaches in combination with tailored antibody and/or virus detection methods.
- The use of sentinel animals is an intrinsic and essential part of DIVA strategies.
- The regulatory framework does not permit the availability/performance of DIVA tests to be taken into account during vaccine licensing procedures.
- An intrinsic problem of the DIVA principle is that infections with all AI subtypes may interfere.
Recommendations

- The use of sentinel animals, DIVA vaccines and assays should be tested and implemented combined.
- Registration of new AI vaccines and their tailored diagnostics assays for the implementation of the DIVA strategy should be combined.
- More research and (field) validation are required to optimise the DIVA strategy. The development of recombinant vaccines may offer this opportunity.
- A surveillance system is needed to monitor the success of AI vaccination campaign. To minimize the number of samples to be tested, surveillance strategies based on specific case by case risk assessment, should be in place.
Acknowledgements

- **WG Members:** A. Osterhaus (Chairman); A. Bouma; I. Capua; T. Harder; M. de Jong; G. Koch; V. Martin; A. Nicoll; J. Pujols; M. Salman; M. Tollis; R. Woodland
- **Committee for Medicinal Products for Veterinary Use (CVMP) of the European Medicines Agency (EMEA), London, UK.**
- **European Centre of Disease Control (ECDC)**
- **IFAH (International Federation for Animal Health) and Vaccine Manufacturer Companies.**
- **Dr. David E. Swayne (USDA/Agricultural Research Service, Georgia, USA).**
For any additional info:

www.efsa.europa.eu
Thanks for your attention!!