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For discussion
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LegCo Panel on Food Safety and Environmental Hygiene

Vaccination for the Control of H5N1 Avian Influenza in Hong Kong

Purpose

This paper presents the major findings of the one-year vaccination trial programme and field vaccination during the last outbreak in local farms for the control of H5N1 avian influenza, as well as the way forward for the vaccination programme.

Background

2. The Administration introduced a vaccination programme on a trial basis in April 2002 in the Pak Sha area. A major objective of the trial was to assess the potential role of vaccination for the control of H5N1 avian influenza virus in Hong Kong. The vaccine used was Nobilis® Influenza H5, a commercially available vaccine containing an inactivated H5N2 virus. A total of 22 farms in the area were included in the trial.

3. To facilitate the gathering of more data to evaluate the role of vaccination in the control of H5N1 avian influenza in Hong Kong, we extended the trial programme in December 2002 by also vaccinating the chickens in farms in the vicinity of Pak Sha. As a result, 53 additional farms were included in the trial.

4. In the trial programme, each chicken was given two doses of the vaccine. When the trial commenced, all chickens between 8 and 55 days of age were vaccinated two times with 4 weeks apart. Subsequently, new batches of chickens were vaccinated once they reached 8 days of age and again four weeks later. In each batch of vaccinated chickens, a group of 30 individually identified sentinel chickens were left unvaccinated. The Agriculture, Fisheries and Conservation Department (AFCD) monitored closely the sentinel chickens (i.e. the unvaccinated chickens) as well as the vaccinated chickens for evidence of infection including tests for antibodies to the virus. Prior to sale, AFCD also collected faecal swab samples from 60 chickens per batch for testing of virus excretion.

5. Apart from testing on vaccinated chickens in field conditions, AFCD also conducted a simple vaccinated versus controls laboratory challenge study. The department took both vaccinated and unvaccinated chickens from the field and challenged them in laboratory with a recent H5N1 virus found in a retail market. Separately, Professor Robert Webster at the World Health Organization (WHO) Reference Laboratory for Avian Influenza also conducted three laboratory challenge studies on the same vaccine.

6. In addition, testing results of three infected farms in January 2003 were analysed to assess the effectiveness of the H5N2 vaccine used. In these farms, chickens in the affected sheds were culled whereas those in the adjacent sheds were vaccinated to contain the spread of the virus. For one farm, vaccination was actually applied before infection occurred in that farm as it was in close proximity to another infected farm. AFCD checked the remaining vaccinated chickens in the three farms daily for mortalities and investigated into the cause of the deaths. Samples were collected from these vaccinated chickens to monitor if H5 virus was present. Blood samples were also drawn to test for antibody response.

Results and Evaluation

7. For the 22 farms in the first phase of the trial programme, a total of 248 batches involving 1.35 million chickens had been vaccinated and were fully tested as at 31 March 2003. No clinical outbreaks of disease associated with H5N1 virus had been detected on any of these vaccinated farms. Nor was any virus detected in tests conducted on the chickens from these farms prior to sale or on dead sentinel chickens. About 98% of the 248 batches of chickens responded to vaccination after the first dose of vaccination. Some 80% of the 248 batches of chickens developed satisfactory antibody level after two doses of vaccination were received. Both results exceeded the success targets set up before the trial commenced.

8. For the 53 farms in the second phase of the trial programme, a total of 60 batches involving 0.75 million chickens received two doses of vaccine and were fully tested as at 31 March 2003. Again, no clinical outbreaks of disease associated with H5N1 virus had been detected on any of these vaccinated farms and no virus was detected in the chickens from these farms prior to sale or on dead sentinel chickens. Some 70% of the vaccinated chickens developed satisfactory antibody level after two doses of vaccination were received.

9. It should be noted that there were only limited testing results of the

second phase of the trial as it only commenced in late December 2002. Also, a lot of the laboratory testing capacity was allocated to monitor the infection in wild birds, recreational parks and local farms at that time.

10. All the four laboratory challenge experiments mentioned in paragraph 5 above indicated that the vaccine could give a highly significant level of protection to chickens. All (except one) vaccinated chickens survived while nearly all unvaccinated chickens died. The vaccine was able to reduce markedly quantities of virus excreted via cloaca or throat and the virus shedding was self-limiting over a short period of time.

11. For the testing on the three infected farms, the vaccine was found to be able to protect chickens and shut down virus excretion by 13-18 days post vaccination in two farms. For the remaining one, no deaths caused by H5 avian influenza were detected in the unaffected vaccinated sheds and no H5 virus was detected from samples collected there. Testing conducted at day 22, days 30-33 and day 37 post-vaccination respectively in these three farms also revealed that the remaining vaccinated chickens had satisfactory antibody response.

12. In summary, the findings above revealed that the H5N2 vaccine used could -

(a) protect vaccinated chickens against highly pathogenic avian influenza caused by H5N1 virus;

(b) produce a very significant reduction (>1000-fold) in excretion of infectious H5N1 virus in vaccinated chickens compared with unvaccinated chickens;

(c) produce a protective antibody response in the flock against the H5 avian influenza viruses by field vaccination; and

(d) protect chickens and shut down the virus excretion by 13-18 days post-vaccination in a field challenge with H5N1 virus.

Conclusion and Proposed Way Forward

13. We consider that the H5N2 vaccine used is suitable for vaccination of chickens as an additional protective measure for avian influenza in Hong Kong. As a consequence of the recent outbreaks in local farms and wild birds, all chickens in local farms are now being vaccinated with this vaccine as a control measure. It is recommended that universal vaccination of chickens in

Hong Kong should continue with this or equivalent registered vaccines. The Administration has also started discussions with the Mainland about vaccinating live Mainland chickens supplied to Hong Kong with an equivalent vaccine registered for use in the Mainland.

14. However, it should be noted that vaccination is by no means the panacea for the avian influenza problem. As H5N1 avian influenza virus has become endemic in birds in the region, there remains a risk of H5N1 avian influenza outbreak as long as the live poultry trade exists. Our findings illustrate that vaccinated chickens may still be infected and shed virus. Moreover, concerns over evolution of new virus strains would continue to require further study. It is therefore prudent that we should maintain our existing multi-pronged approach to minimize the risk of recurrence of avian influenza outbreaks. In enhancing our preventive capability, we will continue to upgrade biosecurity standards in farms to meet the international level to prevent the virus from spreading to farms, between farms and within farm, further improve the hygiene condition in markets to guard against the breeding of the virus there, and implement two rest days per month and additional rest days where necessary at retail outlets to prevent the virus load from building up.

15. In view of the possibility of influenza virus evolution in vaccinated chickens, the decision on universal vaccination will be reviewed in two years' time. Meanwhile, a comprehensive monitoring and surveillance programme will be maintained to detect and characterise any new H5 virus incursions. This will include monitoring unvaccinated sentinel chickens in every batch of local chickens for H5 avian influenza virus infection, virus culture on all dead chickens collected daily at the wholesale market, virus culture on dead birds and from random cage swabs per month from retail poultry markets. The local farm monitoring will also include antibody testing to ensure vaccinated flocks are maintaining good H5 antibody levels.

16. There are many groups of avian influenza viruses and many strains in each group. They have the propensity to reassort into new strains. In 1997, a strain of the H5N1 group was found to infect 18 humans with six died subsequently. In February 2003, we also detected an H5N1 strain which infected two persons returning from the Mainland, causing one death. Recently, an H7N7 avian influenza outbreak occurred in the Netherlands and a veterinarian was found to be infected with the H7N7 influenza virus, resulting in death. The WHO, in accordance with its pandemic preparedness plan for influenza, has also recommended that in countries where initial cases of H7N7 were detected, surveillance and diagnosis of the avian H7N7 virus should be enhanced in humans and susceptible animals. We cannot rule out the possibility that avian influenza viruses can reassort and cross species to affect

humans which may result in an epidemic or even pandemic. We therefore need to remain vigilant in our surveillance and control over avian influenza for the protection of public health. We will deploy different strategies and control measures to deal with the changing circumstances and these may include depopulation, quarantine, and other measures that may be warranted by the situation.

17. In the light of the recent outbreak of communicable disease in the community and the resultant significant financial and social impact that has been brought to bear on the economy and the society, there is a need for Hong Kong to take reference from overseas experience in our eating habits in order to provide a higher level of sustainable protection for public health. We therefore envisage that, in the foreseeable future, the extent to which the live poultry trade should be regulated would be a subject of public debate.

Agriculture, Fisheries and Conservation Department
Health, Welfare and Food Bureau
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