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S7 - Protective Efficacy of Poultry Vaccines against Recently Circulating Highly Pathogenic Avian Influenza (HPAI) H5N1 Virus Isolates from Markets and Farms in Hong Kong 2008

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Introduction: Highly pathogenic avian influenza (HPAI) H5N1 remains a major threat to animal and public health. Since 2003, Hong Kong has successfully used poultry vaccination as part of its strategy to minimise this threat within Hong Kong. In mid-2008, an HPAI H5N1 outbreak occurred in a vaccinated poultry farm in Hong Kong.

Aims: a) to compare protective efficacy of different poultry vaccines against the 2008 farm outbreak strain; and b) to assess whether there needs to be a change in the poultry vaccine used in Hong Kong.

Methods: White leghorn chickens were raised in a clean laboratory environment and divided in four groups: a) unvaccinated controls; or vaccinated with b) Nobilis^R vaccine (the vaccine in use in Hong Kong); c) Poulvac^R vaccine, or d) Harbin Re-5^R vaccine, in accordance with the manufacturer's recommendations. Pre-challenge sera were collected at day 63 of age. Then, 9-12 chicken from each group were challenged by infection with either A/chicken/Hong Kong/8852-2/08 (H5N1), a clade 2.3.4 virus isolated from the affected farm or with A/chicken/Hong Kong/782/2009 (H5N1) (clade 2.3.2). Experimental challenge was done with a dose of 10⁵ egg-infection-dose₅₀ in a volume of 0.5 mL by the intranasal route. Haemagglutination inhibition (HI) tests were used to evaluate the antibody responses in vaccinated chicken post-immunisation.

Results: All three vaccines provided good protection from death and significantly reduced virus shedding following challenge with A/chicken/Hong Kong/782/2009. Only Harbin Re5 vaccine provided protection against challenge with A/chicken/Hong Kong/8852-2/08, the strain associated with the farm outbreak. Sera from vaccinated chickens had lower geometric HI titres against A/chicken/Hong Kong/8825.2/08, as compared to two other clade 2.3.4 and one clade 0 virus. Alignment of amino-acid sequences of the haemagglutinin of A/chicken/Hong Kong/8825.2/08 and the other H5 viruses revealed several mutations which may correlate with loss of vaccine protection.

Conclusions: Our results indicated that some clade 2.3.4 HPAI H5N1 viruses have undergone antigenic changes that allow them to evade immunity from poultry vaccines. The Nobilis^R vaccine then in use in Hong Kong did not provide acceptable protection against some circulating H5N1 virus strains. A change in the poultry vaccine being used in Hong Kong needs to be considered. The findings highlighted the need for ongoing surveillance and monitoring of vaccine-induced immunity against currently circulating virus strains by serological tests supplemented where necessary with experimental vaccine challenge studies in chicken.