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Protection against highly pathogenic avian influenza by immunisation with a recombinant Newcastle disease virus expressing influenza virus hemagglutinin

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Highly pathogenic avian influenza viruses (HPAIV) of subtype H5 and H7 are causing high mortality and economic losses in poultry. Control strategies include culling of infected flocks as well as vaccination. However, in several countries prophylactic immunization is still prohibited, since vaccination with the widely used inactivated whole virus preparations interfere with the identification of infected birds. Thus, we developed an H7 hemagglutinin-expressing live vectored vaccine based on the lentogenic Newcastle disease virus (NDV) vaccine strain Clone 30. The hemagglutinin gene was inserted as an accessory transcription unit between the NDV fusion and hemagglutinin-neuraminidase gene of NDV. Expression of the hemagglutinin protein was demonstrated by immunofluorescence and western blot analyses of infected cells. Determination of the intracerebral pathogenicity index in one-day-old chickens showed no increase in virulence of the deduced recombinant due to the expression of an HPAIV hemagglutinin. A single immunization of specific-pathogen-free chickens induced H7-specific antibodies and conferred protection against clinical disease after a lethal challenge infection with the homologous HPAIV isolate, whereas all naive controls died within a few days. Real-time RT-PCR analyses of swab samples demonstrated, that shedding of AIV challenge virus in the vaccinates was strongly reduced compared to non-immunised control animals. In addition, the AI vectored vaccine permits serological discrimination between vaccinated and field-virus infected animals using an ELISA based on the AIV nucleoprotein. In conclusion, regarding the applicability of live NDV via aerosol or drinking water, NDV-H7 represent a promising live vectored marker vaccine against avian influenza.

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