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Live influenza vaccines based on the cold-adapted master donor virus which were developed in Russia against avian influenza viruses of various subtypes

Statement of the Problem: Avian influenza viruses may transmit sporadically to humans possess continuous pandemic threat. As part of an influenza pandemic preparedness program, the WHO analyses a range of zoonotic and potentially pandemic influenza viruses for the development of appropriate vaccines. The cold-adapted A/Leningrad/134/17/57 (H2N2) (Len/17) master donor strain (MDS) is licensed in the Russian Federation for the production of the influenza A live influenza vaccine (LAIV) strains for the immunization of adults and children from 3 years old.

Methodology & Theoretical Orientation: we used classical genetic reassortment to generate Len/17-based vaccine strains containing the surface antigens of the nonpathogenic avian influenza viruses of H5, H7, H9, H6 subtypes.

Findings: All vaccine viruses were similar to parent MDS virus in term of replication in upper and lower respiratory tract of mice and fails to infect brain. In mice, the LAIV of H5N2, H7N3, and H9N2 subtypes provided protection against reinfection with distant. The H5N2 LAIV protected mice against reinfection with highly pathogenic H5N1 viruses, which differ significantly both antigenically and genetically, and H7N3 LAIV provided protection against H7N9. Protection against lethality and systemic spread of infection correlated with the formation of cross-reacting serum and secretory antibodies. On the model of post-Influenza bacterial pneumonia, the LAIV administration demonstrated a positive effect both on the decreasing the infecting virus reproduction in the respiratory tract of mice and on the removal of infectious streptococci. Also, H7N3 LAIV provided early protection against H7N9 infection. The H7N3 and H5N2 vaccine candidates demonstrated inability to reproduce in chickens, which confirms the safety of their production and use in areas with highly developed agriculture. In ferrets, the immunogenicity and protective efficacy of H7N3 LAIV were also demonstrated. Inoculation of H7N3 LAIV in ferrets did not cause any inflammation or destructive changes in lungs. When tested in clinical trials, the vaccine strains of H5N2 and H7N3 subtypes have shown high immunogenicity inducing the seroconversions of serum and local antibodies after double immunization.

Conclusion & Significance: The Len/17-based vaccine strains obtained using classical reassortment in chick eggs with potentially pandemic subtypes as a source of surface antigens demonstrated cold-adaptation and attenuation. The use of LAIV can be effective against highly pathogenic influenza viruses even in the case of incomplete antigenic correspondence between the vaccine virus and the infectious strain.

Biography

Yulia Desheva has her expertise in the preparation of vaccine strains for live influenza vaccines, the development of immunization schemes for high-risk individuals, and evaluating the role of neuraminidase antibodies in influenza infection and vaccination.

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