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Immunomodulation and protective properties of combined mucosal vaccine based on attenuated influenza A virus and recombinant group B Streptococcus polypeptides

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Objectives: We are working out combined mucosal vaccine based on live attenuated influenza vaccine (LAIV) and group B Streptococcus (GBS) recombinant polypeptides.

Methods: Groups of outbred mice were intranasally immunized twice with the following preparations: 1) six log10 50% egg infectious dose (EID50) of A/17/Mallard/Netherlands/00/95 (H7N3) live vaccine virus; 2) combined P6, ScAB, ScpB1 and Stv recombinant GBS polypeptide vaccine (5 μg each); 3) mixed virus and four bacterial polypeptides preparation. Control animals were treated by PBS. The antibody responses were evaluated 3 weeks after 1st or 2nd vaccine dose in sera and nasal swabs. On day 45 after 1st vaccine dose the mice were challenged intranasally with 500 50% mouse infectious doses (MID50) of homologous influenza A/Mallard/Netherlands/12/00 (H7N3) wild type (A/H7N3-wt) virus or 100 MID50 of antigenically distinct A/PR8/34 (H1N1) (A/PR8) influenza virus. 24 hours post challenge the mice were infected with 107 KFE of serotype II GBS. Bacterial clearance from the lungs was estimated after 2, 24 and 48 hours of infection. The lung tissues were collected on day 1, 2 and day 3 post GBS infection (p. i.) and then titrated in developing chicken embryos to determine challenge virus reproduction.

Results: Combined LAIV+GBS immunization improved serum IgG antibody response against vaccine virus A(H7N3) ($p=0.02$). Serum IgG antibody response against derivate P6 peptidase was significantly higher after the 2nd vaccine dose compared to 1st vaccination with either GBS or LAIV+GBS ($p<0.05$), although the boost effect against other GBS polypeptides was not achieved after LAIV+GBS 2nd vaccine dose ($p>0.05$). Nasal IgA antibody levels did not significantly differ in mice administered virus-bacterial vaccine compared to single LAIV immunization. Mice administered single LAIV demonstrated reduced challenge A/H7N3-wt virus isolation from lungs 24 hours after sequential virus and GBS infection in contrast to control unvaccinated animals. Interestingly, from 5 mice given polypeptide GBS vaccine, 3 animals were completely recovered from A/H7N3-wt pulmonary infection 48 hours after sequential virus and GBS infection. Combined virus-bacterial immunization decreased replication of distinct A/PR8 influenza virus in mouse lungs 48 hours after virus and GBS infection. Intranasal GBS and combined virus-bacterial immunization improved GBS clearance 24 hours post infection with A/H7N3-wt virus compared to control animals or LAIV single immunization.

Conclusions: From four components of GBS vaccine given either alone or in combination with LAIV, the P6 caused the most pronounced response which increased after the 2nd vaccine dose. Combined vaccination not only provided the advantage of defense from homologous and heterologous challenge viruses, but also enhanced GBS clearance from mouse lungs after virus and GBS infection.

Biography

Y A Desheva has completed her MD in the year 1983 from the Leningrad Medical Institute of Hygiene and Sanitation, St. Petersburg, Russia and Postgraduate courses of Practical Training in Infectious diseases from the Institute for Influenza RAMS, St. Petersburg, Russia in the year 1992. She is working as a senior scientist in the Institute of Experimental Medicine, RAMS and also as a Professor at Saint Petersburg State University. She has also published her papers in reputed journals.

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