Development of a nasal vaccine of infectious bovine rhinotracheitis: Protective immunogenicity of baculovirus-expressed glycoproteins of bovine herpesvirus 1

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Intramuscular immunization with attenuated infectious bovine rhinotracheitis (IBR) live virus vaccines induces serum antibodies against bovine herpesvirus 1 (BHV-1) in cattle and decreases the severity of the clinical signs induced by IBR. However it does not induce protective immunity on the mucosae, where the primary infection occurs in cattle, resulting in the following latent infection. The attenuated vaccine viruses may revert to virulent wild strains. In the present study, to develope more effective and safer IBR vaccines, intranasal immunization of cattle and rabbits with test subunit vaccines containing baculovirus-expressed gC and/or gD glycoproteins of BHV-1 was performed. Cholera toxin B subunit (CTB) was added to the vaccines as a mucosal adjuvant.

Cattle immunized intranasally with gC or gD subunit vaccines produced the neutralizing antibodies against BHV-1 in the nasal secretions. After challenge with $10^{7.8}$ PFU of BHV-1, all of the cattle immunized showed less severity of clinical signs and less virus shedding. However, the complete protection of the animals from BHV-1 infection was not established.

Rabbits were primarily immunized with intramuscular injection of antigens together with Freund's complete adjuvant, followed by intranasal administration of antigens with CTB. Each vaccine containing gC, gD or inactivated BHV-1 virions, as well as gC + gD-combined one, induced anti-BHV-1 antibodies in the sera and nasal secretions of the animals. gD and gC + gD-combined vaccines induced neutralizing antibodies in the nasal secretions and conferred protection from challenge with $10^{6.0}$ PFU of BHV-1.

These findings indicate that intranasal vaccination with the baculovirus-expressed glycoproteins is a promising measure to confer protective immunity to animals against BHV-1 infection.

Analyses of antigenic diversity of a major surface protein of *Theileria sergenti* and host immune responses against the parasite

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Theileria sergenti, a causal agent of bovine piroplasmosis in Japan, is a tick-borne protozoan parasite. The parasites distributed in Japan are divided into two major genotypes, I and C types,