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Immunogenicity and protective efficacy of 3A truncated negative marker foot-and-mouth disease virus serotype A vaccine

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Abstract

Foot-and-mouth disease (FMD) is a highly contagious, economically significant disease of cloven-hoofed animals caused by FMD virus (FMDV) of the Picornaviridae family. Vaccination of susceptible animals with inactivated virus vaccine is the standard practice for disease control. The prophylactic use of the inactivated vaccines has reduced the disease burden in many countries endemic to FMD. In the process of implementation of the mass vaccination program and disease eradication, it is essential to differentiate infected from vaccinated animals (DIVA) where a large proportion of the animal population is vaccinated, and disease-free zones are being established, to help in sero-surveillance of the disease. In such a scenario, the use of a negative marker vaccine is beneficial to rule out false-positive results in a disease-free zone. Here we report the construction and rescue of an infectious cDNA clone for FMDV serotype A Indian vaccine strain lacking 58 amino acid residues (87-144 amino acid position) in the carboxy-terminal region of the viral 3A protein. The recombinant deletion mutant virus showed similarity in the antigenic relationship with the parental strain. Immunization of guinea pigs with the inactivated vaccine formulated using the deletion mutant virus induced potent immune response with 100% protective efficacy upon challenge with homologous virus. Further, we show that sera from the guinea pigs infected with the deletion mutant virus did not show reactivity in an indirect ELISA test targeting the deleted portion of 3A protein. We conclude that the recombinant deletion mutant virus vaccine along with the newly developed companion indirect ELISA targeting portion of FMDV 3A protein could be useful in the implementation of a precise DIVA policy in our country when we reach FMD free status with vaccination.

Keywords: 3A protein; DIVA; FMDV; Guinea pig; Negative marker vaccine.