Impact of cytokine response on FMDV infection outcome in cattle

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Introduction: Foot-and-mouth disease (FMD) remains the single most important constraint to international trade in live animals and animal products. After the acute phase of infection, a proportion of cattle infected with FMD virus (FMDV) become persistently infected and carry the virus in their pharyngeal regions for months or years, which may be critical to the epidemiology of FMD. However, the factors leading to clearance or persistent infection of FMDV are not well defined, but recent studies have indicated the importance of the cytokine response. The present paper provides evidence of the association of IL-10 response during the acute phase of infection with the outcome of FMDV infection (persistence).

Materials and Methods: In 2 separate experiments 25 cattle were infected with the type O UKG/34/2001 either by intradermo-lingual injection or by direct contact. Serum samples were collected at days 0, 1, 2, 3, 4, 5, 6, and 7 after infection. The presence of virus in pharyngeal regions (Probang samples) was assessed by virus isolation on BTY cells and/or qRT-PCR assays. Enzyme-linked immunosorbent assay was employed to measure IL-10 and IFN-gamma levels in serum.

Results: All animals (n=25) infected with FMDV showed acute clinical signs of FMD. They all had virus in their Probang samples for at least 7 days after virus exposure. Four of them had virus in their pharynx 28 days after exposure (so-called carriers). Serum levels of IL-10 and IFN-gamma were assayed by ELISA, and results showed that serum IL-10 in these four carrier cattle was detected early in the course of infection. IL-10 was detected as early as 1 dpi but became undetectable from 5 dpi. Serum IL-10 levels in non-carrier animals was very low or undetectable. There was no such pattern of IFN-gamma observed during infection.

Discussion: Cytokines control many aspects of the immune response, and they affect the balance between the development of immunity and tolerance. A robust Th1 response is necessary for the resolution of infection and development of immunity for the majority of viral infections. IL-10, a potent anti-inflammatory cytokine, has been shown to dampen Th1 responses. Several groups have shown increased IL-10 levels during a variety of persistent bacterial and parasitic infections. The data presented in this paper show that IL-10 response during the acute phase of infection in cattle is related to the outcome of FMDV infection. It is in agreement with recent studies demonstrating a role of IL-10 in establishing persistence of lymphocytic choriomeningitis virus.

Conclusion: Our data suggest that cytokine IL-10 response influences FMDV infection outcome in cattle.