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STUDY ON THE PROPER TIME FOR BEGINNING VACCINE PROGRAM AGAINST FMD USING FMD BIVALENT VACCINE FOR NEWLY BORN CALVES

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ABSTRACT

The present study has been designed to assay the immune response to foot-and-mouth disease vaccines in newly born calves. Maternal antibodies in sera of calves were estimated using serum neutralization test (SNT) and ELISA; the highest level of FMD antibodies was detected in sera taken from new-born calves aged 5-10 days. Calves devoid of maternal antibodies responded satisfactorily to vaccination and the antibody titers at 21 days post-vaccination for the O and A were 2.1 and 1.8 $\log_{10}$ by SNT and in calves from vaccinated dams were 1.2 and 1.1 respectively. A certain degree of suppression for the vaccinal response was observed. Vaccination at age (14-16) week gave the highest antibody titers. Our results suggest vaccination of newly born calves with bivalent FMD vaccine at (4 – 5) months age and re- vaccination 30 may be effective in providing protection against FMD infection.

Keywords: Immune response, ELISA, bivalent vaccine, FMD.

INTRODUCTION

Foot and mouth disease virus (FMDV) is the etiological agent of an acute febrile disease that causes enormous economic losses in many countries of the world. In endemic areas inactivated aqueous (Aq) vaccines with aluminium hydroxide and saponin adjuvant are often used with repeat vaccination at 4-month Intervals **(Inta and Piadc, 1977; Rivenson et al., 1982)**. One of the principal problems in mass immunization against FMD is inducing protection in young calves, since it has been shown that newborn calves with maternal antibodies give very poor or no response to aqueous FMDV vaccines **(Nicholls et al., 1984; Sadir et al., 1988**), and that epidemic waves start in many countries with infection of these unprotected young calves **(Cosalfa, 1981; Ayebazibwe et al., 2010).** In areas of the world where foot and mouth disease (FMD) is controlled by regular vaccination, the incidence of disease is greatest in young stock

under 2 years of age **(Rweyemamu et al., 1982),** suggesting that calves may not respond as well as adults to vaccination. There have been several reports suggesting that maternal antibodies are able to inhibit the calves response to vaccination against FMD **(Graves, 1963; Srubar, 1966; Van Bekkum, 1966; Wisniewsky and Jankowska, 1972; Prudovsky, 1973; Kruglikov et al., 1974; Uppal et al., 1975; Brun et al., 1977; Tekerlekov et al., 1980; Shankar and Uppal, 1982).** The present report describes a series of experiments carried out to examine the effect of maternal antibodies on the primary response of calves and how vaccination regimens could be modified to provide efficient protection of calves from FMD under field conditions.

MATERIAL AND METHODS

Animals

A total of 20 Local breed calves clinically healthy were used in this study.3 calves were free from antibodies against FMD virus and 17 calves showing maternal antibodies as proved by using SNT and ELISA.

FMD viruses O_1/3/93-Egypt Strain and A_1/Egypt/2006 are locally isolated strains of cattle origin. The viruses were typed at Veterinary Serum and Vaccine Research Institute, Abbasia, Cairo and confirmed by Pirbright, International Reference Laboratories, United Kingdom.

FMD vaccine:

Inactivated bivalent FMD vaccine was prepared using the local strains O_1/3/93 Egypt and A_1/Egypt/2006, propagated in BHK-21 cell line. The viruses had a titer of 10^8 $TCID_{50}$ for both and inactivated by Binary Ethylenemine (BEI).

Adjuvant

The inactivated FMD virus's suspension was mixed with 30% Alhydragel solution as adjuvant.

Experimental Design:

In order to determine the proper time for first vaccination and studying effect of maternal antibodies on the calf hood responses to FMD vaccine 2 experiments were carried out. In the first experiment the calves derived from unvaccinated cows and cows which had been vaccinated 4 months before parturition and were vaccinated at 1 week of age. In the second

experiment 14 calves in various ages from 1 - 4 month derived from vaccinated dams (4 month before parturition) .Divided into 7 groups (each group of 2 calves in the same age).all calves were vaccinated with FMD vaccine. One of each group was revaccinated after one month. Blood samples were collected. The immune response was evaluated through the estimation of immune level using SNT and ELISA.

Serum neutralization test (SNT)
It was performed using the technique as described by **Ferreira (1976)**.

Enzyme linked immunosrobent assay (ELISA)
It was carried out according to the method described by **Voller et al., (1976).**

RESULTS

Effect of maternally derived antibodies (MDA) on the primary response of 1-week-old calves

Three calves, were born 40 days after vaccination of their dams, were vaccinated when 1 week old. Twenty-one days later their sera were examined for neutralizing antibodies. A further three calves, from non vaccinated dams devoid of FMD-specific MDA, were also vaccinated when 1-week-old using the same batch of vaccine and serum samples were collected twenty-one days later also. Calves devoid of MDA responded satisfactorily to vaccination and the antibody titers at 21 days post-vaccination for the O and A were 2.1 and 1.8 $\log_{10}$ by SNT respectively and in calves from vaccinated dams were 1.2 and 1.1 respectively**.(Table 1**).

Humoral primary and secondary immune responses of various ages of calves vaccinated with FMD vaccines:

Fourteen calves, born from vaccinated dams were vaccinated when 1-4 months old and serum samples were collected at 30 day later. One calf from each age group was revaccinated at day 30 after primary vaccination and serum samples from all were collected again at day 60 **(Table 2, 3)**.

DISCUSSION

The immune response of newly born calves was born to FMD vaccinated and unvaccinated cows, after vaccination with Bivalent gel FMD vaccine, were studied. The pre vaccination sera of most of the calves (born to FMD vaccinated cows) showed varying levels of maternal antibodies with the SNT ranging from 1.2 to 1.5, while the calves born to unvaccinated cows showed lower antibody levels. Calves of both the groups showed significant rise in SNT antibody titres at 21 days post vaccination however this rise was more appreciable in calves born to unvaccinated cows.

From table (1) the results revealed that calves devoid of MDA responded satisfactorily to vaccination and thire SNT and ELISA titers average antibody at 21 days post-vaccination were higher than that were borne from vaccinated dams, go in hand with the results obtained are consistent with the statement of **Nicholls et al., (1984) ; Ayebazibwe et al., (2010)** who reported that 1-week-old newborn calves responded as well as adult cattle to FMD-vaccines for calves borne from non vaccinated dams .Results were also in agreement with **Francis and Black (1986); Ishikawa and Konishi, (1982); Niedbalski (2003)** who reported the highest level of FMD antibodies in sera of new-born calves aged 5-10 days, and the immune response in calves it is not until around 30 days old that the immune system can respond effectively to most antigens .

The results presented in table (2) for evaluation of Humoral immune response at day 30 using SNT and ELISA of vaccinated calves at various ages, were Supported by **Van Bekkum (1966); Osebold (1982); Brooksby (1974); Sadir et al., (1988)** who mentioned that the maternally-derived antibody (MDA) interferes with the development of active immunity following vaccination.

In table (3) , the obtained results revealed that post vaccination action at day 30 increase the specific antibody titere in the revaccinated calves although there was considerable animal to animal variation in this response.These results supported by **Nicholls et al., (1984) ; Kitching and salt (1995); Pravieux et al., (2007)** who reported that, the

responses to secondary vaccination were more variable than primary responses.

Finally, it can conclude that: vaccination of newly born calves with bivalent FMD vaccine at (4 – 5) month's age and re- vaccination 30 days later is sufficient to provide protection against FMD infection in calves.

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