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Research Article

Characterization of the Immune Response Induced by a Commercially Available Inactivated Bluetongue Virus Serotype 1 Vaccine in Sheep

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The protective immune response generated by a commercial monovalent inactivated vaccine against bluetongue virus serotype 1 (BTV1) was studied. Five sheep were vaccinated, boost-vaccinated, and then challenged against BTV1 ALG/2006. RT-PCR did not detect viremia at any time during the experiment. Except a temperature increase observed after the initial and boost vaccinations, no clinical signs or lesions were observed. A specific and protective antibody response checked by ELISA was induced after vaccination and boost vaccination. This specific antibody response was associated with a significant increase in B lymphocytes confirmed by flow cytometry, while significant increases were not observed in T lymphocyte subpopulations ($CD4^+$, $CD8^+$, and $WC1^+$), $CD25^+$ regulatory cells, or $CD14^+$ monocytes. After challenge with BTV1, the antibody response was much higher than during the boost vaccination period, and it was associated with a significant increase in B lymphocytes, $CD14^+$ monocytes, $CD25^+$ regulatory cells, and $CD8^+$ cytotoxic T lymphocytes.

1. Introduction

Bluetongue virus (BTV), a member of the *Orbivirus* genus in the Reoviridae family [1], shows considerable genetic and antigenic variability, with at least 25 different serotypes characterized to date [2, 3]. These serotypes do not confer cross-protective immunity, which means that specific vaccines must be developed for each serotype [4].

Vaccination has proven very effective in BTV control and eradication strategies [5, 6]. A wide range of vaccines, based on either inactivated or modified live virus, are available against different BTV serotypes [7]. Inactivated vaccines are considered safer than vaccines based on modified live virus because they do not allow the possibility of viral replication. Therefore, they are useful for avoiding virus circulation among susceptible species [8, 9]. Indeed, inactivated vaccines have already been used successfully in field trials, and they are the vaccines most recommended by EU authorities [8, 10].

Several inactivated BTV vaccines have been shown to confer protection mainly by inducing production of neutralizing antibodies [11–14]. These antibodies protect primarily against homologous serotypes, and they appear ineffective at cross-protecting against heterologous serotypes [15, 16]. Some studies reveal that cell-mediated immunity could play an important role [17] when vaccinating with individual antigens [18], or concretely just in some sheep [19]. Also, inactivated vaccines have been shown to protect against BTV in the absence of neutralizing antibodies [4, 20], but it is well known that the main effective response against BT is capable to generate neutralizing antibodies [11].

Evaluating the cell-mediated immunity in animals vaccinated against BTV could provide valuable information for