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SHORT COMMUNICATION

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Role of Recombinant Proteins and DNA Vaccine Constructs in Elicitation of Active Immune Response against Bacterial Infection: A Review

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ABSTRACT

Both cell mediated and humoral immune responses are required for recovery from Brucella abortus infection. In the development of vaccines capable of providing immunity against brucellosis, L7/L12 50S ribosomal protein has been demonstrated to be one of the protective immunogens of Brucella abortus.

Key words: Brucella abortus, DNA Vaccine and Immune Response.

INTRODUCTION

In India, *Brucella abortus* S19 a smooth, avirulent strain is used to vaccinate cattle. Although the S19 vaccine gives considerable protection to cattle, it is pathogenic to humans and it is not effective in controlling the infection of udder, through which milk used for human consumption is contaminated with the bacterium. Further, the vaccine strain, cross reacts with the serological tests used to diagnose clinically infected cases. This is a major drawback in any control program. In the given scenario various researchers are in the process of developing safe and efficacious vaccines against brucellosis. Subunit nucleic acid vaccine strategies which negate many of the demerits of traditional vaccines give us an opportunity to find a suitable solution to control the disease. Many immunogenic proteins like Omp 28, Omp 31, Cu-Zn SOD, L7/L12 have been tried as recombinant subunit, nucleic acid, synthetic peptide vaccines.

Recombinant proteins and generation of immune response

L7/L12 50S ribosomal protein is a promising candidate because it has given good results in mice models. Further, Brucellin INRA (sLPS free cytosolic extract from rough *B. melitensis* B115) which is a purified protein used in skin test to screen positive cases of brucellosis fails to elicit a delayed type hyperimmune (DTH) response, when the L7/L12 fraction is removed from the purified protein (Bachrach *et al.,* 1994). L7/L12 ribosomal protein participates in bacterial protein synthesis by binding elongation factor G and TU. Like any other ribosomal protein this 12 kDa protein encoded by a 375 bp gene is also conserved across many genera of bacteria like *E. coli,* Mycobacteria etc. The exact antigenic motif recognized by the host immune system has not yet been elucidated. L7/L12 with its helix turn helix DNA binding motif makes it a suitable candidate to screen for putative T cell epitopes (Rice and Steitz, 1989). Any vaccine against brucellosis should give a predominantly Th1 mediated immune response to clear the infection. IFN-γ (interferon) and TNF-α have been implicated as key cytokines needed to confer protection against the disease.

Recombinant antigens and DNA vaccines

Among the recombinant antigens that have been tested, HtrA, GroEL, GroES, UvrA and YajC induced cellular and humoral immune responses in mice, but only the L7/L12 (Oliveira and Splitter, 1996; Oliveria *et al.,* 1994) elicited some level of protection. So there is a agreement between the present work and previous studies. *E. coli* expressing the Cu/Zn SOD also conferred a significant level of protection (1.77 log units) (Onate *et al.* 1999). Onate *et al.* (1999) also reported that the complete Cu/Zn SOD protein could induce a protective immune response in mice. But that report was contradictory with the results of Tabatabai and Pugh (1994) who were unable to induce a protective immune response in mice using a combination of adjuvants and purified recombinant Cu/Zn SOD protein as the vaccine antigen, although some level of protection was induced with synthetic peptides of the protein and adjuvant.

DNA vaccination is a relatively novel and powerful method of immunization DNA vaccination is a powerful method of immunization that induces strong cellular immune responses to a wide range of pathogens in many animal models for different diseases (Donnelly *et al.,* 1997). Previous reports demonstrated that intramuscular inoculation with a DNA vaccine that coded for L7/L12 elicited a strong protective response (Ercan and Splitter, 1997). As described previously, viable *B. abortus* RB51 conferred over 2 log units of protection (Tabatabai and Pugh, 1994). Munoz-Montesino *et al.* (2004) concluded that intra-spleen delivery of a DNA vaccine containing the Cu/Zn SOD was able to generate a protective immunity but intramuscular administration of that vaccine in the same doses and under the same conditions as the subcutaneous inoculation did not lead to a significant protective immune response (Onate *et al.,* 2003). Those results demonstrated a higher efficacy of the subcutaneous route of administration and they were in agreement with the results obtained by Cano *et al.* (2001) and Maloy *et al.* (2001).

CONCLUSION

To overcome silencing of the genes, in order to generate DNA vaccine that expresses for extended periods of time,

protein boosting is necessary. S19 vaccination has given highest protection level than that of other vaccinated groups in the present study.

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