



## Investigating the Efficiency of Immunogenicity of Specific Peptides Produced Against FMD Virus

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### Abstract

**BACKGROUND:** Foot-and-mouth disease is a highly contagious and sometimes fatal viral disease affecting livestock. Like other viruses, this virus continuously evolves and mutates, posing a significant challenge to vaccination due to the vast diversity of serotypes. There is no cross-protection among the serotypes, and two strains within a specific serotype may have nucleotide sequences that differ by up to 30% for a particular gene. This indicates that foot-and-mouth disease vaccines must be highly specific to the strain involved. Given the importance of the foot-and-mouth disease vaccine and its role in health and food security, using new peptide candidates for immunization could be beneficial.

**OBJECTIVES:** The aim of this study was to investigate the immunogenic effects of specific peptides produced against the FMD virus.

**METHODS:** After conducting bioinformatics studies, two sequences of 14- and 20-amino acid peptides from the peptide sequences of the immunogenic regions of the VP1 protein of foot-and-mouth virus O2016 were designed and synthesized. The peptide formulation (conjugated to BSA) was then prepared with aluminum phosphate adjuvant, and injections were administered to groups of nine rabbits at two-week intervals for a total of five times. Subsequently, the amount of antibody production was investigated and analyzed using the indirect peptide ELISA test, comparing it to the negative control samples (non-vaccinated calves) against the peptides attached to the BSA base.

**RESULTS:** The results showed that both peptides were capable of stimulating the immune system in rabbits, and antibodies against these peptides, as well as against the complete foot-and-mouth disease virus, demonstrated cross-reactivity with each other. Additionally, the highest immunogenicity in the ELISA test was related to the 20 amino acid sequence at a concentration of 300 µg per well in the checkerboard ELISA and 400 µg per dose injected into the rabbits.

**CONCLUSIONS:** These two peptides, with further research, could serve as suitable candidates for evaluating the immune response against foot-and-mouth disease virus in serology tests, examining vaccinated and non-vaccinated animals, and conducting immunization studies.

**Keywords:** Diagnosis, ELISA, Foot and mouth disease (FMD) virus, Immunization, Peptide

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### Figure Legends and Table Captions

**Table 1.** Sample Analysis Program after Purification.

**Table 2.** Analysis Results of the Designed Sequences.

**Table 3.** Indirect ELISA Reading Results on Sera of Hyperimmune Rabbits against Peptides.

**Table 4.** Median Values and Interquartile Ranges of OD Related to 20- and 14-Amino Acid Peptides Before and After the Test.

**Chart 1.** Comparison chart of OD ELISA values for 20- and 14-amino acid peptides before and after treatment.

**Figure 1.** The General Path of the Research.

**Figure 2.** The hydrophilicity of 14- (up) and 20-amino acid peptides (down).