# PD-1 and VEGF Peptide Vaccine Combination Display Synergistic Anti-Tumor Effect in Cancer Immunotherapy

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Cancer immunotherapy with checkpoint inhibitors (PD-1, CTLA-4, etc.) have had promising effects on suppressing tumor growth in numerous cancers. Programmed death-1 (PD-1) is a receptor commonly expressed on T cells where it plays a key role in maintaining self-tolerance and preventing autoimmunity. In a normal functioning immune system, when PD1 ligand (PD-L1) binds PD-1 receptor, T cell activation is suppressed. Meanwhile, vascular endothelial growth factor (VEGF) is a growth factor secreted by tumor cells that promotes angiogenesis, a key requirement by which tumors grow and invade surrounding tissue. In this study, we aim to exploit the immunological roles of PD-1 and VEGF to promote further T cell activation and inhibit angiogenesis in colon tumors, respectively. By administering the combination of B cell epitopes PD-1 and VEGF peptide vaccines in mouse models, we hypothesize the host immune system will elicit a response by generating neutralizing antibodies to the B cell epitopes in a synergistic manner. To test this, BALB/c mice were immunized with the PD-1/VEGF combination three times and subsequently challenged with the CT26 colon cancer cell line. Antigenicity and immunogenicity were monitored by collecting serum and performing enzyme-linked immunosorbent assay (ELISA). Tumor growth was also monitored for 2 weeks. Results indicate increasing immunogenicity upon subsequent immunizations, along with decreased tumor growth compared to controls. These data suggest the combination of PD-1 and VEGF peptide vaccines synergistically enhance survival outcomes by slowing tumor growth and hold a strong potential as an applicable treatment strategy for colon carcinomas. These findings support further investigation of vaccine efficacy in other cancer models.