Effect of Emdogain®-derived Oligopeptides on Human Microvascular Endothelial Cells in vitro

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Abstract

Purpose: Emdogain® (EMD) is derived from the tooth germ of juvenile swine, and is commonly used for periodontal tissue regeneration, including the formation of alveolar bone, in the treatment of periodontitis. However, because it originates from pig tissue, some patients choose not to be treated with EMD. The active component of EMD is a peptide sequence that corresponds to one of the pro-proteins as amelogenin II. Angiogenesis is one of the most critical events in the wound healing process and in periodontal regeneration. As such, this peptide may function as an angiogenic factor to stimulate cell differentiation and tissue regeneration.

Methods: We characterized the effects of 100 ng/ml of synthetic peptide by using matrix-assisted laser-desorption ionization time-of-flight mass spectrometry analysis of eosinophilic round bodies formed after subcutaneous injection of EMD into the backs of rats in a previous study on the proliferation after stimulation for 30 min or 1, 3, 6, 24 and 72 h, migration after stimulation for 1, 3 and 8 h, outgrowth extension after stimulation for 6 days, and ICAM-1 expression after stimulation for 3 days, in human microvascular endothelial cells (HMVECs).

Results: We demonstrated that the EMD-derived peptide significantly increased HMVEC proliferation and chemotaxis over unstimulated controls after all stimulation times. The peptide also led to an increase in outgrowth of processes from HMVEC spheroids in three-dimensional collagen cultures. ICAM-1 mRNA expression was also significantly elevated in HMVECs following treatment with the EMD-derived peptide.

Conclusion: EMD-derived synthetic peptide may act as an angiogenic factor to stimulate the proliferation, chemotaxis, adhesion and migration of microvascular endothelial cells.

Key words: Peptides, Enamel matrix derivative, Endothelial cells