Inhibition of porphyromonas gingivalis hemagglutinating activity by synthetic peptides derived from phage display selection using Mab against the recombinant outer membrane protein

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Abstract

Porphyromonas gingivalis has been implicated as an pathogen in the development of periodontitis, and hemagglutinins have been identified as an important adhesion onto the gingival tissue cells, and to attach and lyse erythrocytes to uptake Fe ion as an essential nutriant. The 40-kDa outer membrane protein (OMP) has been moleculary cloned from P. gingivalis 381. Since the antibody against recombinant (r) 40-kDa OMP inhibited the hemagglutinating activity, and the polymeric form of r40-kDa OMP itself expressed hemagglutinating activity, the 40-kDa OMP is thought to be one of the hemagglutinins. Moreover, we established MAbs against r40-kDa OMP which were capable of inhibiting hemagglutinating activity of P. gingivalis vesicles. In the present study, a phage-displayed epitope mapping system was used to identify the functional domain expressing hemagglutinating activity by biopanning using the neutralizing mAb, Pg-ompA1. The minimal epitope requirements of the MAb and the predicted amino acid sequences were identified in the region of (96)IALDQTLGIP(105) in 40-kDa OMP. Synthetic peptide, (87)WPRVGQLFIALDQTLGIPTFSVCRME(116), mapped the relevant molecule within a short stretch and is corresponding to residues of 40-kDa OMP. Chemically synthesized peptide was used to determine its inhibitory activity against hemagglutinating activity. The synthetic peptide significantly abolished hemagglutinating activity in a dose-dependent manner. These findings suggest that the synthetic peptide is an effective antagonist of erythrocyte binding, and this peptide may be a potent inhibitor of hemagglutination of P. gingivalis cells. The use of synthetic peptide neutralizing hemagglutinating activity of P. gingivalis represents a possible new therapeutic approach to P. gingivalis infected periodontitis.