Poster Presentation

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Seminar Room (7th F) 13:30 – 15:00

p-1 Antibacterial effect of polyphosphate on endodontopathic bacteria

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Ⅰ. Objectives

Porphyromonas gingivalis is strongly associated with the pathogenesis of endodontic infections and *Enterococcus faecalis* is implicated in endodontic failure with persitent root canal infections. The present study was performed to observe the antibacterial effect of polyphosphate (polyP) with various chain lengths (P3~P75) on virulent, invasive strains of *P. gingivalis* A7A1-28 and W50, and multidrug resistant *E. faecalis* ATCC29212.

Ⅱ. Materials and methods

P. gingivalis strains were grown in brain-heart infusion broth (BHI) containing hemin and vitamin K with or without polyP. PolyP was added at the very beginning of the culture or during the exponential growth phase of the culture. Inhibition of the growth of *P. gingivalis* was determined by measuring the absorbancy at 540 nm of the grown cells. Viable cell counts of the culture were measured to determine whether polyP has a bactericidal activity. Release of intracellular nucleotide from *P. gingivalis* was determined at 260 nm. *E. faecalis* was grown in plain BHI with antibiotics alone or in combination with polyP and the bacterial absorbancy was measured.

Ⅲ. Results

1. Polyp with various chain lengths added at the very beginning of the culture inhibited the growth of strains of *P. gingivalis* at the concentrations of 0.06~0.07%.
2. PolyP75 added to the *P. gingivalis* culture during the exponential growth phase of *P. gingivalis* was as much effective as polyP added at the very beginning of the culture, suggesting that the antibacterial effect of polyP is not much dependent on the initial inoculum size of *P. gingivalis*.
3. The viable cell count assay revealed that almost all cells of *P. gingivalis* were killed by polyP75 at the concentrations used, suggesting polyP has bactericidal activity.
4. Intracellular nucleotide release from the *P. gingivalis* A7A1-28 was increased by 50% in the presence of polyP and was reversed by addition of divalent cations like Ca^{++} and Mg^{++}.
5. Intracellular nucleotide release from the *P. gingivalis* W50 was not much increased (24%) in the presence of polyP and seemed to be reversed by addition of divalent cations like Ca^{++} and Mg^{++}.
6. The growth of *E. faecalis* was not affected by the presence of sodium hexametapolyphosphate (Calgon) at the concentrations of 0.1~1.0%.
7. Permeabilizing activity of Calgon increased the antibacterial effect of erythromycin and especially tetracycline on *E. faecalis*. In contrast, antibacterial effect of ampicillin, gentamicin, and kanamycin was not changed by Calgon.
8. Antibacterial activity of cefotaxime against *E. faecalis* was profoundly increased by Calgon at the lower concentratrions but at higher concentations (0.4~1.0%), permeabilizing activity of Calgon gradually decreased to negligible levels.
9. Antibacterial activity of penicillin-G against *E. faecalis* was rather decreased by Calgon at the lower concentratrions but at higher concentations, Calgon gradually increased its antibacterial activity.

Ⅳ. Conclusions

The overall results suggest that polyP has a strong antibacterial effect on the growth of the virulent strains of *P. gingivalis* and the antibacterial activity of polyP seems largely bactericidal, accompanying bacteriolysis in which chelation phenomenon is not involved. Although polyP does not exert antibacterial activity against *E. faecalis*, it appears to increase antibacterial effect of erythromycin and tetracycline on the bacterium. Therefore, polyP alone or in combination with antibiotics may be developed as a candidate for the agent controlling oral infections including endodontic infection.