

## Dentistry 2019: *Porphyromonas salivosa* ATCC 49407 fimbriae induced osteoclast differentiation and cytokine production

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*Porphyromonas salivosa* ATCC 49407 (*P. salivosa*) is a black-pigmented, anaerobic, Gram-negative and rod-shaped organism. *P. salivosa* is often isolated from the gingival sulcus of various animals including dogs and cats. We examined the involvement of the fimbrial protein in osteoclast differentiation and cytokine production in murine macrophages. Furthermore, alveolar bone resorption induced by *P. salivosa* infection in rats was evaluated. Fimbrial protein was purified from *P. salivosa* by selective protein precipitation and chromatography on a DEAE CL-6B anion exchange column. Western blotting analysis was performed with PAbs against fimbrial protein from *P. salivosa*. Expression of fimbriae on the surface of *P. salivosa* was investigated using transmission electron microscopy.

To estimate osteoclast differentiation, bone marrow cells and MC3T3-G2/PA6 cells were cultured with or without the purified fimbrial protein for 7 days. BALB/c mouse peritoneal macrophages were stimulated with the purified fimbrial protein and cytokine production was determined by ELISA. Special pathogen-free 3-week-old male Sprague-Dawley rats were infected with *P. salivosa*. 45 days after the last infection, jaws were removed and cleaned and the periodontal bone levels were determined by a morphometric measurement. The 60-kDa fimbrial protein of *P. salivosa* induced osteoclast formation and induced IL-1 $\beta$  and TNF- $\alpha$  production.

Rats orally infected with *P. salivosa* exhibited significant alveolar bone loss. Consequently, *P. salivosa* fimbriae may play an important role in induction of periodontal diseases. These results suggest that *P. salivosa* 60 kDa fimbriae may provoke an inflammatory response in host and be involved in periodontal tissue breakdown.

*Porphyromonas salivosa* is a black-pigmented, asaccharolytic, anaerobic, non-motile, non-spore-forming, Gram-negative, rod-shaped organism. In 1987, Love et al. described *Bacteroides salivosus* as a pigmented asaccharolytic pathogen which was isolated from subcutaneous abscesses and pyothoraxes of cats. *B. salivosus* strains have little DNA-DNA hybridization with members of previously described pigmented asaccharolytic *Bacteroides* species. In addition, DNA-DNA hybridization experiments revealed that the levels of hybridization between feline strains and *Bacteroides macacae* ATCC 33141 are not significant.

Periodontitis in companion animals is an almost identical disease to that in humans in terms of disease course and clinical presentations. Black-pigmenting anaerobic bacteria have been isolated from the periodontal pockets of several animals.

The most frequently isolated black-pigmented anaerobic bacteria in canine periodontal pockets are *P. gulae*, *P. salivosa* and *P. denticanis*. However, several differences between human and companion animal *Porphyromonas* isolates have been reported.

*P. gingivalis* isolates from humans are catalase-negative, whereas *P. gingivalis*-like isolates from canine periodontal pockets are catalase-positive. These catalase-positive *P. gingivalis*-like isolates may be of *P. gulae*.

Periodontal disease is a significant oral problem, characterized by halitosis, gingival inflammation, increased periodontal pocket depth, and alveolar bone loss, which results in loosening and eventual loss of teeth. Periodontal pathogens induce inflammatory reactions in the surrounding tissues.