Preferential Colonization Patterns of Periodontopathogens in Subgingival Niches of Periodontitis Patients

W.K. Leung*, L.J. Jin, P. - O. Soder, E.F. Corbet. The University of Hong Kong, Hong Kong SAR, China and 1Karolinska Institute, Huddinge, Sweden.

Introduction
Chronic periodontitis is an infectious disease resulting from intrusive host-parasite interactions at the level below the border of the tooth-supporting apparatus (Conaway 1996). The role of specific periodontopathogens in this disease process was being investigated dating back to the late 70’s (Socransky & Haffajee 1994). At least a dozen putative periodontopathogens were identified (Conaway 1996) while more were being put onto the list when research ability in bacterial identification was pushed beyond the limits of traditional culture techniques (Paster et al 2003). Realizing the possible immense complexity of the microbial etiology of periodontal disease, attention was also being put towards studying the interactions between members of the subgingival microbial biofilm (Socransky et al 1988, Simson et al 1992). Evidence accumulated in recent years pointed towards certain periodontopathogens tending to co-exist in subgingival niches of subjects with various clinical conditions (Simson et al 1998, Jin et al 1999, 2002). Various statistical analysis protocols have been applied to the subgingival microbial data processing (Simson et al 1992, Cohen 1993, Ali et al 1993, Simson et al 1992). Many studies employed statistical protocols focusing on two-way contingency, correlation or cluster analysis of target species. Configural frequency analysis (CFA) was recommended by Cohen (1993) as the statistical tool when configurings the target microorganisms, present or not, were studied.

The aim of the current study is therefore attempt to utilize CFA in studying the possibility of co-colonization patterns among five periodontopathogens namely, Actinobacillus actinomycetemcomitans (Aa), Bacteriodes forsythus (Bf), Porphyromonas gingivalis (Pg), Prevotella intermedia (Pi), and Treponema denticola (Td) (Bf), Porphyromonas gingivalis (Pg), Prevotella intermedia (Pi), and Treponema denticola (Td). The first-order model was 0.05.

Material and Methods
Patients management, site selection and sampling
Microbiological samples from 85 subgingival sites of 16 adult Chinese patients with chronic periodontitis, aged 32-55 years were studied. Related clinical information was published (Jin et al 1999, 2002).

Five to seven non-adjacent sites were sampled from each subject consisting:
- Periodontitis sites - pocket depth (PD) ≥ 5 mm, attachment loss (AL) ≥ 3.0 mm, probing pocket depth (PPD) ≥ 5 mm, gingival recession (REC) ≥ 2 mm, samples and
- Healthy site - GI = 0, BOP (0), PD < 4 mm, AL < 3 mm, BL (1), 1 sample.

Sampling
Samples were collected using paper points and analyzed for Aa, Bf, Pg, Td using species specific DNA probes (Jin et al 1999).

Following sampling, each patient received a course of non-surgical periodontal therapy within a 4-week period. Subgingival plaque samples were collected from the same 85 sites one-month after the non-surgical periodontal therapy.

Statistical analysis

The prevalence of Aa at baseline and 1-month post-therapy was low (0% and 3.5% respectively) and hence not included in the study. Stuart-Maxwell Chi-square test (Fleiss & Everitt 1971) was used to analyze the change of microbial profile, i.e. presence or absence, of the four target species, Bf, Pg, Td and Aa at all possible combinations (n = 16, see Table 2) and baseline and one month post non-surgical therapy. T-test analysis based on McNeamar’s statistic with Bonferroni adjustment was carried out. The level of significance chosen was 0.05.

CFA was then applied to the data set (Cohen 1993) in the statistical tool when configurating the target microorganisms, present or not, were studied.

Within the limitations of this study:
- Bf, Pg, Td colonized periodontal sites in a cluster or not
- while proportion of sites with none of these pathogens had markedly increased one month after non-surgical periodontal therapy, this cluster-type colonization of Bf, Pg, Td and Td persisted.

References
2. Cohen ME. Community Dent Oral Epidemiol 1993: 21: 283-

Acknowledgements
This study was supported by the Research Grant Council, Hong Kong SAR, China.

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Table 1. First-order configurations (model: Bf, Pg, Td, Aa)

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Observed</th>
<th>Expected</th>
<th>p</th>
<th>Odds Ratio</th>
<th>Type/antitype</th>
</tr>
</thead>
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<tr>
<td>Bf+Pg+Td</td>
<td>26.10</td>
<td>12.10</td>
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<td>0.0053</td>
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<tr>
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<td>0.57</td>
<td>0.0000</td>
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<td>0.0012</td>
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<td>0.55</td>
<td>0.05</td>
<td>0.0000</td>
<td>0.0000</td>
<td>type</td>
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</tbody>
</table>

Table 2. First-order configurations (model: Bf, Pg, Td, Aa) at one-month post-non-surgical therapy

<table>
<thead>
<tr>
<th>Configuration</th>
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<th>Expected</th>
<th>p</th>
<th>Odds Ratio</th>
<th>Type/antitype</th>
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<td>0.05</td>
<td>0.0000</td>
<td>0.0000</td>
<td>type/antitype</td>
</tr>
</tbody>
</table>

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Conclusions

Within the limitations of this study:
- Bf, Pg, Td colonized periodontal sites in a cluster or not
- while proportion of sites with none of these pathogens had markedly increased one month after non-surgical periodontal therapy, this cluster-type colonization of Bf, Pg, Td and Td persisted.

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