1186

PerioProtect™ - and its effect on subgingival biofilms

D. Keller[1], C. Schaudinn[2], P. Sedghizadeh[3], J.W. Costerton[2]

[1]PerioProtect® Chief Scientific Officer; [2]University of Southern California, Center for Biofilms;
[3]University of Southern California, Oral & Maxillofacial Pathology

Fig. 5a: Carrier at the site 2 6 distal buccal, before treatment. The bacteria colonized large areas of the carrier and formed a multilayered biofilm.

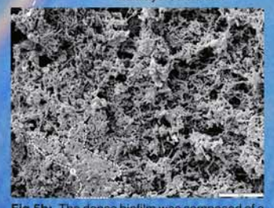

Fig.5b: The dense biofilm was composed of a large variety of different morphotypes which were partly embedded in exopolymeric substance (EPS) (area 1).

Fig. 5c: Fusiform-like bacteria (arrows 1) and EPS producing short rods (arrow 2) dominated some parts of the biofilm in which also numerous large eukaryotic cells were interspersed (arrow 3).

INTRODUCTION: Locally placed acute treatment antibiotics like the PerioChip, Arestin, Actisite or Atridox face problems of the increased GCF of inflamed periodontal pockets diluting or removing solutions placed in this region and using locally delivered antibiotics has been reported to incur resistant bacterial strains. The Perio Protect® method overcomes the crevicular flow and maintains antimicrobial medications (hydrogen peroxide gel) in the infected gingival sulcus or "periodontal pocket". This method consists of a FDA approved medical delivery device called the Perio Tray®, with which the medication is delivered (Fig.1). Clinical trials have demonstrated statistically significant improvements using the Perio Protect Method™. **OBJECTIVE**: In this study clinical changes are correlated with the observed changes of the microbial community in the periodontal pockets. No scaling or root planning was completed during the treatment. **METHODS**: Based on the patient's impressions, Perio Trays® were made in accordance with FDA regulations by a laboratory registered with the FDA to coincide with the specific disease conditions of the patient. The tray is worn in accordance with the scope and magnitude of disease and wearing instructions are modified as healing occurs. This patient was instructed to wear the trays for 20 minutes 4 times a day. Prior to the tray delivery, small, sterile polycarbonate carriers (Thermanox® Nunc™) were inserted for 48 hours in three periodontal pockets; 2 6 mesial buccal, 2 6 distal buccal and 3 6 mesial buccal. New sets of carriers were placed for 48 hours at the same sites after 2, 7, 12 and 17 days, respectively (Fig.2). During the time the carriers were inserted, the patient did not use the Perio-Tray® but was allowed to brush and floss except at the indicated sites. In the first five days of using the Perio Protect® only hydrogen peroxide gel (1.5%) was delivered with the Perio-Tray® into the sulcus and periodontal pockets. Beginning with the seventh day H2O2 was administered along with a sub-clinical dose of Sumycin® syrup (anti-oxidant). The carriers were removed and processed for scanning electron microscopy. The number of micro-organisms was evaluated as a cell count / unit area. **CLINICAL RESULTS**: Before commencement of treatment, the periodontal chart showed probing depths between 2 and 3 mm for 75% of all measured sites, 22 % were probed with 4 and 5 mm, and 3 % with 6 mm. After 12 days of Perio Protect® use, 95% of all sites were found between 1 and 3 mm. The remaining 5 % were probed between 4 and 5 mm.

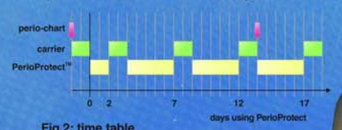

Fig.2: time table

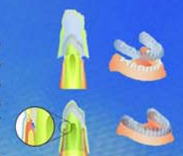

Fig.1 PerioProtect ™

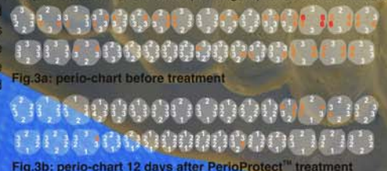

Fig.3a: perio-chart before treatment

Fig.3b: perio-chart 12 days after PerioProtect™ treatment

MICROBIOLOGICAL RESULTS: The number of bacteria cells forming the biofilm on the carriers dropped from approximately 1,000,000 to 10,000,000 cell count / unit area before treatment to 100 or fewer bacteria cells after Perio Protect® was used for 17 days (Fig.4). Before treatment the subgingival biofilms consisted of large numbers of fusiform, cocci and short rod-shaped bacteria and, in one pocket treponema (Fig.5a-e). After five days of Perio Protect® treatment most of the fusiform bacteria and all treponema disappeared (Fig.6a-d) and after 12 days only few small areas colonized by cocci and pleomorphic rods were visible on the carriers next to large numbers of eukaryotic cells (Fig.7a-d). The presence of cuboid Sumycin® crystals on even the most apical regions of the carrier proves that the Perio Protect® method is able to deliver and maintain medication even in the deepest regions of the periodontal pocket (Fig.7a).

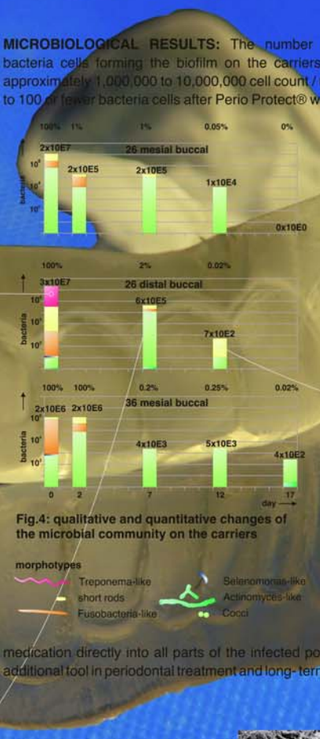

Fig.4: qualitative and quantitative changes of the microbial community on the carriers

DISCUSSION: Perio Protect® obviously turns the anaerobic pocket habitat into an aerobic environment, by delivering hydrogen peroxide, so that strictly anaerobe bacteria (i.e. Treponema spp. or Fusobacteria spp.) are reduced or completely vanish. After 12 days of high influx of hydrogen peroxide in combination with the antibiotic / antioxidant Sumycin® the number of bacteria on the carriers decreased by 99.75 % as compared to the untreated cell count / unit area. Eventually even Actinomyces-like and Streptococci-like morphotypes are affected, and the primary nutrients of these organisms are sugars known to be partially degraded by H2O2. 99.98% of the bacteria are eradicated by day 17 and no adverse tissue effects were observed as hydrogen peroxide is a natural occurring antimicrobial agent produced by human neutrophils. The increasing number of different eukaryotic cells on the carriers over time supports the impression that eukaryotic cells are not negatively affected by 1.5 % H2O2. **SUMMARY**: Although these results need to be verified by a larger number of patients, the simplicity with which the Perio Protect® method can be used to deliver high and sustained concentrations of virtually any medication directly into all parts of the infected pocket makes it an invaluable additional tool in periodontal treatment and long-term maintenance.

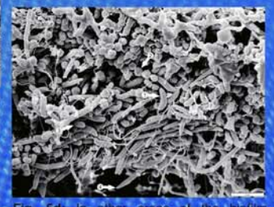

Fig. 5d: In other areas of the biofilm Selenomonas-like bacteria appeared with their characteristic half-moon morphology (arrow 1) next to cocci (arrow 2), short rods (arrow 3) and groups of fusiform rods (arrow 4).

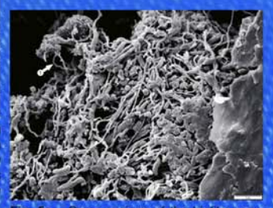

Fig. 5e: Some regions of the biofilm were dominated by Treponema-like morphotypes (arrow 1).

Fig. 6a: Carrier at the site 2 6 distal buccal, 7 days after using PerioProtect™. Patches of biofilm (i.e. in area 2) were found amongst a group of large eukaryotic cells (arrow 1).

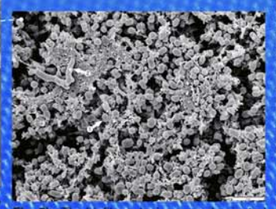

Fig. 6b: The biofilm colonies were dominated by cocci (arrow 1) but some pleomorphic rods were also visible (arrow 2).

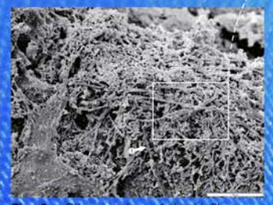

Fig. 6c: Other patches of the biofilm were dominated by long hyphae-like rods (arrow 1) and by short pleomorphic rods.

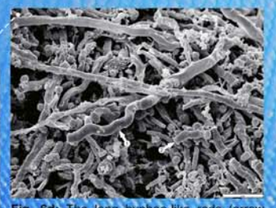

Fig. 6d: The long hyphae-like rods (arrow 1) and the short pleomorphic rods (arrow 2) vary in length and diameter.

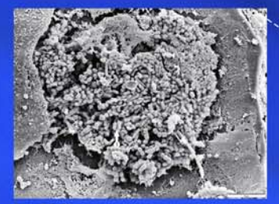

Fig. 7d: The micro-colonies consisted of EPS-producing short rods. The dehydrated EPS is visible as a fine fibrous network around the bacteria (arrow 1).

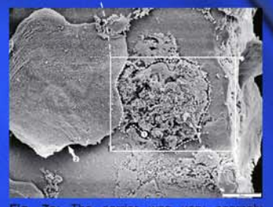

Fig. 7c: The carrier was very sparsely populated with small patches of biofilm. The micro-colony (area 1) depicted is situated adjacent to a eukaryotic cell (arrow 2).

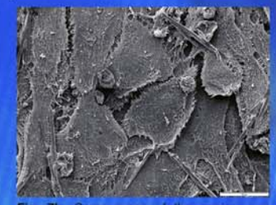

Fig. 7b: Some areas of the carrier were densely covered with large eukaryotic cells.

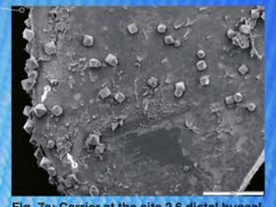

Fig. 7a: Carrier at the site 2 6 distal buccal, 12 days after using PerioProtect™. The carrier was covered with eukaryotic cells (arrow 1) and crystals with a characteristic cuboid shape (arrow 2).