

University of Rome, Rome, Italy

²Department of Biomedical Sciences, University of Sassari, 07100 Sassari, Italy

³Department of Basic Medical Sciences, Neurosciences and Sense Organs, "Aldo Moro" University of Bari, Bari, Italy

Aim: To compare the clinical periodontal outcomes and the levels of salivary matrix metalloproteinases MMP-8 after non-surgical periodontal therapy alone or coadjuvated by the use of a mouthwash based on ozonated extra virgin olive oil in patients with periodontitis.

Method: A randomized double-blind case-control study was conducted. The analysis will include data from all patients with different stages of periodontitis. The level of salivary MMP-8 metalloproteases will also be detected. After enrollment, the patients were divided into two groups, according to randomization: experimental and control. Ninety-six subjects of both sexes, aged between 30 and 60 years, were selected at a private dental practice in Cecina, Italy. The enrolled subjects were subsequently divided into two groups: control group (n = 48), scaling and root planning procedures; experimental group (n = 48), scaling and root planning procedures + mouthwash based on ozonated extra virgin olive oil. All the participants signed an informed consent. The study population was analyzed by Intention To Treat (ITT), then all randomized patient data were analyzed. Frequencies, means, medians and standard deviation were calculated for the descriptive analysis. Group differences were assessed using the Chi-square test for categorical variables and the T-Student test for independent samples for continuous variables. The multivariate logistic regression model was used to examine the effect of the ozonated extra virgin olive oil mouthwash supplement compared to the SRP causal therapy alone.

Results: After treatment, improvement in the periodontal indices examined, PI, BoP, PDD and salivary MMP-8 levels was observed in both groups. However, the differences in values between baseline and post-treatment were statistically significant only in the study group (p<0,01).

Conclusion: The Scaling and Root Planing procedure has a beneficial effect on the inflammatory status in patients with periodontitis. The SRP coadjuvated by the use of ozonated oil contributes to a further improvement of the clinical periodontal parameters. The traditional SRP treatment causes a decrease in the MMP-8 levels in the saliva of the treated subjects, but the SRP followed by ozone therapy can certainly speed up and improve the result. SRP in combination with ozonated oil leads to a significant and faster reduction in saliva MMP-8 concentrations in patients with periodontitis.

In vitro activity of ozonated olive oil-based products against carious pathogen streptococcus mutans

Nardi G.M.¹, Fais S.², Casu C.^{2,3}, Mazur M.¹, Di Giorgio R.¹, Grassi R.⁴, Grassi F.R.⁵, Orrù G.^{2,6}

¹Department of Oral and Maxillofacial Sciences, Sapienza University of Rome, Italy

²Department of Surgical Sciences, University of Cagliari, Cagliari, Italy

³DDS, Private Dental Practice, Cagliari, Italy

⁴Department of Biomedical Sciences, University of Sassari, Sassari, Italy

⁵Department of Basic Medical Sciences, Neurosciences and Sense Organs, Aldo Moro, University of Bari, Italy.

⁶National Research Council of Italy, ISPA-CNR, Sassari, Italy

Aim: The Gram-positive bacterium *Streptococcus mutans* is mainly known to be a causative agent of dental caries as well as some genotypes are also involved in severe systemic affections. In this context is strictly crucial the control of *S. mutans* amount inside the oral microbiome, in fact high levels of this bacterium in the oral tissues are related to severe clinical events: caries, tonsillitis, transitory bacteraemia's are the most common. In other hands, the current agents used against the *S. mutans* have low substantiveness and present side effects as skin irritation, teeth discoloration, and allergic reactions. In this in vitro study we investigated the antibacterial activity of two commercial ozonated olive oil-based products against a pathogenic strain of *Streptococcus mutans*.

Methods: Two different commercial mouthwashes were obtained from Gemavip, (Cagliari Italy): (i) lalozon Blu, IB within ozonated olive oil and (ii) lalozon Rosa IR, with ozonated olive oil, hyaluronic acid and E vitamin. All formulates were analyzed in a dilution range from 2 to 256 folds in saline solution. A strain of *S. mutans*, CIP103220 (Collection Institut Pasteur) was used for the antimicrobial susceptibility test. The Minimum Inhibitory (MIC) and Minimum Bactericidal Concentration (MBC), were performed by the micro-dilution method following the Clinical & Laboratory Standards Institute (CLSI), while (MBIC) was evaluated following the modified protocol described by Montana University Center for Biofilm Engineering.

Results: Both formulates showed the same antimicrobial activity and this suggest the main role of ozonated -oil in antibacterial antibiofilm process. MIC, MBC, MBIC were observed for dilutions factors of 1/32, 1/8 and 1/8 respectively. These results suggest that these formulates are able to inactivate the sessile and planktonic form of *S. mutans* avoiding the dilution effect by saliva in the oral cavity.

Conclusion: Dental caries is a microbe-mediated



oral disease with a four-factor aetiology: oral microorganisms and environment, host and time. In this case scenario dental biofilm plays a central role and evidence exists that controlling dental biofilm is effective on tooth decay prevention. When compared with chlorhexidine, olive oil showed lower antimicrobial activity, but lower cytotoxicity, resulting in a safer product for a long-term use. In addition, topical ozone is effective through damage to the microbial cytoplasmic membrane, but it is

very safe on human cells. Recent studies suggested the use of ozonated olive oil in periodontology, with antibacterial efficacy comparable to chlorhexidine. The current study showed that ozonized olive oil, with and without hyaluronic acid and other fillers, could be useful to reduce bacteria load of *S. mutans*, and to prevent, safely, dental caries. For these reasons ozonated oil could be a new frontier for the non-invasive treatment of dental caries.