

# **EVALUATION OF THERMAL SPRING WATER EFFECT ON THE ORAL ECOSYSTEM: EXAMPLE OF CASTERA-VERDUZAN'S THERMAL SPRING WATER**

Sixou M., Linossier L., Diouf A.

MCU-PH

Representative sub-section of Public Health

Faculty of Surgery. Toulouse, France, August 2004.

Castéra-Verduzan Thermal spring water respects the oral flora and has a moderate antibacterial action on anaerobic bacteria.

## **SUMMARY**

Thermal spring water is used for therapeutic aims since antiquity. Castéra-Verduzan matured Thermal spring water is rich in oxygen. This study's authors have evaluated this Thermal spring water impact on the oral ecosystem respect by its antibacterial activity analysis versus an antiseptic reference molecule on 9 clinical bacterial stocks. The results have shown a respect of oral supra-gingival biofilm by Castéra-Verduzan thermal spring water.

The antibacterial action on anaerobic bacteria has been shown but it is inferior to the antiseptic of reference. Castéra-Verduzan Thermal spring water finds its indication in the long term period following of patients presenting a periodontal disease. Castéra-Verduzan Thermal spring water contributes to oral ecosystem recovery and mantains a weak pressure on the selection of potentially pathogenic microbes.

## INTRODUCTION

In France, Thermal spring water is used for therapeutic aims since antiquity. In France, 107 thermal spas are recognized by Health authority in different therapeutic treatments, of which 10 are specialized in periodontal diseases and Oral affections. Among it, we find Castéra-Verduzan thermal spa. Physico-chemical characteristics of its Thermal spring water permits to affirm an advantageous activity on the oral sphere.

The oral cavity is perfect place for pathogenic opportunist microorganisms development (8). The oral cavity constitutes a real ecosystem composed by more than 350 different species of bacteria: 10 millions of microbes per mg of supra-gingival plaque and 500 000 microbes per ml of saliva (11). A healthy mouth presents an equilibrated oral ecosystem which acts as a natural buckler against the appearance of opportunistic pathogenic microbes or true pathogens (6). When this equilibrium is broken, naturally present bacterial kinds develop in the oral cavity which by selection pressure colonize this environment, became preponderant and, in some cases, cause the appearance of pathologies (tooth decay or periodontal disease) (7) (15) (16) (4).

The antiseptics constitute reference molecules used for the taking care of the oral contagious pathologies. The antiseptic molecule choice will be in function of the desired therapeutic effect (12).

This study objective is to evaluate Castéra-Verduzan Thermal spring water impact on oral ecosystem respect by its antibacterial activity analysis, versus an antiseptic reference molecule on 9 clinical bacterial stocks.

The bacteriological study in vitro aims to define the impact of a product of the BUCCOTHERM<sup>®</sup> line (Dental spray) on the oral ecosystem. BUCCOTHERM<sup>®</sup> Dental spray will be tested on nine essential bacteria present in the oral ecosystem. The impact of this product on the oral ecosystem will be compared to a solution of Chlorhexidine (0,12%), the Thermal Spring Water of Castéra-Verduzan and a NaCl 0,9% solution.

Bacterias selected in this test are the main primary and secondary colonizers of the oral flora. They play an essential role in the constitution and the ripening of the dental biofilm (supra-gingival flora) and the development of periodontal diseases (gingivitis or periodontitis).

## RESULTS

The results pictures 1 and 2, and the graph 1 represent the inhibitive minimal concentrations (CMI) of tested products opposite the 18 bacterial strains. The acquired results for Chlorhexidine (at 0,12 %) show a normal antibacterial activity as an antiseptic molecule of reference. The solution of NaCl (at 0,9%) (negative model solution) doesn't show any antiseptic activity. The matured Thermal spring water shows CMI closed to  $\frac{1}{4}$  on the supra-gingival flora and  $\frac{1}{8}$  on the sub-gingival flora. The results show a high homogeneity between both category of strains, of reference and clinical.

## DISCUSSION

The bacteria chosen in this study can be classified into 2 categories. The supra-gingival bacteria constitute the normal supra-gingival flora and are involved in the development of tooth decay (5) (10). They are the main primary and secondary colonizers of the oral biofilm (12). They have an essential role in constitution and ripening of the plaque. The sub-gingival bacteria constitute the sub-gingival flora and are involved in periodontal pathologies (13). The bacteria with negative Gram, strict anaerobes (*Porphyromonas gingivalis*, *Prevotella intermedia*, *Tanerella forsythensis*) permit to evaluate the presence of an antibacterial activity on the bacteria which have an important role in the periodontal diseases development (1) (2). *Actinobacillus actinomycetemcomitans* and *Campylobacter rectus* are presents in weak proportion into numerous healthy persons (3) (14) but a flora imbalance can make it appear. Therefore it is interesting in this study to know the microorganisms sensibility to these products.

The results show the respect of the supra-gingival flora and a slight antibacterial action on bacteria of the sub-gingival biofilm, which are called periopathogens. Indeed, an activity on the bacteria involved in gingivitis and periodontitis clearly appears even if this activity doesn't reach those of Chlorhexidine 0,12%.

These results show a total respect of the supra-gingival flora and a moderated action on the bacteria of the under-gingival ecosystem i.e. anaerobic germs.

The bacteria used in this type of study can present differences in sensitivity compared to the clinical stocks taken recently on patient. For that reason we tested in this study a stock of reference and a clinical stock for each test. The results show a great homogeneity between the two categories of stocks. We can thus conclude that the results obtained in this study can be extrapolated to clinical stocks with a good probability.

Similar results are found between the Thermal Spring water of Castéra-Verduzan and BUCCOTHERM® Dental spray. This result shows the quality

of the conditioning process which preserves the properties of the active ingredient.

The comparison of the results obtained between the Spring Water and the placebo (NaCl 9%) shows the respect of the supra-gingival flora. On the other hand, an activity on the bacteria responsible of the gingivitis and the periodontal disease appears clearly even if the activity does not reach that of the chlorhexidine 0,12%.

## **CONCLUSIONS**

This study shows in a clear way the respect of the supra-gingival oral ecosystem by BUCCOTHERM® Dental spray and permits to think that this product can be used for long term period without any negative impact on oral flora.

A moderate anti bacteria action (lower to an analgesic of reference like the Chlorhexidine 0,12%) has been proved on 5 main periodontal germs.

If complementary studies confirmed it, BUCCOTHERM® Dental spray could be indicated in complement to the traditional treatments within the framework of periodontal diseases.

This study shows the respect of supra-gingival oral bio film by the matured Castéra-Verduzan Thermal spring water. This result permits to think that this matured Thermal spring water can be used every day, for the oral hygiene without negative impact on oral flora.

The moderate antibacterial action (inferior to any antiseptic of reference as Chlorhexidine 0,12% shown on periopathogen bacteria) permits to think that Castéra-Verduzan Thermal spring water can be indicated to complete periodontal treatments in case of periodontal diseases. The Chlorhexidine is a molecule of reference in the treatment of periodontal diseases, at 0,2% in first step of treatment for adults suffering from periodontitis, then follow with Chlorhexidine 0,12%. The matured Castéra-Verduzan Thermal spring water finds its legitimacy in the long-term following of patients suffering from periodontal diseases, to recover the oral ecosystem and keep a weak pressure of selection on potentially pathogen bacteria.

## BIBLIOGRAPHY

- (1) Dzink JL, Tanner ACR, Haffajee AD, Socransky SS, Gram negative species associated with active periodontal lesions. *J Clin Periodontol.* 1985 ; 12 : 648-659
- (2) Haffajee AD, Socransky SS, Dzink J, Clinical, microbiological and immunological features of subjects with destructive periodontal diseases. *J Clin Periodontol.* 1988 ;15 : 240-246.
- (3) Mandell RL, Socransky SS, A selective medium for *Actinobacillus actinomycetemcomitans* and the incidence of the organism in juvenile periodontitis. *J Periodontol.* 1981 ; 52 : 593-598
- (4) Marsh PD, Microbial ecology of dental plaque and its significance in health and disease. *Adv Dent Res.* 1994 ; 8 : 263-271
- (5) Marsh PD, Microbiologic aspects of dental plaque and dental caries. *Dent Clin North Am.* 1999 ; 43 (4) : 599-614
- (6) Marsh PD, Dental plaque as a microbial biofilm. *Caries Res.* 2004 May-Jun ; 38 (3) : 204-211
- (7) Page RC, Schroeder HE, *Periodontitis in man and other animals.* Basel : Karger, 1981 ; 21-85
- (8) Paster BJ, Boches SK, Galvin JL and al, Bacterial diversity in human subgingival plaque. *J Bacteriol.* 2001 ; 183 : 3770-3783.
- (9) Rapport de l'Inspection Générale des Affaires Sociales sur le thermalisme français, Octobre 2000
- (10) Roeters FJ, van der Hoeven JS, Burgersdijk RC, Schaeken MJ. Lactobacilli, mutants streptococci and dental caries: a longitudinal study in 2-year-old children up to the age of 5 years ; *Caries Res.* 1995 ; 29(4) : 272-279
- (11) Sixou M, Bactéries de la flore buccale. *Bull Soc Fr Microbiol.* 1997 ; 12 : 19-26
- (12) Sixou M, Critères de choix bactériologiques lors de la prescription de bains de bouche antiseptiques en odonto-stomatologie. *JPIO.* 2001 ; 21 : 25-41
- (13) Slots J, Bacterial specificity in adult periodontitis. *J Periodontol.* 1986 b ; 13 : 912-917
- (14) Slots J, Reynolds HS, Genco RJ, *Actinobacillus actinomycetemcomitans* in human periodontal disease : a cross-sectional microbiological investigation. *Inf. Immun.* 1980 ; 29 : 1013-1020
- (15) Socransky SS, Microbiology of periodontal disease : present status and future considerations. *J Periodontol.* 1977 ; 48 : 497-504
- (16) Woodman AJ, Vidic J, Newman HN et al, Effect of repeated high dose prophylaxis with amoxicillin on the resident flora of adult volunteers. *J Med Microbiol.* 1985 ; 19 : 15-23

