EFFECT OF ERYTHRITOL-ENRICHED POWDER IN ORAL BIOFILM ON DENTAL IMPLANTS: AN IN VITRO STUDY

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Introduction

Due to the increase of dental implant treatments, peri-implant infectious complications (mucositis and peri-implantitis) are increasing (1). Biofilm removal plays a central role in its prevention (2,3,4). Plaque debridement may be accomplished by air polishing using abrasive powders. In this in vitro study, a new formulation consisting of erythritol and chlorhexidine (3%) is compared with the standard mechanical removal by saline and gauze. The *in vitro* antimicrobial and antibiofilm effects on *P. gingivalis, A. actinomycetemcomitans, F. nucleatum, A. naeslundi, V. parvula and S. oralis* are investigated.

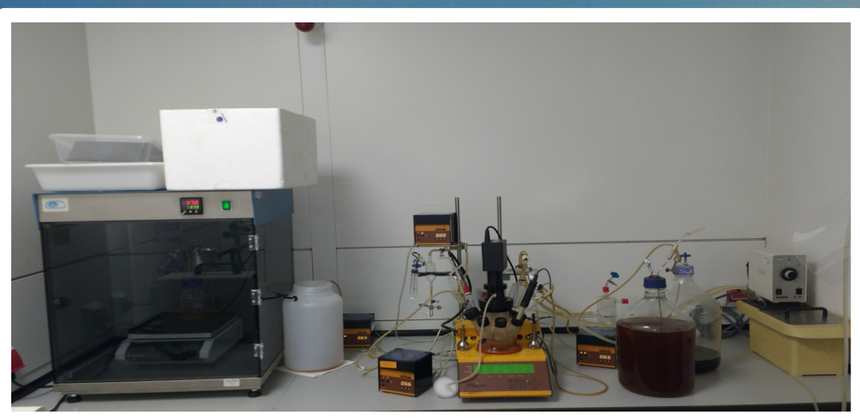


Fig1. Artificial mouth. (Lambda Laboratory Instruments, Sihlbruggstasse, Switzerland)

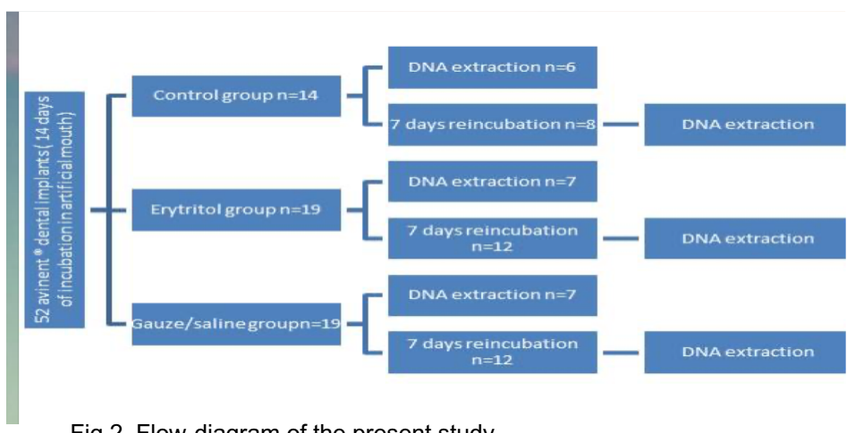


Fig 2. Flow-diagram of the present study.

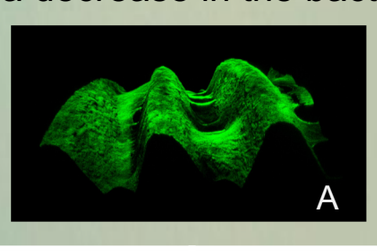
Material and Methods

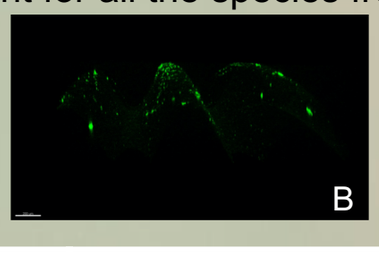
In vitro multispecies biofilm was grown for 14 days on 52 titanium dental implants (Avinent ® Santpedor, Spain) in an artificial mouth (Fig.1) and were randomly divided into three groups: negative control (CON), erythritol-clorhexidine (ERY) and saline-gauze (GAU). Twelve dental implants from groups ERY and GAU, and 8 implants from CON group were re-incubated after treatment for 7 additional days. DNA extraction, q-PCR (quantitative polymerase chain reaction) and qPCR-PMA (propidium monoazide) was performed (Fig 2). Furthermore the implants were analyzed with confocal microscopy after treatment. A descriptive and bivariate analysis of the data was performed with SPSS v22.0 (SPSS; IBM corp, Armonk, USA).

Erithrytol/clorhexidine powder (left) and airflow device (right) both from EMS (electromedical systems,Switzerland)

Results

After 14 days of biofilm formation, bacterial count of the different groups showed a decrease in *A. actinomycetencomitans* and *P. gingivalis* in group ERY when compared with CON. A decrease was also detected in *A. naeslundii* and *P. gingivalis* in the GAU group when compared to CON. There were no significant differences between the groups ERY and GAU. After re-incubation (7 additional days), there was a decrease in the bacterial count for all the species from group ERY (Table 1).





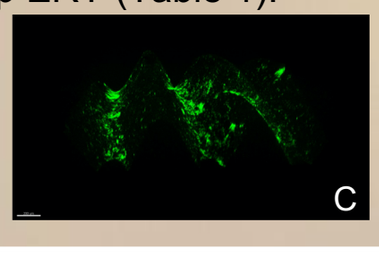


Fig 3. Image of confocal microscopy after 7 days of recolonization (IMARIS software) a) control implant, b) ERY group implant.c) GAU group implant

Bacterial species 7 days reincubation	qPCR cfu log10 (mean)			qPCR cfu log 10 (SD)			PMA cfu log10 (mean)			PMA cfu log10 (SD)		
	ERY	GAU	CON	ERY	GAU	CON	ERY	GAU	CON	ERY	GAU	CON
S. Oralis	4,92	5,70	6,30	0,64	0,40	0,47	4,52	5,1	6	0,36	0,60	1,8
V.Parvula	6,38	6,75	7,34	0,27	0,28	0,21	5,05	6,08	6,98	0,39	0,12	0,20
A.Naeslundi	3,15	5,02	5,42	0,75	0,21	0,61	3,43	4,05	4,72	0,26	0,46	0,84
F.Nucleatum	4,46	5,98	6,62	1,22	0,23	0,36	4,17	4,73	5,87	0,48	0,30	1,03
P.Gingivalis	5,15	5,77	6,26	0,50	0,25	1,56	5,19	5,24	5,81	0,16	0,85	1,66
A.Actinomycetemcomitans	5,29	5,72	6,05	0,33	0,20	0,87	3,96	4,83	5,83	0,92	0,25	0,76

Table 1. Main results of the 3 treatment groups (ERY, GAU and CON) in the second phase of the study (7 days of re-incubation after treatments) stratified by bacterial species. SD: standard deviation.

Conclusions

The use of erythritol and chlorhexidine applied by air polish system displays a similar antibiofilm activity when compared with the standard mechanical treatment (gauze with saline). However, the combination of erythritol/chlorhexidine seems to reduce the formation of a new biofilm during the first 7 days after therapy.

References

1.Suárez-López del Amo F, Yu SH, Wang HL. Non-surgical therapy for peri-implant diseases: a systematic review. J Oral Maxillofac Res. 2016;7:e13

2. Mellado-Valero A, Buitrago-Vera P, Solá-Ruiz MF, Ferrer-García JC. Decontamination of dental implant surface in peri-implantitis treatment: a literature review. Med Oral Patol Oral Cir Bucal. 2013;18:869-76.

3. Smeets R, Henningsen A, Jung O, Heiland M, Hammächer C, Stein JM. Definition, etiology, prevention and treatment of peri-implantitis – a review. *Head & Face Medicine. 2014;10:* 34.

4 Mir-Mari J, Mir-Orfila P, Figueiredo R, Valmaseda-Castellón E, Gay-Escoda C. Prevalence of peri-implant diseases. A cross-sectional study based on a private practice environment. *J Clin Periodontol. 2012;39*: 490–4.