Clorhexidina Lacer®



0,2% Clorhexidina digluconato, **0,1%** Cymenol
Excipiente bioadhesivo de alta permanencia

Eficacia antibiofilm/ antimicrobiana[1,2]

La combinación de la Clorhexidina y el Cymenol incrementan la actividad antimicrobiana, generan una mayor penetración en el biofilm bacteriano que la Clorhexidina sola lo que permite una mayor eliminación del biofilm bacteriano.

Sustantividad prolongada[2]

Debido a su formulación con un polímero bioadhesivo de alta permanencia, la nueva fórmula de Clorhexidina Lacer permite una mayor adherencia y, en consecuencia, una eficacia antimicrobiana prolongada y sostenida durante más tiempo.

Sabor agradable

Para facilitar el cumplimiento del tratamiento completo por parte del consumidor.

Mucoadhesividad mejorada[2]

La nueva fórmula de Clorhexidina Lacer contiene Hidroxipropilmetil-celulosa, un polímero bioadhesivo que permite una mejor mucoadhesión en la zona a tratar.

7 horas eficacia antimicrobiana[3,4,5]

La Clorhexidina ha demostrado su eficacia durante 7 horas con estudios clínicos que la avalan.

1. Kunarti, Sri, et al. Comparison of IPMP, Chlorine Dioxide and Chlorhexidine Gluconat Contained in Mouthwashes for Reducing Exopolysaccharide on Streptococcus Mutans Biofilms. International Medical Device and Technology Conferenc, 2017. **2.** Estudio in vitro. Lacer. Data on file. 2021. **3.** Tomás, I., et al. Evaluation of chlorhexidine substantivity on salivary flora by epifluorescence microscopy. Oral Diseases 15.6 (2009): 428-433 **4**. Tomás, I., et al. Substantivity of a single chlorhexidine mouthwash on salivary flora: influence of intrinsic and extrinsic factors. Journal of dentistry 38.7 (2010): 541-546. **5.** Suárez-Rodríguez, B., et al. Randomised-crossover clinical trial on the substantivity of a single application of a gel containing chlorhexidine and o-cymen-5-ol on the oral biofilm and saliva. BMC Oral Health 24.1 (2024): 1247.

EFFECT OF CHX-CYM BIOADHESIVE GEL ON THE PREVENTION OF BACTERIAL BIOFILMS ON THREE SURFACE DENTAL IMPLANTS: AN IN VITRO STUDY

D. Torres-Lagares[1], J. Pascual[2], E. Oliva-Ferrusola[1], M. Baus-Domínguez[1], F. Vivancos-Cuadras[3], B. Rodriguez-Amigo[3], J. Delgado-Ojeda[3], L. Kilpatrick[3]
[1]Universidad de Sevilla, Estomatología, Sevilla, Spain; [2]Darwin Bioprospecting Excellence, Department of Microbiology, Paterna, Spain; [3]LACER, R&D Department, Cerdanyola del Valles, Spain.

Introduction

Oral biofilms, complex communities of microorganisms that adhere to surfaces within the oral cavity, pose significant challenges to dental health. These biofilms are implicated in oral diseases, including dental caries, periodontal diseases, and peri-implantitis. Prevention and management of biofilm formation are crucial to maintaining oral health, especially in patients with dental implants, where biofilms can lead to implant failure and other complications. Recent advances in biotechnology have introduced bioadhesive gels as a promising approach to prevent biofilm formation. Understanding the interaction between bioadhesive gels and implant surface properties is essential to developing comprehensive strategies to prevent biofilm-related complications in dental implants.

Objectives

The research project focused on evaluating the efficacy of a bioadhesive gel in preventing microbial biofilm formation on dental implant surfaces. To this end, a detailed microbiological analysis of the gel's effect on growth inhibition and adhesion of a simplified consortium of peri-implantitis-related pathogenic microorganisms was carried out.

Material and method

Three types of dental implants with different physicochemical properties were used to carry out the study, all composed of titanium discs and provided by Klockner® (Spain). The implants were classified as follows:
- Sandblasted implants
- ContacTi® Implants
- Machined implants

The bioadhesive gel tested in the study was Lacer Chlorhexidine 0.2% [1]. The gel was manually applied to the surface of the implants, evenly distributing 0.1 grams of gel per implant.

MICROBIAL CONSORTIUM MADE SIMPLE The microbial consortium used in the study represents a simplified microbial community associated with peri-implantitis processes. [2,3] This microbial model is composed of the reference strains *Streptococcus oralis* CECT 907T, *Veillonella parvula* NCTC 11810 (=DSM 2008), *Actinomyces naeslundii* ATCC 19039 (=DSMZ 17233), *Fusobacterium nucleatum* DMSZ 20482, *Aggregatibacter actinomycetemcomitans* DSMZ 8324 and *6* ATCC 33277 (=DSMZ 20709).

INOCULATION OF THE IMPLANTS The sterile implants were placed in 24-well tissue culture plates (Sarstedt) wells and then inoculated with 900µL of the microbial consortium suspension. Subsequently, the culture plates were incubated at 37 ºC under anaerobic conditions (5% H_2, 5% CO_2, and N_2 equilibrium) for 10 days. Non-implant wells containing the culture medium were used as a control. Three biological replicates were tested for each type of implant surface (Sandblasted, ContacTi®, and Mechanized) and treatment (with and without bioadhesive gel).

COUNTS OF CULTURABLE MICROORGANISMS To determine the viability of the microorganisms after treatment with the bioadhesive gel, the Colony Forming Units (CFU) per implant were counted. This metric reflects the number of viable cells capable of forming biofilm after a 10-day incubation period. Bacterial suspensions were seeded on blood agar plates (Blood Agar Oxoid No. 2) enriched with 5 % (v/v) sterile equine blood (Oxoid), 5 µg/L hemin (Sigma), and 1.0 mg/L menadione (Merck). The culture was carried out under anaerobic conditions —5% H_2, 5% CO_2, and N_2 balance— at a constant temperature of 37 ºC for a period ranging from 24 to 72 hours.

MICROSCOPIC CHARACTERIZATION OF BIOFILMS BY SEM The structural and morphological characteristics of the bio lms developed in the implants were analyzed by scanning electron microscopy (SEM). The implants were fixed by immersion in a Karnovsky xative (2% paraformaldehyde and 2.5% glutaraldehyde in 0.1 M sodium phosphate buffer at pH 7.4) overnight and then washed with sterile deionized water and a series of ethanol solutions (30%, 50%, 70%, 90%, and 100% absolute ethanol; PanReac, AppliChem). The samples were incubated in a desiccator for 48 hours before being soaked in resin with carbon tape. Gold and palladium particles were sprayed, and samples were examined with the Hitachi S4800 Field Emission Scanning Electron Microscope (FE-SEM).

Results

MICROORGANISM COUNTS After 10 days of incubation, significant differences were observed between implants treated with bioadhesive gel and untreated implants. Specifically, in gel-treated implants, complete inhibition of microbial growth was observed after 10 days of incubation. In contrast, in the untreated implants, biofilms developed on the surface, keeping the cells viable.

MICROSCOPIC CHARACTERIZATION OF BIOFILMS BY SEM By observing the surface of the implants, the amount of biofilm developed by the microbial consortium after 10 days of incubation was determined semi-quantitatively. Consistent with the quantification of viable microorganisms, those implants treated with the bioadhesive gel did not show biofilm development due to the inhibition capacity of its active ingredients. In some cases, loose bacterial cells (not in biofilm form) were observed, so they could be planktonic bacteria that recovered when the implants were obtained. Since no structure associated with biofilm is observed, it is hypothesized that inhibition took place in the early stages after inoculation.



Figure 1: Photograph of the three types of surfaces tested in the studio.

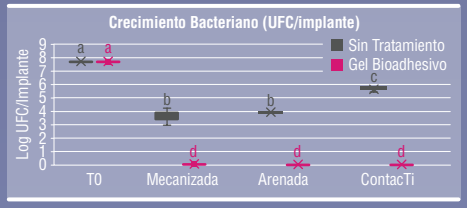


Figure 2: Counts of the Colony Forming Units (log) per implant analyzed. According to Tukey's test, different letters indicate significant differences between the data (p-value < 0.05).

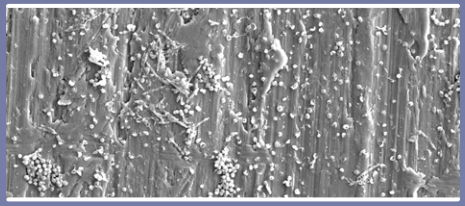


Figure 3: SEM image of a titanium disc (Grupo Arenado) with bacteria forming biofilm.

On the contrary, the implants not subjected to the treatment did show biofilm development, with differences in the degree of biofilm maturation between the three surfaces tested. In the case of untreated sandblasted implants, there is a dense biofilm with different morphotypes in its composition, including cocci that could correspond to *Streptococcus oralis* and/or *Veillonella parvula* and bacilli that could be identified as *Actinomyces naeslundii, Fusobacterium nucleatum, Aggregatibacter actinomycetemcomitans and/or Porphyromonas gingivalis*. Interestingly, there are regions in implants where the biofilm mainly comprises the cocoid morphotype. The biofilm formed in untreated ContactTi implants is slightly less dense than in sandblasted and machined implants. However, as mentioned, the viability of the bacteria associated with the ContactTi surface is slightly higher than on the other two surfaces. On the third surface, mechanized, the biofilm developed by the bacterial community occupies a large surface, although it is characterized by being not very dense at the three-dimensional level. In this biofilm, cocoid species also dominate.

Discusion

The present study evaluated the effect of a bioadhesive gel formulated with biocidal agents on the ability to develop biofilm on different surfaces of dental implants, specifically Sandblasted, ContacTi, and Machined. The results showed that the bioadhesive gel inhibits microorganisms after 10 days of exposure, preventing them from developing three-dimensional biofilms. In addition, it appears that the biocidal agents in the gel affect planktonic bacteria (which do not form bio lm) differently. The different surfaces of the implants showed different effects on the ability to modulate the developed biofilm. In particular, the mechanized surface showed a slightly higher inhibition than the other two surfaces, mainly affecting the colonization of the biofilm by *Fusobacterium* and, to a lesser extent, *Streptococcus*.

Conclusions

In conclusion, the bioadhesive gel has a powerful biocidal effect, inhibiting the biofilm regardless of the surface of the implants. The colonization ability of the implants is also affected by the type of surface.

Conclusiones: el gel bioadhesivo presenta un potente efecto antimicrobiano, inhibiendo la formación de biofilm independientemente de la superficie de los implantes. La capacidad de colonización de los implantes también se ve afectada por el tipo de superficie.

Póster presentado en EuroPerio 11 - Mayo 2025.

Bibliografía:

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