Disinfecting tablet for removable dental appliances
Biofilm: A potential problem for removable dental appliance wearers

What is a biofilm?

Biofilms can be defined as communities of microorganisms attached to a surface. Due to their porous nature and to the ideal conditions provided by the oral cavity, removable dental appliances are especially susceptible to being contaminated by a biofilm. There are several species of micro-organisms that may comprise a biofilm, notably, Candida albicans, Staphylococcus aureus, Pseudomonas aeruginosa, Pseudomonas fluorescens, Escherichia coli, Vibrio cholerae, and the Herpes simplex Virus.

Three Key Processes:

Attachment
- Adsorption / adhesion of a microbial cell to a solid surface

Colonization
- Establishment of a microbial community at the site of attachment

Growth
- Maturation of a three-dimensional biofilm community

What are the causes of biofilm formation on removable dental appliances?

- Poor dental hygiene
- Failure to regularly clean and disinfect the dental appliance
- Lack of awareness with regard to the importance of disinfecting & cleaning a dental appliance
- Immune deficiency (such as diabetes)

Undesirable consequences

- Denture stomatitis: The biofilm has been reported to harbour micro organisms that act as important agents for the installation, maintenance and exacerbation of denture stomatitis (an inflammation of the mucous lining of any of the structures in the mouth).
- Bad breath (Halitosis)
- Angular cheilitis
- Burning sensations
- Potentially more serious complications for people with conditions likely to be aggravated by the biofilm (such as cardiovascular diseases, Diabetes, etc...)
- Dental Caries
- Periodontal Disease
- Dental Unit Waterlines
Biofilm: Recommended Control Strategies

Disinfecting Tablet

Removable dental appliance toothpaste
Biofilm: Recommended Control Strategies

NitrAdine® DISINFECTING TABLET

The effervescent disinfecting tablet based on the NitrAdine® formula has demonstrated high in-vitro biofilm removal activity against a variety of micro-organisms, namely Candida albicans, Pseudomonas aeruginosa, Staphylococcus aureus, including the MRSA type, and viruses. The NitrAdine® works deep into the pores of the device without discolouring or colouring and without damaging its metallic parts.

ISO 13727 Bactericidal Activity in 15 minutes: Significantly reduces Pseudomonas aeruginosa, Staphylococcus aureus and Enterococcus hirae

ISO 13624 Yeasticidal activity in 15 minutes: Reduces Candida albicans

ISO 14476 + A1 Virucidal activity: Significantly reduces Adenovirus and Poliovirus in 1 hour

Disinfection of the dental appliance

Bactericidal

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Yeasticidal

ISO 13624 Yeasticidal activity in 15 minutes: Reduces Candida albicans

Virucidal

ISO 14476 + A1 Virucidal activity: Significantly reduces Adenovirus and Poliovirus in 1 hour
With its “Anti-biofilm” formula, NitrAdine® Shine has been especially formulated to clean, whiten, refresh and polish dentures or removable appliances.

NitrAdine® Shine will not corrode, discolor or distort your appliance in any way and is highly recommended for use with all types of removable dentures made of nylon, metal, acrylic, silicon and elastomer.

Proven efficacy

- Significant decrease of biofilm biomass in PMMA disks treated with NitrAdine® SHINE compared to non treated disks (See figure).

- NitrAdine® SHINE was less abrasive compared to several types of toothpastes (Feitas & Paranhos 2006)

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Internal Study - 29/10/2010
Clinical Performance
(Example Studies)
Clinical and antimicrobial efficacy of NitrAdine®-based disinfecting cleaning tablets in complete denture wearers.


1. Objectives

Evaluation of the clinical efficacy of NitrAdine® as disinfecting tablet for complete denture in terms of denture biofilm removal and antimicrobial action in denture wearers.

2. Materials and Methods

This study was conducted with 40 complete denture wearers. The volunteers were divided into two groups:

Control group: This group was instructed to brush 3 times a day using a denture brush.

Experimental group: This group was instructed to brush the denture using the denture brush and tap water following meals (breakfast, lunch and dinner), and treating the denture with NitrAdine® Tablets, by immersing the denture into 150 mL of lukewarm water and then adding one tablet.

• The denture was then allowed to soak in the solution for at least 15 min once a day for 21 days. After treatment, the denture was removed from the solution and rinsed vigorously under running water before replacing back in the mouth.

• For the microbiological analysis, at the end of the 21 days, the biofilm was collected by brushing in saline solution.

3. Results

The biofilm percentage in the internal surface of the upper complete denture after the use of the Control method and after the use of the NitrAdine tablets:

Microbial denture biofilm counts were substantially higher in the control group as opposed to those on the experimental group.
Orthodontic treatment often involves the use of removable orthodontic appliances (ROA). Most of these appliances are composed of acrylic or other porous materials, that can be colonized with micro-organisms such as Candida albicans, Staphylococcus aureus and Pseudomonas aeruginosa. Once attached to the ROA, biofilm formation by these micro-organisms is frequently observed.

There is growing evidence that C. albicans biofilms play an essential role in the development of stomatitis and although the disease is more common in elderly patients, also young children wearing ROA’s often suffer from stomatitis symptoms (Figure 1). Efficient sanitization of ROA’s using disinfectants and antiseptics is considered to be essential. In the present study we evaluated the in vitro efficacy of a novel effervescent tablet for routine cleansing and disinfection of ROA’s called NitrAdine®.

Objectives

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Impressive in-vivo performance

Figure 1: Clinical evaluation in orthodontic treatment: Eleven year old female patient wearing an orthodontic appliance (Twin Block functional appliance) day and night with clear signs of irritation of the palatal mucosa due to insufficient disinfection of the appliance (left), after 1 week of treatment with NitrAdine® (middle), and after 1 month of treatment with NitrAdine® (right) with continuation of orthodontic treatment. Note the indentation of the appliance in the palatal mucosa.
Materials and Methods

The in vitro activity of NitrAdine® was determined against C. albicans, S. aureus (including MRSA) and P. aeruginosa, respectively. Biofilms were formed on disks of polymethyl metacrylate (PMMA), medical grade silicone, plastic and elastomer under standard flow conditions using the Modified Robbins’ Device (Figure 2). After 24h of biofilm growth, contaminated disks were consequently submerged for 15 minutes in NitrAdine® solution (1 tablet dissolved in 150 ml water at 45°C). For negative control, biofilms were exposed to water only (15 min/ 45°C).

Results & Conclusion

Our data showed that treatment of PMMA disks with NitrAdine® resulted in > 99.99% reduction in S. Aureus, P. aeruginosa and S. Aureus (MRSA) biomass compared to the control treatment (P<0.0001) (Graph 1). In addition, NitrAdine® also has high activity against biofilms of C. albicans and S. aureus (MRSA) formed on silicone (Graph 2) and C. albicans and S. aureus (MRSA) biofilms formed on polystyrene (Graph 3) (P<0.0001).

Previous reports (Glass et al., 2004) showed that these effervescent tablets are suitable for routine cleansing and disinfection of metal containing ROA. In addition, our data clearly indicate that treatment with NitrAdine® allows the efficient removal of microbial biofilms from ROA. Clinical trials are on-going to document the subsequent beneficial effects in the prevention and treatment of stomatitis symptoms, including halitosis.
NitrAdine® Product Range

Disinfecting tablets for removable sport mouth guard

Disinfecting tablets for anti-bruxism devices

Disinfecting tablets for removable orthodontic appliances

Disinfecting tablets for removable dental appliances

Disinfecting tablets for anti-snoring devices

Anti-biofilm toothpaste for removable dental appliances

Conveniently disinfect an appliance
Scientific references


