

Inițierea, formarea și dezvoltarea biofilmelor microbiene de pe suprafața materialelor de amprentă 1

INITIATION, FORMATION AND DEVELOPMENT OF MICROBIAL BIOFILMS ON THE SURFACE OF
IMPRESSION MATERIALS

Doctoral Thesis

**INITIATION, FORMATION AND DEVELOPMENT OF
MICROBIAL BIOFILMS ON THE SURFACE OF
IMPRESSION MATERIALS**

PhD Candidate

Lorelai Georgeta Stoleriu (Bilinschi)

PhD Coordinator

Sorin Popșor, University Professor



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ABSTRACT

INTRODUCTION

It seems that more than in any other dental medicine speciality, dental prosthetics, as well as the consulting room where the prosthetics specialist works are often incriminated for infections or contagious widespread diseases. This is also due to the fact that dental prosthetics is a speciality where almost any manoeuvre means a direct contact with human body secretions and humours, as well as the fact that the action territory of the dental prosthetics specialist, namely the “oral cavity”, is an area over populated with a micro - viral - fungicide flora. (1, 2)

Together with the classical infectious agents we have been confronted with, especially during the latest two decades, more pathogenic agents, such as: hepatitis B, C and D virus (HBV, HCV and HDV), human immunodeficiency virus (HIV), *Mycobacterium tuberculosis*, as well as prions (producing Creutzfeldt -Jacobs disease), frequently involve this speciality in transmitting some diseases which are specific to the XXI century. (1)

Protection against bacteriae, fungi and their spores (spreading and resistance elements), viruses, rickets and prions, aim several issues in dental prosthetics, (1, 2), namely:

- air (environment), water, pavement and walls of the consulting room;
- instruments and materials, accessories used in dental prosthetics;
- medical team: dental prosthetics specialist, assistant and dental technician;
- patient

Many instructions and recommendations elaborated by national and international organisms and authorities represent consequences of serologic investigations , which discovered an increased incidence with HBV and HCV for specialists and students working in this area, as well as the existence of widely promoted accidents involving HIV positive professionals who infected their patients. At the same time there were stomatology specialists who were professionally infected by their HBV and HIV infected patients. (1, 2)

Most of the publications I studied present this issue in a standard way, insisting on the infectious risk in dental medicine and on the classical asepsis, anti-asepsis, disinfection and sterilization methods. Only in very few circumstances they insist on the infectious risk represented by dental impressions and impression materials used in this medical speciality. (1, 2)

This is why, the present thesis tries a special approach of the infectious risk in dental medicine, with reference to dental prosthetics, having as starting point not only impressions, but also impression materials used. (1, 2)

The present thesis studies the initiation, formation and development of microbial biofilms on the surface of impressions and of the impression materials used in dental prosthetics. Finally some extremely simple but efficient protocols will be elaborated and described referring to controlling microbial biofilms by decontamination and disinfection on the surface of these impression materials. (1, 2)

3. STUDY OF INTERACTION BETWEEN MICROBIAL BIOFILMS AND IMPRESSION MATERIALS USED IN DENTAL PROSTHETICS

3.1 Prevention of infectious risk in dental prosthetics by decontaminating impressions

3.2. Isolation, identification and characterization of the biofilms capacity to adhere and develop on microbial strains isolated from patients who were functionally rehabilitated by fixed (conjunct) prosthetic restorations

3.3. Study of the dynamics of biofilms formed by microorganisms isolated from patients rehabilitated by using fixed (conjunct) prosthetic restorations on impression materials which are usual in dental prosthetics

3.4. Study of the antimicrobial efficiency of some disinfectant substances used in dental prosthetics

3.5. Studies and research referring to the influence of incorporating chemical substances with disinfectant and antiseptic potential in dental plaster structure

- I. Influence of including disinfectant substances on linear expansion of dental plaster
- II. Effect of incorporating disinfectant solutions on plaster dilation, resistance at compression and bending of plaster models

General conclusions

Because of the increase in incidence of infectious and contagious diseases it is compulsory for all medical specialities to apply some protection measures both for patients and for specialists.

In dental medicine including dental prosthetics, which may be the most important speciality of stomatology, there are more recent concerns referring to nosocomial infections compared to other medical specialities. This is determined by the alarming increase of the number of viral hepatitis (B, C, D, E), as well as by the microbial contamination with other extremely aggressive pathogen agents

among medical specialized staff (dentist/prosthetics specialist , medical assistant, dental technician), as well as patients.

Stomatology, including dental prosthetics, being a medical speciality where almost any manoeuvre means a direct contact with human body secretions and humours, and oral cavity being an area over populated with a micro- viral - fungicide flora therapy manoeuvres need to be reconsidered in order to avoid nosocomial infections.

Various materials have been used for dental impressions starting from wax and plaster to condensation and addition silicone materials and polyether. Nevertheless the dental impression imposes a direct contact with the septic oral environment and there is also the possibility for disseminating these components into the clinical compartment (stomatology room), in the dental technique laboratory and for contaminating the medical specialized staff (dentist/prosthetics specialist , medical assistant, dental technician), as well as patients.

Future might completely eliminate this impression system because the optical impression method and the CAD/CAM technology have more and more advocates in Romania as well. Unfortunately, these revolutionary, very sophisticated and laborious technologies are still extremely expensive, at least in Romania where there are only a few patients who can afford these modern techniques for prosthetic desaturations.

This means that until optical impression and CAD/CAM technology is widely used in our country , prosthetics specialists will continue to use the present impression materials provided by specialized industry.

Thesis originality

As the title of the present thesis is: *Initiation, formation and development of microbial biofilms on the surface of impression materials in dental prosthetics*, the research was based on the study of interaction between microbial biofilms and impression materials used in dental prosthetics. This is, in fact, the third chapter including my personal contribution, namely a succession of very representative research which described and justified my preoccupations referring to microbial biofilms on the impression surface in dental prosthetics.

Here follow the main titles:

- I. Prevention of infectious risk in dental prosthetics by decontaminating impressions

II. Isolation, identification and characterization of the biofilms capacity to adhere and develop on microbial strains isolated from patients who were functionally rehabilitated by fixed (conjunct) prosthetic restorations:

- Set up a base of bacterial and fungic strains on the dental plaque (over and under gingiva) from patients who were functionally restaured by fixed prosthetic restaurations.
- Isolate și identify some species of microorganisms existing at the level of dental microbial plaque.
- Determine the capacity to adhere and form of microbial biofilms

III. Study of the dynamics of biofilms formed by microorganisms isolated from patients who were rehabilitated by using fixed (conjunct) prosthetic restorations on impression materials which are usual in dental prosthetics:

- Test the sensibility of microorganisms at impression materials which are usual in dental prosthetics
- Test the capacity of microorganisms to adhere at impression materials which are usual in dental prosthetics

IV. Study of the antimicrobial efficiency of some disinfectant substances used in dental prosthetics:

- Quality screening of different microbial strains sensitivity at substances with potential anti-infectious action
- Quantity testing of anti-microbial activity, in order to determine some quantity parameters of anti-microbial action (CMI) on clinically isolated bacterial strains.

V. Studies and research referring to the influence of incorporating chemical substances with disinfectant and antiseptic potential in dental plaster structure:

1. Influence of including disinfectant substances on linear expansion of dental plaster
2. Effect of incorporating disinfectant solutions on plaster dilation, resistance at compression and bending of plaster models

Lorelai Georgeta Stoleriu Bilinschi

Depending on these experimental studies , I improved a series of practical recommendations which I briefly included in chapter 4.

