Aspects of Testing the Biological Characteristics of Alginic Impression Materials

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The current trend is the introduction of antimicrobial agents for the purpose of inhibiting or avoiding (adherence) adhesion and (increasing) the multiplication of their microorganisms on the surface of the impression materials. This study aims to determine the properties of antibacterial and antifungal elastic impression materials in full agreement with (bacterial flora) microflora specific for every patient (with identification of existing species). In the same time there are considered modern methods of sterilization and insertion of antiseptics, trajectories with profound impact in the field of biocompatibility. The obtained microorganisms were transplanted on differentiated and selective (differentiated) culture medium in order to obtain pure cultures. Each microbial strain obtained was tested to identify several characteristics. The examinations carried out by means of the electron microscopy very accurately detect the microbial load in the structure of the impression materials, sounding an alarm signal on its use in particular clinical situations. Alginates present in their structure polysaccharide structures that represent an excellent substrate of microorganisms.

Keywords: elastic impression biomaterials, biologic behaviour, biocompatibility, antibacterial effect;

The alginic impression materials find their usefulness in the registration of the preliminary impressions, the particularly important stage in the clinical-technological algorithm for the realization of the removable prostheses, as well as in any type of documentary impression[1-3].

The current trend is the introduction of antimicrobial agents for the purpose of inhibiting or avoiding (adherence) adhesion and (increasing) the multiplication of their microorganisms on the surface of the impression materials. In the case of irreversible hydrocolloids, in addition to recommendation (disinfection) decontamination impression, the addition of antimicrobial agents can reduce the presence of viable micro-organisms contained in the impression material. Due to the presence of polysaccharide structures that represent an (excellent) substrate nutritious for microorganisms, alginites are unlikely to be free of (microorganism) germs[4-6]. The main active constituent of reversible hydrocolloids is agar, a sulfuric ester of a galactan complex. The agar-agar is liquefied, passing from gel to soil between 71°C and 100°C and gelling, passing from soil to gel between 30°C and 50°C. The size of the suspended jelly particles varies between 0.001 and 0.2µm. Composition of reversible hydrocolloids: the potassium content makes these materials very sensitive to the phenomenon of syneresis - increasing the water content. Therefore it is recommended to cast the models in laboratory - where a gypsum model is poured, the substrate nutritious for microorganisms, there is a risk of transmitting notices accidentally complicated to some infections[13-15].

It is very important for dentists to identify symptoms of an infection in the mouth in order to prevent their spread. During various dental procedures, the mucosa can be affected, and during the impressioning, saliva and blood can reach the level of the impression materials very easily[16,17].

When such a contaminated impression reaches the laboratory - where a gypsum model is poured, the microorganisms in the impression material are taken over by the model, thus protecting the risk (infection) of contamination of the dental technique laboratory and, implicitly, of dental technicians[18,19].

This study aims to determine the properties of antibacterial and antifungal elastic impression materials in full agreement with (bacterial flora) microflora specific for every patient (with identification of existing species). In the same time there are considered modern methods of sterilization and insertion of antiseptics, trajectories with profound impact in the field of biocompatibility.

Experimental Part

For testing the biological characteristics of elastic impression materials, an important line of research aimed the degree of contamination of each material, without

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causing a further contamination. In this purpose, aseptic conditions were ensured for the opening of the containers containing the impression materials and the collection of the samples (for their testing).

The samples were taken (under) in the class II microbiological hood, under sterile conditions (Fig. 1).

Result and discussion

Radiation sensitivity varies from one microorganism to another. In all microorganisms, sporulated forms are more resistant. Oxygen decreases radioresistance, and dehydration increases radioresistance.

Experience has shown that most of the germs present on medical materials produced under good manufacturing practice are more radiosensitive than a microorganism declared germ-test. It is Bacillus pumilus, and its spores were signed (most resistant form) have $D_{10} = 3.1$ kGy.

The European Pharmacopoeia does not impose a minimum or maximum dose, but only indicates that the treatment by gamma irradiation should be done at a dose sufficiently high to allow the expected (safety coefficient) SAL to be achieved for the sterilized product. This approach allows the possibility of reducing the sterilization dose, implicitly of the costs of the process, under the conditions of reducing the number of initial germs, by perfecting the rules of good manufacturing practice.

Dose measurement is done with dosimetric systems whose accuracy is well determined by reporting to national and international standards. There is a methodology for obtaining this traceability. Dosimetric systems used in technological irradiation are chemical ones. The approved systems are radiochromic films, the wax / wax sulphate system, the ethanol and chlorobenzene system, the...
cellulose acetate system, the polymethyl methacrylate system and the alanine system.

For all the mentioned systems there are standards that regulate the manufacture, method of measurement and interpretation of data.

The dosimetric bulletin issued at the irradiation facility is the essential part of the sterilization process certification.

As the doses in an irradiation container are not uniform, the dosimetric bulletin also specifies this non-uniformity. The third research direction seeks to find a thymol, eugenol or silver antiseptic agent, which used in the process of preparing impression materials to inhibit the contamination and colonization of impressions with various microorganisms. For this purpose, 0.1 mg, 0.5 mg, 0.8 mg of thymol and eugenol, respectively, were used for the preparation of alginate, of which 3 samples were made for each antiseptic agent and for each quantity of antiseptic agent resulting in a number of 18 specimens that were subjected to microbiological tests to determine the degree of microbial contamination.

The examinations carried out by means of the electron microscopy very accurately detect the microbial load in the structure of the impression materials, prevalent gram positive bacilli and Gram negative cocobacilli, sounding an alarm signal on its use in particular clinical situations.

The obtained microorganisms were transplanted on differentiated and selective (differentiated) culture medium in order to obtain pure cultures.

Each microbial strain obtained was tested to identify several characteristics: cultural features-cultural aspects in liquid environments (turbidity, sediment, film); cultural aspects on solid environments (type, size and appearance of colonies, pigments). Morphological characters - for the bacteria, stains were stained using the Gram method, and for the micellums, native preparations were made between the blade and the blade.

Biochemical characters: polytopropic mediums: MIU (mobility, indole, urea), TSI (glucose, lactose, sucrose, H2S, indole); miniAPI galleries. Serotyping (where possible) with species-specific serum; pathogenicity characters - haemolysis and bioprobe on mice.

Conclusions

Based on the results obtained, the following conclusions can be drawn:

The examinations carried out by means of optical microscopy (electron microscopy) very accurately detect the microbial load in the structure of the impression materials, triggering an alarm signal on its use in particular clinical situations. Alginate present in their structure polysaccharide structures that represent an excellent substrate of microorganisms.

- The tests performed revealed that the impression materials are contaminated with a diverse microbial flora, both bacterial and fungal.

- Contamination is mainly carried out on the production stream.

- A reduction of microbial contamination can be achieved either by implementing hygiene rules on the production stream or by incorporating antimicrobial agents before use.

- Alginate present in their structure polysaccharide structures that represent an excellent substrate of microorganisms.

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