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, alginates 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 syneresewater loss or inbibition - increasing the water content. Therefore it is recommended to cast the models in maximum 15 minutes from the registration of the impression[7-9].

The irreversible hydrocolloids impressiont materials pass from the ground state to the gel state due to a chemical reaction. Once the gelling is complete, the substance can no longer be relocated to the ground state.

Alginic acid obtained from a marine algae and is a linear polymer of anhydro acid -β-D- mannuronic compound of high molecular weight (32,000 - 200,000).

In impression alginate mixtures, soluble alginate and calcium sulfate dihydrate are included in the powder and when the powder is mixed with water, the dihydrate, slightly soluble, dissolves and reacts with potassium alginate to form calcium alginate. It is insoluble in water, its formation causing the passage of the mixed material to the gel stage[10-12].Manufacturers adjust the sodium phosphate concentration to produce fixed and fast-setting alginates. Also, by changing the concentration of diatomaceous earth, the flexibility of the material is controlled after the outlet, resulting in soft and hard alginates.Impression procedures can cause (mild) minor (level) lesions of soft tissue. Since blood is a rich culture medium and transport microbial and that any injury affecting the integrity of the lining provides a (gateway for) potential source of contamination with pathogenic microorganisms, there is a risk of trans sending 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).

Fig.1. Aseptic enclosure in the class II microbiological hood

We used 6 samples, (each) 3 Tropicalgin (samples 1a, 1b, 1c) and 3 Phase (samples 2a, 2b, 2c). The probes (coming) were derived from three different batches of Samples 1a, 1b, 1c from group 46 183, samples 2b and 2c of the group 98 428 and sample 2a in the group 95 596 (fig.2).

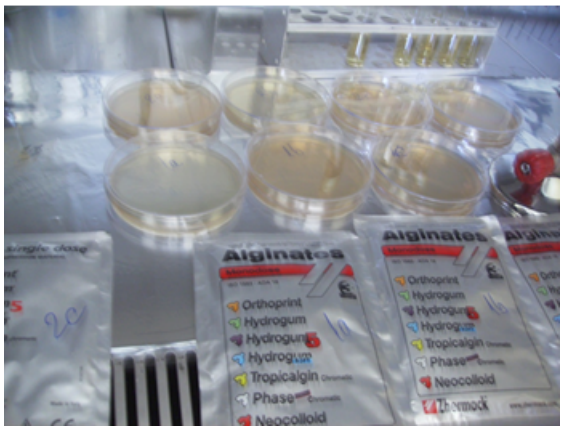

Fig.2.Preparation of products for sample collection

Collecting evidence (was made) using a sterile scalpel.The samples were sown on the usual medium: for bacteria - aerobes - Plate-Count agar, especially recommended for germ counting),anaerobic - VF broth with thioglycolate, for miceliums and yeasts - Sabouraud agar with chloramphenichol.

Incubation was performed at 37°C for 24 hours for bacteria and (37) 25°C for 1-5 days (and 22°C for 1-5 days) for miceliums and yeasts .

After thermostats, mixed bacterial cultures, yeasts and filamentous miceliums were obtained .

There were under control contaminated a number of specimens of Candida albicans, (bacteria) yeast commonly encountered in the immunosuppressed patients known as HIV pozitive, the algorithm prosthetic impressing excludes these types of materials(Fig.3, Fig.4) .As a method of improving the microbiological quality of irreversible hydrocolloids, gamma-ray irradiation (or x at the end of production , after division and distribution in the final packaging) could be used. To use this method, a very good knowledge of the microbial load, both qualitatively, is required as well as quantitatively, for the purpose (to determine the dose) of determining the required (required) radiation dose.

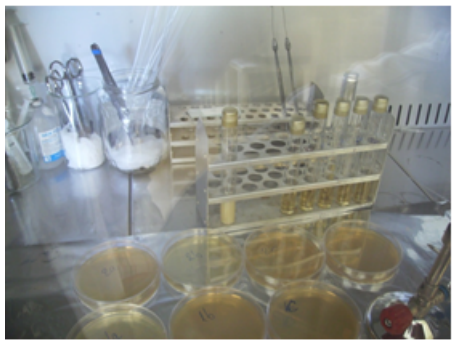

Fig.3. Sowing the plates with solid cultivation mediums

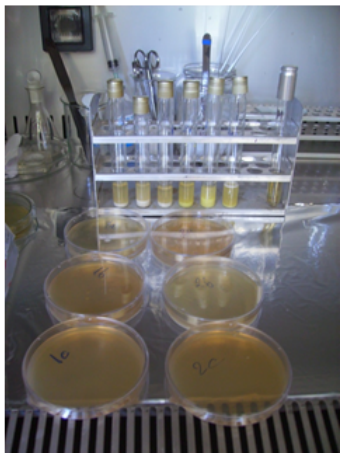

Fig. 4.The appearance of tubes with liquid medium after inoculation

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 and (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

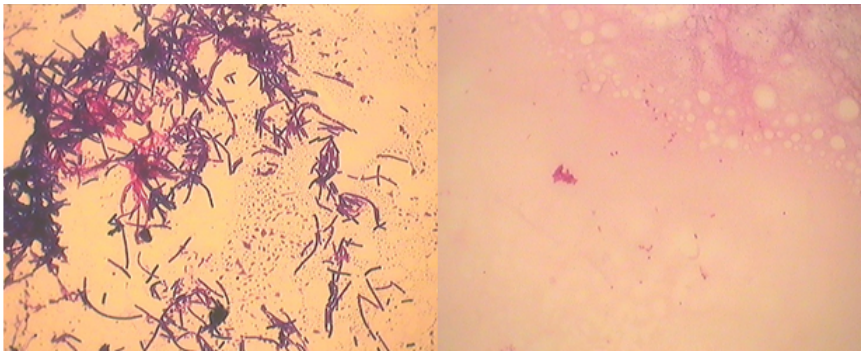

Fig.5.Gram positive bacilli and Gram negative cocobacilli ; col. Gram x900

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 miceliums, 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. Alginates 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.

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

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