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USING ULTRAVIOLET CONTAINERS FOR STORAGE AND TRANSPORTATION OF MOUTHGUARDS

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Abstract:

The article is devoted to the problem of bacteria content in sports protection devices, on the example of sports mouthguards. The microorganisms can cause oral health disorders, systemic changes as well as dysfunction of the protective properties of saliva. The study involved a round plate made of EVA blanks for the mouthguard. Circular samples were placed in a suspension of the culture of St.aureus (strain No. 6538-P ATCC), E coli (strain No. 25922 ATCC), Candida albicans (strain No. 24433 ATCC), 4 samples each. All round, the samples were washed under running water after which they were divided into two groups. The first group was the control study. The second group was placed in a container with ultraviolet light. The growth of bacteria in the second group missed completely or partially, whereas the second group observed the growth of bacteria. This study shows the necessity and urgency of using UV containers for storage and transportation of mouthguards as an effective means of controlling microorganisms and preventing various diseases.

Key words: *mouthguard, UV containers, dental trauma, ethylene vinyl acetate.*

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INTRODUCTION:

Prevention has always been and remains one of the most important direction in medicine, in particular, in dentistry. Its main tasks are: prevention of the appearance of various pathological states, minimization of risk factors and overall health promotion. The important factor preventing the occurence of various diseases is a tight control over the growth of the number of both pathogenic and opportunistic microorganism [1,2]. These microorganisms can cause changes in homeostasis of the oral cavity as well as various diseases of the whole organism [3-5].

Science has long known about the existence of symbiotic relationship between bacteria and their hosts [6]. Human body also contains a large number of bacteria in different biotopes. Microorganisms colonize the oral cavity in a few minutes after birth and create stable structures. Our knowlwdge of oral microflora has vastly imcreased with the creation of new research methods that allow us to study variety, structure, function and topography without cultivating separate components of biofilm.

After applying, the sport mouthguard become a reservoir for microorganisms remained on the surface of the construction material — Ethylene-vynil acetate (EVA). EVA is widely used as a polymeric biomaterial in different instruments such as endovenous devices, catheters, artifical organs and mouthpieces. Many biomaterials are prone to bacterization[7]. This can lead to infection of the implantation site or the place of biomaterial application. Furthermore, the important factor contributing to microbial adhesion is surface roughness[8]. The consequence of the technological features of mouthguard manufacturing is its very rough surface that adheres to tissues of oral cavity. This, undoubtedly, affects the dental status of the sportsmen who use mouthguard for a long time.

Although there are many preventive measures, none of them does specificaly targets antibacterial treatment of the mouthguards before application. Long term storage or lack of proper care can cause the appearance of not only paradontal bacterial group on the mouthguard's surgace, but also a variety of pathogens that can lead to serious changes in the human body[9-12].

Often a sportsman takes a mouthguard out from a bag with equipment and form right before the start of competition and he has no opportunity to treat it with a liquid disinfectant. This leads to an increase of growth of bacterial population on the mouthguard's surface. As a result, the protective device becomes a device that can harm.

For desinfection of sports mouthguards and other devices the ultraviolet container for storage and transportation was invented. To assess the possibility of storage of protective mouthguard based on EVA in closed container with disinfection function the microbiogical research has been conducted. In the course of the study the adhesion of microorganisms was determined according to method the presented by the Testing Laboratory Center of the FBU "Hygiene and Epidemiology Center in Moscow".

MATERIALS AND METHODS:

The studuing of adhesion of microorganisms to the surface of test samples is based on methodic of V.N.Tzarev (2000). From plates of EVA on the smooth surface of gypsum disk (covered with insullating varnish) the die was formed on the technology of a combined three-layered individual mouthguard (Patent RU 2577758). Later samples of a round shape with a diameter of 14 millimeters were produced in the number of 18 pieces (Fig.1).

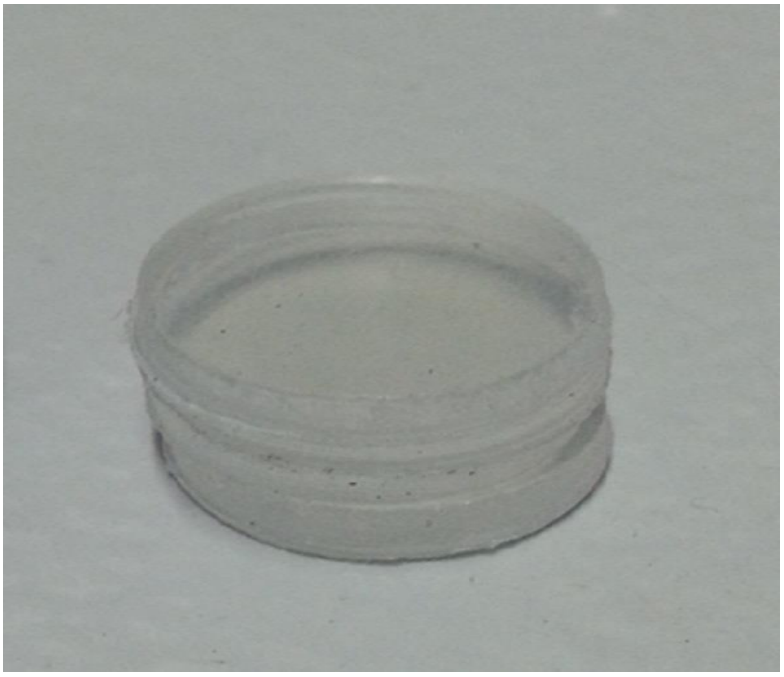

Fig.1: Discs with a diameter of 14mm. lie on top of each other.

On the basis of the Test Laboratory Center FBUZ "Center for Hygiene and Epidemiology in the City of Moscow" to conduct a procedure for assessing primary adhesion, samples with a diameter of 14 mm. were placed in a suspension of the culture of St.aureus (strain No. 6538-P ATCC), E coli (strain No. 25922 ATCC), Candida albicans (strain No. 24433 ATCC), 4 samples each.The number of bacteria in 1 ml of the suspension was 10 in the fourth colony-forming unit (CSEM), and for Candidaalbicans10 in the fourth CFU / ml. Exposure 1 hour (Fig.2).

Fig.2: Conducting microbiological research.

In the course of a microbiological study, a device for disinfection and storage of protective mouthguard was assessed (RU 2632704). The top and bottom of the device, there are sources of ultraviolet light. Then, all samples were thoroughly rinsed for 3 minutes with sterile water.After that, groups of three samples from each of the suspensions were placed in an ultraviolet container for disinfection and storage of mouthguards and UV-irradiated in the exposure automatically set by the device.

The remaining samples were placed in nutrient media: 2% simple nutrient broth (growth control of St. aureus and E. coli) and Saburo broth (growth control of Candidaalbicans). The exposure was 24 hours in a thermostat at 37 ° C. After the exposure from each culture medium with samples that passed and did not undergo UV disinfection, seeding on dense nutrient media was made: yellow-salt agar for St.aureus, endo-agar for Ecoli, agar Saburo for Candida albicans.

An assessment of the quality of disinfection of the samples was carried out by quantitatively counting colonies of control strains from the initial suspensionš (seeding 0.1 ml on each dense nutrient medium) and the test samples (seeding 0.1 ml of broth culture for each dense nutrient medium).

RESULTS:

In the course of a microbiological study, the adhesion of microorganisms was determined according to the method proposed by the Testing Laboratory Center of the FBU Center for Hygiene and Epidemiology in the City of Moscow, and also the possibility of storing protective mouthguards based on ethylene vinyl acetate in closed a container with disinfection function was assessed.

The growth of E. coli on the Endo medium sowed from the control (initial) suspension was 300 CFU (continuous growth). And there is no growth of E. coli from the test material samples after UV disinfection on the Endo medium.

The growth of St.Aureus on the yolk-salt agar sowed from the control (initial) suspension was 300 CFU (continuous growth). The growth of St.aureus from the test material samples after UV disinfection on yellow-salt agar is observed in the form of single colonies.

The growth of Candida albicans on Saburo agar sowed from the control (initial) suspension was 300 CFU (continuous growth).The growth of Candida albicans from the test material samples after UV disinfection on Saburo agar was observed in the form of single colonies.

CONCLUSION:

In the absence of proper care sports protective devices, including dental devices, can become a reservoir for microorganisms. According to the results of the study, it was found that the antibacterial container almost completely suppresses the growth of microbial association on the surface of products made from ethylene vinyl acetate.

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