A COMPARATIVE STUDY OF THE ANTIBACTERIAL ACTIVITY OF DIPEROXYAZELAIC AND MONOPEROXYPHTHALIC ACIDS

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Introduction. Among the realm of disinfectants noteworthy preparations based on organic peroxides. They are characterized by broad spectrum of activity against microorganisms, germicidal type of action, low toxicity, combination of disinfectant properties with low corrosion activity and aggressiveness on structural materials for the production of medical devices; flexibility, solubility in water; availability and low cost of raw materials, environmental friendliness. The well-known European brand disinfectant Dismozon® pur (Germany) based on magnesium salts of monoperoxyphthalic acid (MMPP), which is a water-soluble powder substance is effective against bacteria, spores, viruses and fungi. Activity increases in acidic solutions and the combined use with alcohol or heating. They are recommended for disinfection baths, kitchens. In powder form of anionic surfactants can be used to disinfect walls and floors in hospitals, in particular, to control hepatitis B and HIV. Monoperoxyphthalic acid (MPP) belongs to Aromatic peroxymonocarboxylic acids. Interest was the study of antimicrobial activity Aliphatic diperoxydicarboxylic acid compared to Aromatic peroxymonocarboxylic acids.

Aim. The purpose is synthesis of diperoxyazelaic acid and comparative study of antimicrobial activity regarding Magnesium monoperoxyphthalate.

Material and methods. The substance of Magnesium monoperoxyphthalate hexahydrate (the active ingredient) in certain surface disinfection such as Dismozon Pur), 50%. The diperoxyazelaic acid was produced in accordance with the publications cited above, J. Am. Chem. Soc. 79, 1929 et seq (1957); more particularly, 100 g (0.53 mole) of azelaic acid was dissolved in 300 g. of 95% sulfuric acid in an open reaction vessel. With good stirring 105 g. (2 moles) of 65% hydrogen peroxide was added dropwise over a 5-10 minute period while maintaining the internal temperature at 20°-25° by an ice-water bath. Stirring was continued for an additional 8 hr. Several volumes of a half-saturated aqueous solution of ammonium sulfate (35 g./100 g. H_2O) were added at 0° and the precipitate of diperoxyazelaic acid was filtered off. The product was washed on the funnel with the cold ammonium sulfate solution until the filtrate was free of sulfuric acid (several washes). The crude product was dried under vacuum at room temperature. Recrystallization from ethanol-water (1:5) yielded an analytically pure product.

To assess drug activity test was used Staphylococcus aureus strains ATCC 25923, Escherichia coli ATCC 25922, Pseudomonas aeruginosa ATCC 27853,

Basillus subtilis ATCC 6633, Proteus vulgaris ATCC 4636, Candida albicans ATCC 885/653. Microbial load was 10^7 bacterial cells per 1 ml of media and installs in McFarland standard. The work took a 18-24 hour culture of microorganisms. For studies were used the agar Mueller Hinton ("Nutrient medium" Dagestan NGO). The diffusion of the drug in agar method was carried out "wells". Determination of antibacterial drugs was performed on two layers of a dense nutrient medium poured into a Petri dish. The lower layer was used "hungry" not inoculated medium (agar-agar, water, salt). The bottom layer is a substrate height of 10 mm which horizontally mounted thin walled cylinder of 03/06 stainless steel with a diameter of 8 mm and a height of the cylinder 10. Around the poured upper layer consisting of a nutrient agar medium, melted and cooled to 40 °C to which was added an appropriate standard overnight culture test microbe. Previously, the top layer is well mixed until smooth. After solidification cylinders were removed with sterile tweezers and placed into wells formed with a test substance given its volume (0.3 ml) .The volume of the medium to the top layer varied from 14 to 16 ml. The plates were dried for 30-40 minutes with room temperature and placed in an incubator for 18-24 hours.

Results and discussion. The results of disquisition of antibacterial activity of the samples diperoxyazelaic acid (DPAA) and the magnesium salt of monoperoxyphthalic acid (MMPP) are represented in the table. They show higher activity of newly synthesized diperoxyazelaic acid.

Table

Antibacterial properties of peroxycarboxylic acids samples

w, in terms of API, 0,05%	The diameters of the zones of growth inhibition in mm (*n*=3, P=0,95)					
	St.aureus ATCC 25923	*E.coli ATCC 25922*	*P. eruginosa ATCC 27853*	*Proteus vulgaris ATCC 4636*	*B. subtilis ATCC 6633*	*Candida albicans ATCC 653/885*
DPAA	21.0±1.8	16.3±1.1	17.3±1.1	17.3±1.1	21.3±2.1	16.0±1.8
MMPP	15.7±1.1	14.3±1.1	14.3±1.1	14.3±1.1	17.3±1.1	14.3±1.1

Conclusions. In a comparative perspective antimicrobial activity of magnesium monoperoxyphthalate and the newly synthesized diperoxyazelaic acid is investigated. It was found that the activity diperoxyazelaic acid is significantly higher than the comparison drug (reference preparation). Based on the availability of raw materials bases findings can be seen as an opportunity to create a new class of oxidants disinfectant based on aliphatic diperoxycarboxylic acids.