ANTIMICROBIAL EFFECT OF NANOCERIA IN WOUND HEALING PROCESS

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Despite advances in traumatic wound care and management, infections remain a leading cause of mortality, morbidity and economic disruption in millions of patients around the world. Animal models have become standard tools for studying a wide array of external traumatic wound infections and testing new antimicrobial strategies. “Nanoceria” (0.05% cerium dioxide dissolved in 0.5% carbopol) had antimicrobial property against Staphylococcus aureus, Pseudomonas aeruginosa, Candida albicans, that is one of the mechanisms of wound healing. Application of the “Nanoceria on wound area enhanced wound cleaning from dead tissue and reduced eschar, stimulated the early growth of granulation tissue, and improved epithelialization of the wound. The aim was to study animicrobial effect of Nanoceria in wound healing.

Materials and Methods. The study included 75 rats. Plate wounds were reproduced on epilated skin in anesthetized rats. The skin was cut using surgical scalpel and forceps, 1 × 1 sm2. Treatment was started immediately after wounds reproduction until healing. Rats were divided into 3 groups. Intact group (untreated rats), experimental group (treated with nanoceria) and control group (administration of 0.5 % carbopol). The wound dressings were put together by electrospinning. The film comprising 0.05% CeO2 (dissolved in 0.5% Carbopol) nanoparticles was elected as the optimal dressing for the in vivo study on full-thickness excisional wounds of rats. To study antibacterial properties
of “Nanoceria” the method of application of the drug (1 g) to the surface of the nutrient medium was used (NA-Nutrientagar, manufacturer Sigma-Aldrich, Spain). Previously surface environment was covered with suspension of test microorganisms according to the recommendations. Number of colony forming units (CFU) were determined by densitometer «Vitek-2» ( «BioMerieux» (France). CFU load in microorganism suspensions amounted to 105 bc / ml, for bacteria, 106 CFU / ml for yeasts. Culture collections of bacteria Staphylococcus aureus ATCC 25923, Pseudomonas aeruginosa ATCC 27853 and yeasts Candida albicans were used as test culture.

**Results.** Biocidal effect of Nanoceria was revealed on test cultures of bacteria Staphylococcus aureus and Pseudomonas aeruginosa. In a test culture of Candida yeasts Nanoceria produced fungistatic effect (areas of growth retardation were noted, where a decreased intensity of yeast growth was observed). “Naoceria” had strong bactericidal effect on S. aureus, P. aeruginosa, C. albicans. The degree of Nanoceria influence in test cultures of microorganisms was evaluated by the presence or absence of growth inhibition zones and their size (diameter). Variants of experiments using gel containing carbopol only (without nanoceria) and options without making any drugs served as control options.

Key words: wound, Nanoceria, full-thickness skin wound, Anti-fungal, Anti-bacterial, Carbopol.

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