Nano-biocomposites for biomedical application

Igor Y Denisyuk1, Natalia V Vasilyeva2, Mari Iv Fokina1, Maya V Vysenkova1, Julia E Burunkova1, Natalia A Zulina2, Tatiana S Bogomolova2, Irina V Vybornova2, Aleksandr S Stepanov1 and Elena A Orishak1

1ITMO University, Russia
2I. Metchnikov North-Western State Medical University, Russia

Silver, gold, selenium and metal oxides nanoparticles in polymer matrix intensively investigated in biomedical application due to the plenty of unique properties of antimicrobial properties to Gram-positive, Gram-negative pathogens and antifungal activity is an important scientific problem to create bio-nanocomposites. Non-selective, broad spectrum antibacterial and antifungal activity against different types of microorganisms as well as the long-term effect for a few months is one of the main requirements to biopolymers. Nanocomposites with nanoparticles Ag, Au, SiO2, ZnO were prepared on the basis of two monomer compositions: (1) Acidic composition consisting of monomers: 2-Carboxyethyl and Bisphenol A glycerolate. (2) pH neutral formulation consisting of monomers: Diurethanedimethacrylate and Isodecyl acrylate and photo initiator. Methods of preparing polymer films based nanocomposites can be found in our papers. Exposure was increased 5 times from total time of polymerization for these composites; prepared samples were heated at 50°C for 12 hours to minimize the effects of residual monomers in the experiment. As test objects were used: Strains of fungi Candida albicans (C. albicans NCTC 885-653) and Aspergillus fumigatus (clinical isolate); strains of staphylococci Community-associated Methicillin-resistant Staphylococcus aureus (CA-MRSA, penicillin-binding protein (PBP2α) - positive); Healthcare-associated Methicillin-resistant Staphylococcus aureus (HA-MRSA, penicillin-binding protein (PBP2α) - positive); Methicillin-resistant Staphylococcus epidermidis (MRSE, penicillin-binding protein (PBP2α) - positive); Methicillin-resistant Staphylococcus epidermidis (MRSE, penicillin-binding protein (PBP2α) - negative); Methicillin-resistant Staphylococcus aureus (MRSA, penicillin-binding protein (PBP2α) - negative); Methicillin-susceptible Staphylococcus aureus (MSSA); Methicillin-susceptible Staphylococcus epidermidis (MSSE). The antifungal activity of ZnO nanocomposites based on polymeric matrix 2-Carboxyethyl acrylate/Bisphenol-A-glycerolate (1 glycerol/phenol) diacrylate against C. albicans and A. fumigatus was found. Pronounced suppressive effect of ZnO nanocomposites based on polymeric matrix 2-Carboxyethyl acrylate/Bisphenol-A-glycerolate (1 glycerol/phenol) diacrylate against staphylococci was identified. The antifungal activity of polymeric matrix based on 2-Carboxyethyl acrylate/Bisphenol-A-glycerolate (1 glycerol/phenol) diacrylate against C. albicans was found.

Biography

Igor Y Denisyuk has his expertise in field of nanoparticles, non-linear molecular crystals, polymer material, photonics, phodegradable nanocomposites and biomedical nanocomposites.

denisiuk@mail.ifmo.ru

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