HIGHLY POROUS POLYMERIC MATERIALS FOR MEDICINE AND BIOTECHNOLOGY

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A highly porous materials based on biodegradable and biocompatible polymers in recent years has become particularly urgent owing to the development of modern reconstructive biomedical technologies: when restoring the structural integrity of the skin and soft tissues damaged by burns or other influences.
For this purpose use biodegradable porous polymer matrix. Porous materials act as a skeleton for the surface for adhesion and cell growth, which should gradually replace evolving from these cells living tissues. In addition, the system of interconnected pores is required for mass transfer when using the material as a sorbent in detoxification of the body or of drug controlled release system.
There are a number of techniques to increase the specific surface of a polymer material, but not all of them are suitable for biopolymer materials.
The report discusses the three main methods of obtaining porous polymeric materials: a method of phase separation, electrospinning and the preparation of composite cryogels method. Phase separation method is considered on the example of the mixture of biodegradable polyesters: polyhydroxybutyrate and polycaprolactone. Mixed solutions of polyesters in chloroform received composite film with different pore size and composition, as well as the repetition of nanofibers with antimicrobial and proteolytic activity. Highly porous biosorbent for selection of radionuclides produced by cryogelation of chitosan in the presence of cross-linking reagents.

BIOSAFETY ASSESSMENT OF POLYMER MATERIALS

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Creation and implementation of new medical polymer products influence on the progress of modern surgery significantly. But the question of biosafety is very actual issue for today. Questions about the ethical using of animals in contemporary medical and biological tests are increasingly attracting professionals and the public.
Within this work on evaluating the properties of biomedical hydrogels and experimental samples of microgels of different series, both native and degraded in sterilization processes at various ways and modes, mouse embryonic fibroblasts (STO) and multipotent mesenchymal stem cells (MMSC), extracted from bone marrow of cattle were used.
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The obtained data indicate the ability of regenerative cells manifestation MMSC in the presence of experimental samples, as in the simulation burn and cut at modeling. In case of STO cell cultures regenerative ability is lower than in case of MMSC cells, but in case of simulation vitality burn exceeds the values obtained by simulation cut.
The study found out that the vitaliy of the cell cultures combined specimens hydrogels and microgels exceed the reference values. This can contribute to regenerative processes in the healing of wounds. Also degraded samples of the hydrogels and microgels based on recombinant spidroin non-toxic and biosafety.

SYNTHESIS OF POLYMERS WITH HIGH 3HHX CONTENT BY THE WILD-TYPE STRAIN CUPRIAVIDUS EUTROPHUS B10646 AND STUDY OF THEIR PROPERTIES

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Polyhydroxyalkanoates (PHAs), which are accumulated by numerous bacteria as carbon and energy storage materials under nutrient limitation and carbon excess, are aliphatic polyesters with thermoplasticity, optical activity, and biodegradability. Properties of PHAs are determined by the PHA structure. Copolymers of 3-hydroxybutyrate (3HB) and 3-hydroxyhexanoate (3HHx) or 3-hydroxyhexanoate (3HHx) and 3-hydroxyvalerate (3HV) have been found to exhibit particularly useful material properties relative to other PHAs. However, synthesis of PHAs of a definite structure is a technological challenge; therefore, PHAs of a definite structure can only be produced based on the fundamental knowledge of their synthesis. Thus, this study addressed synthesis of copolymers of 3HB and 3HHx, 3HHx and 3HV by the bacterium *Cupriavidus eutrophus* B10646 and properties of the copolymers.
Bacterial cells were cultured under special conditions of carbonic nutrition (with such sources of carbon as fructose, salts of organic acids with length of carbon chain C_5-C_6). To obtain P(3HB-co-3HHx) and P(3HB-co-3HV-co-3HHx) different concentrations of sodium valerate, sodium hexanoate and sodium acrylate (inhibitor of β-oxidation of fatty acids) in the medium were used. Maximal content of 3HHx in P(3HB-co-3HHx) was 70 mol.% and maximal con