POLYVINYL ALCOHOL BASED THERAPEUTIC SYSTEMS

POLIVINILSPIRTA TERAPEITISKĀS SISTĒMAS

Jolanta Greidāne, Anda Dzene, Velta Tupureina
RTU, Institute of Polymer Materials
Ludmila Savenkova
LU, Institute of Microbiology and Biotechnology

Kopsavilkums
Pētīta biosavietojamu, ārstnieciskās vielas (ĀV) saturošu, medicīnā brūču aizsargāšanai un ārstēšanai izmantojamu, makromolekulāru terapeitisko sistēmu izveidošana, lietojot plastificēta polivinilspirta polimērmatricu, kurā ievadītas antiseptiskas, antibakteriālas vielas, lokālās anestēzijas līdzekļi, kā arī to kombinācijas. Veikti polimērmatricu sterilizācijas pētījumi, izmantojot ^{60}Co γ–starojumu (25 kGy) un pārbaudīta izstrādāto terapeitisko sistēmu sterilitāte. Ar UV spektroskopijas metodi novērtēta komponentu ķīmiskās dabas, koncentrācijas un γ–starojuma ietekme uz ĀV izdalīšanās intensitāti. Valsts Apdegumu centrā tiek veikti izstrādāto polivinilspirta terapeitisko sistēmu klīniskie pētījumi.

Some possibilities for reducing environmental pollution can be achieved by economy of drugs saturated therapeutic systems and prolongation of their usage.

Hydrophilic polymers are of special interests for application in medicine due to their biocompatibility, solubility and ability to absorb water.

One of the most ancient and at the same time the most popular polymers for developing hydrophilic medical materials is polyvinyl alcohol (PVA).

The main objective of presented study was elaboration of therapeutic substances (TS) containing macromolecular polymeric matrices on the bases of PVA provided for wound protection. Partially crystalline water soluble PVA (0.8 – 2 mas% acetate groups) with molecular mass 130 kDa, melting temperature 225,8 ^{o}C, glass transition temperature – 76,6^{o}C (according to DSC method) was used for investigation.

The choice of PVA is determined by its ability to form polymer matrices from water solution, excluding use of organic solvents in the process of film making which facilitates incorporation of TS as most of them are soluble in water. In order to prevent formation of splits during the PVA films drying process, its plasticization was necessary and one of the most suitable PVA plasticizers – glycerol was employed.

PVA water solution (10 – 15 % mas%) plasticized with glycerol and containing TS was chosen as base material for working out polymeric matrices for antiseptic therapeutic systems. Some kind of TS - antiseptic, antibacterial and substances for local anesthesia – such as water or alcohol solutions of furaciline, brilliant green, dioxidine, lidocaine, chlorhexidine and novacaine were used.

Sterilization process of polymeric matrices was studied by use of ^{60}Co γ–radiation which has several essential advantages:

1. sterilization occurs in absolutely isolated and impenetrable packing, which excludes repeated pollution;
2. radiation ability to get into any place of the material destroys organisms vegetating;
3. control of the process is simple and reliable.

Usually for sterilization of medical materials ^{60}Co γ-irradiation dose 25 kGy is used but in some cases even smaller doses may be effective. Polymer resistance to γ –irradiation is determined mainly by chemical structure of macromolecules.

Three kinds of sterility testing of polymeric matrices were examined (Institute of Microbiology and Biotechnology):

- non sterile;
- sterilized by steam (autoclaved in a special package “Biobag - 30” for 15 min, at 121^{o}C);
- sterilized by γ–irradiation (25 kGy).

Investigation shows that the necessary sterility of all samples tested was ensured. Low content of microorganisms was observed for TS containing samples even without sterilization.

Study on extraction of TS were carried out on ultraviolet (UV) one ray spectrophotometer UV mini 1240 SHIMADZU with two light sources which allows appreciate changes in optical density (absorbance).

In order to evaluate extraction of TS from polymeric matrices in physiological solution changes of UV spectra in time were measured.

Simultaneous incorporation of antimicrobial/antiseptic TS and local anesthesia aids in PVA matrices is possible.

Different materials may be used for burn wounds protection but assessement of wound must be done before choosing them. Some conditions are important for burn treatment: preservation of undamaged epithelium cells, prevention of infection, promotion of spontaneous epithelisation.

The clinical investigations of elaborated PVA based therapeutic systems are started at State Burn Center and still going on.

Jolanta Greidane, student
RTU, Institute of Polymer Materials
Address: 14/24 Azenes St., Riga LV 1048, Latvia
Phone: (+371) 7089219
e-mail: Velta Tupureina <veltupur@ktf.rtu.lv>