PS04 - 1.11

SURFACE STUDIES OF POLY(ACRYLIC ACID) HYDROGEL GRAFTED ONTO LDPE AND PVC FILMS WITH IMMOBILIZED ALBUMIN FOR CARDIOVASCULAR APPLICATIONS

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For biomedical purpose is desirable that the blood contacting materials possess some degree of blood compatibility. The surface of polymers can be modified to attain compatible characteristics with the biological fluids. The grafting of acrylic acid (AA) onto polymeric surfaces of poly(vinyl chloride) (PVC) and low density polyethylene (LDPE) were carried out by simultaneous irradiation and peroxidation techniques, in a ^{60}Co source and electron beam accelerator, respectively. The homopolymerization was controlled by the addition of the comonomer N,N'-dimethylacrylic acid (DMA) in the grafting system. The carboxilic groups of PVC-g-AA and PE-g-AA were activated initially by a methylation procedure. After transfering the films to a 1% solution of hydrazine for 12-15 hrs at 40º C, the azide formation was accomplished by immersing the films in a mixture of 0,5 M $NaNO_2$ and 0,3 M HCℓ at 5º C. The activated films of PE-g-AA and PVC-g-AA were dipped overnight into a BSA solution of PBS buffer pH 8,8 (1mg/mℓ) at 0º C. The coupling yield of BSA on the PVC-g-AA was 80 µg /cm^2 and 200 µg/cm^2 for LDPE-g-AA. Hemocompatibility of the surfaces was evaluated by in vitro tests as albumin and fibrinogen adsorption, couting adhered platelets and kinetics of thrombus formation. BSA immobilization on the PE-g-AA and PVC-g-AA enhanced the antithrombogenic property of LDPE and PVC films.

PS04 - 1.12

EVALUATION OF BIOCOMPATIBILITY OF PHOSPHOLIPID POLYMER USING A NEWLY DESIGNED QUARTZ CRYSTAL MICROBALANCE SYSTEM

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[Introduction] We have already reported high biocompatibility of phospholipid polymer consisted of 2-methacryloyloxyethyl phosphorylcholine (MPC). In this study, to investigate the mechanism of the nonthrombogenicity of the MPC copolymer with respect to its affinity for phospholipid molecules, a quartz crystal microbalance(QCM) system was newly designed and applied for dynamic measurement of adsorption process of the dipalmitoylphosphatidylcholine(DPPC) liposomes on the MPC copolymer surface.

[Materials and Method] A 10 MHz AT-cut quartz resonator with gold electrodes (effective surface area: 20mm^2) was used in all experiments. One of the two resonators was coated with the MPC copolymer with n-butylmethacrylate (MPC mole fraction:0.25) and the other by poly 2-hydroxyethyl methacrylate (HEMA). The cell was dipped into a temperature controlled PBS (pH 7.4) and the resonant frequency was measured by a frequency counter. For dynamic measurement of adsorption process of liposomes, an appropriate amount of DPPC liposome was added into the PBS and the resonant frequency was measured.

[Results and Conclusion] In Fig. 1 is shown a typical example of the resonance frequency change associated with the addition of the liposomes. As shown in this figure, frequency shift of the poly HEMA coated resonator was larger than that of the MPC coated one, and a gradual increase of the resonance frequency was still observed on the poly HEMA coated one even after 20 minutes from the addition. Fig. 2 shows relationships between liposome concentration and frequency shift measured at 5, 10, and 15min after the addition of the liposomes. From this result, it is clearly indicated that the amount of liposomes adsorbed on the polyHEMA surface is strongly influenced by the liposome concentration, whereas those on the MPC copolymer are scarcely influenced. These results strongly suggest high affinity of the MPC copolymer to phospholipid molecules, which characteristics will play an important role on forming biomembrane-like surface leading to obtain high biocompatibility.

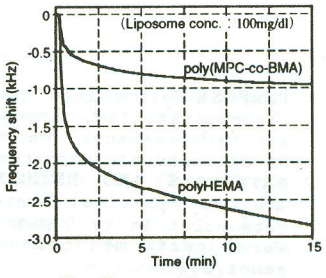

Fig. 1 Frequency shift of the resonators after addition of liposomes

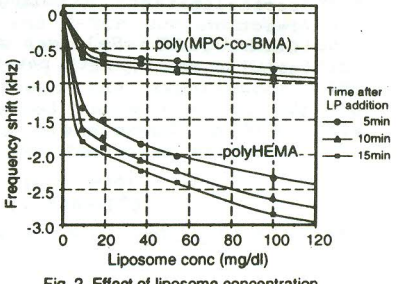

Fig. 2 Effect of liposome concentration on frequency shift