SOME SORPTION CHARACTERISTICS OF POLYHEMA

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Since there is some debate as to whether the presence of chlorhexidine in solutions used to disinfect soft contact lenses can lead to eye irritancy, we have been investigating the interaction of this antimicrobial agent with polyHEMA, a polymer widely used in the manufacture of contact lenses. The sorption behaviour is found to be at variance with that normally exhibited when polymers interact with aqueous solutions. Chlorhexidine is not desorbed from the polymer in water and repeated cycling of polyHEMA in aqueous chlorhexidine digluconate solutions results in a steady accumulation of preservative, the final uptake from a 0.01% solution exceeding the value predicted from the initial equilibrium isotherm by a factor of about 14.

In order to establish whether these properties are a function of the polymer or the preservative, the interaction of polyHEMA with benzoic acid and benzocaine was studied at 30°C using powdered polyHEMA of a uniform size fraction (75 - 120 μm). Both compounds were sorbed in a reversible manner and gave linear uptake isotherms (figure 1) which can be characterised by their slopes or sorption constants. Figure 2 shows that the sorption of benzoic acid is pH dependent. The circles represent experimentally determined sorption constants and the solid line was calculated assuming that only the unionised species interacted with the polymer. Similar results were obtained for benzocaine.

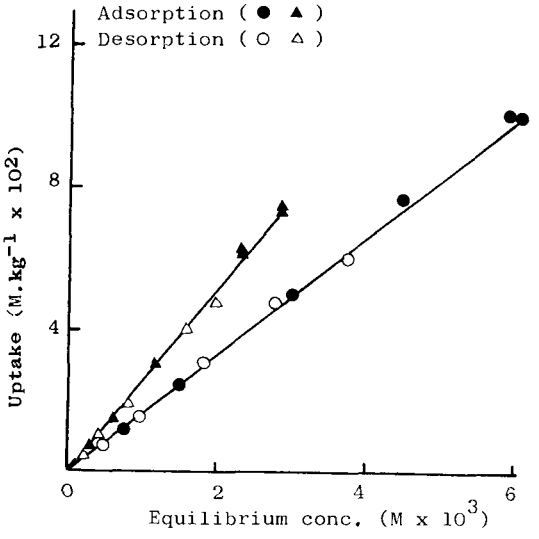

Figure 1. Uptake of benzoic acid (● ○) and benzocaine (▲ △) by polyHEMA powder at 30°C (I = 0.5M) at pH's 2.32 and 4.69 respectively.

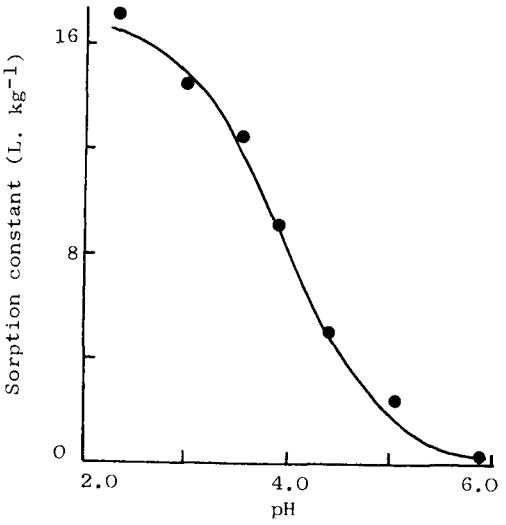

Figure 2. Effect of pH on sorption constant for benzoic acid at 30°C (I = 0.5M)

Thus polyHEMA behaves in a conventional manner with these molecules showing reversible uptake behaviour, linear sorption isotherms and the expected lack of affinity for simple organic cations and anions. The abnormal sorption characteristics of chlorhexidine therefore appear to be a function of the preservative rather than the polymer.