EVALUATION OF A NEW IONTOPHORETIC SYSTEM USING MODEL COMPOUNDS

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Iontophoresis is the use of an electric potential gradient to deliver ions into body tissues. The efficiency of delivery is limited by the presence of competing extraneous ions produced by the electrodes during the iontophoretic process. A new system has been developed that increases efficiency by isolating these competing ions. It is composed of a vertical four compartment cell in which the two inner units, containing donor and receptor solutions, are separated by the model membrane. The two outer units, containing helical silver/silver chloride electrodes (chosen to reduce hydrolysis and pH changes in the system) are separated from the inner compartments by an ion exchange membrane. This membrane isolates the electrolytic products of the electrodes from the inner sample units. A continuous constant current was supplied during iontophoresis. When no current was applied the system served as a passive diffusion cell.

Evaluation of the above system has been carried out using aqueous solutions of sodium benzoate or sodium salicylate (62.5mM) as donor, and normal saline as receptor solution. Excised pig skin (area: 1.245cm^2) was used as the model membrane. Iontophoretic permeation studies were performed over 8h at 32°C while experiments without current were extended to 30h. Drug permeation into the receptor unit were monitored every hour spectrophotometrically. No significant change in pH of the contents of the inner sample units was observed during the course of the experiment.

During iontophoresis there was a substantial increase in the permeation flux of both molecules as compared to passive diffusion. Figures 1 & 2 show the drug permeation flux versus time at various current densities.

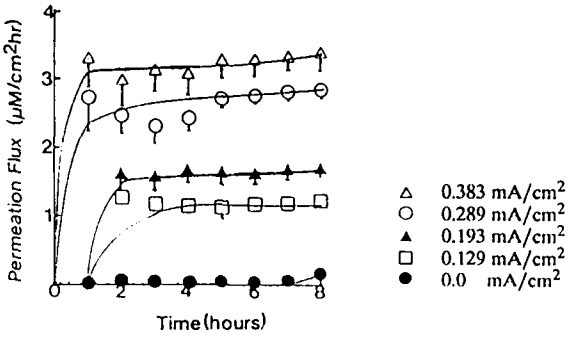

Figure 1 Iontophoresis of sodium benzoate

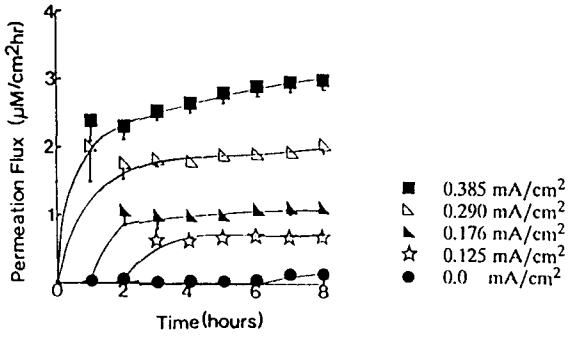

Figure 2 Iontophoresis of sodium salicylate

The lag time of 6 to 7 h observed in the passive diffusion experiments decreased as current density increased. Permeation flux for each molecule increased almost linearly with an increase in applied current density and decreased with increased molecular weight. The improved efficency of the system is shown by the the fact that there was a twofold increase in sodium benzoate flux over that reported by Bellantone et al (1986) for similar levels of current density.

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Bellantone, N.H. et al (1986) Int. J. Pharm. 30: 63-72