

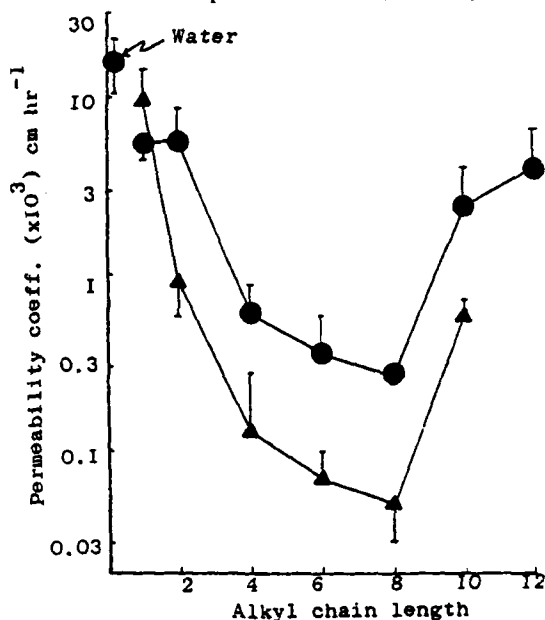
SOLVENT INFLUENCES ON THE TRANSPORT OF HOMOLOGOUS CHEMICALS ACROSS HUMAN NAIL PLATE

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The human nail is prone to attack by a host of fungi and micro-organisms some of which can invade the keratin matrix of the nail plate. In order to elucidate optimum formulation parameters for the topical treatment of nail infections, baseline data on the kinetics of diffusive penetration and the thermodynamics of solubility in the nail plate are necessary. As part of a project to obtain this data the effects of solvents on the penetration of a series of n-alcohols has been assessed using an in vitro diffusion chamber (Walters et al 1981).

The permeation of ^3H -water, ^3H -methanol and ^{14}C -alcohols from both dilute aqueous solution and their corresponding neat alcohol was followed as a function of time at 39°C . The influence of the organic solvents dimethylsulphoxide (DMSO) and isopropanol on the permeability coefficients of methanol and hexanol has also been determined.

The permeability/alkyl chain length profiles for both dilute aqueous solutions and neat alcohols are shown in Figure 1. With the exception of methanol the permeability coefficients from neat alcohols were uniformly lower than from dilute aqueous solutions. Since nail plate thicknesses were relatively constant the explanation of this finding must lie either in slightly depressed diffusivities or partitioning in nail plate material. General parallelism in the patterns suggest that the alcohols are soluble within the nail plate in rough proportion to the external concentration. In addition, it is likely that nail plate hydration plays a role in increasing the rates of permeation, probably through increasing the diffusivities, of these compounds. DMSO was found to decrease the permeation rate of both methanol and hexanol as a function of



solvent concentration (0-100%). On the other hand, isopropanol decreased the permeation rate of hexanol but had no effect on methanol permeation. It is concluded that solvents which tend to facilitate diffusion through skin (Scheuplein and Ross 1970) have little promise as accelerants of nail plate permeability.

Figure 1: Permeability coefficients of n-alcohols through nail plate as a function of alkyl chain length.
 ●: from dilute aqueous solution.
 ▲: from neat alcohols.

Scheuplein, R. and Ross, L. (1970) *J.Soc.Cosmet.Chem.* 21: 853-873.
 Walters, K.A. et al (1981) *J.Invest.Derm.* 76: 76-79.

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