THE EFFECT OF DIMETHYLSULPHOXIDE CONCENTRATION ON THE PENETRATION OF HEXANOL THROUGH NEONATAL RAT AND HUMAN STRATUM CORNEUM

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Transdermal permeation, recognised as being an important route of drug absorption, is limited mainly by the stratum corneum. Permeation of drugs across the skin can be increased by many substances, including Dimethylsulphoxide (DMSO). Despite a sizeable literature on DMSO its precise mechanism of action is still unknown, but most authors agree that a concentration greater than 60-70% v/v is required (Sweeney et al., 1966).

In this study the effect of DMSO concentration on the penetration of hexan-1-ol through isolated neonatal rat or human abdominal stratum corneum was observed, using a diffusion cell with a flowing receptor solution (based on Akhter et al., 1984). The rate of penetration, expressed as the permeability coefficient (Kp), was determined from water (control), the DMSO solution (1st Run) and water again (2nd Run), on three consecutive days.

In the presence of low and high concentration DMSO, the Kp is depressed in both neonatal rat (Fig. 1) and human stratum corneum. This is because of a decrease in the availability of hexanol when in a DMSO solution. On the 2nd Run after low concentration DMSO, the Kp returns to the control level. Any increase is probably due to hydration of the stratum corneum. The 2nd Run after high concentration DMSO gives an increase in Kp in the neonatal rat, but the Kp again returns to the control level in the human. The increase in permeability of the rat stratum corneum is likely to be due to changes in its molecular arrangement. The lack of action of DMSO on human stratum corneum may therefore be because of structural differences. The physico-chemical nature of the penetrant also affects the action of DMSO.

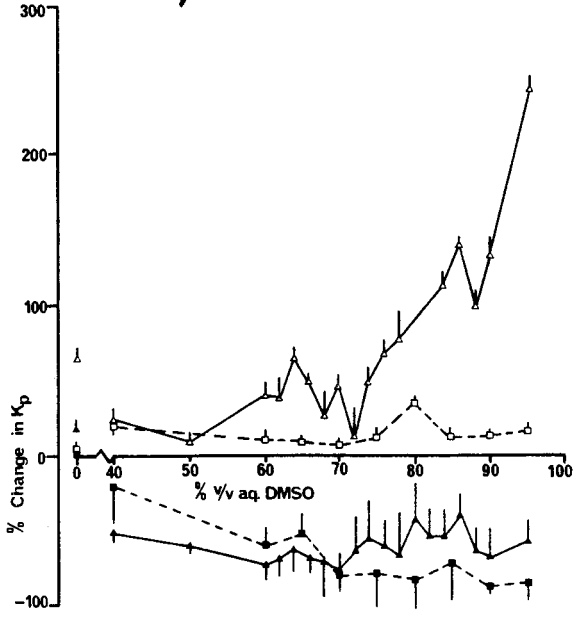

Fig. 1: Effect of DMSO concentration on the penetration of hexanol through neonatal rat and human stratum corneum.

Neonatal Rat:
▲——▲ 1st Run (from DMSO)
△——△ 2nd Run (from water)

Human:
■- -■ 1st Run
□- -□ 2nd Run

± S.E.M.

Akhter, S.A. et al (1984) Int. J. Pharm. 21: 17-26

Sweeney, T.M. et al (1966) J. Invest. Derm. 46: 300-302