EFFECT OF OIL PHASE ON RELEASE FROM W/O/W MULTIPLE EMULSIONS STABILISED BY INTERFACIAL COMPLEXATION

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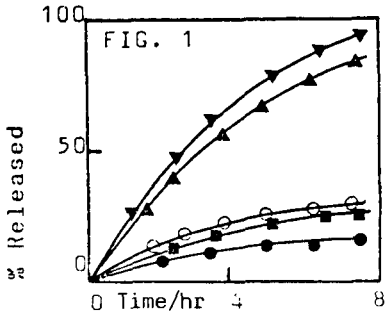
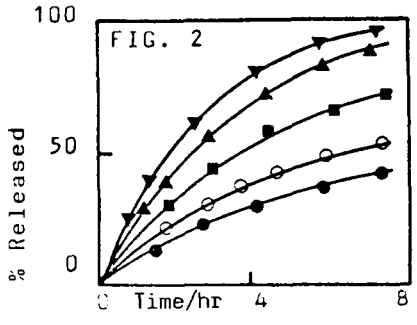
The ability of W/O/W multiple emulsions to entrap water soluble materials and to provide controlled release systems makes them potentially useful pharmaceutical systems. Mechanisms of release are not well understood : transfer across the oil phase is clearly important. This diffusion could involve unionised species, inverse micelles and/or swollen micelles. As part of a study to understand both the stability and release behaviour of W/O/W/ multiple emulsions, we have investigated the effect of the nature of the oil phase.

Multiple emulsions were prepared as described previously (Law et al., 1984) using bovine serum albumin (0.2%) in the inner aqueous phase, Span 80 (2.5%) in the oil phase and Tween 80 (1.0%) in the external aqueous phase with the following oil phases: (the symbols indicate those used in Figures 1 and 2). Octane ● , dodecane ■ ,hexadecane ▲ , cyclohexane ○ and toluene ▼ . Sodium chloride (1.25%) and 5-fluorouracil (1mg/ml) were incorporated separately into the inner aqueous phase. Sorbitol (7.6%) was present in the outer aqueous phase when sodium chloride was present in the inner aqueous phase to prevent osmotic flow. The final phase volume ratios were 50:25:25 (External aq.: oil: Internal aq.)





Diameters of multiple oil droplets and the internal aqueous droplets as well as their numbers were determined over 6 weeks: there were no significant changes indicating stable multiple emulsions. Figure 1 shows the release profiles for sodium chloride and Figure 2 those for 5-fluorouracil(5-FU). In such stable systems, diffusion across the oil phase or through localised thin lamellae is the primary transport mechanism. 5-FU is released at a faster rate than NaCl through all the oil phases, due to its greater lipophilic nature. The order of release through the various oil phases is the same for both solutes. In the presence of surface active agents water is taken up by oil phases in the form of swollen micelles (Kita et al 1978). The main factor in the large differences in rates of release is the droplet size of the internal aqueous phase, e.g. mean droplet diameter with toluene is 4.5μm and with octane 12.6μm.

Law, T.K. et al (1984) J.Pharm.Pharmac., 36, 50P.
Kita, Y. et al (1978) Nippon Kagaku Kaishi, 1, 11.