

THE CHARACTERIZATION OF MULTIPLE (w/o/w) EMULSIONS USING A
RADIOTRACER TECHNIQUE

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Multiple emulsions (w/o/w) have been proposed as possible vehicles for drug delivery (Herbert, 1965). The main distinguishing feature of such a system is that the oil droplets of the disperse phase contain within themselves a further disperse phase of aqueous droplets. The measurement of the stability of the oil droplets is a relatively simple matter, whereas studies on the stability of the internal droplets have involved the use of freeze-fracture electron microscopy (Davis & Burbage, 1977) and the determination of droplet size changes under an osmotic gradient; the thin oil-surfactant films that separate the water droplets, acting as semi-permeable membranes (Davis & Burbage, 1978). We now report two additional non-perturbative methods that both employ tritium and a two compartment dialysis cell. In method (1) tritium is added originally to the internal aqueous phase of the emulsion at the time of manufacture. The kinetics of transfer of the isotope from emulsion compartment to aqueous compartment of the diffusion cell (biphasic for a w/o/w system) are determined by the total number as well as the size of the internal aqueous droplets (Fig. 1). In method (2) the multiple emulsion is challenged by allowing it to equilibrate in the dialysis cell against an appropriate tritiated aqueous phase. The uptake of tritium into the internal aqueous droplets is followed, as is its subsequent release when the system is allowed to re-equilibrate against a non-tritiated aqueous solution. The rate and extent of uptake and release is controlled by the properties of the internal aqueous phase. In this way changes in the characteristics of the internal phase upon storage can be followed (Table 1).

Fig. 1 Release of tritiated water from
o/w and w/o/w emulsions
(Dialysis cell method)

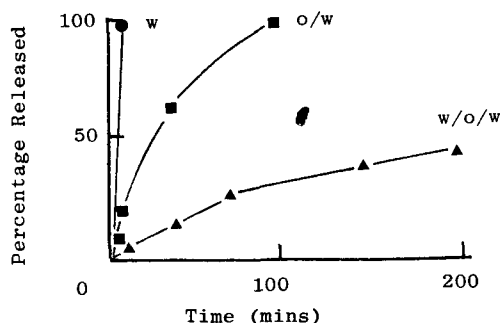


Table 1 The release of tritium from
a multiple emulsion (w/o/w)

<u>Storage time (days)</u>	<u>Release (Phase 1) ($\mu\text{C}/\text{min}$)</u>
0	0.0038
1	0.0053
2	0.0075
8	0.0097

Davis, S.S. & Burbage, A.S. (1977) *J. Colloid Interface Sci.* 62 : 361

Davis, S.S. & Burbage, A.S. (1978) *In Particle Size Analysis*. Ed. M.J. Groves,
p.395, Heyden, London

Herbert, W.J. (1965) *Lancet* ii : 771