

Specific values measured were as follows:—

Bottle number	1	2	3	4
Coulter	0.70	0.62	0.62	0.64
HIAC	0.68	0.62	0.61	0.68

It is concluded that the two instruments are broadly comparable, and are suitable for the purpose of counting particulate contamination in intravenous solutions.

Collaboration between different laboratories is required to establish the utility of this approach to the problem of assessing contamination, and to devise a realistic standard of cleanliness.

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REFERENCES

- APPINO, J. B. & ROBINSON, R. U. (1969). *Annals New York Acad. Sci.*, **158** (3), 680–689.
 CARVER, L. D. (1969). *Ibid.*, **158**, 710–721.
 GROVES, M. J. (1969). *Analyst*, **94**, 992–1001.

Some investigations of the effect of a non-ionic surfactant on the diffusion of hydrocortisone across a cellulose acetate membrane

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The authors report further studies of the effects of non-ionic surfactants upon the diffusion of steroids across a cellulose acetate membrane. Diffusion rates have been measured using the 'short' and 'ultra-short' time methods recently developed (Short, Abbs & Rhodes, 1970; Short, Jenkins & Rhodes, unpublished); the apparatus was also described in these publications. The temperature dependence of the diffusion rate has been examined in systems with and without n-alkyl polyoxyethylene surfactant. In all cases the Arrhenius equation was obeyed, e.g. correlation coefficient for five temperatures 0.997. The diffusional energies, ΔH_d , and entropies, ΔS_d , have been calculated, following the method of Barrer (1939). In distilled water the values were estimated to be $36.0 \times 10^3 \text{ J mol}^{-1}$ and $-3.4 \times 10^2 \text{ J deg}^{-1} \text{ mol}^{-1}$ respectively.

The enthalpy, ΔH_b , and entropy, ΔS_b , of micellar binding, calculated by previously described methods (Molyneux, Rhodes & Swarbrick, 1965; Humphreys & Rhodes, 1968; Molyneux & Rhodes, unpublished), were found to be $-17.6 \times 10^3 \text{ J mol}^{-1}$ and $-22 \text{ J deg}^{-1} \text{ mol}^{-1}$ respectively.

Interpretation of the diffusion and micellar binding results has led to the development of a simple thermodynamic hypothesis. This can explain how surfactants can both increase and decrease diffusion rates even when, as in the systems investigated in this work, the surfactants do not modify membrane permeability by direct interaction with the membrane. From the micellar binding data values of ΔH_d and ΔS_d , with 2% $\text{C}_{16}\text{E}_{30}$ solutions on the donor side of the membrane, have been predicted. The agreement between the predicted and experimental values is good, ΔH_d 53.9 (expt 50.9) $\times 10^3 \text{ J mol}^{-1}$ $\times 10^3$, ΔS_d -3.1 (expt -2.9) $\times 10^2 \text{ J deg}^{-1} \text{ mol}^{-1}$.

REFERENCES

- BARRER, R. M. (1939). *Trans. Farad. Soc.*, **35**, 628–643, 644–656.
 HUMPHREYS, K. J. & RHODES, C. T. (1968). *J. pharm. Sci.*, **57**, 79–83.
 MOLYNEUX, P., RHODES, C. T. & SWARBRICK, J. (1965). *Trans. Farad. Soc.*, **61**, 1043–1052.
 SHORT, P. M., ABBs, E. T. & RHODES, C. T. (1970). *J. pharm. Sci.*, **59**, 995–998.