CORKILL, J. M., GOODMAN, J. F. & OTTEWILL, R. H. (1961). *Ibid.*, **57**, 1627–1636.
ELWORTHY, P. H. & MYSELS, K. J. (1966). *J. Colloid Inter. Sci.*, **21**, 331–347.
HUDSON, R. A. & PETHICA, B. A. (1964). *Proceedings of the Fourth International Congress on Surface Active Substances*, Gordon and Breach, New York, **2**, 631–639.
LANGE, H. (1967). In *Nonionic Surfactants*, pp. 443–476, Editor, Schick, M., New York: Marcel Dekker.
WILLIAMS, E. F., WOODBURY, N. T. & DIXON, J. K. (1957). *J. Colloid Sci.*, **12**, 452–459.

Micellar polydispersity of the non-ionic detergent cetomacrogol

The determination of the micellar molecular weights of detergents in aqueous systems has been restricted mainly to the evaluation of the weight average figure ($\overline{M}_w$) using light scattering and ultracentrifuge techniques (Elworthy & Macfarlane, 1965). To obtain an idea of the degree of polydispersity of macromolecules in solution, $\overline{M}_w$ is compared with the number average molecular weight $\overline{M}_n$; if $\overline{M}_w/\overline{M}_n$ is significantly larger than unity, the macromolecules, or micelles, are said to be polydisperse. A direct comparison of $\overline{M}_w$ and $\overline{M}_n$ has been reported for only a few detergents. Sirianni & Gingras (1961) using a vapour pressure technique found values for $\overline{M}_n$ of pure polyoxyethylene glycol ethers to be significantly lower than the published value for $\overline{M}_w$ of similar detergents, a fact corroborated by later work on non-ionic detergents of industrial origin (Sirianni & Coleman, 1964). Both Ikeda & Kakiuchi (1967) and Schott (1966) however, report a fairly close agreement between $\overline{M}_w$ and $\overline{M}_n$ of polyoxyethylene ethers in aqueous solution.

Membrane osmometry is used here for the first time to ascertain $\overline{M}_n$ of a detergent forming large micelles, with the intention of comparing the values with $\overline{M}_w$ obtained by light scattering.

A commercial sample of cetomacrogol was ion-exchanged twice in methanol on a mixed bed resin column and dried for 6 h at 50° C/30 mm Hg. The ethylene oxide chain length was estimated using the method of Siggia, Starke & others (1958) and corresponded to 23 units. $\overline{M}_n$ of the detergent in aqueous solution was determined using a Hewlett Packard 503 Membrane Osmometer with B19 Cellulose Acetate Membranes (Hewlett Packard Ltd.).

Two major problems are associated with this technique when it is applied to micellar systems. The first involves the reduction to the minimum of any monomer diffusion across the membrane. This was achieved by placing a solution of cetomacrogol just in excess of the critical micellar concentration (CMC) below the membrane. Since the number of monomers in solution does not significantly increase with concentration once the CMC is exceeded, any flow of monomers across the membrane, when a more concentrated solution is placed above it, is obviated. Hence, any contribution the monomers might make to the osmotic pressure may be neglected.

The second difficulty is associated with diffusion of micelles. Since the osmotic pressure readings were shown to remain constant for 3 h, it was concluded that the membrane was impermeable to micelles. Verification of this assumption was obtained by measuring the partition coefficient of the solute with respect to the solutions above and below the membrane (Gardon & Mason, 1957) using a diffusion cell similar to that of Hartley & Runnicles (1938) and Stokes (1950). An average value of 0·003 was obtained for this coefficient over the concentration range of the test solutions, as against a theoretical value of zero for a completely impermeable membrane and unity for complete permeability.

$\overline{M}_w$ values were obtained using the light scattering apparatus described by Attwood (1968).

Table 1. *$\bar{M}_w$ and $\bar{M}_n$ of cetomacrogol micelles in aqueous solution*

Temperature °C	Weight average micellar weight (light scattering)	Number average micellar weight (osmometry)
18	101,000*	
25	108,000	103,000
36	110,000	106,000

* Elworthy (1960).

The differences between the two sets of values do not exceed 5%, indicating no significant discrepancy within the error of experimental technique. Thus the micelles are monodisperse or have a very narrow range of sizes.

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REFERENCES

ATTWOOD, D. (1968). *J. phys. Chem., Ithaca*, **72**, 339–345.
ELWORTHY, P. H. (1960). *J. Pharm. Pharmac.*, **12**, *Suppl.*, 260*T*–266*T*.
ELWORTHY, P. H. & MACFARLANE, C. B. (1965). *Ibid.*, **17**, 129–143.
GARDON, J. L. & MASON, S. G. (1957). *J. Polym. Sci.*, **26**, 255–275.
HARTLEY, G. S. & RUNNICLES, D. F. (1938). *Proc. R. Soc.*, **168A**, 401–419.
IKEDA, S. & KAKIUCHI, K. (1967). *J. Colloid Inter. Sci.*, **23**, 134–138.
SCHOTT, H. (1966). *J. phys. Chem., Ithaca*, **70**, 2966–2973.
SIGGIA, S., STARKE, A. C., GARIS, J. J. & STAHL, C. R. (1958). *Analyt. Chem.*, **30**, 115–116.
SIRIANNI, A. F. & GINGRAS, B. A. (1961). *Can. J. Chem.*, **39**, 331–338.
SIRIANNI, A. F. & COLEMAN, R. D. (1964). *Ibid.*, **42**, 682–689.
STOKES, R. H. (1950). *J. Am. chem. Soc.*, **72**, 763–767.

Effect of tyramine and octopamine on lipolysis in isolated fat cells of the rat

Injection of tyramine increases plasma free fatty acid (FFA) levels in man (Mueller & Horwitz, 1962), in rats (Stock & Westermann, 1965) and in guinea-pigs (Maier, Maitre & Staehelin, 1967). The present study shows that tyramine and its metabolite, octopamine (Musacchio & Goldstein, 1963), has little direct lipolytic action, and in high concentration reduces noradrenaline-induced lipolysis in isolated rat fat cells.

Male Holtzman rats, 180–220 g, were fasted overnight and killed. Immediately after the epididymal fat pads were removed, and the fat cells prepared by a slight modification (Nakano, Ishii & others, 1968) of the method described by Rodbell (1964). The isolated fat cells, suspended in Krebs-Ringer-bicarbonate buffer (pH 7·4) containing 3% bovine albumin (gassed with 5% carbon dioxide in oxygen), were incubated in a temperature-controlled bath shaker (37°) with noradrenaline, tyramine or octopamine for 1 h. Then the FFA concentration of an aliquot of the mixture was determined (Duncombe, 1963). Triglyceride content of fat cells was measured by van Handel & Zilversmit's method (1957).