NOVEL POLOXAMER (PLURONIC) AND POLOXAMINE (TETRONIC) HYDROGELS: SWELLING AND DRUG RELEASE

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Hydrogels have attracted widespread attention for a variety of biomedical applications (Andrade 1976). Our previous attempts to form non-ionic surfactant hydrogels on irradiation in a cobalt-60 source failed because the ethylene oxide chain of the surfactants studied degraded upon irradiation (Al-Saden et al 1977). The objective was to secure a solubilizing gel which might retain some of the solubilizing capacity of the individual micelles in the surfactant solutions. We have since succeeded in cross-linking poloxamer (Pluronic) ABA block copolymeric surfactants and now report the cross-linking of related poloxamine (Tetronic) block copolymers with the general formula

$$[H(C_2H_4O)_y(C_3H_6O)_x]_2NCH_2CH_2N[(C_3H_6O)_x(C_2H_4O)_yH]_2$$

and compare some of the properties of these gels with those of the related poloxamer hydrogels. Inverted BAB copolymers (meroxamers) also gel but have little structural integrity. Tetronic gels were obtained by irradiating aqueous solutions of Tetronic 908 and Tetronic 1508, both with 80% ethylene oxide content, sealed under nitrogen in a cobalt-60 source at 0.33 mRad hr^{-1} for up to 24hr. Water uptake for 2% Tetronic gels and Pluronic F68 and F88 gels are compared in Fig. 1. Scanning electron microscopy showed little difference in the morphology of freeze dried Tetronic and Pluronic gels, having similarities to the poly(ethyleneoxide) gels of Blank and Reimschuessel (1974). Acetanilide, used as a model drug substance, and sorbed into the preformed gel was released slowly into water. Release from these systems can be related to the ability of the gel to swell from the dried state in water as shown in Fig. 2. Swelling may thus provide a useful index of the release rate of such systems.

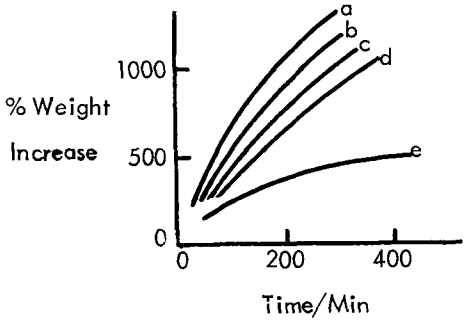

Fig. 1 Uptake of Water in Tetronic and Pluronic Gels

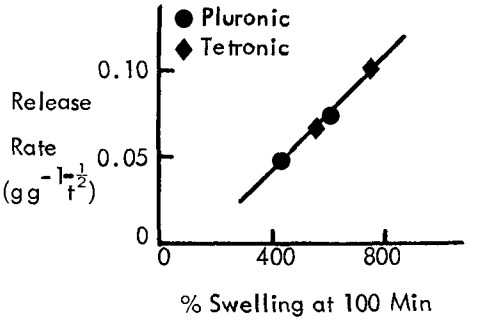

Fig. 2 Relation between Water Uptake and Release of Acetanilide

a Tetronic 908 b Pluronic F68 c Tetronic 1508
d Pluronic F88 e Tetronic 1508 in 1M NaCl

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