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THE INFLUENCE OF GELATIN HYDROLYSIS ON DIFFUSION THROUGH GLYCEROGELATIN GELS

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Diffusion through columns of glycerogelatin gels representing soft shell capsules has been extensively studied in these laboratories (Armstrong et al., 1989). In soft shell capsule manufacture, the shell-forming material is held at an elevated temperature while it is extruded as ribbons which ultimately constitute the capsule shell. Depending on the batch size, gel material may be held at temperatures above its melting point for several days and it is known that this can affect the properties of the gel mass. This work investigates if it might also have an effect on diffusion.

Diffusion of 4-hydroxybenzoic acid through columns of glycerogelatin gels was studied (Table 1). The technique, analytical methods and calculation of diffusion coefficient using the Eversole and Doughty equation are described elsewhere (Armstrong et al., 1987). The diffusion studies were carried out at 22.5°C. Gel I represents a typical soft capsule gel formulation, freshly prepared. Gel II is an identical gel, stored at 60°C for 5 days. Gel III is a freshly prepared gel in which about 25% of the gelatin in I has been replaced by a partially hydrolysed gelatin (Byco C., Croda).

Tiemstra (1968) studied the hydrolysis of gelatin as a function of temperature and pH. A nomogram in this work indicates that about 25% of the gelatin would be hydrolysed at 60° and pH 5.9, the pH of the gels studied in this work. Negligible degradation takes place at 22.5° over the duration of the diffusion experiments. Diffusion coefficients are given in the table. That in Gel I is significantly higher than in Gels II and III, but there is no significant difference between II and III ($P = 0.01$). These results support the hypothesis that diffusion takes place via the interstitial fluid within the gelatin matrix. The products of gelatin hydrolysis dissolve in the interstitial fluid, increasing its viscosity and thereby hindering diffusion.

Table 1.

	Gel I	Gel II	Gel III
Gelatin	433.6g	433.6g	333.6g
Byco C	-	-	100.0g
Glycerol	200.1g	200.1g	200.1g
Water	366.3g	366.3g	366.3g
Mean diffusion coefficient (mmh^{-1})	0.0500 (n=16)	0.0314 (N=16)	0.0314 (n=17)

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