MICROELECTROPHORETIC BEHAVIOUR OF MICROCAPSULES

D J Burgess* and J E Carless, The School of Pharmacy, University of London, 29/39 Brunswick Square, London WC1 1AX, * Present address, Department of Pharmacy, University of Nottingham, Nottingham NG7 2RD.

Coacervates prepared by complexation of oppositely charged polyions are used to prepare drug-containing microcapsules (Kitajima et al 1976) and artificial cells (Chang 1972). The charge on coacervate droplets and on microcapsules formed from coacervates will affect their stability in suspension. This study examines the possibile effects of core material on the electrophoretic behaviour of these dispersions.

Gelatin/acacia coacervates were prepared at 40°C by mixing equal volumes of 2% w/v solutions of the two polyions at pH 3.8, Type A gelatin and at pH 3.6, Type B gelatin (predetermined optimum pH values for coacervation, Burgess & Carless 1984). The acacia was of B.P. quality; two types of gelatin were used, Type A (acid processed) isoelectric pH 8.3 $\bar{M}n$ 4.7 x 10^4; and Type B (alkali processed) isolectric pH 4.8, $\bar{M}n$ 4.6 x 10^4. The coacervates were hardened using formaldehyde solution 37% w/v. Indomethacin microcapsules were formed by mixing the drug powder (geometric mean diameter, 4.9 μm) into the gelatin solution prior to the addition of acacia. The microcapsules obtained in all cases were of an average particle diameter of 75 μm. pH-electrophoretic mobility profiles (Zeta-meter) were obtained for the coacervates, the indomethacin microcapsules, the individual polyions, and the indomethacin powder. The electrophoretic mobilities of the polyions were determined after adsorption onto colloidal silica (Burgess & Carless 1984).

The microelectrophoretic mobility of the gelatin/acacia coacervates and of microcapsules prepared from these coacervates were found to be identical. Encapsulated indomethacin did not affect the electrophoretic properties of the coacervates. Figure I shows the pH-mobility profile of Type A gelatin/acacia microcapsules and of Type B gelatin/acacia microcapsules. Microcapsules prepared using different types of gelatin had different pH-mobility profiles. These differences could be related to differences in the mobility of the gelatins. This data indicates that the charge carried by these microcapsules appears to be dependent on their constituent polyions and is unaltered by the presence of encapsulated indomethacin particles. pH-mobility profiles were also determined for polyion mixtures adsorbed onto colloidal silica, where the polyions were present in the same proportions as in the microcapsules. The electrophoretic mobility profiles of these gelatin/acacia mixtures were representative of the electrophoretic mobility of the microcapsules, confirming that the electrophoretic behaviour of these microcapsules is dependent on the microcapsule coating and is unaffected by an indomethacin core material.

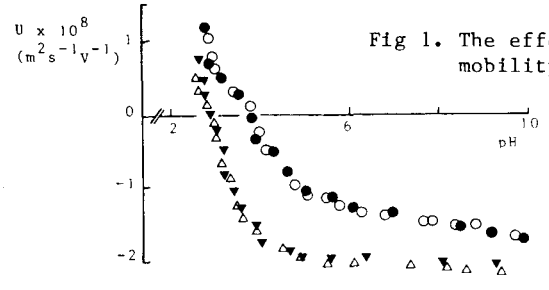

Fig 1. The effect of pH on the electrophoretic mobility of microcapsules.

●Type A gelatin/acacia empty
○Type A gelatin/acacia indomethacin
▼Type B gelatin/acacia empty
△Type B gelatin/acacia indomethacin

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