J. Pharm. Pharmacol. 1998, 50 (Supplement): 168



# Drug delivery gels from palmitoyl glycol chitosan

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Drug delivery hydrogels are usually prepared from cross-linked hydrophilic polymers resulting in an insoluble non-erodible matrix, Graham and McNeill (1984). We have used the new amphiphilic polymer - palmitoyl glycol chitosan (GCP), previously used to form carbohydrate based drug delivery vesicles, Uchegbu et al (1998), to produce a drug delivery gel. It is envisaged that the use of non-covalently cross-linked amphiphilic polymers may enhance drug permeation across the biological membranes as well as allow for the formation of a swelling and eroding matrix with improved biocompatibility. GCP vesicles, are biocompatible with mammalian cell lines Uchegbu et al (1998).

Glycol chitosan (Mw = 164kD) was hydrophobically modified by reacting with palmitic acid N-hydroxysuccinimide (PNS) in a 1: 1 molar ratio of PNS to sugar monomers. The modified polymer (GCP11) was purified by ether extraction and exhaustive dialysis. An aqueous dispersion of GCP11 was freeze-dried in 96 well plates to give a fibrous, spongy gel. The swelling of GCP11 gels in a variety of aqueous media was studied and the gels loaded with a model compound rhodamine B by freeze-drying. The release of rhodamine B from GCP11 gels at various pH values and in the presence of sodium chloride solutions of different ionic strength was also monitored.

GCP11 gels are formed on freeze drying presumably due to the hydrophobic interaction of the palmitoyl units. Hydration of GCP11 gave rise to a swelling and slowly eroding mass in which the swelling ratio was found to be higher at elevated pH. This is due to the reduced erosion of this amino polymer at elevated pH. The swelling ratio of GCP11 was also reduced in the presence of sodium chloride as the gel was effectively salted out. The release of rhodamine B from these gels was slightly reduced at acid pH but especially retarded if the gels were prepared in the presence of phosphate buffered saline (PBS - Figure 1). These studies demonstrate that the attachment of hydrophobic units to carbohydrate polymers may yield drug loaded

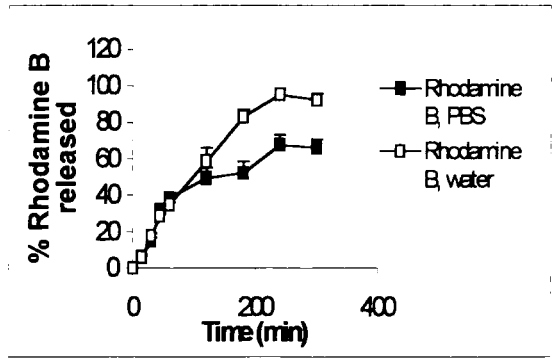


**Figure 1: The release of rhodamine B from GCP11 gels at pH = 9.0**

erodible hydrogels by simple freeze drying techniques.

These gels are especially suited to the delivery of labile drug molecules. A variety of gels may be formed from any one carbohydrate by varying the level of hydrophobic modification and the release of small molecular weight drugs may be controlled by the pH of the environment and the presence of salts within the gels.

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Uchegbu IF, Schätzlein AG, Tetley L, Gray AI, Sludden J, Siddique S, Mosha E (1998). J Pharm Pharmacol 50:453-458.