POROUS HYBRID MATERIALS AS POTENTIAL DRUG DELIVERY SYSTEMS

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Introduction

In recent years, numerous studies have been carried out to obtain composites (hybrids) based on hydroxyapatite.
Hybrid materials belong to the new generation of materials, which constitute a homogeneous mixture of inorganic and organic components, not exceeding the 1 μm scale. Thanks to this construction, it is possible to design new materials or modify existing ones that will have features that are not seen separately in individual components [1-5]. In our work, we have developed hybrid materials containing hydroxyapatite (HA) and organic compounds: alginate (Alg), keratin (Ker), chondroitin sulphate (CS) and cellulose (Cel). The Ibuprofen (Ibu), a model drug was additionally incorporated into the material's structure.
The release profile of ibuprofen from the obtained composites was also checked.

Materials and Methods

Four types of granules were analyzed in the work (TABLE 1).The granules were obtained by instilling the water solution of all ingredients in a 1.5% $CaCl_2$ solution. The granules were then dried at 40˚C.

TABLE 1. Granules composition.

	Granules			
	I	II	III	IV
HA	+	+	+	+
ALG	+	+	+	+
Ibu	+	+	+	+
	-	CS	Ker	Cel

SEM images of the granules were taken and also release of the ibuprofen from the granules to the pH 7.4 buffer was examined.
The released ibuprofen was determined by HPLC method and release profile over time was plotted.

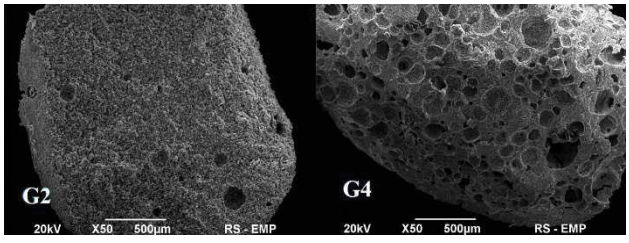

FIG. 1. SEM photos of granules showing cross-section through granules G2 and G4.

Results and Discussion

FIG. 1 shows representative SEM images of cross-sections through granules. SEM images shows that the most compact structure was observed in the granules containing CS. On the other hand, granules that make Cel and Ker possess numerous micropores. It should be noted that the porosity may affect the release of the therapeutic substance from the granules.
The studies of release of Ibu by HPLC method show that during the first 12h granules I, II and IV released the whole of Ibu, while the release process from granules III containing Ker was much slower.

Conclusions

The obtained hybrid materials containing: hydroxyapatite (HA) and organic compounds: alginate (Alg), keratin (Ker), chondroitin sulphate (CS) and cellulose (Cel) may be used as drug delivery systems.
The addition of Ker, Cel and CS affects the internal structure of the obtained granules. Their interior can be compact or contain numerous micropores. The addition of Ker, Cel and CS also affects the release time of Ibu.
Keratin addition significantly prolonged the release time of ibuprofen.

Acknowledgments

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