IMPROVEMENT OF DRUG DELIVERY SYSTEMS BY THE INTEGRATION OF TRADITIONAL AND SUPERCRITICAL FLUID TECHNIQUES

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Drug discovery by itself may be not sufficient for the treatment of some diseases. The control of the amount, rate and location of pharmaceutical delivery has frequently identical importance as drug discovery for clinical success. Development of new systems and devices that can improve the efficiency of therapeutics for specific treatments continues to be a significant and active area of research.

The use of biocompatible and biodegradable polymers as drug-carrier systems is increasingly more popular in pharmaceutical applications. Although several controlled drug delivery systems are available, the use of micro/ nanoparticles appears to be the most interesting way, as these systems facilitate the diffusion through biological barriers.

Several processes are commonly used for fabrication of polymer micro and nanospheres. The emulsion-solvent extraction/ evaporation technique is one of the most common traditional methods employed in the production of particles from preformed polymers due to its simplicity and compatibility with various polymers. To overcome some limitations of the conventional methods other technology has been investigated to produce particles for drug delivery applications. Production of micro or nanoparticles using supercritical fluid technology is very attractive since it provides an alternative solution to the various problems encountered in traditional techniques. The possibility of producing very small particles with a narrow size distribution using mild and inert conditions represents a major improvement over the conventional processes.

However, for some specific drug delivery systems none of these particle production techniques - emulsification solvent evaporation in the traditional methods and RESS, SAS or PGSS in the supercritical fluid technology - seem to be in fact effective in terms of encapsulation efficiency. The major problems in these systems are due to the drug and polymer solubility and swellability.

As an alternative, the combination of traditional methods to produce empty microspheres and supercritical fluid impregnation for drug loading in these particles can promote an improvement for some drug delivery systems. Supercritical fluid impregnation can be a useful method for the preparation of pharmaceutical forms when the active compound is soluble in carbon dioxide and the polymer can be swollen by the supercritical fluid.

The aim of this research is to compare microspheres produced by traditional methods, by supercritical fluid techniques and by integrating supercritical fluid impregnation with traditional methods. Biocompatible polymers (as drug carries) and anti-cancer and anti-inflammatory compounds (as model drugs) were used. Fundamentals studies are required for the design of adequate process, hence, the solubility of the drug in carbon dioxide as well as the sorption degree of polymeric matrix in the presence of carbon dioxide were studied and results are presented and discussed.