

A REVIEW ON MICROBALLOONS

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ABSTRACT

Microballoons also known as hollow sphere drug delivery systems. These are typically spherical in size from 200 microns and do not have a core. They have a gastric retention drug delivery system (GRDDS), which can improve drug bioavailability and reduce stomach irritation. These floating microballoons have the convenience that they stay buoyant and circulate uniformly over the gastric ingredients to withhold the variations of gastric emptying and release the drug for extended period of time. It's floating containing synthetic polymers that improves the processing of solid dosage forms such as tablets, capsules and powders. Due to the presence of hollow space inside the microballoons, these improve gastric drug therapy and gastric mucosal concentration which helps reduce drug residence time in the stomach. It is less soluble at higher pH. The formulation of these Microballoons depends on temperature, preparation and surface smoothness to increase the buoyancy of a good propellant as it uses a multiple unit system. It helps to treat peptic ulcers, chronic stomach problems and Rheumatoid arthritis.

KEYWORDS: Microballoons, Hollowspheres, Gastric Retention Drug Delivery Systems, Buoyant agent, Floatability, Bioavailability.

INTRODUCTION

Microballoons are drug delivery systems and these microballoons show promise as a specific approach for the treatment of gastric retention. Microballoons are based on a non effervescent system consisting of spherical hollow particles without a core, ideally these are 200 microns in size. These microballoons are free flowing powders composed of proteins and synthetic polymers. In general, microballoons are a low density system with sufficient buoyancy to float on gastric fluid for long periods of time without irritating the gastrointestinal tract.^[1] these are prepared by different techniques such as single solvent evaporation method, double emulsification method, spray drying method, polymerization method, coagulation method by spraying and the hot melt encapsulation method.^[2] The drug is slowly released at the desired rate, resulting in increased gastric retention and reduced fluctuations in plasma drug concentration. By reducing the frequency of administration, the microballoons can improve patient compliance and provide better efficacy of drug therapy and a short halflife can be achieved. Absorption of drugs dissolved only in the stomach is increased, so gastric residence time is increased due to buoyancy.^[3] Polymers such as Eudragit RS-100, Eudragit RL-100, Eudragit S, ethyl cellulose, Dichloromethane (DCM), ethanol, water and HCL have been used in

the formulation of hollow microballoons by optimizing polymer concentration and optimizing polymer release and polymer optimizing plastizier ratio to modulate drug release.^[4]

Preparation of microballoons

Microballoons were prepared by the method of evaporation by diffusion of solvent in O/O emulsion. Weigh Ph, Eudragit RSPO and glyceryl monostearate (12.5% w/w) and dissolve in a mixture of dichloromethane (10ml) and ethanol (10ml) at room temperature. Add the resulting pH solution dropwise to 200ml of light liquid paraffin oil containing span 20(0.2% v/v) as surfactant in a three-blade helical mixer with constant stirring at 500 rpm at different temperatures for 2 hours. The temperatures are 30°, 40°, and 50° C. Evaporate the remaining organic solvent for 20min using a rotary evaporator at 40°. The resulting microballoons were isolated by filtration, liquid paraffin oil was removed by repeated washings with n-hexane (4 × 50 mL), and finally air-dried for 12 h.^[5,6]

Variation of formulation factors

Different Ph: Eudragit RSPO ratios (1:1, 1:2, 1:3, 1:4, and 1:5) were used to determine the effect of drug:polymer ratio on the physical properties and buoyancy of the microballoons. Effect of stirring speed (250, 500 and 750 rpm), span 20 concentration (0.2%, 0.3% and 0.4% v/v), average treatment volume (oil of light liquid paraffin, 150, 200 And 250ml) effects of study on depolymerisation. Effects of additives (5%, 10%, 15%, w/w) on the properties of the microballoons.

CHARACTERIZATION OF MICROBALLOONS

Microballoon Morphology

The morphology of the microballoons was studied by scanning electron microscopy (Philips 505, the Netherlands). SEM involves coating a dry sample with a conductive material, usually gold. SEM samples were prepared by lightly dusting the powder on double-sided tape stuck to an aluminium rod. Then covered with a mixture of gold and palladium with a thickness of 200 to 500 Å and a pressure of 10-2 mbar. The coated samples were then randomly scanned and micrographs were taken using SEM. To examine the internal morphology, dissect the hollow microballoons with a razor blade.^[7,8]

Micromeritic Properties

Microballoons are characterized by crystalline properties such as particle size, bulk density. True density and porosity.^[7,9]

Particle size analysis

The particle size measurements are carried out on an image analysis system. Images of the microballoons were generated using an optical microscope connected to a digital camera (YOKO CCD camera, Taiwan). The particle size distribution of each formulation was measured by determining the diameter of 100 randomly selected microballoons using MEDICAL PRO software.^[10]

Bulk density, True density and Porosity

➤ Bulk density was calculated from the formula given below^[11]

Bulk density $P_b = \text{Mass of microballoons} / \text{Bulk volume of microballoons}$

➤ True density (P_t) was determined by using a Helium air densitometer (No. 1305, Shimadzu, Japan).

➤ Porosity was calculated as follows:

Porosity $\varepsilon = [1 - P_b/P_t] \times 100$

Interaction studies

The IR spectra were recorded for Ph, Eudragit RSPO, physical mixture and drug-loaded microballoons using KBr pellets by FTIR-8400s (Shimadzu, Japan). The scanning range was 4000 cm^{-1} – 400 cm^{-1} .

Process yield

The prepared microballoons were collected and weighed. Divide the measured weight by the total amount of all non-volatile components used to prepare the microballoons.^[12]

% Yield=Actual weight of the product/Total weight of excipient and drug×100

CONCLUSION

Microballoons are a new drug delivery system that can float on stomach contents for a long time. Floating microballoons have the advantage of maintaining activity and evenly distributing in gastric juice to avoid gastric emptying variation and release drug for a long time. Microballoons are characteristic free flowing powders composed of proteins or synthetic polymers, ideally less than 200 microns in size. Microballoons are prepared by diffusion and solvent evaporation in methods to form hollow cores. Microballoons can be evaluated for surface morphology, flow properties, buoyancy, percentage yield, drug loading, in vitro release, gastric Ph stability, and FT-IR studies. Floating microballoons are promising candidates for the development of gastric retention drug delivery systems for potential therapeutic use.

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