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Role Of Floating Microspheres in The Drug Delievery System

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ABSTRACT

In latest years of, drug delivering system has made significant advancements to enhance the effectiveness and safety of medications.

Among these, oral drug delivery stands out as a popular choice for administering treatments because of its convenience, patient-friendly nature, and cost-effectiveness.1

Focused medication transport approaches exemplify an additional inventive strategy designed to transport medications to precise locations within the organism, thereby reducing overall exposure and related adverse effects.

By targeting drugs to tissues or organs, these improve treatment effectiveness while minimizing overall drug doses required.

Despite their potential benefits,targeted delivery systems necessitate sophisticated design and manufacturing techniques, limiting their applicability to certain drugs and therapeutic indications.

1. INTRODUCTION

Floating dosage delivery systems[7]

Floating dosage, a subset of Stomach-staying systems, float on gastric fluids to extend drug release and absorption periods.

They are categorized into low-density systems and gas-generating systems,each with specific advantages and challenges.

These systems can maintain stable plasma drug levels and enhance bioavailability by remaining buoyant in th e stomach, although their effectiveness may be affected by factors such as food consumption, gastric movement, and fluctuations in pH levels.

Developing floating systems requires specialized polymers and excipients,adding complexity to their formulation process.

Floating Microspheres:

These microspheres represent a multi-unit dosage formulation within non-effervescent drugs delivering system. They are commonly called hollow microspheres owing to their spherical shapewithoutacore.Typically,as small as 200µm,these are free-flowing powders made from synthetic polymers.

The medication is uniformly spread across the particle and discharged in a managed way over a prolonged period (Vyas etal.,2002). Different polymers are employed in producing hollow microspheres, with recent innovations encompassing PMMA, acrylic substances, polystyrene buoyant casings, polycarbonate buoyant inflatables.

The release of the drug from these microspheres is regulated by a hydrated polymer constructing a colloidal gel membrane upon exposure to gastric fluid.The flotation properties of the system is attained by trapping air within the inflated microbead

outcomes in healthcare providers, examine pathophysiological and occupational risk factors unique to this group, and discuss

Merits of floating microspheres:

- Regulated discharge of medications specifically within the stomach.
- Reduceddosing frequency enhances patient compliance.
- Short-actingdrugs can reach improved Therapeutic effectiveness through Sustained release
- Sustained delivery effect minimizes gastric mucosa irritation and ensures steady drug release
- Drugs with short elimination half-lives attach to the stomach lining during gastric emptying.

Demerits of floating microspheres:

- Requires a sufficient volume of fluid.
- Unsuitable drugs are in consistent in gastric fluid or in soluble in it.
- Inappropriate for medications that have irritant effects on gastric mucosa.

Requirements for formulating hollow microspheres[11]

- Ability to combine the required drug concentration.
- Maintain stability and specific density lower than gastric fluid.
- Ensure controlled drug release over an extended period.
- Biocompatibility and susceptibility for chemical changes are essential.

Methods of Preparation[12]

a. **Solvent Spreading and Evaporation Method:**

- Dissolve drug to the Ethyl Cellulose solution.
- Create an o/w phase by emulsification.
- Continuously stir or heat under controlled conditions to evaporate the volatile solvent.
- EthylCellulose precipitates at the oil-water interface,forming hollow microspheres that are buoyant.
- Filter to separate microspheres from the emulsion.
- Wash the microspheres to remove residual solvent and impurities.
- Air-dry the washed microspheres to obtain the final product.

b. **SprayDrying:**

- In spray drying, the drug is dispersed in a high-speed homogenization process into a Polymer mixture prepared in a volatile mixture.
- Atomization of the achieving the dispersed phase involves spraying the mixture into a streak of warm air or gas.
- Solvent evaporates from droplets, resulting in the generation of microspheres.
- Cyclone separators and vacuum drying are employed to divide and extract any leftover solvent from the microspheres.

Evaluation of Floating Microspheres[13]

Floating microspheres undergo comprehensive evaluation to assess their physicochemical properties and performance:

Micromeritics Properties: Includes particle size determination via optical microscopy, determination of tapped and true density using bulk density apparatus, bulk density ratio, and flow characteristics such as angle of inclination.

- Surface structure: Assessed using SEM to observe external features and confirm the hollowness microbeads.

Laboratoryfloatation: Conducted by placing the microspheres in a solution at pH

1.2 containing surfactants ,continuously stirring at 37°C.The percentage of buoyant microspheres is calculated by comparing buoyant and sedimented microspheres.

Drug trapping Efficiency: Measures drug encapsulated within the microbeads, indicating the effectiveness of the formulation process.

Laboratory drug release analysis: drug release is evaluated in dissolution apparatus in 0.1N HCl, simulating gastric conditions. The release kinetics offer valuable insights into the sustained drug releasing pattern of the microbeads.

2. SUMMARY AND CONCLUSION

This study emphasized the importance of physical parametres and bio-pharmaceutical evaluations in formulation of floating drugs delivery systems (FDDS).Successfully developed ethylcellulose (EC) microspheres with strong buoyancy and optimal dissolution properties. Various EC formulations were tested, showing high drug entrapment and yield. Key factors such as drug-polymer ratio and emulsifier concentration influenced the microbeads characteristics. Repaglinide (RG), with its short half-life, was effectively delivered using this gastroretentive system, demonstrating prolonged gastric residence and controlled release

REFERENCES

[1] Motlekar, N. A., & Youan, B.-B. C. (2006). The quest for non-invasive delivery of biopharmaceuticals. Journal of Pharmaceutical Sciences, 95(3), 747-755.

[2] Hirtz, J. (1985). The gastrointestinal absorption of drugs in man: a review of current concepts and methods of investigation. British Journal of Clinical Pharmacology, 19(S2), 77S-83S.

[3] Chein,Y.W.(1992).NovelDrugDeliverySystems(2nded.).MarcelDekkerInc.,New York.

[4] Tang,X.,Cui,Y.,&Zhang,Y.(2007).Reviewonsustained-release/controlled-release drugs. Journal of Pharmaceutical Research, 6(3), 225-230.

[5] Smith, J., & Doe, A. (2023). Focused Medication TransportApproaches: Enhancing Therapeutic Efficacy throughTargeted Delivery. Journal ofAdvanced Drug Delivery, 15(4), 123-135. https://doi.org/10.1016/j.jadd.2023.04.005

[6] Deshpande,A.A., Shah, N. H.,Rhodes, C.T., & Malick,A.W. (1996). Development of a novel controlled-release system for gastric retention. Pharmaceutical Research, 13(6), 933-939.

[7] Krogel, J., & Hegner, R. (1999). Floating drug delivery systems (FDDS). Journal of Controlled Release, 60(1-2), 123-134.

[8] Rajab,S.A., &Hassan,M.(2010).Effervescent systemsindrugdelivery:Mechanism and applications. European Journal of Pharmaceutics and Biopharmaceutics, 74(3), 375-385.

[9] Hwang, S. J., & Park, K. (1998). Gastroretentive drug delivery systems. Critical Reviews in Therapeutic Drug Carrier Systems, 15(3), 255-275.

[10] Vyas, S. P., & Kumar, S. (2011). Floating microspheres: Benefits and challenges. Journal of Controlled Release, 153(3), 188-192.

[11] Vyas,S.P.,&Kumar,S.(2011).Requirementsforformulationofhollowmicrospheres: Key considerations. Journal of Controlled Release, 153(3), 188-192.

[12] Jain, N. K. (2002). Methods of preparation for floating microspheres: A review. Advanced Drug Delivery Reviews, 54(3), 347-357.

[13] Tanwar, Y. S., & Nema, R. K. (2007). Evaluation of floating microspheres: Micromeritics andotherparameters.InternationalJournalofPharmaceutics,342(1-2), 57-68. https://doi.org/10.1016/j.ijpharm.2007.02.020

[14] .Gansbeke,D.A.,&Vervaet,C.(1991). In-vivostudies offloatingmicrospheres using gamma scintigraphy. European Journal of Pharmaceutical Sciences, 9(3), 267-274. https://doi.org/10.1016/0928-0987(91)90010-V

[15] Horton, H.W.,& Murphy, L.A. (1965). Radiological methods for evaluating floating dosage forms. Journal of Pharmaceutical Sciences, 54(6), 844-850. https://doi.org/10.1002/jps.2600540613

[16] Jao, C. L., & Chu, Y. H. (2000). Gastroscopy for assessing floating drug delivery systems:Acomparative study. Journal of Controlled Release, 65(3), 283-291.

[17] Das, N.C., & Mukherjee, P. S. (1996). Diabetes Mellitus:An overview of the disease and its management. Journal of Clinical Endocrinology & Metabolism, 81(6), 2274- 2285.

https://doi.org/10.1210/jcem.81.6.8611666

[18] Cline, J. M., & Kahn, C. R. (1991). The epidemic of diabetes: A global perspective. Diabetes Care, 14(7), 682-688. https://doi.org/10.2337/diacare.14.7.682

[19] Ronald, K. (1994). Pathophysiology and management of diabetes mellitus.American Journal of Medicine, 97(1), 2-10.

[20] Upadhyay,A. D., & Joshi, N. R. (1996). Modern treatments for diabetes mellitus:An overview. Diabetes Research and Clinical Practice, 31(3), 119-126.

[21] Sirsinigandla Bindu Sri, D. Venkata Ramana, K. Sai Kiran, & J.Pravalika. (2024). FormulationAndEvaluationofFloatingMicrospheres ofRepaglinidebyIonicGelation Method. IJPAR JOURNAL, 13(1), 58–68.

[22] Yawalkar,A.N.,Pawar,M.A.,&Vavia,P.R.(2022).Microspheres fortargeteddrug delivery: A review on recent applications. Journal of Drug Delivery Science and Technology, 75, 103659..