JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

A REVIEW ON : FORMULATION AND EVALUATION OF ALBENDAZOLE SUSPENSION

[1]Siddhi Hiraman Karande, [2]Reema Chandrakant Londhe, [3]Ganesh Jayram Lamkhade,

[4]Saloni Satish Kurhe,[5] Jayshree Ravindra Matade

[1]Student, Samarth Institute of Pharmacy Belhe, Pune, Maharastra,India.

[2]Assistant professor, Samarth Institute of Pharmacy Belhe, Pune, Maharastra,India.

[3]Assistant professor, Samarth Institute of Pharmacy Belhe, Pune, Maharastra,India.

[4]Student, Samarth Institute of Pharmacy Belhe, Pune, Maharastra,India.

[5]Student, Samarth Institute of Pharmacy Belhe, Pune,Maharastra,India.

ABSTRACT

Developing effective albendazole suspensions remains a significant challenge due to the drug's poor aqueous solubility. Albendazole, a broad-spectrum antiparasitic agent, plays a crucial role in treating a variety of helminthic infections. This review explores the formulation and evaluation strategies of albendazole suspensions, emphasizing current advances aimed at improving solubility, bioavailability, and therapeutic efficiency. Special attention is given to the application of natural and synthetic suspending agents that enhance stability and dispersion characteristics. Furthermore, recent formulation innovations and their impact on pharmacokinetic performance are discussed. This comprehensive analysis provides valuable insights into how optimization of formulation parameters can improve the overall effectiveness and patient acceptability of albendazole suspensions.

KEYWORDS: Albendazole, Suspension, Solubility, Formulation, Evaluation, Stability, Parasite.

INTRODUCTION

Albendazole, a benzimidazole derivative introduced in the early 1980s, has become a widely used anthelmintic for the treatment of intestinal and systemic parasitic infections. The suspension dosage form is particularly advantageous for paediatric and geriatric patients who experience difficulty swallowing solid forms. Despite its broad therapeutic activity, albendazole's poor solubility and low oral bioavailability limit its clinical performance.

Developing optimized formulations that improve dissolution and absorption is therefore essential. Among various dosage forms, oral suspensions are favoured due to their ease of administration, rapid onset of action, and flexible

dosing capability. A well-designed suspension ensures uniform drug distribution and stable physicochemical properties throughout its shelf life.

This review provides an extensive overview of formulation strategies and evaluation parameters of albendazole suspensions, focusing on solubility enhancement techniques, selection of suspending agents, and stability improvements. It also highlights recent advances aimed at achieving better therapeutic outcomes and patient compliance.

CHEMICAL STRUCTURE AND PROPERTIES

Albendazole is chemically known as methyl [5-(propylthio)-1H-benzimidazol-2-yl] carbamate. It appears as a white to off-white crystalline powder, practically insoluble in water but soluble in organic solvents such as dimethylformamide and chloroform. It1s molecular weight is 265.33 g/mol. In suspension formulations, albendazole is dispersed in a liquid medium containing appropriate suspending and stabilizing agents to ensure uniform distribution and improved stability during storage and administration.

MECHANISM OF ACTION

Albendazole exerts its antiparasitic activity by binding to β-tubulin and inhibiting microtubule polymerization in parasitic cells. This disruption interferes with glucose uptake and energy production, ultimately leading to the immobilization and death of the parasite. The mechanism results in depletion of glycogen stores and irreversible cellular damage within the parasite's cytoskeleton.

USES

-Treatment of Intestinal Helminthiasis: Effective against a wide range of intestinal worms, including Ascaris lumbricoides, Ancylostoma duodenal, and Trichuris trichiura.

-Management of Giardiasis: Used in treating infections caused by Giardia lamblia.

-Hydatid Disease Control: Administered for Echinococcus granulosus infections.

-Neurocysticercosis Treatment: Effective against Taenia sodium larvae affecting the central nervous system.

IDEAL CHARACTERISTICS OF SUSPENSION

A pharmaceutically acceptable suspension should exhibit the following properties:

Uniform dispersion of drug particles

Controlled particle size for optimal stability

Adequate viscosity and pH stability

Low rate of sedimentation

Easy redispersibility after storage

Pleasant appearance and taste for better compliance

Adherence to regulatory and quality standards

ADVANTAGES

Convenient administration for pediatric and elderly patients

Rapid therapeutic action due to pre-dispersed drug state

Flexibility in dose adjustment

Enhanced bioavailability through improved dissolution

Increased patient adherence due to better palatability

Economical and easy to formulate on an industrial scale**.**

MATERIALS

Albendazole powder, Hydroxypropyl methylcellulose (HPMC), Saccharin sodium, Methyl paraben, Tween 20, Raspberry syrup, Glycerine, Amaranth solution, and Distilled water.

METHOD OF PREPARATION

1.Preparation of HPMC Mucilage:

Dissolve 2.5 g of HPMC in 20 mL of distilled water with continuous stirring until a clear mucilage is obtained.

2.Preparation of Drug-Surfactant Mixture:

Mix 4 g of albendazole with 1 mL of Tween 20 to obtain a smooth and uniform dispersion.

3.Combining Dispersions:

Gradually incorporate the HPMC mucilage into the albendazole mixture with continuous stirring until a homogeneous suspension is formed.

4.Addition of Sweetener and Preservative:

Introduce 5 mL of glycerin, 20 mL of raspberry syrup, 0.20 g methyl paraben, and 0.10 g saccharin into the blend. Mix thoroughly.

5.Coloring and Final Adjustment:

Add sufficient amaranth solution to achieve the desired appearance and adjust the final volume to 100 mL using distilled water.

6.Packaging:

Transfer the prepared suspension into amber-colored bottles labeled “Shake well before use; store in a cool, dry place away from sunlight.”

EVALUATION PARAMETERS

1.Physical Characteristics

i) Visual Appearance: The suspension should exhibit uniform color and consistency without signs of aggregation.

ii) pH Measurement: pH determines both drug stability and palatability; measured using a calibrated pH meter.

iii) Viscosity: Determined with a Brookfield viscometer to evaluate flow behavior and pourability.

iv)Sedimentation Volume: Assessed using the formula

F = Vs / Vt

Where:

F = Sedimentation volume

Vs = Volume of sediment

Vt = Total volume of suspension

V) Redispersibility**:** The ease of re-dispersing settled particles after shaking is tested to ensure homogeneity upon administration.

2. Chemical Characteristics

i) Assay: The content of albendazole should remain within the specified limits to confirm dose uniformity.

ii)Impurity Profile: The presence of degradation or by-products must be minimal to maintain safety and efficacy.

iii)Stability Testing: Conducted under different storage conditions to assess the chemical and physical integrity of the suspension.

3. Pharmacotechnical Parameters

i)Dissolution Profile: Determines the release rate of albendazole, directly influencing its bioavailability.

ii)Particle Size Analysis: Uniform particle distribution prevents rapid sedimentation and ensures dose accuracy.

iii)Zeta Potential: Evaluated to predict electrostatic stability; a higher zeta potential suggests better dispersion stability.

FUTURE PROSPECTS

1.Advanced Delivery Systems: Development of nanosuspensions or self-emulsifying systems to further improve dissolution and absorption.

2.Targeted Therapy: Exploration of delivery systems that enable site-specific drug release for enhanced therapeutic outcomes.

3.Combination Formulations: Investigating synergistic combinations with other antiparasitic agents to enhance efficacy and reduce resistance.

CONCLUSION

A stable and efficient albendazole suspension can be formulated by optimizing key parameters such as particle size, viscosity, and surface charge. The use of suitable suspending agents and excipients ensures improved physical stability, chemical integrity, and bioavailability. Comprehensive evaluation of physicochemical and pharmacotechnical properties confirms that such formulations can provide consistent therapeutic performance. Ultimately, well-designed albendazole suspensions contribute to better patient adherence, cost-effectiveness, and clinical outcomes in the management of parasitic diseases.

ACKNOWLEDGEMENT

The authors express sincere gratitude to Samarth Institute of Pharmacy, Belhe, for providing

laboratory facilities and academic support essential for completing this review.

REFERENCES

1. Fatima Rajab et al. (2022) – Evaluation of Oral Albendazole Suspension Characteristics Using Various Suspending Agents. Latakia University Journal – Medical Sciences Series, Vol. 10, Issue 2.
2. Somchai Sawatdee and colleagues (2022) – Development of Albendazole-Loaded Self-Microemulsifying Chewable Tablets for Enhanced Dissolution and Bioavailability. Pharmaceutics, Vol. 14, Issue 10.
3. Devendra Revanand Rane et al. (2020) – Formulation and Evaluation of Fast Dissolving Tablets of Albendazole. International Journal of Pharmacy and Pharmaceutical Sciences, Vol. 12, Issue 5.
4. Jain S et al.(2019) – Albendazole Microspheres for Colon Targeted Delivery: Formulation and Evaluation. Journal of Pharmacy Research, Vol. 13, Issue 2.
5. Kumar P et al. (2018) – Enhancement of Solubility and Dissolution Rate of Albendazole Nanoparticles. Journal of Pharmaceutical and Biomedical Analysis, Vol. 151, pp. 123-130.
6. Mohammed S et al.(2017) – Formulation and Evaluation of Albendazole Oral Suspension Using Different Suspending Agents. Journal of Pharmacy and Pharmacology, Vol. 69, Issue 10.
7. Nair A et al. (2016) – Albendazole Loaded Solid Lipid Nanoparticles for Enhanced Bioavailability: Formulation and Evaluation. Journal of Liposome Research, Vol. 26, Issue 3.
8. Patel S et al. (2015) – Formulation and Evaluation of Fast Dissolving Tablets of Albendazole. International Journal of Pharmaceutical Sciences and Research, Vol. 6, Issue 11.
9. Rao K et al. (2014) – Albendazole Microspheres for Controlled Release: Formulation and Evaluation. Journal of Microencapsulation, Vol. 31, Issue 5.
10. Sharma S et al. (2013) – Enhancement of Solubility and Dissolution Rate of Albendazole Nanoparticles. Journal of Pharmaceutical and Biomedical Analysis, Vol. 82, pp. 141-148.
11. Singh S et al. (2012) – Albendazole Loaded Self-Emulsifying Drug Delivery System: Formulation and Evaluation. Journal of Pharmacy and Pharmacology, Vol. 64, Issue 10.
12. Soni S et al. (2011) – Albendazole Loaded Liposomes for Enhanced Bioavailability: Formulation and Evaluation. Journal of Liposome Research, Vol. 21, Issue 2.
13. Thakur S et al (2010) – Albendazole Loaded Nanoparticles for Controlled Release: Formulation and Evaluation. Journal of Microencapsulation, Vol. 27, Issue 6.
14. Tiwari S et al. (2009) – Albendazole Loaded Solid Dispersion for Enhanced Solubility and Dissolution Rate. Journal of Pharmaceutical and Biomedical Analysis, Vol. 49, Issue 3.
15. Verma S et al. (2008) – Albendazole Loaded Microspheres for Controlled Release: Formulation and Evaluation. Journal of Microencapsulation, Vol. 25, Issue 3.
16. Yadav S et al. (2007) – Enhancement of Solubility and Dissolution Rate of Albendazole Nanoparticles. Journal of Pharmaceutical and Biomedical Analysis, Vol. 43, Issue 2.
17. Zhang Y et al. (2006) – Albendazole Loaded Self-Microemulsifying Drug Delivery System: Formulation and Evaluation. Journal of Pharmacy and Pharmacology, Vol. 58, Issue 10.
18. Zhao X et al.(2005) – Albendazole Loaded Liposomes for Enhanced Bioavailability: Formulation and Evaluation. Journal of Liposome Research, Vol. 15, Issue 2.
19. Al-Mohsen M et al (2004) – Formulation and Evaluation of Albendazole Oral Suspension Using Different Suspending Agents. Journal of Pharmacy and Pharmacology, Vol. 56, Issue 10.
20. Al-Otaibi S et al.(2003) – Albendazole Loaded Solid Lipid Nanoparticles for Enhanced Bioavailability: Formulation and Evaluation. Journal of Liposome Research, Vol. 13, Issue 3.