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EFFERVESCENT TABLETS: FORMULATION, ADVANTAGES, AND EVALUATION

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ABSTRACT

Effervescent tablets offer a unique drug delivery system with several advantages over traditional oral dosage forms. This review discusses the formulation of effervescent tablets, including essential components and methodologies, the benefits and drawbacks of their use, and the critical evaluation parameters for ensuring quality and efficacy. Effervescent tablets typically contain active pharmaceutical ingredients and excipients that facilitate the desired pharmacokinetic and mechanical properties of the final product.

These tablets, dissolved in water before administration, provide a solution or dispersion of the drug for immediate intake.

Keywords: Effervescent tablet, formulation, drug delivery, evaluation

1. INTRODUCTION

Oral drug delivery has been a widely utilized method for systemic drug administration through various dosage forms, primarily due to its ease of use. However, oral dosage forms sometimes have limitations, such as slow drug absorption and delayed onset of action.

Effervescent tablets present an alternative to overcome these limitations.

Effervescent tablets are uncoated tablets that contain acid and carbonate or bicarbonate substances. These substances react rapidly in the presence of water, releasing carbon dioxide. This reaction produces carbon dioxide, which enhances drug dissolution and can also mask unpleasant tastes.

2. FORMULATION

The formulation of effervescent tablets involves several key components:

- Active Pharmaceutical Ingredient (API): The therapeutic drug intended for delivery.
- Effervescent Base: This usually consists of an acid source and a carbonate or bicarbonate source. Common acids include citric, tartaric, and malic acid, while the alkaline component is often sodium bicarbonate.
- Excipients: These are inactive substances added to the formulation for various purposes, including:
  - Diluents: Increase tablet weight and improve content uniformity (e.g., lactose).
  - Binders: Impart cohesive properties to the powder mixture (e.g., cellulose derivatives).
  - Disintegrants: Promote tablet breakup in an aqueous environment (e.g., carboxymethylcellulose).
  - Lubricants and Glidants: Improve flow properties and prevent tablet sticking during compression.
  - Sweetening and Flavoring Agents: Enhance palatability.

The selection of appropriate excipients is crucial and they must be non-toxic, commercially available, cost-effective, physiologically inert, color-compatible, and must not have any negative effect on the bioavailability of the drug.

2.1 Formulation Methodologies

Several methods are employed in the preparation of effervescent tablets, including:

- Wet Granulation: This involves the massing of a powder blend with a granulating liquid, followed by wet sizing and drying. This method can improve powder flow and uniformity but has the disadvantage of being expensive and having material loss during processing.
- Dry Granulation: This method compresses the powder mixture without heat or solvent. It includes slugging (compression of powder into large tablets, which are then milled) and roller compaction.
- Other Granulation Techniques: Include steam granulation (using steam as a binder) and melt granulation (using a meltable binder).

3. ADVANTAGES OF EFFERVESCENT TABLETS

Effervescent tablets offer several advantages:

- Rapid Drug Action: The drug is available in solution form for immediate absorption. [1,2]
- Improved Bioavailability: Effervescence can enhance the solubility and dissolution rate of poorly soluble drugs. [1,2]
- Patient Convenience: Effervescent tablets are easy to administer, particularly for patients who have difficulty swallowing tablets. [1]
- Palatability: The dissolved tablet often results in a more palatable solution compared to conventional tablets.
- Gastric Tolerance: Effervescent formulations may be gentler on the stomach. [7,8]
- Enhanced Liquid Intake: Administration involves dissolving the tablet in water, which aids in hydration.
- Accurate Dosing: Effervescent tablets provide a pre-measured dose.
- Stability: Some APIs may exhibit improved stability in effervescent formulations.
- Capability of incorporating large amounts of ingredients.

4. DISADVANTAGES OF EFFERVESCENT TABLETS

Effervescent tablets also have some disadvantages:

- Formulation Complexity: Effervescent formulations can be complex and require careful control of manufacturing processes. [1,2]
- Moisture Sensitivity: Effervescent tablets are susceptible to moisture, which can trigger premature effervescence. Therefore, they need proper storage.
- Unsuitable for Some Patients: Patients on sodium-restricted diets should avoid effervescent tablets containing sodium bicarbonate.
- Not for Sustained or Controlled Release.
- Taste Masking Limitations: The unpleasant taste of some APIs cannot be masked by effervescence.
- Cost: Effervescent formulations can be more expensive to produce. [18]

5. EVALUATION OF EFFERVESCENT TABLETS

Evaluation of effervescent tablets involves various tests to ensure quality, safety, and efficacy. These tests can be classified as:

- Pre-Compression Parameters: These evaluate the powder blend before tablet compression, including:
  - Angle of Repose: Measures the flowability of the powder.
  - Flow Rate: The rate at which powder emerges from a funnel.
  - Bulk Density: The mass of powder divided by its bulk volume.
  - Tapped Density: The mass of powder divided by its tapped volume. [16]
- Post-Compression Parameters: These evaluate the finished tablets and include tests for hardness, friability, effervescence time, pH of the solution, drug dissolution, and stability. [4,5,7]

6. CONCLUSION

Effervescent tablets are a distinctive dosage form that offers advantages like rapid drug action, improved bioavailability, and patient convenience. Careful formulation and evaluation are essential to ensure the production of high-quality effervescent tablets.

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