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## A Review on Fast Dissolving Tablets

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### Abstract:

Fast dissolving tablets (FDTs) have gained significant attention in recent years as an innovative drug delivery system designed to improve patient compliance, particularly among pediatric and geriatric populations who experience difficulty swallowing conventional tablets. This review focuses on the formulation and evaluation of fast dissolving tablets containing Ketoprofen, a nonsteroidal anti-inflammatory drug (NSAID) widely used for the management of pain and inflammation associated with rheumatoid arthritis, osteoarthritis, and other musculoskeletal disorders. The development of FDTs aims to achieve rapid disintegration and dissolution in the oral cavity without the need for water, leading to quicker onset of action and enhanced bioavailability. Various formulation approaches such as direct compression, sublimation, freeze-drying, and superdisintegrant addition are discussed in relation to their influence on tablet properties. The review also examines critical formulation parameters including disintegration time, wetting time, hardness, friability, drug content uniformity, and in vitro dissolution profile. The role of excipients like superdisintegrants (croscarmellose sodium, crospovidone, sodium starch glycolate) and taste-masking agents is emphasized to achieve optimal performance and patient acceptability. Overall, fast dissolving tablets of Ketoprofen represent a promising alternative to conventional dosage forms, offering rapid pain relief, improved therapeutic efficacy, and better patient adherence.

**Keywords:** Fast dissolving tablets; Ketoprofen; NSAIDs; Oral drug delivery; Superdisintegrants; Direct compression; Rapid disintegration; Taste masking; Patient compliance; Bioavailability enhancement; Sublimation method; Immediate release formulation.

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### Introduction

The oral route of drug administration remains the most preferred, convenient, and widely accepted method of delivering therapeutic agents due to its safety, ease of administration, accurate dosage, and patient

compliance. However, the effectiveness of oral drug therapy largely depends on the solubility and dissolution characteristics of the active pharmaceutical ingredient (API). A significant number of newly developed

drug molecules exhibit poor aqueous solubility, which leads to low oral bioavailability and inconsistent therapeutic effects. It is estimated that nearly 40% of drugs currently marketed and more than 60% of those under development are poorly water-soluble, thereby posing a major challenge in pharmaceutical formulation development.

Ketoprofen (2-(3-benzoylphenyl) propionic acid) is a propionic acid derivative belonging to the NSAID class. It is extensively used for the management of pain, fever, inflammation, arthritis, and musculoskeletal disorders. The drug acts primarily by inhibiting cyclooxygenase (COX-1 and COX-2) enzymes, thereby preventing the biosynthesis of prostaglandins responsible for pain and inflammation. Despite its therapeutic importance, ketoprofen suffers from poor aqueous solubility (approximately 0.51 mg/mL at 25°C) and exhibits a slow dissolution rate in gastrointestinal fluids.

This poor solubility often leads to low oral bioavailability (ranging between 60–70%), delayed onset of therapeutic action, and variable absorption profiles. Moreover, ketoprofen is weakly acidic (pKa 4.5) and tends to remain in an undissociated form in the acidic pH of the stomach, further reducing its dissolution rate. These limitations not only affect the drug's pharmacokinetic performance but also compromise its efficacy in providing rapid pain relief, which is critical in acute inflammatory conditions. Therefore, there is a strong need to design a formulation that can enhance the solubility, dissolution, and absorption of ketoprofen for improved therapeutic outcomes.[1]

### **Ideal Characteristics of Fast Dissolving Delivery System [2]**

#### **Mouth-feel**

Mouth-feel is critical, and patients ought to receive a product that feels pleasant. Any large particles from the disintegrating pill that are insoluble or slowly soluble in secretion would result in an unpleasant gritty feeling. This could be overcome by keeping the bulk of the particles below the detectable size limit. In some cases, certain flavors will improve mouth-feel perception, leading to a product that's perceived as being less gritty, even if the sole change is that the flavor. Effervescence is adscititious to assist disintegration and improve mouth-feel by reducing the “dryness” of a product.

#### **Hygroscopicity**

Several quick dissolving dose forms are absorptive and can't maintain physical integrity beneath normal conditions of temperature and humidness. They have protection from humidness that calls for specialized product packaging.

#### **Friability**

In order to permit quick dissolving tablets to dissolve within the mouth, they're made of either terribly porous or soft wrought matrices or compressed into tablets with terribly low compression force, that makes the tablets friable and/or brittle that are difficult to handle, usually requiring specialized peel off blister packing.

#### **Super disintegrants**

A disintegrant is an excipient that is added to a tablet or capsule mix to assist within the breakup of the compacted mass once it's place into a fluid environment.

### **Desirable characteristics of Fast Dissolving Tablets [3]**

#### **Fast Disintegration**

FDTs ought to disintegrate mouth while not further water or with a very small amount (e.g., 1–2 mL) of water. The disintegration fluid is provided by the spittle of the patient.

The disintegrated tablet ought to become a soft paste or liquid suspension, which may offer sensible mouth feel and sleek swallowing. The “fast disintegration typically suggests that disintegration of tablets in but one minute, however it's most popular to possess disintegration as shortly as possible.

### **Taste of Active Ingredients**

Because FDTs dissolve or disintegrate within the patient's mouth, the drugs are going to be partly dissolved in shut proximity to the taste buds. Once swallowing, there ought to be borderline or no residue within the mouth.

A pleasant taste within the mouth becomes vital for patient acceptance. Unless the drug is tasteless or doesn't have an undesirable taste, taste- masking techniques ought to be used.

### **Drug Properties**

For the perfect FDT technology, the drug properties mustn't considerably have an effect on the tablet property. Several drug properties may potentially have an effect on the performance of FDTs. for instance, the solubility, crystal morphology, particle size, hygroscopicity, compressibility.

### **Tablet Strength and Porosity**

Because FDTs are designed to possess a fast dissolution/disintegration time, the tablet consistency is typically maximized to confirm quick water absorption into the tablets. The key properties of the tablets are fast absorption or wetting of water into the tablets and disintegration of associated particles into individual parts for fast dissolution. Moisture Sensitivity.

### **Salient Features of Fast Dissolving Tablets [4]**

- Does not require water for oral administration

- Have sufficient strength to withstand the rigors of the manufacturing process and post-manufacturing handling
- Allow high drug loading
- Insensitive to environmental conditions such as humidity and temperature
- Adaptable and amenable to existing processing and packaging machineries
- Cost effective.
- Have a pleasant mouth feel

### **Challenges to develop Fast Dissolving Tablets [5]**

#### **Palatability**

As most drugs are unpalatable, FDTs typically contain the medicine during a taste-masked type. FDTs once administration, it disintegrates or dissolves in patient's oral cavity, so cathartic the active ingredients that are available contact with the taste buds. Hence, taste- masking of the medicine becomes crucial to patient compliance

#### **Mechanical strength and disintegration time**

In order to permit FDTs to disintegrate within the oral cavity, they're made from either terribly porous and soft-molded matrix or compressed into tablets with terribly low compression force, that makes the tablets friable and/or brittle, tough to handle, and sometimes requiring specialized peel-off blister packing which will augment the cost.

#### **Hygroscopicity**

Several orally disintegrating dose forms are absorptive and can't maintain physical integrity underneath traditional conditions of temperature and humidity. Hence, they have protection from humidity that concerns specialized product packaging.

#### **Amount of drug**

The application of technologies used for FDTs is proscribed by the quantity of drug that may be incorporated into every unit dose. For freeze-dried dose forms, the drug dose should be but 400 mg for insoluble medicine and 60 mg for soluble medicine this parameter is especially difficult once formulating a fast-dissolving oral films or wafers.

### **Aqueous solubility**

Water-soluble medicine cause varied formulation challenges as a result of they form mixture mixtures that lead to freezing-point depression and also the formation of a glassy solid which will collapse upon drying because of loss of construction throughout the sublimation method.

### **Size of tablet**

The ease of administration of a pill depends on its size. It's been reportable that the simplest size of tablet to swallow is 7-8 mm whereas the simplest size to handle was one larger than 8 ml. Therefore, the tablet size that's each simple to require and straight forward to handle is tough to realize.

### **Mouth feel**

FDTs should not disintegrate into larger particles within the oral cavity. The particles generated once disintegration of the FDTs ought to be as tiny as doable. What is more addition of flavours and cooling agents like application improve the mouth feel.

### **Need for Development of Fast Dissolving Tablets [6]**

#### **Patient factors:**

Fast dissolving dose forms are acceptable for those patients (particularly drugs and geriatric patients). These embody are following:

- Patients who have difficulty in swallowing or chewing solid dosage forms

- Patient's incomppliance due to fear of choking
- Very elderly patients of depression who may not be able to swallow the solid dosage forms
- An eight-year-old patient with allergies desires a more convenient dosage form than antihistamine syrup
- A schizophrenic patient who may try to hide a conventional tablet under his or her tongue to avoid their daily dose of an atypical antipsychotic
- A patient with persistent nausea, who may be journey, or has little or no access to water.

### **Effectiveness factor**

Dispersion in secretion in oral cavity causes pre-gastric absorption of drug that dissolves. Buccal, pharyngeal and gastric regions are all areas of absorption for several medications.

### **Manufacturing and marketing factors**

A new dosage form permits a manufacturer to increase market exclusivity, distinctive product differentiation, value-added line of products extension, and extend patent protection, whereas providing its patient population a lot of convenient dosage form.

This results in raised revenue, whereas conjointly targeting underserved and under-treated patient populations.

### **Limitations:**

The tablets typically have poor mechanical strength.

Hence, careful handling is needed throughout manufacturing process. The tablets could leave unpleasant taste and/or grittiness in oral cavity if not developed properly. Medicines with larger doses are tough to formulate into FDT.

### **Benefit of Fast Dissolving Tablets [7]**

- Administered without water, anywhere, anytime.
- Suitability for geriatric and paediatric patients, UN agency expertise difficulties in swallowing and for the other groups which will expertise issues using tablets because of being unstable, the developmentally disable and also the patients UN agency are un-cooperative, or are on reduced liquid intake plans or are nauseated.
- Beneficial in cases such as motion sickness, sude episodes of allergic attack or coughing, where an ultra-rapid onset of action required.
- A multiplied bioavailability, significantly in cases of insoluble and hydrophobic medication, because of speedy disintegration and dissolution of those tablets. Stability for extended length of your time, since the drug remains in solid indefinite quantity type until it's consumed. So, it combines advantage of solid indefinite quantity type in terms of stability and liquid dosage type in terms of bioavailability.

### Methods for Preparation of Fast Dissolving Tablets (FDTs)

Fast dissolving tablets (FDTs), also known as fast-disintegrating or orally disintegrating tablets (ODTs), are designed to disintegrate rapidly in the oral cavity without the need for water, ensuring improved patient compliance, especially for pediatric, geriatric, and dysphagic patients. Several formulation techniques are used to develop FDTs, depending on the desired disintegration time, mechanical strength, and stability.

#### Direct Compression Method [8]

##### Principle:

FDTs are prepared by directly compressing a blend of the drug, superdisintegrants (e.g.,

crospovidone, croscarmellose sodium, and sodium starch glycolate), diluents, and lubricants.

##### Advantages:

- Simple, cost-effective
- High stability
- Scalable for industrial production

#### Freeze-Drying (Lyophilisation) Method [9]

**Principle:** A solution or suspension of drug and polymers (e.g., gelatin, PVP) is poured into blisters and freeze-dried. Sublimation creates a highly porous structure that dissolves rapidly.

##### Advantages:

- Extremely fast disintegration (few seconds)
- Ideal for heat-sensitive drugs

#### Sublimation Method [10]

**Principle:** Volatile ingredients (camphor, ammonium bicarbonate, menthol) are incorporated in the tablet blend and later sublimed at low pressure, leaving a porous tablet structure.

##### Advantages:

- Improved porosity and fast disintegration
- Suitable for moisture-sensitive drugs

#### Spray Drying Method [11]

**Principle:** A mixture of drug, polymer (e.g., HPMC, Gelucire), and superdisintegrant is spray-dried to form porous, highly dispersible powder that is compressed into tablets.

##### Advantages:

- Produces highly porous particles
- Enhanced dissolution rate

#### Molding Method [12]

**Principle:** Tablets are prepared by moistening the powder mixture with hydroalcoholic solvents and molding the blend under low pressure.

**Advantages:**

- Highly porous structure
- Smooth mouthfeel

**Cotton Candy (Flash Foam) Method [13]**

**Principle:**

A floss-like matrix is produced by flash heat processing of saccharides (e.g., sucrose, mannitol), then ground and compressed into tablets with drug.

**Advantages:**

- Very rapid disintegration
- High sugar content provides good taste

**Mass Extrusion Method [14]**

**Principle:** A mixture of drug and excipients softened with PEG and water-soluble solvents is extruded into cylindrical shapes and cut into tablets.

**Advantages:**

- Simple and economical
- Good for taste-masked formulations

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