4. Drug Profile

1. Cefpodoxime Proxetil

Molecular Formula: \( \text{C}_{15}\text{H}_{17}\text{N}_{5}\text{O}_{6}\text{S}_{2} \)
Molecular Weight: 557.61
Chemical name: 5-thia-1-azabicyclo [4.2] oct-2-ene-corboxylic acid, 7-\{[(2-amino-4-thiazolyl) (methoxyimino) acetyl] amino\}-3-(methoxymethyl) - 8-oxo-1-\{[(1-methylethoxy) carbonyl] oxy\}ethyl ester.
Partition coefficient: 2.9
Solubility: Sparingly soluble in water, slightly soluble in methanol.
Appearance: A pale yellow colored amorphous powder.
Melting point: 157\degree C-159\degree C
Bioavailability: 45-50 %
Identification: A. Examined by infrared absorption spectroscopy
B. Ultraviolet absorption spectroscopy
C. Melting point
D. Differential scanning calorimetry
Plasma half-life: 2.4 \pm 0.5 h
Dose: Adults: 250-500-1000 mg twice a day or in four divided doses usually for 5-7 days
Therapeutic Category: Antibacterial.
Storage/Stability: Preserve in well-closed containers, at temperature not exceeding 25 \degree C
Mechanism of action:  
Cefpodoxime Proxetil has bactericidal activity. They inhibit mucopeptide synthesis in the bacterial cell wall, rendering it defective and osmotically unstable.

Pharmacokinetic profile:  
Cefpodoxime Proxetil is absorbed from upper part of GI tract.

- $V_d$: 32.3 L 
- Half-life: 2.4±0.5 hrs 
- $T_{max}$: 0.5-3 hrs 
- $C_{max}$: 1.6-2.2 mg/ml.

Oral bioavailability: 50%

Therapeutic uses:  
Cefpodoxime Proxetil is indicated for the treatment of the following infections

- Genito Urinary Tract,
- Respiratory,
- Gastro-intestinal,
- Skin and soft tissue infections.

Contraindications:  
Cefpodoxime Proxetil is contraindicated in hypersensitivity, pregnancy, and lactation

Drug interactions:  
Probenecid administered concurrently with Cefpodoxime Proxetil increases and prolongs plasma levels by competitively inhibiting renal tubular secretion. The loop diuretic increases nephrotoxicity of Cefpodoxime Proxetil. Amino glycoside also increases nephrotoxicity

Unwanted Effects:  
Hypersensitivity reactions, skin reactions, G.I. upset, Tachycardia, Hypotension, Transient hearing loss.
2. Lutfidine

![Lutfidine molecule](image)

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Molecular Formula</strong></td>
<td>C\textsubscript{22}H\textsubscript{12}N\textsubscript{3}O\textsubscript{4}S</td>
</tr>
<tr>
<td><strong>Molecular Weight</strong></td>
<td>431.56</td>
</tr>
<tr>
<td><strong>Chemical name</strong></td>
<td>(±)-2-(furfuryl sulfinyl)-N-[Z]-4-[4-(piperidinomethyl) - 2-pyridyl] oxy]-2-butyl] acetamide</td>
</tr>
<tr>
<td><strong>Solubility</strong></td>
<td>It is freely soluble in acetic acid, slightly soluble in methanol, slightly soluble in ethanol (99.5), very slightly soluble in diethyl ether and practically insoluble in water.</td>
</tr>
<tr>
<td><strong>Appearance</strong></td>
<td>Lutfidine is a yellowish white crystalline powder with slight peculiar odor.</td>
</tr>
<tr>
<td><strong>Melting point</strong></td>
<td>96°C-99°C</td>
</tr>
<tr>
<td><strong>Bioavailability</strong></td>
<td>20 - 35 %</td>
</tr>
<tr>
<td><strong>Identification</strong></td>
<td>A. Examined by infrared absorption spectroscopy</td>
</tr>
<tr>
<td></td>
<td>B. Ultraviolet absorption spectroscopy</td>
</tr>
<tr>
<td></td>
<td>C. Melting point</td>
</tr>
<tr>
<td></td>
<td>D. Differential scanning calorimetry</td>
</tr>
<tr>
<td><strong>Plasma half-life</strong></td>
<td>1.8 ± 0.5</td>
</tr>
<tr>
<td><strong>Therapeutic category</strong></td>
<td>It is a novel Histamine H\textsubscript{2} receptor antagonist with a potent and long lasting anti acid secretory effect and also gastro protective effect.</td>
</tr>
<tr>
<td><strong>BCS Class</strong></td>
<td>Class II drug (Low solubility, High permeability)</td>
</tr>
</tbody>
</table>
Clinical Pharmacology:

Pharmacodynamics and mechanism of action:

Lafutidine is protective against experimental gastric lesions even in the presence of supplementary potent antisecretory therapy, suggesting that it has a direct gastroprotective effect in addition to its antisecretory properties. Lafutidine reduces oesophageal injury in the gastric acid reflux model, apart from its antisecretory effect. This protective effect is abolished by selectively ablating CSAN, antagonism of CGRP and inhibition of NO synthase, suggesting that the capsaicin pathway is integral to Lafutidine protective properties.

Pharmacokinetic Parameters:

Absorption constant (Ka) : 0.956 h

Elimination constant (Kel) : 0.329 h

Volume of distribution (Vd) : 42.46 lit

Clearance (Cl) : 12.97 l/hr

Cmax : 133.9 (ng/ml)

Tmax : 1.844 hr

Gastric and duodenal ulcers:

Adult 10 mg bid, once after breakfast, once after evening meal or before sleeping. Adjust dose according to patient's age and symptoms.

Stomal ulcers: Adult: 10 mg bid, once after breakfast, once after evening meal or before sleeping. Adjust dose according to patient's age and symptoms.

Gastric mucosal lesions: Adult: 10 mg once daily, after evening meal or before sleeping. Adjust dose according to patient's age and symptoms.

Storage: Store at room temperature, protected from light and moisture.
Polymer Profile

1. Hydroxypropyl methyl cellulose

Nonproprietary names:

**B.P:** Hypromellose 2208, **Ph.Eur:** MethylHydroxyPropyCellulosum, **USP:** Hydroxy Propyl Methylcellulose

**Synonyms:**

Cellulose, Hydroxy propyl methyl ether; culminaal MHPC; E-464; HPMC; Methylcellulose propylene glycol ether; Methyl hydroxy propyl cellulose; Metolose; Pharmacoat.

**Chemical Name:** Cellulose, 2-Hydroxypropyl-methyl ether.

**Molecular weight:** Molecular weight is approximately 10,000 – 1, 50,000.

**Functional category:**

Coating agent, film former, stabilizing agent, suspending agent, tablet binder, viscosity-increasing agent.

**Applications:**

Hydroxy propyl methyl cellulose is widely used in oral and topical pharmaceutical formulation. In oral product, hydroxy propyl methylcellulose is primarily used as a tablet binder, in film coating and as an extended release tablet matrix.

Concentrations of between 2-5% w/w may be used as a binder in either wet or dry granulation processes. High viscosity grades may be used to retard the release of water-soluble drugs from a matrix.

**Description:** Hydroxypropyl methylcellulose is an odorless and tasteless, white or creamy white colored fibrous or granular powder.
Pharmacopoeial Specifications:

**pH (1% solution)** : 5.5-8.0.

**Apparent viscosity** : 3000-5600 cps.

**Typical Properties** :

**Acidity/alkalinity** : pH 5.5 – 8 (for a 1% aqueous solution).

**Density (tapped)** : 0.50-0.70 g/ml.

**Specific gravity** : 1.26.

**Solubility** : Soluble in cold water, forming a viscous colloidal solution; practically insoluble in chloroform, ethanol (95%) and ether.

Various grades of hydroxypropyl methyl cellulose with viscosity:

<table>
<thead>
<tr>
<th>Methocel grade</th>
<th>Nominal</th>
<th>Viscosity (cps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>K100LV</td>
<td>100</td>
<td>80-120</td>
</tr>
<tr>
<td>K4M</td>
<td>4000</td>
<td>3000-5600</td>
</tr>
<tr>
<td>K15M</td>
<td>15000</td>
<td>12000-21000</td>
</tr>
<tr>
<td>E5 PREM.LV</td>
<td>-</td>
<td>4-6</td>
</tr>
<tr>
<td>E6 PREM.LV</td>
<td>-</td>
<td>5-7</td>
</tr>
<tr>
<td>E 15 PREM.LV</td>
<td>-</td>
<td>12-18</td>
</tr>
<tr>
<td>E 50PREM.LV</td>
<td>-</td>
<td>40-60</td>
</tr>
<tr>
<td>K3 PREM.LV</td>
<td>-</td>
<td>2.4-3.6</td>
</tr>
<tr>
<td>K100MP</td>
<td>100000</td>
<td>80000-120000</td>
</tr>
<tr>
<td>E4MP</td>
<td>4000</td>
<td>3500-5600</td>
</tr>
<tr>
<td>E10MP CR</td>
<td>10000</td>
<td>8000-13000</td>
</tr>
<tr>
<td>E3 PREM.LV</td>
<td>-</td>
<td>2.4-3.6</td>
</tr>
</tbody>
</table>
2. Xanthan gum

**Non-proprietary name:** USP NF: Xanthum gum

**Synonyms:**
Corn sugar gum, E415, Keltrol, Merezan, Polysaccharide B-1459, Rhodigel, and Xanthum gum.

**Chemical name:** Xanthum gum [11138-662]

**Functional Category:**
Stabilizing agent, suspending agent, viscosity increasing agent, matrix making agent in preparation of oral sustained released tablets.

**Application in Pharmaceutical Formulation:** Widely used in oral and topical pharmaceutical formulation, cosmetics, and food as a suspending and stabilizing agent. It is non-toxic, compatible with other pharmaceutical ingredient and has good stability and viscosity properties over a wide pH and temperature range. It is also used in preparation of matrix tablets.

**Description:** Cream or white colored, odorless, free-flowing and fine powder.

**Typical properties:**
- **Acidity/alkalinity:** pH 6- 8 for a 1% w/v aqueous solution.
- **Solubility:** Practically insoluble in ethanol, soluble in cold/ warm water.
- **Viscosity:** 1200-1600mPas (1200-1600cP) for a 1% w/v aqueous solution.

**Stability and storage condition:**
It is a stable material. The bulk material should be stored in a well-closed container in a cool and dry place.
3. Carbopol

**Synonym:** Acritamer, Acrylic acid polymer, Carbopol, Polyacrylic acid

<table>
<thead>
<tr>
<th>Non proprietary names:</th>
<th>B.P: Carbomer, U.S.P: Carbomer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Chemical name:</strong></td>
<td>Carboxypolymethylene</td>
</tr>
<tr>
<td><strong>Molecular weight:</strong></td>
<td>$7 \times 10^5$ to $4 \times 10^9$</td>
</tr>
<tr>
<td><strong>Category:</strong></td>
<td>Bioadhesive, emulsifying agent, suspending agent, release modifying agent, tablet binder, viscosity-enhancing agent</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
<td>Carbomers are white colored, fluffy, acidic, hygroscopic powder with slightly characteristic odor.</td>
</tr>
<tr>
<td><strong>Solubility:</strong></td>
<td>Soluble in water and after neutralization soluble in ethanol (95%) and in glycerin.</td>
</tr>
<tr>
<td><strong>Viscosity:</strong></td>
<td>Carbomers disperse in water to form acidic colloidal solutions of low viscosity which when neutralized produce highly viscous gels. (4000-11000 cps)</td>
</tr>
<tr>
<td><strong>Stability:</strong></td>
<td>Carbomers are stable, though hygroscopic materials and can be heated at temperature below 104°C for up to 2 hours without affecting their thickening efficiency. Dry powder forms of Carbomers do not support the growth of molds and fungi but aqueous dispersions are very susceptible to microorganisms.</td>
</tr>
<tr>
<td><strong>Storage Condition:</strong></td>
<td>The powder should be stored in a well-closed container in a cool and dry place.</td>
</tr>
</tbody>
</table>
Pharmaceutical applications:
Carbopol are mainly used in liquid or semisolid pharmaceutical formulations as suspending or viscosity increasing agents.
Carbopol having low residuals only of ethyl acetate, such as Carbopol 71G may be used in oral preparations, in suspensions, tablets or sustained release tablet formulations.
In tablet formulations, Carbopol are used as dry or wet binders & as a rate controlling excipients.
Carbopol resins have also been investigated in the preparation of sustain release matrix beads, as enzyme inhibitors of intestinal proteases in peptide containing dosage form, as a bioadhesive for cervical patch and for intranasal administered microspheres.
Carbopol are also employed as emulsifying agent in the preparation of oil in water emulsions for external use.

Uses:

<table>
<thead>
<tr>
<th>Use</th>
<th>concentrations (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emulsifying agent</td>
<td>0.1-0.5</td>
</tr>
<tr>
<td>Gelling agent</td>
<td>0.5-2.0</td>
</tr>
<tr>
<td>Suspending agent</td>
<td>0.5-1.0</td>
</tr>
<tr>
<td>Tablet binder</td>
<td>5.0-10.0</td>
</tr>
</tbody>
</table>
4. Sodium alginate

**Synonym:** Alginic acid, Sodium salt, E401, Kelcogel, Keltone

**Empirical Formula:** Sodium Alginate consists of the sodium salt of alginic acid which is mixture of polyuronic acids composed of residues of D-mannuronic acid and L-glucuronic acid.

**Functional Category:** Suspending agent, tablet and capsule disintegrant, tablet binder, viscosity-increasing agent.

**Viscosity:** 200-400cps.

**Application in pharmaceutical formulation:**
Sodium alginate is used in a variety of oral and topical pharmaceutical formulations. In tablet formulations, sodium alginate may be used as both a binder and disintegrant. It has been used as a diluent in capsule formulations. Sodium alginate has also been used in the preparation of sustained release oral formulations since it can delay the dissolution of a drug from tablets, capsules and aqueous suspensions.

The adhesiveness of hydrogel prepared from sodium alginate has been investigated and oral release from oral mucoadhesive tablets based on sodium alginate has been reported. Other novel delivery systems containing sodium alginate include an ophthalmic solution that forms a gel in situ administered to the eye and freeze dried device intended for the delivery of bone growth factors.

Therapeutically, sodium alginate has been used in combination with H$_2$- receptor antagonist in the management of gastroesophageal reflux, and as a haemostatic agent in surgical dressings. Alginate dressings, used to treat exuding wounds, often contain significant amounts of sodium alginate as this improves the gelling properties.
5. Karaya gum

**Non-proprietary name:** Karaya gum

**Synonyms:** Gum Sterculia; Crystal Gum; Gum Karaya; Indian Tragacanth;

**Chemical name:** Sterculia Gum

**Empirical formula:** \((\text{C}_6\text{H}_{12}\text{O}_6)_n\)

**Molecular weight:** 220.

**Description:** Karaya gum occurs as an odorless or nearly odorless, white to yellowish-white powder with a bland taste.

**Functional category:** Suspending agent, tablet binder, tablet disintegrant, viscosity increasing agent.

**Typical properties:**

**Acidity / alkanity:**

**pH:** 5.0 – 7.0 (1% W/v aqueous dispersion).

**Solubility:** Practically insoluble in organic solvents. In cold or hot water it disperses and swells almost immediately to form highly viscous, thixotropic sol.

**Viscosity:** 2000- 3500 cps (for 1% W/v aqueous dispersion).
Excipients Profile

1. Sodium bicarbonate

Non proprietary names:

BP: Sodium Bicarbonate, Ph Eur: Natrii hydrogenocarbonas, USP: Sodium Bicarbonate

Synonyms: Baking soda, E500, monosodium carbonate, sodium acid carbonate, sodium hydrogen carbonate.

Empirical Formula: NaHCO₃.

Molecular Weight: 84.01.

Functional Category: Alkalizing agent, therapeutic agent.

Application in Pharmaceutical formulation of Technology:

Sodium bicarbonate is generally used in pharmaceutical formulations as a source of carbon dioxide (10 – 40%) in effervescent tablets and granules. In effervescent tablets and granules, it is formulated with either citric acid or tartaric acid. It is used as buffering agent (10 – 40%). Therapeutically it is used as antacid, and as a source of the bicarbonate anion in the treatment of metabolic acidosis.

Description:

Sodium bicarbonate occurs as an odorless, white crystalline powder with a saline taste. The crystalline structure is monoclinic prisms.

Typical Properties: Acidity alkalinity;

pH: 8.3 for a freshly prepared 0.1M aqueous solution at 25°C.

Density: 2.159 g/ml.

Melting point: 270 °C.

Solubility: Practically insoluble in ethanol, ether and soluble in water as 1 in 11 at 20°C and 1 in 100 at 100°C.
2. Citric Acid

Synonym: 2-Hydroxypropane-1, 2, 3, tricarboxylic acid monohydrate.

Non proprietary names: BP. Citric acid monohydrate, USP Citric acid.

Chemical name: 2-Hydroxy-1, 2, 3, propanetricarboxylic acid monohydrate.


Category: Acidifying agent, Buffering agent

Description: Citric acid monohydrate occurs as a colorless or translucent crystal or as white crystalline efflorescent powder. It is odorless and strong acidic in taste. The crystal structure is orthorhombic.

Solubility: Soluble 1 in 1.5 parts of ethanol and 1 in less than 1 part of water, sparingly soluble in ether.

Stability and storage condition:
Citric acid monohydrate loses water of crystallization in dry air or when heated about 40°C. It is strongly deliquescent in moist air. It should be store in airtight containers in a cool dry place.
3. Microcrystalline cellulose (MCC-KG 100):

Chemical name: Cellulose

Empirical formula and molecular weight: \((C_6H_{10}O_5)_n\) \(n\) \((36000)\)

Functional category:

Adsorbant, Suspending agent, tablet and capsule diluent, tablet disintegrant

Description:

The key to the compactibility of the Ceolus KG grades lies in their needle-like particle shape. Needle-like particles, once compressed, have less elastic recovery and more particle-to-particle entanglements to provide greater tablet hardness.

It is commercially available in different particle size & moisture grades that have different properties and application. It is incompatible with strong oxidizing agent.

Applications:

It is widely used in cosmetics, foods, and pharmaceutical formulations. It is primarily used as a diluent in capsule and tablet manufacturing.
4. Magnesium Stearate

Synonyms:

Magnesium octadecanoate, octadecanoic acid, magnesium salt, stearic acid and magnesium salt.

Chemical Formula: Octadecanoic acid magnesium salt. $C_{36}H_{70}MgO_4$.

Molecular weight: 591.34.

Functional Category: Tablet and capsule lubricant.

Description:

Magnesium stearate is a fine, white, precipitated or milled, impalpable powder of low bulk density, having a faint odor of stearic acid and a characteristic taste. The powder is greasy to the touch and readily adheres to the skin.

Solubility:

Practically insoluble in ethanol, ether, and water, slightly soluble in warm benzene and warm ethanol.

Stability and storage conditions:

Magnesium stearate is stored in a well closed container in a cool, dry place.

Incompatibilities:

Incompatible with strong acids, alkalis, and iron salts. Avoid mixing with strong oxidizing materials. Magnesium stearate cannot be used in products containing aspirin, some vitamins, and most alkaloidal salt.

Applications:

Magnesium stearate is widely used in cosmetics, foods, and pharmaceutical formulations. It is primarily used as a lubricant in capsule and tablet manufacture at concentrations between 0.25% and 5.0% w/w. It is also used in barrier creams.
5. Sodium lauryl sulphate

Non-proprietary name: BP. Sodium lauryl sulphate.

Synonyms: Sodium lauryl sulphate.

Description: White to off-white powder.

Solubility: Partly water-soluble and partly oil-soluble.


Molecular weight: 288.37.

Functional category: Sodium lauryl sulphate is a surfactant.

Application In Pharmaceutical Formulation:

Anionic surfactant; detergent; emulsifying agent; skin penetrant; tablet and capsule lubricant; wetting agent.