FORMULATION AND IN-VITRO EVALUATION OF LEVOFLOXACIN TABLETS BY USING DIFFERENT SUPERDISINTEGRANTS

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ABSTRACT

Levofloxacin is a synthetic third generation fluoroquinolones antibacterial agent with a broad spectrum of activity against Gram-positive and Gram-negative aerobic bacteria, atypical respiratory pathogens and some anaerobes. The present work was aimed to formulation development, in-vitro evaluation and comparative study of the effect of different types of superdisintegrants on disintegration time and in-vitro dissolution of Levofloxacin 250 mg tablets for the potential use of the drug for its therapeutic effect. Levofloxacin oral formulations were prepared with different super disintegrants. The superintegrants were sodium starch glycolate (SSG), crosspovidone (XL-10) and crosscarmellose sodium (CCS) used in the preparation of Levofloxacin oral formulations. The formulations were coded as F1 (Cross povidone), F2 (crosscarmellose sodium) and F3 (sodium starch glycolate). The Levofloxacin oral formulation (F2) with crosscarmellose sodium has shown the better disintegration time and increases the dissolution rate when compared to the other super disintegrants.

Key words: Levofloxacin, Superdisintegrants, In-vitro evaluation, Dissolution.


INTRODUCTION

Levofloxacin is a synthetic third generation fluoroquinolone antibacterial agent with a broad spectrum of activity against Gram-positive and Gram-negative aerobic bacteria,
atypical respiratory pathogens and some anaerobes. It is active against both penicillin-susceptible and penicillin-resistant Streptococcus pneumoniae [1,2].

Levofloxacin is useful in the treatment of a wide variety of infections, including community-acquired pneumonia [3,4] acute exacerbation of chronic bronchitis [5,6] acute maxillary sinusitis [7-10], uncomplicated skin and skin-structure infections [15,16], uncomplicated urinary tract infections [11], complicated urinary tract infections [12,13], and acute pyelonephritis [14].

**MATERIALS AND METHODS:**

**Materials:**
Levofloxacin hemihydrate was received as a gift from Bio Lab Pharmaceutical Islamabad. Lactose monohydrate (Shanghai Honest Chem. Co., Ltd., China), Polyvinylpyrrolidone - PVP K30 (Yuking Chemtech Co. Ltd., China), Microcrystalline cellulose (Avicel PH 200; Mingtai Chemical Co Ltd., Taiwan), Crospovidone (Ludwigshafen, Germany), Croscarmellose sodium (Rasua Pharmaceuticals and finr chemicals, India), Sodium starch glycolate (Yung Zip Chemical Industries, Taiwan), Magnesium stearate (Coin Chemical Industrial Co. Ltd., Taiwan), Talcum ( Micron, Pakistan), Colloidal silicon dioxide (Cab-O-Sil; Cabot Corporation, Germany), Hypromellose (Methocel E5; Colorcon, UK.), Isopropyl alcohol (Lee Chang Yung Chemical Industry Corporation, Taiwan), Methylene chloride (ICI, UK.), and 37% HCl concentrated (Sigma-Aldrich, Germany) were received as a gift from Amson Vaccines & Pharma (PVT) Ltd.

**Methods:**

**Formulations of Levofloxacin 250 mg tablets:**
Levofloxacin 250 mg tablets were prepared by wet granulation method by using three different types of superdisintegrants at a concentration of 2.5% according to the formulations given in Table I. The formulations containing crospovidone, croscarmellose sodium and sodium starch glycolate as superdisintegrants were coded as F1, F2 and F3 respectively.
Table I: Formulations of Levofloxacin 250 mg tablets

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Ingredients</th>
<th>F1  (mg/tablet)</th>
<th>F2  (mg/tablet)</th>
<th>F3  (mg/tablet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Levofloxacin hemihydrate (97.8%)</td>
<td>256</td>
<td>256</td>
<td>256</td>
</tr>
<tr>
<td>2</td>
<td>Lactose monohydrate</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>PVP K30</td>
<td>8.6</td>
<td>8.6</td>
<td>8.6</td>
</tr>
<tr>
<td>4</td>
<td>Avicel PH 200</td>
<td>41.65</td>
<td>41.65</td>
<td>41.65</td>
</tr>
<tr>
<td>5</td>
<td>Crospovidone</td>
<td>9.4</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>6</td>
<td>Croscarmellose sodium</td>
<td>–</td>
<td>9.4</td>
<td>–</td>
</tr>
<tr>
<td>7</td>
<td>Sodium starch glycolate</td>
<td>–</td>
<td>–</td>
<td>9.4</td>
</tr>
<tr>
<td>8</td>
<td>Magnesium stearate</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>Talcum</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>10</td>
<td>Cab-O-Sil</td>
<td>0.35</td>
<td>0.35</td>
<td>0.35</td>
</tr>
<tr>
<td>11</td>
<td>Isopropyl alcohol</td>
<td>Q.S.</td>
<td>Q.S.</td>
<td>Q.S.</td>
</tr>
</tbody>
</table>

**Total weight of tablet**

<table>
<thead>
<tr>
<th></th>
<th>F1 (mg/tablet)</th>
<th>F2 (mg/tablet)</th>
<th>F3 (mg/tablet)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>375</td>
<td>375</td>
<td>375</td>
</tr>
</tbody>
</table>

Dissolution test

Dissolution rate of Levofloxacin tablets was studied using USP II (paddle Type) dissolution test apparatus. The quantity of dissolution medium was 900 ml of 0.1N HCL, with the speed of rotation at 100 rpm and the temperature was set at 37 ± 0.5 °C. The sample was withdrawn at different time intervals. The withdrawn samples were suitably diluted with more quantity of dissolution medium and the same volume was replaced with fresh dissolution medium. The samples were then studied in UV spectrophotometer at 281 nm for Levofloxacin content. The release rate at different time intervals were then determined.

**In-vitro dissolution test:**

The film coated tablets of formulations F1, F2 and F3 were subjected to in-vitro dissolution test by using Tablet Dissolution Tester (Model No. GDT-7Tv3, Galvano Scientific, Pakistan).

**Parameters of dissolution test:**

- **Medium:** 0.01N HCl maintained at 37 ± 0.5 °C
- **Volume:** 1000 ml
- **Apparatus:** 2 (Paddle type)
- **Speed:** 75 rpm
- **Time:** 30 minutes
Limits: Not less than 80% (Q) of the labeled amount of Levofloxacin is dissolved in 30 minutes.

Statistical analysis: The data of dissolution test was evaluated statistically by analysis of variance (ANOVA) and comparison among mean dissolution data was made by Least significant difference (LSD) test.

RESULTS AND DISCUSSION

Disintegration test was carried out under USP specifications. The tablets of formulation F2 showed better disintegration time (10 minutes) than formulations F1 and F3. Table II and Fig. I shows the results of disintegration time test.

Table II: Disintegration time test results of Levofloxacin tablets

<table>
<thead>
<tr>
<th>Formulation</th>
<th>Disintegration time (average)</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>12 minutes</td>
</tr>
<tr>
<td>F2</td>
<td>10 minutes</td>
</tr>
<tr>
<td>F3</td>
<td>13 minutes</td>
</tr>
</tbody>
</table>

Fig. I: Comparison of disintegration time of F1, F2 and F3
There was considerable difference in dissolution data of formulations F1, F2 and F3. The maximum average dissolution (97.73%) was observed for formulation F2 while the minimum average dissolution (85.48%) was shown by formulation F3 (Fig.II).

![Fig. II: Comparison of dissolution of F1, F2 and F3.](image)

It has been reported that dissolution rate has a direct effect on the bioavailability profile of tablet dosage forms because it can be used to determine the pattern of drug release in vivo [15].

**CONCLUSION**

Levofloxacin tablets containing different types of super disintegrants (SSG, CCS and Cross povidone XL-10) were prepared by wet granulation method and subjected to disintegration studies and in vitro drug release studies. The disintegration time for three formulations was observed. F 2 shows the better disintegration than the F1 and F3. The disintegration time for F2 is 10mins. In -vitro dissolution profile also showed that F 2 has the better percentage drug release when compared to the F 1 and F 3. The Levofloxacin formulation F 2 (crosscarmellose sodium) release was found to be 97.73 %. The Levofloxacin oral formulation F 2 (crosscarmellose sodium) shows the better disintegration time and % of drug release.
REFERENCES


