Validated Spectrophotometric Estimation of Ganciclovir in Pure and Capsule Dosage Form

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Abstract: Ganciclovir (GCV) is a nucleoside analogue of guanosine, a homologue of acyclovir, and the first antiviral drug to be effective in the treatment of cytomegalovirus (CMV) infection in humans. In present work, a simple, sensitive, accurate and economical Spectrophotometric method has been developed for the estimation of Ganciclovir in bulk drug and its pharmaceutical formulation. An absorption maximum of Ganciclovir in 0.1M HCl was found to be at 255nm. The drug follows Beer’s law in the concentration range of 2-16 μg/ml with correlation coefficient of 0.999. The percentage recovery of Ganciclovir ranged from 100.11 to 100.48 %. The developed method is validated for accuracy, precision, LOD, LOQ as per ICH guidelines. Statistical analysis proved that the developed method shows the % RSD within the acceptance limit. It is conclude that the developed method is simple, selective, rapid, reproducible and suitable for the routine quality control application.

Key Words: Ganciclovir, UV spectrophotometry, Natclovir Capsule.

Introduction and Experimental:
Ganciclovir (GCV) is chemically 2-amino -1,9-[(2-hydroxy -1-(hydroxymethyl) ethoxy) methyl]-6-H-purine -6-H-one, is a synthetic nucleoside analogue closely related to Acyclovir. It is used in the treatment of cytomegalovirus (CMV) infection in AIDS patients. GCV exhibits antiviral activity against herpes simplex virus (HSV) and cytomegalovirus (CMV) at relatively low inhibitory concentrations. Ganciclovir is a white crystalline powder and soluble in Hydrochloric acid, water, methanol, ethanol, and dimethyl sulphoxide. Its molecular weight 255.23g/mol.

The standard solution of Ganciclovir was prepared by dissolving 100mg in 100ml standard volumetric flask diluting with 0.1M hydrochloric acid solution and made up to the mark then 10ml of this solution is pipetted out into 100ml standard volumetric flask and diluting with 0.1M hydrochloric acid solution to produce 100µg/ml then 20ml of this solution is pipetted out into 100ml standard volumetric flask and diluting with 0.1M hydrochloric acid solution to produce 20µg/ml.

Ten capsules were weighed and powdered. The capsule powder equivalent to 100mg of Ganciclovir was transferred into 100ml volumetric flask then it was diluted with the 0.1M hydrochloric acid solution and made up to the mark. From the above solution 10ml was pipetted out into 100ml volumetric flask and the volume was made up to the mark with 0.1M hydrochloric acid solution to produce 100µg/ml then 20ml of this solution is pipetted out into 100ml standard
volumetric flask and diluting with 0.1M hydrochloric acid solution to produce 20µg/ml. Aliquots of Ganciclovir ranging from 1-8ml of standard solution were transferred into a series of 10ml volumetric flasks. Then all dilutions were measured at 255nm (fig-2). The amount of Ganciclovir present in the sample was computed from the calibration curve.

The same λ max was used for further measurement of drug. A calibration curve v/s concentration was plotted.

The absorption spectral analysis shows the χ max at 255nm. The calibration curve was obtained for the series of concentration in the range of 2µg/ml-16µg/ml. They were found to be linear and hence suitable for the estimation of the drug. The slope, intercept, correlation coefficient and optical characteristics are summarized in the table 1. Regression analysis of Beer’s law plot revealed a good a correlation. The effects of various excipients generally present in capsule dosage form of Ganciclovir were investigated. The results indicated that they did not interfere in the assay in amounts far in excess of their normal occurrence in it. The developed method was validated s per ICH guidelines. The recovery technique was performed to study the accuracy and reproducibility of the proposed method. For this, known quantities of the Ganciclovir solution were mixed with definite amount of pre-analysed formulation and the mixture were analysed. The total amount of Ganciclovir was determined by using the developed method and the amount of added drugs was calculated by the difference. The %RSD was less than ±2.0. This showed that the recovery of Ganciclovir by the method is satisfactory and the results are shown in table 2. The precision method was studied as intraday and interday. Intray day precision was determined by analyzing Ganciclovir (4, 6, 8µg/ml) for six times in the same day, interday precision was determined by analyzing the same concentration of the solution daily for six days and the results are shown in table 3. Limit of detection (LOD) and Limit of quantitation (LOQ) were determined by the developed method.

Results and discussion:

The absorption spectral analysis shows the λ max at 255nm. The calibration curve was obtained for the series of concentration in the range of 2µg/ml-16µg/ml. They were found to be linear and hence suitable for the estimation of the drug. The

\[ y = 0.0526x + 0.0027 \]
\[ R^2 = 0.9998 \]

<table>
<thead>
<tr>
<th>Drug</th>
<th>Sample drug µg/ml</th>
<th>Standard drug µg/ml</th>
<th>Amount recovered µg/ml</th>
<th>%Recovery ± Standard deviation</th>
<th>%RSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ganciclovir</td>
<td>8</td>
<td>4</td>
<td>11.983</td>
<td>100.17±0.989</td>
<td>0.98</td>
</tr>
<tr>
<td>(Nativclovir)</td>
<td>8</td>
<td>6</td>
<td>13.980</td>
<td>100.11±0.478</td>
<td>0.47</td>
</tr>
<tr>
<td>250mg</td>
<td>8</td>
<td>8</td>
<td>16.006</td>
<td>100.48±0.361</td>
<td>0.36</td>
</tr>
</tbody>
</table>

Average of six determinations, RSD indicates relative standard deviation.
Table 3: Results of Precision Studies

<table>
<thead>
<tr>
<th>Concentration µg/ml</th>
<th>Intraday precision</th>
<th>%RSD</th>
<th>Interday precision</th>
<th>%RSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>100.06</td>
<td>0.80</td>
<td>99.9</td>
<td>0.80</td>
</tr>
<tr>
<td>6</td>
<td>99.83</td>
<td>0.52</td>
<td>99.66</td>
<td>0.52</td>
</tr>
<tr>
<td>8</td>
<td>99.53</td>
<td>0.38</td>
<td>99.40</td>
<td>0.44</td>
</tr>
</tbody>
</table>

* Average of six determinations, RSD indicates relative standard deviation.

Thus it can be concluded that the method developed in the present investigation is simple, sensitive, accurate, rapid and precise. Hence, the above said method can be successfully applied for the estimation of Ganciclovir in pure and capsule dosage form.

Reference:


