METHOD DEVELOPMENT AND VALIDATION OF
METHOCARBAMOL IN BULK AND ITS FORMULATION
BY UV SPECTROSCOPY

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ABSTRACT
A new, simple, specific, sensitive, accurate, rapid and precise UV-Visible method was developed for
the estimation of methocarbamol in bulk and pharmaceutical formulation. Methocarbamol used
extensively in pharmaceutical solid unit dosage form as alone or combination with other active
ingredient, for the estimation of methocarbamol in UV at λmax,274nm by using methanol as solvent.
Detector response was linear in the concentration of 10-50µg/ml. The inter and intraday variation was
found to be less than 1%. The mean recovery of the drug from the solution was 100.24%.

Keywords: UV-Visible, Methocarbamol, Validation, Precision, Accuracy.

INTRODUCTION
Methocarbamol1,2 is chemically 3-(2-methoxyphenoxy)-1,2-propanediol-1-carbone as
in fig.1. It is a white powder, freely soluble in propylene glycol, soluble in alcohol, sparingly
soluble in water and insoluble in benzene and n-hexane. It has the empirical formulaC11H15NO5
and molecular weight is 241.24. Methocarbamol is a carbamate derivative of guaifenesin, is
a central nervous system (CNS) depressant with sedative and musculoskeletal
relaxant properties. Literature survey reveals that few spectroscopic and chromatographic
methods have been reported for the quantitative estimation of methocarbamol in bulk and
pharmaceutical formulations.3-7 Hence an attempt has been made to develop UV-Visible
spectroscopic method for its estimation in bulk and pharmaceutical formulation with good
precision, linearity and reproducibility.

Methocarbamol tablet USP is available as 500mg and 700mg for oral administration.
Methocarbamol tablet contains the following excipients sodium lauryl sulfate, sodium
starchglycolate, povidone K90, polyethylene glycol, magnesium stearate, colloidal silicon
dioxide, low substituted hydroxyl propyl cellulose and stearic acid.

EXPERIMENTAL
MATERIALS AND METHODS
Pc based ThermoGenesis™ double beam spectrophotometer with a pair of 1cm quartz

STANDARD PREPARATION
Preparation of stock solution (1000µg/mL)
Accurately weighed 100 mg of methocarbamol and transfer into 100 ml volumetric flask and
dissolved with methanol, finally made up to the volume with methanol, to obtain the stock
solution of concentration 1000 µg/mL.

Preparation of standard solution (100µg/mL)
Accurately pipette out 10ml of methocarbamol stock solution and transferred it in to 100ml
volumetric flask and made up to the volume with methanol, to get the standard solution of
concentration 100 µg/mL.

Methocarbamol working standard
Accurately pipetted out 1,2,3,4 and 5 ml of methocarbamol standard solution and
transferred each into a separate 10 ml volumetric flasks and made up to the volume with methanol to obtain the working standard solutions of concentration 10, 20, 30, 40 and 50 µg/mL respectively. Absorbs of these standard concentrations were measured at λmax 274nm. Each dilution was measured five times and the average absorbance of each dilution was computed. Calibration graph was constructed by concentration of the drug on X-axis and absorbance on Y-axis, the graph was found to be linear in the concentration of 10-50 µg/mL of the drug. The relevant data was furnished in table 1.

A typical calibration plot was followed the Beer Lambert’s law and which was shown in fig.2. The regression equation of this curve was computed. The regression equation was later used to estimate the amount of methocarbamol tablet.

Sample preparation
Weighed and finely powdered not more than 20 tablets. Accurately weighed and transferred the equivalents to 100 mg of methocarbamol in to 100ml volumetric flask and sonicated for 30 minutes with intermittent shaking and made up to the volume with methanol and filtered. Collect the above solution, from this solution accurately measured 5ml of solution and transferred into 10 ml volumetric flask and made up to the volume with methanol, and the absorbance of the resulting solution was measured at λmax 274 nm. The actual concentration of the drug was determined from the standard curve.

Assay

\[ \text{Assay} = \frac{\text{Std.Abs/ Test.Abs} \times \text{Std.dilution/ Test.Dilution} \times \text{Avg.wt/ Label/ claim x Potency/ 100 x 100}}{\text{100.20%}} \]

Validation of proposed method

After method development, validation of the proposed method was performed in accordance with USP requirement for assay. Quantization of methocarbamol was done by analytical methods like linearity, accuracy, precision and robustness.

Linearity

The drug concentrations were prepared as per given in the standard preparation. Calibration curve was constructed by taking concentration on X-axis and absorbance on Y-axis was shown in fig.2.  

Accuracy

Accuracy was studied by using known amount of methocarbamol in the range of 1-10 µg/mL and the recovery has to be in the range of 99.17-101.36%. The results were given in the table 2.

Precision

We determined the precision of the method through its repeatability and reproducibility. We repeated the assay method for 5 times in the same day and 5 times for the next day by 2 different analysts and then we computed the relative standard deviation (RSD). The acceptance criteria demands that RSD should be less than 2% and there results were given in the table 3.

Robustness

Robustness of this method was determined by analyzing the methocarbamol tablet in different day and different analyst. The given above data was observed that the method was robust enough to analyze the methocarbamol tablet, which was shown in table 4.

RESULTS AND DISCUSSION

Quantitative determination of methocarbamol was simple, accurate, robust and specific. Quantization was linear in the concentration range of 10-50 µg/mL. The regression equation of the linearity plot of methocarbamol over its absorbance was found to be Y=0.0228X (R²=0.9997), where X is the concentration of methocarbamol (µg/mL) Y is the corresponding absorbance. The λmax of the drug for analysis was determined by taking scans of the drug solutions in the entire UV-Visible region. The replicate analysis of the standard solution was used to assess the accuracy, precision and reproducibility of the proposed method. The prepared methocarbamol analyzed with the relevant calibration curve to determine the intra and interday variability of the methocarbamol drug.

CONCLUSION

The proposed UV-Visible method was rapid, sensitive, precise and accurate for the determination of methocarbamol and can be reliably adopted for routine quality control analysis of methocarbamol in its bulk and its formulation without any interference from the excipients.

ACKNOWLEDGEMENTS

The authors are thankful to Mohammadiya Institute of Pharmacy for providing the facilities to carry out the work.
Table 1: The drug concentrations

<table>
<thead>
<tr>
<th>S.No</th>
<th>Conc. (µg/mL)</th>
<th>Absorbance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>0.222</td>
</tr>
<tr>
<td>2</td>
<td>20</td>
<td>0.463</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td>0.692</td>
</tr>
<tr>
<td>4</td>
<td>40</td>
<td>0.909</td>
</tr>
<tr>
<td>5</td>
<td>50</td>
<td>1.137</td>
</tr>
</tbody>
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Table 2: The drug concentrations

<table>
<thead>
<tr>
<th>Conc. µg/mL</th>
<th>Conc. of recovery product</th>
<th>Concentration %</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2.0</td>
<td>100.0</td>
</tr>
<tr>
<td>4</td>
<td>4.0</td>
<td>100.0</td>
</tr>
<tr>
<td>6</td>
<td>5.99</td>
<td>99.99</td>
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<tr>
<td>8</td>
<td>8.80</td>
<td>99.92</td>
</tr>
<tr>
<td>10</td>
<td>10.13</td>
<td>101.30</td>
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</table>

Table 3: The drug concentrations

<table>
<thead>
<tr>
<th>Declared amount</th>
<th>Absorbance</th>
<th>% Assay</th>
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<tbody>
<tr>
<td>50mg (0.917g)</td>
<td>2.907</td>
<td>99.58</td>
</tr>
<tr>
<td></td>
<td>2.903</td>
<td>99.00</td>
</tr>
<tr>
<td></td>
<td>2.908</td>
<td>99.55</td>
</tr>
<tr>
<td></td>
<td>2.903</td>
<td>99.00</td>
</tr>
<tr>
<td>Drug 50mg (0.917g)</td>
<td>2.906</td>
<td>99.60</td>
</tr>
<tr>
<td>Mean</td>
<td>2.905</td>
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</tr>
<tr>
<td>S.D</td>
<td>0.0009</td>
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</tr>
<tr>
<td>RSD</td>
<td>0.0003098</td>
<td></td>
</tr>
<tr>
<td>%RSD</td>
<td>0.03098</td>
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Table 4: The drug concentrations

<table>
<thead>
<tr>
<th>Variable parameter</th>
<th>Assay results %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analyst – I Day-I</td>
<td>99.58</td>
</tr>
<tr>
<td>Day-II</td>
<td>99.00</td>
</tr>
<tr>
<td>Analyst - II Day-I</td>
<td>99.55</td>
</tr>
<tr>
<td>Day-II</td>
<td>99.60</td>
</tr>
</tbody>
</table>

![Chemical structure](image.png)

3-(2-methoxyphenoxy)-2-hydroxypropyl carbamate

**Fig. 1:**
Fig. 2: Linearity of Methocarbamol (concentration in µg / ml)

\[ y = 0.022x \]
\[ R^2 = 0.999 \]

REFERENCES