www.ThePharmaJournal.com

The Pharma Innovation

ISSN: 2277- 7695
TPI 2016; 5(3): 24-25

www.thepharmajournal.com
Received: 19-01-2016
Accepted: 20-02-2016

RK Maheshwari
Department Of Pharmacy, SGSITS, Indore - 452003, M.P., India.

Toshika Jain
Department Of Pharmacy, SGSITS, Indore - 452003, M.P., India.

Rohit Adhav
Department Of Pharmacy, SGSITS, Indore - 452003, M.P., India.

Priyanka Vaswani
Department Of Pharmacy, SGSITS, Indore - 452003, M.P., India.

Correspondence
Toshika Jain
Department Of Pharmacy, SGSITS, Indore - 452003, M.P., India.

Solid as solvent- Novel spectrophotometric analytical method to estimate indomethacin in capsule dosage form using solids (Eutectic liquid of phenol and metformin hydrochloride) as solubilizing agents (Mixed solvency concept)

RK Maheshwari, Toshika Jain, Rohit Adhav, Priyanka Vaswani

Abstract
The present investigation illustrates the application of mixed solvency concept which states that each and everything present on earth has got solvent character. Authors have tried to show that solid can also be employed as solvent for spectrophotometric analysis of drugs precluding the use of organic solvents. Phenol crystals and Metformin hydrochloride powder were triturated in 4:1 ratio to obtain the eutectic liquid PMHCl 41. There was nice solubility of Indomethacin in PMHCl 41 (more than 200 mg/ml) as compared to the solubility of Indomethacin in distilled water (0.36 mg/ml). In the present research, PMHCl 41 was employed to solubilize the drug (Indomethacin) from capsule powder precluding the use of organic solvent. Phenol, Metformin Hydrochloride and capsule excipients do not interfere in the spectrophotometric analysis at 320 nm. The accuracy, reproducibility and the precision of the method were confirmed by recovery studies and statistical data.

Keywords: Mixed Solvency Concept, Indomethacin, Phenol, Metformin hydrochloride, Spectrophotometric Analysis, Eutectic Liquid.

1. Introduction
Maheshwari[1] has explained about the mixed solvency concept. If a concentrated aqueous solution is made by dissolving small concentrations of different additives (solubilizers), this solution may show additive or synergistic solvent action for a poorly water-soluble drug. If, the solubility of the same drug is enhanced by large concentration of a single solvent/solubilizer or so, then, this may result in toxicity due to employed solvent/solubilizer. However, by application of mixed solvency concept, this problem of toxicity can be solved. The small concentrations of solubilizers may solve the problem of toxicity of large concentration of a single solubilizer.
The major issue with most of the existing and upcoming pharmaceutical products is their poor water solubility. The drug shows poor solubility in their analytical estimation and in the liquid dosage form in solutions. All substances present on the earth possess solubilizing properties. Each substance shall show solubilizing power for some solutes and non-solubilizing power for other. For water insoluble drugs, commonly used organic solvents for spectrophotometric analysis include- Methanol, Ethanol, Chloroform, Benzene, Dichloromethane, Dimethyl formamide, Acetonitrile, Ethyl acetate, Toluene, Carbon tetrachloride, Acetone, Hexane, etc. The main problems of organic solvents are their high cost, toxicity and pollution. They should be replaced by eco-friendly and alternative sources. The use of "solids as solvents" shall prove a boon in pharmaceutical field.
The solvent action of solids can be demonstrated nicely by mixed solvency concept. By application of this concept innumerable solvent systems can be developed. The advantage of mixed solvency concept is employing combination of pharmaceutical excipients in small concentration as a result of which toxicity is reduced.
The present research is an attempt to prove that solids can also be wisely used to act as solvents, precluding the use of organic solvents. The main objective of present study is to demonstrate solvent action of solids.

2. Materials and Methods

Indomethacin bulk drug sample was a generous gift by M/S Alkem Laboratories Limited, Mumbai (India). Metformin hydrochloride was generous gift from M/S IPCA Laboratories Ltd., Ratlam(India). Commercial capsules of Indomethacin were procured from local market. Other chemicals used for research were of analytical grade.

A Shimadzu-1700 UV Visible spectrophotometer with 1 cm matched silica cell was used for spectrophotometric analysis.

2.1 Preparation Of Eutectic Liquid

Phenol and Metformin hydrochloride were triturated in 4:1 ratio of their respective weight quantity and eutectic liquid-PMHCl 41 was prepared.

2.2 Calibration Curve

Accurately weighed 50mg of Indomethacin standard drug was transferred to a 500ml volumetric flask and 10ml of PMHCl 41 was added to it. The flask was shaken to solubilize the drug. Then, about 400ml distilled water was added and the flask was shaken for 5min to solubilize the contents. The volume was made up to the mark (500ml) with distilled water. This stock solution (100µg/ml) was suitably diluted with distilled water to obtain standard solutions of 15, 30, 45 and 60 µg/ml. The absorbances of these standard solutions were noted at 320 nm against respective reagent blanks to obtain the calibration curve.

2.3 Proposed Method of Analysis

To carry out spectrophotometric analysis, twenty capsules of capsule formulation I were emptied to get fine capsule powder. Powder equivalent to 50 mg Indomethacin was transferred to a 500 ml volumetric flask. Then, 10 ml of PMHCl 41 was transferred to it and the flask was briskly shaken for 10 minutes to extract the drug from powder. Then, 400 ml distilled water was added and the flask was shaken for 5 minutes to homogenize the contents. The volume was made up to the mark (500 ml) with sufficient distilled water. Filtration was carried out through Whatmann filter paper #41 to remove the excipients. Ten ml of the filtrate was diluted to 50 ml with distilled water. Then, the absorbance was noted at 320 nm against reagent blank. Using the calibration curve, the drug content was calculated. Same procedure was repeated for capsule formulation II. The results of analysis were reported as in table 1.

2.4 Recovery Studies

The recovery studies were performed in which standard Indomethacin drug was added (15 mg and 30 mg, respectively) to the pre-analyzed capsule powder equivalent to 50 mg Indomethacin and drug content was determined by the proposed method. Results of analysis were reported as in table 2 with statistical evaluation.

Table 1: Analysis data of Indomethacin capsule formulations with statistical evaluation (n=3)

Capsule Formulation	Label Claim (mg/capsule)	Percent drug estimated (mean ± SD)	Percent coefficient of variation	Standard Error
I	25	100.34 ± 1.449	1.444	0.837
II	25	99.49 ± 1.921	1.931	1.109

Table 2: Results of recovery studies with statistical evaluation (n=3)

Capsule Formulation	Drug in pre-analyzed capsule powder (mg)	Amount of Standard drug added (mg)	% Recovery estimated (mean ± SD)	Percent coefficient of variation	Standard Error
I	50	15	98.36 ± 1.292	1.314	0.746
I	50	30	98.71 ± 1.494	1.522	0.863
II	50	15	99.44 ± 1.767	1.777	1.020
II	50	30	100.15 ± 1.088	1.086	0.628

Results And Discussion

The Solubility of Indomethacin in distilled water at the room temperature was found to be 0.36 mg/ml. The solubility of Indomethacin in PMHCl 41 was more than 200 mg/ml, It is evident from capsule 1 that the percent drug estimation in capsule formulation I and II were 100.34 ± 1.449 and 99.49 ± 1.921, respectively. The values are very close to 100, indicating the accuracy and precision of the proposed analytical method. In addition to this, the table 2 emphasizes on the percent recoveries studies which varies from 98.36 ± 1.292 to 100.15 ± 1.088 which are again very close to 100.00, indicating the accuracy and precision of the proposed method. Proposed analytical technique is further supported remarkably by small values of statistical parameters viz. standard deviation, percent coefficient of variation and standard error as indicated in table 2.

Conclusion

The evidence that supports the solvency of Indomethacin in Eutectic liquid of phenol and Metformin Hydrochloride in 4:1 ratio on weight basis was suitably demonstrated by the above research. This supports that the extraction (dissolution) of Indomethacin from powder of capsules can be carried out by use of "solid as solvent concept". The presence of PMHCl 41 does not interfere in spectrophotometric estimation at 320 nm. Phenol and metformin hydrochloride do not interfere above 300 nm.

The proposed research opens the new dimensions of eco-friendly and safe methods of estimations in pharmaceutical field. The research evokes and builds potential for use of such novel methods for use of "solid as solvents".

References

1. Maheshwari RK. Mixed-solvency approach- Boon for solubilization of poorly water-soluble drugs. Asian J Pharm. 2010; 4(1):60-3.
2. Maheshwari RK. Mixed- solvency– A novel concept for solubilization of poorly water-soluble drugs. Delving J. Tech Eng Sci. 2009; 1(1):39-43.
3. Maheshwari RK. Potentiation of solvent character by mixed solvency concept: A novel concept of solubilization. J Pharm Res. 2010; 3(2):411-3.