Research in Pharmaceutical Sciences, 2012;7(5)
School of Pharmacy and Pharmaceutical Sciences
Isfahan University of Medical Sciences

Performance of solubility models for prediction of acetaminophen solubility in binary and ternary solvent mixtures of ethanol, water and glycerin

S. Mohammadi-Samani, E. Sadeghi*

Department of pharmaceutics, School of Pharmacy, Shiraz University of Medical Sciences, Shiraz, Iran

Background and Aims: Solubility prediction in pharmaceutical systems is very important, because many aspects of drug formulation and the bioavailability of low water soluble drug are directly involved with the extent of active pharmaceutical solubility. Nevertheless the available solubility equation which was used to predict the solubility of drugs in polar or semi-polar solvents cannot predict the exact amounts of drug solubility in binary and ternary solvents mixtures. The main objective of this study is to evaluate the usefulness of some available solubility models.

Methods: Sealed flasks containing excess amount of acetaminophen in water–ethanol–glycerin binary and ternary mixtures were agitated at 25°C in shaker incubator for 48hours to produce saturated solutions. After filtration and dilution of the solutions they were assayed by spectrophotometric method. Some empirical solubility models including Jouyban- Acree model was used to predict the solubility of acetaminophen in binary and ternary mixtures. A minimum number of 3 solubility data points in sub-binary solvents has been employed to calculate the solvent–solute interaction terms of the model. The calculated interaction terms were used to predict the solubility in binary and ternary solvent systems. The predicted solubilities were compared with experimental solubility data and mean percentage deviation (MPD) was computed as a criterion of prediction capability.

Results: MPDs for predicted solubilities of acetaminophen in binary solvents of water-ethanol, ethanol-glycerin, water-glycerin and ternary solvents were 52.3% (N9),49.2% (N9),18.1%(N9) and 66.1% (N9) respectively.

Conclusions: According to this study one could predict the solubility of acetaminophen with minimum number of experimental solubility data in binary solvents and then prediction of the solubility in all solvent compositions of binary and ternary solvents would be practical. Although the prediction errors were relatively high but they were within an acceptable error range and these models could be used to estimate the solubility of drug in mixed solvent systems.

Keywords: Acetaminophen; Solubility prediction; Empirical models