Extraction Spectrophotometric Determination of Pharmaceutical Compounds

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ABSTRACT

A simple, sensitive and fairly rapid method for the determination of noscapine (an opium alkaloid of pharmaceutical importance) is described. It is based on the measurement of the absorbance of the organic soluble ion association complex formed between the noscapine monocation and a bulky counter anion. The most suitable system was based on bromocresol green (BCG) (pH 3.0). The BCG system exhibits negligible or no interference when used for the determination of 38 ppm noscapine in the presence of several drug excipients, thus lending themselves as a possible procedure for the analysis of this alkaloid in pharmaceutical preparations.

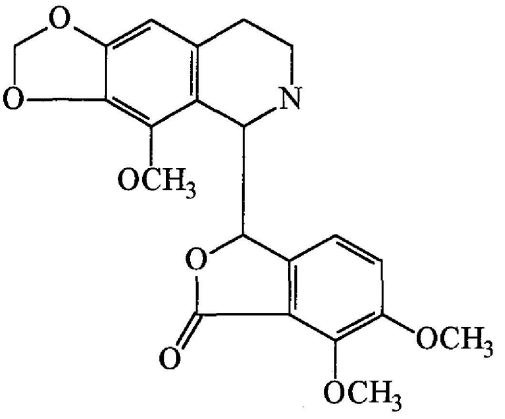
INTRODUCTION

Noscapine (**I**) is an important naturally occuring opium alkaloid and is present in amounts of 6-11% of the raw material depending on season and locality [1,2]. Unlike morphine and codeine, it has no analgesic activity nor abuse potential. Its major pharmaceutical actions is its anti-tussive activity, which has been reported to be equivalent to that of codeine [1].

Noscapine and its metabolites in plasma have been determined using high-performance liquid chromatography (HPLC) [3-7]. The *British Pharmacopoiea* procedure [8] for the determination of noscapine in pharmaceutical preparations is based on non-aqueous titration. This method lacks specificity and is not suitable for determination of low levels of the alkaloid.

Simpler alternative methods that uses inexpensive instruments is needed for the determination of this pharmaceutically important

alkaloid. In this paper, the use of three bulky dyes were investigated as anionic counter ions for the formation of noscapine ion-association complex whose absorbance can be monitored upon extraction. The system were further optimized with respect to pH, choice of solvent., counter ion concentration and shaking time. Key analytical characteristics of the complexes were compared. Determinations of noscapine in the presence of common drug expicients were also performed.



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EXPERIMENTAL

Apparatus

All absorbance measurements were made on a Perkin-Elmer Lambda 5 UV/Vis Spectrophotometer with a matched quartz cuvettes of 1 cm path length. pH measurements of the aqueous phase were done using a Corning combination glass electrode (Catalog no. 476530) in conjunction with a Corning pH meter Model 21.

General procedure for extraction-spectrophotometry

1 ml of counter ion and buffer solution, respectively, were transferred into a series of 125-ml separating funnel. Aliquots of 1.0 millimolar alkaloid solution were next added to the funnels. The total volume of the aqueous phase was adjusted to 5 ml by the addition of distilled water. Finally, 10 ml extraction solvent was added to each funnel and the contents shaken vigorously for 60 seconds and was then allowed to stand for a few minutes until the two phases had completely separated. The absorbance of the separated organic layer was measured at their respective λ_{max} against a reagent blank. At least a duplicate was made for all measurements.

RESULTS AND DISCUSSION

The most suitable extraction conditions was found to be :
BCG : extracting solvent (chloroform or dichloromethane), pH 3.0.
In all instances, a shaking time of 60 seconds and counter-ion concentration of 1 m*M* was adopted.

Linearity of the calibration graph was studied at the above conditions for the respective counter-ions. The analytical characteristics of the extraction is summerized in Table 1.

Table 1. Characteristics of noscapine-bromocresol green complex

λ_{max}	413 nm
Molar absorptivity/ mol^{-1} cm^{-1}	9100
Detection limit	1.6 mg L^{-1}
Dynamic linear range	5-60 mg L^{-1}

The detection limit was calculated as described earlier [9] using the equation 3 *Sd*/*S* where *Sd* is the standard deviation of the blank and *S* is the corresponding slope of the calibration graph. The upper and lower limit of the dynamic linear range of concentration was estimated from the calibration graph, noting when the points start to deviate from the straight line. The molar absorptivity of the ion-association systems obtained are comparable to those based on phenothiazine derivatives [9] and anti-inflammatory drugs [10] described earlier. The table reveals that the most sensitive counter ion is BCG. The use of chloroform was chosen as the extracting solvent due to its lower volatility for application studies. The BCG-based ion association complex is not only the most sensitive but also exhibits the lowest detection limit and the widest dynamic linear concentration range (Table 1).

Determination of noscapine

Interferences from some common drug excipients were examined. It was found that these compounds exhibit minimum interference, even when present at fifty times the level of noscapine. Determination of 38 ppm noscapine in a mixture containing 380 ppm each of ascorbic acid, citric acid, glucose, magnesium sulfate and starch are also satisfactory.

The relative standard deviation of five determinations of 38 ppm noscapine was found to be 0.50.

CONCLUSION

An extractive spectrophotometric procedure for the determination of noscapine was developed based on BCG with chloroform as the extracting solvent. The proposed procedure is fairly rapid, simple, sensitive and accurate and promised good prospects for the analysis of noscapine in pharmaceutical preparations. Additionally, the method uses cheaper instrumentation as compared to HPLC.

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