"Analytical Study on Some Drugs Used in Ear and Eye Drops"

Presented by

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ABSTRACT

This thesis is concerned with analytical study of some drugs used in ear and eye drops, representing different chemical classes. namely Phenylephrine HCl , Cyclopentolate HCl , Ciprofloxacin HCl , Hydrocortisone , Chloramphenicol , Dexamethasone Sodium Phosphate , Tetrahydrozoline HCl (TETRA), Clioquinol , Flumethasone Pivalate .

The aim of this work is to develop simple, rapid, sensitive and selective methods for simultaneous determination of the cited drugs in their mixtures in pure forms or in pharmaceutical preparations.
The thesis comprises four parts:

PART 1 :

Simultaneous Determination of Phenylephrine HCl and Cyclopentolate HCl in Pure Forms and in Pharmaceutical Preparation.

This part comprises four sections:

Section (A) : Simultaneous Determination of Phenylephrine HCl and Cyclopentolate HCl by Spectrophotometric Method.

In this section, Phenylephrine HCl could be determined in presence of Cyclopentolate HCl using a zero order spectrum with an analytical useful maximum at λ_{max} 275 nm. The absorbance obeyed Beer's law over concentration range 4 - 40µg.mL^{-1} with mean percentage recovery 99.77± 1.092.While determination of Cyclopentolate HCl in presence of Phenylephrine HCl was obtained by third derivative D_3 spectrophotometry at λ_{max}222.2 nm. The peak height response obeyed Beer's law over concentration range 1–10 µg.mL^{-1} with mean percentage recovery 99.86 ± 1.379.

Section (B): Simultaneous Determination of Phenylephrine HCl and Cyclopentolate HCl by Spectrodensitometric Method.

In this section, both drugs are separated on a silica gel plate using ethylacetate : methanol : ammonia solution(48 : 12: 2.4 by volume) as

mobile phase and UV detection of Phenylephrine HCl band at 254 nm over a concentration range of 1- 9µg.band $^{-1}$ with mean percentage recovery 100.31±1.293 and Cyclopentolate HCl band was detected at λ_{max} 210 nm over a concentration range of 2 - 8µg.band $^{-1}$ with mean percentage recovery of 100.56± 1.251 .

Section (C): Determination of Cyclopentolate HCl by The Colorimetric Method (Ternary Complex) in Presence of Phenylephrine HCl.

This section includes a colorimetric determination of Cyclopentolate HCl in presence of Phenylephrine HCl through formation of ternary complex. A bluish green color was obtained which can be measured at λ_{max} 625 nm.

The absorbance obeyed Beer's law over concentration range 10 - 70 µg.mL $^{-1}$ with mean percentage recovery 100.69± 0.720. The selectivity of the proposed method was checked using laboratory prepared mixtures and it was successfully applied to the analysis of the pharmaceutical preparation containing Cyclopentolate HCl with no interference from Phenylephrine HCl and other dosage form additives .

Section (D): Determination of Phenylephrine HCl by The Colorimetric Method (Diazotization Coupling Technique) in Presence of Cyclopentolate HCl.

This section includes a colorimetric determination of Phenylephrine HCl in presence of Cyclopentolate HCl using diazotization coupling technique method. Yellow color was obtained which can be measured at λ_{max} 460 nm. The absorbance obeyed Beer's law over concentration range 4 - 10 µg.mL $^{-1}$ with mean percentage recovery 100.02±0.488.

PART ll :

Simultaneous Determination of Ciprofloxacin HCl and Hydrocortisone in Pure Form and in Pharmaceutical Preparation.

This part comprises four sections:

Section (A): Simultaneous Determination of Ciprofloxacin HCl and Hydrocortisone by Spectrophotometric Method.

In this section, Ciprofloxacin HCl could be determined in presence of Hydrocortisone using a zero order spectrum with an analytical useful maximum at λ_{max} 322 nm. The absorbance obeyed Beer's law over concentration range 1 - 12 µg.mL^{-1} with mean percentage recovery 99.63 ± 1.352. Determination of Hydrocortisone in presence of Ciprofloxacin HCl was obtained by simultaneous use of the first derivative of the ratio spectra (^{1}DD) with measurements at 255.8 nm using the spectrum of 12µg.mL $^{-1}$of Ciprofloxacin HCl as a divisor over a concentration range of 1–25µg.mL^{-1} with mean percentage recovery 100.11 ± 0.833.

Section (B): Simultaneous Determination of Ciprofloxacin HCl and Hydrocortisone by The Spectrodensitometric Method.

In this section, both drugs are separated on a silica gel plate using chloroform : methanol : benzene : ammonia solution (57: 21 : 25.5: 3 by volume) as mobile phase and UV detection of Ciprofloxacin HCl band at 254 nm over a concentration range of 0.2 - 1 µg.band $^{-1}$with mean percentage recovery of 99.62 ± 0.421. Hydrocortisone band was detected at 245nm over a concentration range of 0.3 – 1.4 µg.band $^{-1}$ with mean percentage recovery of 99.8 ± 1.291.

Section (C): Multivariate Spectrophotometric Technique for Determination of Ciprofloxacin HCl and Hydrocortisone Mixture.

Two chemometric techniques, Principle component regression (PCR) and Partial least squares (PLS) have been successfully applied for simultaneous determination of Ciprofloxacin HCl and Hydrocortisone in pure forms and in pharmaceutical preparation .CLS has been applied for pure forms only .Training set of 10 mixtures containing different ratios of Ciprofloxacin HCl and Hydrocortisone is used for construction of the three models .

Section (D): Determination of Ciprofloxacine HCl in presence of Hydrocortisone by the Spectrofluorimetric Method.

This section includes studying different factors affecting the native fluorescence of Ciprofloxacin HCl including the solvents, different surface active agent, different pH values and different excitation and emission wavelengths. Also the stability of Ciprofloxacin HCl fluorescence intensity by time is studied.

PART lll:

Simultaneous Determination of Chloramphenicol, Dexamethasone Sodium Phosphate and Tetrahydrozoline HCl by The Spectrophotometric Method in Their Ternary Mixtures and Multivariate Spectrophotometric Method in Their Ternary Mixtures and in Presence of Chloramphenicol Degradate .

This part comprises three sections:

Section (A): Simultaneous Determination of Chloramphenicol, Dexamethasone Sodium Phosphate and Tetrahydrozoline HCl by Spectrophotometric Method in Their Ternary Mixtures.

In this section, the first derivative D_1 spectrophotometric method is applied for determination of Chloramphenicol in presence of Tetrahydrozoline HCl and Dexamethasone Sodium Phosphate at λ_{max} 295 nm in the range of 5 – 60µg.mL $^{-1}$ with mean percentage recovery of 99.74 ± 1.816 .

Dexamethasone Sodium Phosphate was determined by simultaneous use of the first derivative of the ratio spectra (^{1}DD) with measurements at λ_{max} 262.4 nm using the spectrum of 6µg.mL $^{-1}$of Tetrahydrozoline HCl as a divisor over a concentration range of 5 – 25µg.mL^{-1}with mean percentage recovery 99.82 ± 1.631.

Tetrahydrozoline HCl was determined by simultaneous use of the first derivative of the ratio spectra (^{1}DD) with measurements at λ_{max}236.6nm using the spectrum of 60µg.mL $^{-1}$of Chloramphenicol as a divisor over a concentration range of 3 – 18 µg.mL^{-1}with mean percentage recovery100.73 ± 0.765 .

Section (B): Simultaneous Determination Chloramphenicol, Dexamethasone Sodium Phosphate and Tetrahydrozoline HCl by The Multivariate Spectrophotometric method in Their Ternary Mixtures.

Two chemometric techniques, Principle component regression (PCR) and Partial least squares (PLS) have been successfully applied for simultaneous determination of Chloramphenicol, Dexamethasone and Tetrahydrozoline HCl in pure forms and in pharmaceutical preparations .Training set of 13 mixture containing different ratios of Chloramphenicol, Dexamethasone and Tetrahydrozoline HCl is used for construction of the two models .

Section (C): Simultaneous Determination of Chloramphenicol, Dexamethasone Sodium Phosphate and Tetrahydrozoline HCl by The Multivariate Spectrophotometric method in Presence of Chloramphenicol Degradate .

Two chemometric techniques, Principle component regression (PCR) and Partial least squares (PLS) have been successfully applied for simultaneous determination of Chloramphenicol, Dexamethasone Sodium Phosphate and Tetrahydrozoline HCl and Chloramphenicol Degradate in pure forms and in pharmaceutical preparations. Training set of 16 mixture containing different ratios of Tetrahydrozoline HCl , Dexamethasone and Chloramphenicol is used for construction of the two models.

PART lV:

Simultaneous Determination of Clioquinol and Flumethasone Pivalate in Pure Forms and in Pharmaceutical Preparations .

This part comprises two sections:

Section (A): Simultaneous Determination of Clioquinol and Flumethasone Pivalate by Spectrophotometric Method.

In this section, Clioquinol could be determined in presence of Flumethasone Pivalate using a zero order spectrum with an analytical useful maximum at 328nm. The absorbance obeyed Beer's law over concentration range 1 - 9 µg.mL $^{-1}$ with mean percentage recovery 99.99 ±0.875. Determination of Flumethasone pivalate in presence of Clioquinol was obtained by simultaneous use of the first derivative of the ratio spectra (^{1}DD) with measurements at λ_{max} 241 nm using the spectrum of 50µg.mL $^{-1}$of Clioquinol as a divisor over a concentration range of 1–20µg.mL^{-1} with mean percentage recovery 100.68 ± 1.193.

<u>Section (B):</u> Simultaneous Determination of Clioquinol and Flumethasone Pivalate by The Spectrodensitometric Method.

In this section, both drugs are separated on a silica gel plate using ethylacetate : hexane : benzene : 96 % acetic acid (35 : 21 : 5 : 0.35 by volume) as mobile phase and UV detection of both bands at 254 nm . Clioquinol was determined over a concentration range of 0.6 – 2.2 µg.band $^{-1}$ with mean percentage recovery of 99.92 ± 0.983 while Flumethasone Pivalate was determined over a concentration range of 0.3 – 1.6 µg.band $^{-1}$ with mean percentage recovery of 99.85 ± 1.914.

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