International Journal of Pharmaceutical and Clinical Research
Online ISSN: 2664-7605; Print ISSN: 2664-7591
Received: 01-05-2019; Accepted: 02-06-2019; Published: 09-06-2019
www.pharmaceuticaljournal.in
Volume 1; Issue 2; 2019; Page No. 01-03

Identification and characterisation of lornoxicam (non-steroidal anti-inflammatory drug)

Navneet Kumar Verma[1], Asheesh Kumar Singh[2], Prem Chand Mall[3], Vikas Yadav[4]
[1-4] Buddha Institute of Pharmacy, GIDA, Gorakhpur, Uttar Pradesh, India

Abstract
Lornoxicam is a non-steroidal anti-inflammatory drug of the oxicam class with analgesic, anti-inflammatory and antipyretic properties. It is available in oral and parenteral formulations. Lornoxicam differs from other oxicam compounds in its potent inhibition of prostaglandin biosynthesis, a property that particularly explains the pronounced efficacy of the drug. Lornoxicam's anti-inflammatory and analgesic activity is related to its inhibitory action on prostaglandin and thromboxane synthesis through the inhibition of both COX-1 and COX-2. This leads to the reduction of inflammation, pain, fever, and swelling, which are mediated by prostaglandins. However, the exact mechanism of lornoxicam, like that of the other Non-steroidal anti-inflammatory drugs (NSAIDs), has not been fully determined. In this article authors had discuss about the preformulation study.

Keywords: lornoxicam, anti-inflammatory drug, antipyretic properties, preformulation study

Introduction
Lornoxicam is used for the treatment of various types of pain, especially resulting from inflammatory diseases of the joints, osteoarthritis, surgery, sciatica, and other inflammations [1] Very few analytical methods have been reported previously for the estimation of Lornoxicam in bulk, pharmaceutical dosage forms and biological samples using different analytical techniques. The summary results of the previously reported methods were discussed below. Aher K *et al.* [2] developed a simple, rapid, and precise method for quantitative analysis of Lornoxicam in pharmaceutical dosage forms. Chromatographic separation of Lornoxicam was achieved on a C18 analytical column with potassium dihydrogen phosphate buffer: acetonitrile, 70:30 (v/v), as mobile phase at ambient temperature. The flow rate was 1.0 ml/min and detection was carried out by absorption at 291 nm using a photodiode-array detector. The number of theoretical plates and tailing factor for Lornoxicam were 6,577 and 1.03, respectively. The linearity of the method was excellent over the range 10–100 µg/ ml Lornoxicam. The correlation coefficient was 0.9999. Relative standard deviations of peak areas from six measurements were always less than 2%. The proposed method was found to be suitable and accurate for quantitative analysis of Lornoxicam. Mahesh Attimarad *et al.* [3] developed a simple RP-HPLC method for the simultaneous determination of paracetamol and lornoxicam without prior separation. In this method, Kromasil C8 (250 mm, 4.6 mm, 5 µm) column was used. The mobile phase used was methanol:phosphate buffer (60:40, v/v, pH 6.4), at flow rate of 1 ml min -1. UV detection was monitored at 302 nm. Calibration graphs were established in the range of 1-150 µg ml -1 and 0.5-100 µg ml -1 for paracetamol and lornoxicam, respectively. The average retention time for paracetamol and lornoxicam was found to be 3.15 ± 0.03 min and 5.25 ± 0.06 min, respectively. The detection limit and quantification limit for paracetamol were 0.19 µg ml -1 and 0.59 µg ml -1 and for lornoxicam 0.10 µg ml -1 and 0.31 µg ml -1, respectively. The intraday and interday precisions expressed as percent relative standard deviation were below 2%. The mean recovery of paracetamol and lornoxicam was found to be in the range of 99.03- 101.2%. B.S. Kuchekar *et al.* [4] developed a simple, selective, rapid, and precise RPHPLC-PDA method for the simultaneous estimation of Lornoxicam (LOR) and Thiocolchicoside (THIO) in pharmaceutical dosage form by reverse phase liquid chromatography using Waters Symmetry C18 (250 mm × 4.6 mm, 5.0 µ) column. The 63 mobile phase consisting of methanol: THF: acetate buffer (60: 10: 30 v/v); pH adjusted to 5.5 with glacial acetic acid at a flow rate of 0.75 ml min-1and column was maintained at 500C with detection at 382 nm. The retention time of Thiocolchicoside and Lornoxicam was 3.36 and 4.08 minutes, respectively. The method was validated according to the ICH guidelines with respect to specificity, linearity, accuracy, precision and robustness, limit of detection and limit of quantification. Linearity of Lornoxicam and Thiocolchicoside were in the range of 0.2 to 80 µg/ml and 0.1 to 40 µg/ml, respectively and its percentage recovery were found to be 100.37 % and 100.51 %, respectively. The proposed method was suitable for simultaneous determination of Lornoxicam and Thiocolchicoside in pharmaceutical dosage form. Method was successfully applied for dissolution study of tablet formulation. Patel a *et al.* [5] developed and subsequently validated a simple reverse phase liquid chromatographic method for simultaneous determination of paracetamol and lornoxicam in combination. The separation was carried out using a mobile phase consisting of potassium dihydrogen phosphate, pH adjusted to 7.3 with triethyl amine and acetonitrile 70:30(%v/v).The column was used phenomex C18, 5 µm, (250x 4.6 mm) with flow rate 1.5ml/min using UV detection was at 257nm. The described method was linear over concentration range 20 to 60 µg/ml & 0.2 to1.8µg/ml for assay of paracetamol & lornoxicam respectively. The

retention time of paracetamol & lornoxicam were found to be 2.33 & 7.61 min, respectively. Result of analysis was validated statistically. The method show good reproducibility & recovery with % less than 1, all the tests of above mentioned studies were found to be in acceptance criteria. The method was found to be rapid, specific, precise & accurate and can be successfully applied for routine analysis of paracetamol & lornoxicam in bulk & combined dosage forms. G.devala rao *et al.* [6] described two simple and sensitive visible spectrophotometric methods (A & B) for the determination of lornoxicam (loc) in bulk and pharmaceutical dosage forms. Method-A, was based on oxidation of drug with ferric chloride and subsequent complexation of Fe(II) with 2, 2' bipyridine toform a blood red colored species (λmax:520nm). Method-B, was based on oxidation of lornoxicam with ferric chloride and chelation of Fe (II) with bathophenanthroline to produce a blue colored chromogen (λmax: 610 nm). These methods were extended to the analysis of pharmaceutical formulations and results were compared with the reference method.

Preformulation

Preformulation is the stage of development during which the physicochemical properties are characterized by various parameters some of these are solubility, stability, partition coefficient, hardness, adhesiveness, in vitro drug release study etc. The compilation of physicochemical properties is known as Preformulation studies. Preformulation studies are needed to ensure the development of a stable as well as therapeutically effective and safe dosage form. It is a stage of development during which the formulator characterizes the physic-chemical properties of the drug substances before initiating formulation development. The scope of Preformulation parameters maximizes the chance of success in formulating an acceptable, safe, efficacious and stable product and at the same time provide the basis for optimization of the drug product quality and efficacy. This investigation may merely confirm that there are no significant barriers to the compound's development.

Identification and Characterisation

Organoleptic characterization of Lornoxicam

The API was characterized for its organoleptic properties including the physical state, colour and odour has been reported.

Table 1: Physical properties of the drug

S. No	Characteristics	Specification
1	Physical state	Solid, Powder
2	Colour	Dark yellow
3	Odour	Characteristic

Interpretation of Pure Drug (Lornoxicam)

Table 2: IR Interpretation of the pure drug

S. No	Bonds	Functional group
1	N-O asymmetric stretch	Nitrogen compound
2	C-N stretch	Aliphatic amines
3	C-C stretch (in ring)	Aromatic
4	C=O stretch	Unsaturated aldehydes

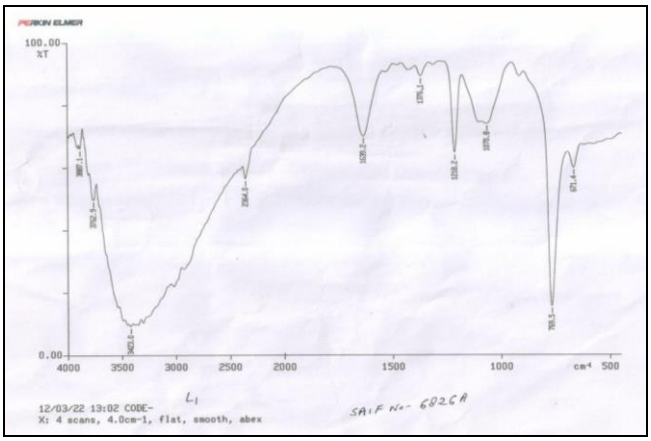

Fig 1: IR of the pure

3.1.3 Drug excipients compatibility studies (FTIR)

Fourier transform infrared spectroscopy is technique which is used to obtain an infrared spectrum of absorbance, emission, photoconductivity or Raman scattering of solid a solid, liquid or gas. An FTIR spectrum simultaneously collects spectrum data in a wide range. This confers significant advantages over a dispersive spectrometer which measures intensity over a narrow range of wavelength at a time.

3.1.3.1 FTIR Interpretation of Drug and Polymers

Table 3: FTIR Interpretation of Drug and Polymer (Lornoxicam + Carbopol 934)

S. No	Bonds	Functional groups
1	-O-H stretch, H bond	Alcohols, phenols
2	-C (triple bond) c-stretch	Alkynes
3	C=O stretch	Unsaturated aldehydes
4	C-C stretch (in ring)	Aromatic
5	N-O asymmetric stretch	Nitrogen compound
6	C-N stretch	Aromatic amines
7	C-N stretch	Aliphatic amines
8	C-N stretch	Aliphatic amines
9	C-N stretch	Aliphatic amines
10	C-N stretch	Aliphatic amines
11	C-N stretch	Aliphatic amines
12	C-Cl stretch	Alkyl halides
13	C-H	Aromatic
14	-C(Triple bond) C-H:C-H bend	Alkynes

Table 4: FTIR Interpretation of Drug and Polymer (Lornoxicam + Carbopol 940)

S. No.	Bonds	Functional groups
1	O-H stretch, H-bonded	Alcohols, phenols
2	C-H stretch	Aromatics
3	C=C stretch	Alpha, beta-unsaturated aldehydes, ketones
4	-C=C- stretch	Alkynes

5	N-O asymmetric stretch	Nitro compounds
6	C-C stretch (in ring)	Aromatics
7	N-O symmetric stretch	Nitro compound
8	C-H wag (-CH2X)	Alkyl halides
9	C-N stretch	Aliphatic amines
10	C-N stretch	Aliphatic amines
11	C-Cl stretch	Alkyl halides
12	C-Br stretch	Alkyl halides

3.1.4 Solubility Study

The solubility of drug is an important physicochemical property because it affects the bioavailability of the drug, the rate of drug release into the dissolution medium, and the therapeutic efficacy of the pharmaceutical product. Common solvents used various polar and non-polar solvent. The API and solvent were added in a ratio of 1:1.

Table 5: Solubility studies of Lornoxicam drug

S. No.	Solvent	Solubility
1.	Distilled water	Freely soluble
2.	PBS (6.8 PH)	Freely soluble
3.	DMSO	Freely soluble
4.	Methanol	Slightly soluble
5.	Ethanol	Slightly soluble

3.1.5 Calibration curve of API (Lornoxicam)

3.1.5.1 Preparation of Phosphate buffer pH 6.8 (1000 ml)

34.87 gram of potassium dihydrogen phosphate and 35.08 gram of Disodium hydrogen phosphate was dissolved in sufficient water to produce 1000 ml of buffer

3.1.5.2 Calibration procedure

Serial dilution

100 mg of Lornoxicam drug was dissolved in 100 ml of phosphate buffer pH 6.8 (Primary stock solution). 2 ml of sample withdrawn from the primary stock solution in a 100 ml volumetric flask and volume was made up to 100 ml with phosphate buffer (Secondary stock solution). After the serial dilution with phosphate buffer pH 6.8, the absorbance was noted by the U.V Spectrophotometer.

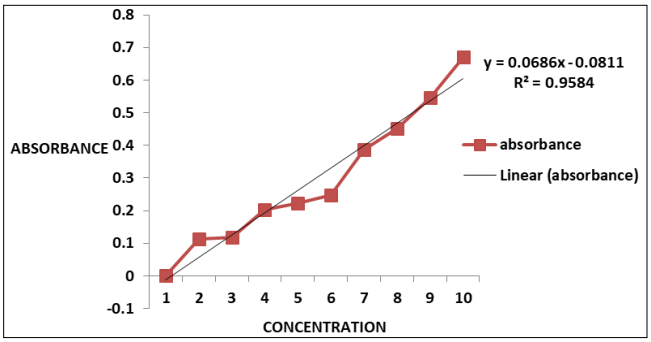

Fig 2: Calibration curve of Lornoxicam in phosphate buffer pH 6.8 at λ max (380 nm)

Conclusion

The carbopol 934 and carbopol 940 were used as gelling agent at various concentrations and it provide good appearance and consistency to the formulation. The combination of carbopol 934 and carbopol 940 were used in the formulation of emulgel in ratio of 1:1 to 1:9. Due to its non-greasy, gel like property it provides better release of drugs as compare to other topical drug delivery system. Incorporation of emulsion into gel makes it a dual control release system Further problem such as phase separation, creaming associated with emulsion gets revolved and its stability improves.

References

1. Haberfeld H. ed. Austria-Codex (2009/2010 Ed.). Vienna: Osterreichischer Apothekerverlag, 2009.
2. Aher KB, Bhavar GB, Joshi HP, Rapid RP-HPLC. Method for quantitative determination of Lornoxicam in Bulk and pharmaceutical Formulations. International Journal of chemtech Research. 2011; 3(3):1220-1224.
3. Mahesh Attimarad, Simultaneous determination of paracetamol and lornoxicam by RP-HPLC in bulk and tablet formulation. 2011; 2(1):61-66.
4. Madhusmita Sahoo, Pratima Syal, Snehal Ingale, Kunal Ingale, Santosh Sindhe, Monali Sali, *et al.*. Development and Validation of a RP-HPLC-PDA method for Simultaneous Determination of Lornoxicam and Thiocolchicoside in Pharmaceutical dosage form and its Application for Dissolution study, Int. J Res. Pharm. Sci. 2011; 2(1):1-7.
5. Patel A, Patel N, Patel M, Lodha A, Chaudhuri J, Jadia P, *et al.*. Development and validation of anlytical methods for the simultaneous estimation of lornoxicam and paracetamol from their pharmaceutical dosage form, iosr journal of pharmacy. 2012; 2(3):364-366.
6. Venumadhav E, Neeha T, Bhargavi P, Amreen Nishat, Swetha A, Devala Rao G, *et al.*. New spectrophotometric methods for the Determination of lornoxicam in pharmaceutical dosage Forms. International journal of pharma and bio sciences, 2010; 4(4).