Abstract

Prazosin is one of the alphaone adrenoreceptor blocker used in hypertension, benign prostatic hyperplasia, prostate cancer etc. The alpha blockers are relatively inexpensive and exert their effects quickly and Prazosin is the most commonly used alpha blocker. This review highlights various analytical methods for the determination of Prazosin hydrochloride in different matrices. Analytical methods reported are classified into four categories viz; spectrophotometry, chromatography, pharmacopoeial and other methods. The methods were described in terms of sensitivity (LOD & LOQ), linear range, principle and its applicability. This review also briefly highlights pharmacology of prazosin. This review is helpful for the researchers and scientists studying Prazosin hydrochloride in its analytical and pharmacological aspect.

Keywords: Prazosin, Hypertension, Benign Prostatic Hyperplasia, Analytical methods, Spectrophotometry, Chromatography.

1. Introduction

Prazosin Hydrochloride [CAS number 19237-84-4], [4-(4-Amino-6,7-dimethoxy-2-quinazolinyl)-1-piperazinyl]-2-furanylmethanone, 1-(4-amino-6,7-dimethoxy-2-quinazolinyl)-4-(2-furanylcarbonyl) piperazine and 2-[4-(2-furoyl)piperazin-1-yl]-4-amino-6,7-dimethoxy quinazoline furazosin [1] a quinazoline derivative, is a peripheral vasodilator used in the treatment of arterial hypertension and congestive heart failure (CHF). Prazosin is extensively metabolised by the liver and has high first-pass metabolism and low oral bioavailability. In normal healthy volunteers, the time of peak concentration occurs between 1 and 3 hours after oral administration, with wide interindividual variations. The extent of oral absorption seems to be similar for different pharmaceutical forms and is not influenced by the presence of food in the digestive tract. Oral bioavailability of prazosin ranges from 43.5 to 69.3% (mean 56.9%). Prazosin is highly (92 to 97%) bound to human plasma proteins (albumin and alpha 1-acid glycoprotein) and the extent of binding is independent of the plasma concentration of the drug in the range of 20 to 150 ng/ml [2].

Selective α1-blockers (Prazosin and doxazosin) causes vasodilation. They are also used for benign prostatic hyperplasia (relaxation of urinary tract smooth muscle), congestive heart failure and Raynaud’s disease. All α-blockers should be titrated carefully as first-dose hypotension can be severe. They have additional favourable metabolic effects on lipid and glucose metabolism [3]. The quinazoline-based α1-blockers have been shown to have antitumor efficacy against prostate cancer cells via their potency to induce apoptosis and anoikis via an α1-adrenoceptor-independent mechanism [4]. Prazosin is a potential anticancer agent that induces apoptotic signaling cascades in a sequential manner [5]. Prazosin was the next selective (after Phenoxycbenzamine) alpha-1-blocker used to manage benign prostatic...
Prazosin is usually prepared as solid-state forms of prazosin hydrochloride, five crystalline polymorphic modifications of which are claimed, namely, forms α, β, γ, δ, and ε [11]. The alpha form is reproducibly manufactured and has valuable advantages over the other polymorphic forms due to ease of handling, storage, stability and formulating. This alpha form was used in clinical trials to show efficacy of the drug. Prazosin hydrochloride is a white to off-white, crystalline, odorless powder [12]. Its chemical formula is C19H23N3O6, molecular weight is 383.41 and melting point is 278-280 °C [1].

2. Analytical methods

2.1 Spectrophotometry methods

Spectrophotometry methods are among the oldest methods of analytical chemistry. Spectrophotometric methods of identification and determination of substances are based on the existence of relationship between the position and the intensity of absorption bands of electromagnetic radiations, on the one hand, and the molecular structure on the other [13].

In this paper, twenty one different spectrophotometry methods are described. The summary of these methods is presented under Table 1. Methods available in the current literature are described in terms of principle, linear range, limit of detection (LOD), limit of quantitation (LOQ) and applicability. It is clear from Table 1 that spectrofluorimetry methods are more sensitive methods as compared to direct and simple spectrophotometry methods. Flow injection analysis by using spectrofluorimetry has additional advantage over other methods of determining many samples in a short period of time.

Table 1: Summary of various spectrophotometry methods for Prazosin HCl determination

<table>
<thead>
<tr>
<th>Principle</th>
<th>Wavelength</th>
<th>Linear Range</th>
<th>LOD</th>
<th>LOQ</th>
<th>Application</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ion pair formation with bromocresol purple</td>
<td>410 nm</td>
<td>2-10 μg/ml</td>
<td>-</td>
<td>-</td>
<td>Tablets</td>
<td>14</td>
</tr>
<tr>
<td>Reaction with mercurochrome</td>
<td>542 nm</td>
<td>5-10 μg/ml</td>
<td>-</td>
<td>-</td>
<td>Tablets</td>
<td></td>
</tr>
<tr>
<td>Fluorometry: with mercurochrome in aqueous neutral buffered solution</td>
<td>λex = 295, λem = 530 nm</td>
<td>0.05-0.2 μg/ml</td>
<td>-</td>
<td>-</td>
<td>Tablets</td>
<td></td>
</tr>
<tr>
<td>Dissolved in Britton–Robinson buffer at pH 1.8</td>
<td>317, 329 and 341 nm</td>
<td>100x10⁻³ and 5.0x10⁻³ M</td>
<td>0.9x10⁻³ M</td>
<td>40 μg/ml</td>
<td>Tablets</td>
<td>15</td>
</tr>
<tr>
<td>Coloured derivative between the drug and 1,2-naphthoquinone-4-sulphonic acid sodium salt (NQS). The reaction proceeds quantitatively at pH 4.5 and 70°C for 40 min and extracted with chloroform: n-butanol (3:1).</td>
<td>400 nm</td>
<td>6-30 μg/ml</td>
<td>-</td>
<td>-</td>
<td>Tablets</td>
<td></td>
</tr>
<tr>
<td>Second-derivative in 0.2 N methanolic hydrochloric acid</td>
<td>Positive peak at 156 nm, negative peak at 346 nm</td>
<td>1-20 μg/ml</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reaction with 2,3-dichloro-5,6-dicyano-1,4-pyridine-DODD (in acetonitrile)</td>
<td>460 nm</td>
<td>5-60 μg/ml</td>
<td>-</td>
<td>-</td>
<td>Tablets</td>
<td></td>
</tr>
<tr>
<td>Reaction with bromophenol blue (BPB) in CHCl₃</td>
<td>410 nm</td>
<td>2-18 μg/ml</td>
<td>-</td>
<td>-</td>
<td>Tablets</td>
<td></td>
</tr>
<tr>
<td>Treating with excess N-bromosuccinimide (NBS) and determining the un consumed NBS with p-aminophenol sulphate (metol)-sulphanilamide (SA) reagent</td>
<td>320 nm</td>
<td>1-10.0 μg/ml</td>
<td>-</td>
<td>-</td>
<td>Tablets</td>
<td>19</td>
</tr>
<tr>
<td>Treating with 3-methyl-2-benzothiazolone hydrazide hydrochloride (MBTH) in the presence of ceric ammonium sulphate (CAS)</td>
<td>620 nm</td>
<td>2.5-25 μg/ml</td>
<td>-</td>
<td>-</td>
<td>Tablets</td>
<td></td>
</tr>
<tr>
<td>Treating with acidic dyes such as orange-II (O-11) and alizarin violet 3B</td>
<td>490 and 570 nm</td>
<td>1.75 and 2.5-30.0 μg/ml</td>
<td>-</td>
<td>-</td>
<td>Tablets</td>
<td></td>
</tr>
<tr>
<td>Dilutions prepared in methanol</td>
<td>246nm</td>
<td>5.80 μg/ml</td>
<td>1 μg/ml</td>
<td>2.2 μg/ml</td>
<td>API and tablet</td>
<td>20</td>
</tr>
<tr>
<td>Diazotization with sodium nitrite and hydrochloric acid and reaction with β-naphtol</td>
<td>480 nm</td>
<td>40-225 μg/ml</td>
<td>1.23 μg/ml</td>
<td>4.1 μg/ml</td>
<td>Tablets</td>
<td></td>
</tr>
<tr>
<td>Complex with rose Bengal (RB)</td>
<td>572 nm</td>
<td>2.5-25 μg/ml</td>
<td>0.89 μg/ml</td>
<td>0.5-8 μg/ml</td>
<td>Tablets</td>
<td></td>
</tr>
<tr>
<td>Fluorometry: Dilutions prepared with Clark and Labs buffer solution pH 5.5. The difference in the fluorescence intensity (ΔF) was plotted vs. the final concentration of the drug (μg/ml) to get the calibration curve</td>
<td>λex,388 nm using λem, 340 nm</td>
<td>0.05–1.4 μg/ml</td>
<td>0.019 μg/ml</td>
<td>0.182 μg/ml</td>
<td>Tablets</td>
<td>22</td>
</tr>
<tr>
<td>Fluorometry: Dilutions prepared with Clark and Labs buffer solution pH 5.5</td>
<td>577 nm after excitation at 483 nm</td>
<td>0.5-8 μg/ml</td>
<td>0.006 μg/ml</td>
<td>0.55 μg/ml</td>
<td>Tablets</td>
<td></td>
</tr>
<tr>
<td>Drug extracted from blood by ethyl acetate after alkalization of the plasma with NaOH and then extracted back from the ethyl acetate into 0.1 N HCl and estimated by spectrofluorimetry</td>
<td>λex, 330 nm, λem, 390 nm</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>plasma prazosin levels</td>
<td>23</td>
</tr>
</tbody>
</table>
Fluorimetry: Bovine serum albumin (BSA) and Tris-HCl buffer (pH 7.4) used to prepare dilution. λex = 280 nm with λem recorded between 300–420 nm. 0 to 1.5×10^4 mol L^−1

Spectrophotometry

<table>
<thead>
<tr>
<th>Method</th>
<th>Chromatographic condition</th>
<th>Linear range</th>
<th>LOD</th>
<th>LOQ</th>
<th>Application</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPLC-F</td>
<td><em>l</em> bonded particle 10 μm, 30 cm × 3.9 mm column, Mobile phase: acetonitrile-water-acetic acid (50:47:3) flow-rate 2.2 ml/min, λex = 248 nm, λem = 389 nm.</td>
<td>1-15 ng/ml</td>
<td>-</td>
<td>-</td>
<td>Human plasma</td>
<td>29</td>
</tr>
<tr>
<td>HPLC- Electrochemical Detection</td>
<td>ODS Hypersil HPLC column (150 × 4.6 mm), Mobile phase consisting of 0.05 M Na2HPO4-acetonitrile (60:40), pH 8.4. Flow rate 1.0 ml/min. Potential of channel 2 was kept at +0.00 V and the guard cell had a potential of +300 V.</td>
<td>5 ng/ml to 250 ng/ml</td>
<td>2.5 ng/ml</td>
<td>Serum samples</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>HPLC-F</td>
<td>Column: 10 × 25 cm. Partisol 10-SCX cation-exchanger. Mobile phase: 14.7% acetonitrile, 85.3% deionized water, 0.5% diethylamine and 1.3% orthophosphoric acid. The flow rate was 2 ml/min.</td>
<td>0.2 ng to 50 ng/ml</td>
<td>0.2 ng/ml in whole blood and 0.5 ng/ml in plasma</td>
<td>-</td>
<td>Pharmacokinetic studies</td>
<td>32</td>
</tr>
<tr>
<td>HPLC-F</td>
<td>Column: <em>l</em> bonded particle reversed-phase column (30 × 3.9 mm ID, 10 μm particle size), λex = 340 nm, λem = 384 nm.</td>
<td>1.164 ng/ml</td>
<td>0.1 ng/ml in plasma, urine and whole blood.</td>
<td>-</td>
<td>Pharmacokinetic studies</td>
<td>33</td>
</tr>
<tr>
<td>HPLC-F</td>
<td>ODS column (25 × 4.6 mm i.d.) of 5μm particle size (Finepak SIL C18-5). The ODS guard column had dimensions 5cm×4-mm i.d. (Finepak SIL C18-5). Mobile phase: methanol-water: PIC B-5 (456:24:1,v/v). Flow rate of 1.0 ml/min λex = 340 nm, λem = 405 nm.</td>
<td>0.1 to 30 pmol/ml</td>
<td>0.2 pmol/ml</td>
<td>0.4 pmol ml^−1</td>
<td>Plasma determination</td>
<td>34</td>
</tr>
<tr>
<td>HPLC-UV</td>
<td>Nucleosil 50-10, C18 column (250×4.6mm, 10 micron) using methanol-water:acetonitrile-water: orthophosphoric acid (60:45:5 v/v, pH 3.83 ) as the mobile phase at a flow rate of 1 ml/min, 1 ml eluents λ = 240 nm.</td>
<td>2.5 to 50 μg ml^−1</td>
<td>0.0315 ng μg ml^−1 (Bulk)</td>
<td>0.0095 μg ml^−1 (Bulk)</td>
<td>Human Serum</td>
<td>35</td>
</tr>
<tr>
<td>HPLC-UV</td>
<td>Column: Nucleosil C18 (250×4-6 mm, 10 μm), mobile phase: 55:25:10(v/v) acetonitrile-water: orthophosphoric acid (pH 3.8) adjusted with glacial acetic acid. Flow rate of 1 ml/min using gradient elution through prepacked λ = 240 nm.</td>
<td>1.0-10 μg ml^−1</td>
<td>3.3 ng ml^−1 (Bulk)</td>
<td>2.2 ng ml^−1 (Bulk)</td>
<td>Pharmaceutical formulation, human serum</td>
<td>36</td>
</tr>
<tr>
<td>(LC-ESI TOF/MS)</td>
<td>Thermo Scientific C18 (250 mm × 2.1 mm, i.d.: 5 μm) column. Dilutions of this mixture were prepared in 0.1% formic acid in (Methanol-water:10/90, v/v). Mobile phase: (A) 0.1% FA in water and (B) Acetonitrile- Methanol (3:1, v/v) at 0.3 ml min^−1. The elution started at 5% B and was then linearly increased to 60% B over 3 min, further increased to 97% B over 3 min and then kept constant for 5 min.</td>
<td>1.5-150 μg ml^−1</td>
<td>-</td>
<td>33 ng/ml</td>
<td>Analysis in Tangkas River-Malaysia</td>
<td>37</td>
</tr>
<tr>
<td>HPLC-UV</td>
<td>Column: 5 μm, MS II (150 × 4.6 mm, 5 μm i.d.). Security guard cartridge (C18) (4 mm × 3 mm, i.d.) was 0.5-20 ng ml^−1</td>
<td>0.16-0.71 ng ml^−1</td>
<td>0.53-2.14 ng ml^−1</td>
<td>Rabbit plasma</td>
<td>38</td>
<td></td>
</tr>
</tbody>
</table>
HPLC-UV
Column: Nucleosil C18 (250 mm x 4.6 mm, 5μm), mobile phase: acetonitrile + 20 mM phosphate buffer (pH 6.3) (60:40, v/v) containing 25 mM SDS (Sodium dodecyl sulfate), λ = 290 nm, λ = 240 nm.
Flow rate was 1.0 ml/min. λ = 240 nm.

HPLC-RP
Gemini 5 μ C18 reversed phase column (250 mm x 4.6 mm, 5 μm). The mobile phase consisted of methanol (B) and ammonium acetate-formic acid buffer solution (25 mM; pH = 3.0). The gradient elution performed was: 0-9 min hold at 10% B, 9-20 min, turn from initial conditions to 30% B. 70% D The RLS signal was monitored at λ = 254 nm.

HPTLC
Silica gel G 60 F254 plates (10 cm x 0.1 mm) were cut into 250 μl samples. Flow rate: 1 ml/min. λ = 230 nm (0.05 ml), (B) methanol, (C) 10 mM ammonium acetate
Chromatography condition: Column (200×4 mm, 5μm), Zorbax Sil, Mobile phase: (0.01% diethylamine in glacial acetic acid, water and methanol in 2:2:96 ratio).

HPLC-F
Column: A. Polyspher® RP-18 (125mm x 4.4 mm id, 5 μm). Mobile phase: 70.0 ml of methanol, 1.0 ml of acetic acid 99.8%, 0.02 ml of triethylamine, and 30.0 ml of distilled water; pH 3.83. λ = 244 nm (λ = 389 nm).

HPLC-F
HPLC-F
HPLC-F
HPLC-UW
Waters Spherisorb ODS2 column (250 mm x 4.6 mm, 5 μm). Mobile phase: 0.05M monobasic sodium phosphate buffer (0.02 mole= L) adjusted to pH 3.0 (30:70, v/v), λ = 230 nm.
Flow rate 1 ml/min. λ = 254 nm.

HPLC-UW
Column: Purospher® RP-18 (250 mm x 4.6 mm, 5 μm). Mobile phase: formic acid buffer solution (25:75:0.1, by volume). λ = 254 nm
Flow rate was 1.0 mL min

HPLC-UW
Column: Nucleosil 18 (250×4.6mm), Waters Spherisorb ODS2 column (250 mm×4.6 mm, 5 μm). The mobile phase consisted of methanol, water, acetic acid and diethylamine 0.2 ml. Dilutions prepared in methanol water mixture in ratio 65:35:1:0.2.
Flow rate 1.1 ml/min. λ = 254 nm.

HPLC-UV
Column: Nucleosil C18 (250 mm x 4.6 mm, 10μm column. λ = 240 nm.
Flow rate 1 ml/min. λ = 250 nm.

HPLC-UW
Column: Nucleosil 18 (250×4.6mm), methanol: water (45:5:50% v/v) and (8.8:0.3:0.9, by volume). λ = 254 nm
Flow rate: 1 ml/min.

HPTLC
Silica gel C 60 F254 plates (10 cm x 0.1 mm) with 250 μl samples. Flow rate 1 ml/min. λ = 240 nm for PRZ and 254 for AB.

HPLC-F
Column: A. Polyspher® RP-18 (125mm x 4.4 mm id, 5 μm). Mobile phase: 70.0 ml of methanol, 1.0 ml of acetic acid 99.8%, 0.02 ml of triethylamine, and 30.0 ml of distilled water; pH 3.83. λ = 244 nm.

HPLC-UV
Spherisorb RP-C18 column (250mmx4.6mm, 5 μm) using water/acetonitrile/methanol/glacial acetic acid/diethylamine (25:35:40:1:0.017). flow rate 1 ml/min. λ = 254 nm.

HPLC-UW
Column: Kromasil C18 column. Methanol mobile phase. Flow rate 1.0 column. λ = 240 nm.

HPLC-UW
Column: Nucleosil 18 (250×4.6mm), Waters Spherisorb ODS2 column (250 mm×4.6 mm, 5 μm). Mobile phase: 0.05M monobasic sodium phosphate solution and 350 ml acetonitrile pH was adjusted to 3.0 with phosphoric acid. λ = 268 m for PRZ and 254 for AB.

HPLC-UW
Column: Kromasil C18 column. Mobile phase: 10 μ column. λ = 240 nm. Flow rate 1 ml

HPLC-UW
Column: IBM Cya, 5 μ spherical particles, 4.5 mm id x 250 mm, 650 ml. Mobile phase: 0.05M monobasic sodium phosphate solution and 350 ml acetonitrile pH was adjusted to 3.0 with phosphoric acid. λ = 268 m for PRZ and 254 for impurities.

HPLC-UW
Waters Spherisorb ODS2 column (250 mm x 4.6 mm i.d., 5 μm) acetonitrile;water:acetic acid:diethyl amine (65:35 1.0 2). Flow rate 1 ml min λ = 254 nm.

HPLC-UW
Column: Cyaano column (150×4.6 mm), mobile phase: acetonitrile: methanol: water: 45:50:5% v/v, and 3 mm heptane. sulphonic acid sodium. λ = 230 nm. Flow rate was 1.5 ml/min.

HPLC-UW
Cyan column (150×4.6 mm). Mobile phase: acetonitrile: methanol: water: 30:70:0.1%
Flow rate 1.0 column. λ = 254 nm.

HPLC-UW
Kromasil C18 column (250 x 4.6 mm, 5 μm). Mobile phase A: ACN-diethylamine (0.05 ml), B, methanol, and C: 10 mM Ammonium acetate
Stability indicating method

HPLC-UW
Stainless-steel tube (250 x ± 5 mm ID ) packed with Spherisorb SSW silica (5 μm). Mobile phase 10 mM ammonium perchlorate in methanol adjusted to pH 8.7 by the addition of 1 ml/m methanolic sodium hydroxide (0.1 M), Flow rate of 2.0 ml/min. λ = 250 nm, λ = 290–700 nm.

HPTLC
Silica gel aluminum plates 60:254 (20 x 15 cm, 200 μm thickness) mobile phase composed of methylene chloride:n-hexane:methanol (8:8.5:3.9:9, by volume) λ = 254 nm

HPLC-UW
Column: Cyan column (150 x 4.6 mm), mobile phase: acetonitrile: methanol: water (45:50:5% v/v) and 3 mm heptane sulphonic acid sodium. λ = 230 nm. Flow rate was 1.5 ml/min.

HPLC-UW
Column: Cyan column (150 x 4.6 mm), mobile phase: acetonitrile: methanol: water: 30:70:0.1%
Flow rate 1.0 column. λ = 254 nm.

HPLC-UW
Kromasil C18 column (250 x 4.6 mm, 5 μm), a UV detector at 230 nm and a elution was performed under a gradient mobile phase composed of (A) ACN diethylamine (0.05 ml), (B) methanol, (C) 10 mM ammonium acetate and (D) Water.
Flow rate: 1 ml/min.

Table 3: Summary of different chromatography methods

<table>
<thead>
<tr>
<th>Principle</th>
<th>Dosage form</th>
<th>Method</th>
<th>Limit</th>
<th>Ref</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPLC-UV</td>
<td>Prazosin tablet</td>
<td>Chromatography condition: Column 200×4 mm, 5μm, Zorbax Sil, Mobile phase: 0.01% diethylamine in glacial acetic acid, water and methanol in 2:2:9:6 ratio. Dilutions prepared in glacial acetic acid, water and methanol in 2:2:9:6 ratio. Flow rate 1 ml/min. λ = 254 nm.</td>
<td>90-110 % of stated amount</td>
<td>55</td>
</tr>
<tr>
<td>HPLC-UV</td>
<td>Prazosin tablet</td>
<td>Chromatography condition: Column 200×4 mm, 5μm, Mobile phase: 0.01% diethylamine in glacial acetic acid, water and methanol in 2:2:9:6 ratio. Dilutions prepared in glacial acetic acid, water and methanol in 2:2:9:6 ratio. Flow rate 1 ml/min. λ = 254 nm.</td>
<td>Not less than 98.5% and not more than 101.0 %</td>
<td>55</td>
</tr>
<tr>
<td>Potentiometry</td>
<td>Prazosin HCl</td>
<td>0.35 μm in 20 ml formic acid and 30 ml acetic anhydride. Titrated with 0.1 M perchloric acid.</td>
<td>Not less than 90.0% and more than 110.0%</td>
<td>55</td>
</tr>
<tr>
<td>HPLC-UW</td>
<td>Prazosin HCl</td>
<td>Chromatography condition: Column 250×4.6 mm, 5μm. Mobile phase: methanol, water, acid and diethylamine (3500: 1500: 50: 1). Flow rate is adjusted to RT 5 min, λ = 254 nm.</td>
<td>Not less that 97.0 % and not more than 103.0 %</td>
<td>57</td>
</tr>
<tr>
<td>HPLC-UW</td>
<td>Prazosin HCl capsules</td>
<td>Mobile phase, Chromatographic system, and Procedure are same as Prazosin HCl. Dilutions are prepared in Acid-methanol solution (300 ml water+0.85 ml HCl and diluted to 1000 ml with methanol).</td>
<td>Not less than 90 % and not more than 110.0 % of the labeled amount</td>
<td>57</td>
</tr>
</tbody>
</table>

Review Article
Alankar Shrivastava /2015
2.3 Other methods

Modern electrochemical methods are now sensitive, selective, rapid and easy techniques applicable to analysis in the pharmaceutico-technical fields, and indeed in most areas of analytical chemistry. They are probably the most versatile of all trace pharmaceutically active compound analysis [58,59]. Some methods based on electroanalytical techniques are also available including potentiometry, amperometry, voltammetry, capillary electrophoresis and electrochemical sensors. All of these reported methods are described in Table 4.

Table 4: Summary of some electroanalytical methods reported in literature

<table>
<thead>
<tr>
<th>Principle</th>
<th>Method</th>
<th>Linear range</th>
<th>LOD</th>
<th>LOQ</th>
<th>Application</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potentiometric</td>
<td>Plastic membrane electrode on incorporation of an ion pair complex of phosphotungstic acid (PT) anion with prazosinum cation in a poly (vinylchloride) (PVC) matrix plasticized with dioctylphthalate (DOP)</td>
<td>2.5×10⁻⁴ to 1×10⁻³ M</td>
<td>2×10⁻⁷ to 1×10⁻⁴ mol dm⁻³</td>
<td>-</td>
<td>Solution and tablets</td>
<td>60</td>
</tr>
<tr>
<td>Potentiometric</td>
<td>PVC membrane sensor</td>
<td>1×10⁻⁴ and 1×10⁻³ mol L⁻¹</td>
<td>6.3×10⁻⁷ mol L⁻¹</td>
<td>Tablets</td>
<td>61</td>
<td></td>
</tr>
<tr>
<td>Flow injection analy sis with multiple-pulse amperometric (FIA-MPA) detection</td>
<td>Boron-doped diamond film electrode.</td>
<td>2 to 200 μmol L⁻¹</td>
<td>0.5 μmol L⁻¹</td>
<td>-</td>
<td>Tablets</td>
<td>62</td>
</tr>
<tr>
<td>Capillary electrophoresis</td>
<td>Capillaries (50 and 75 μm I.D., 200 pm O.D., 64 cm long with 48 cm effective length) UV absorbance detector set at 220 nm.</td>
<td>0.5-30 μg/ml</td>
<td>-</td>
<td>-</td>
<td>human urine</td>
<td>63</td>
</tr>
<tr>
<td>Capillary electrophoresis</td>
<td>50 cm×75 μm I.D. capillary using a buffer containing 20% acetonitrile, 60 mM ammonium acetate, and 1.0% glacial acetic in methanol medium, with applied voltage and capillary temperature of 23 kV and 25 °C, respectively. λ = 220 nm.</td>
<td>5.0-250 μg ml⁻¹</td>
<td>0.5 μg ml⁻¹</td>
<td>-</td>
<td>Tablets</td>
<td>64</td>
</tr>
<tr>
<td>Differential pulse voltammetry (DPV)</td>
<td>Three-electrode system was used: a platinum counter, an Ag/AgCl reference and a nafion modified carbon paste electrode (NMPCE) as working electrode.</td>
<td>4.0×10⁻¹⁰ to 4.0×10⁻⁸ M</td>
<td>3.1×10⁻⁷ M</td>
<td>Urine and tablets</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Electrochemical sensor based on in situ modification of graphite electrode via graphene nanosheets (GNs)</td>
<td>Adsorptive stripping differential pulse voltammetry (Ads-DPV)</td>
<td>0.09-100 mM</td>
<td>0.02 mM</td>
<td>-</td>
<td>In urine samples and tablets</td>
<td>65</td>
</tr>
</tbody>
</table>

3. Conclusion

Hypertension is one of the most serious diseases of the XXI century concerning about 20 to 30% of the world population of adults [66]. Prazosin is largely free of toxic or major symptomatic side effects, with the exception of postural hypotension and syncope after first doses or large dose increments [67]. This review highlights the various analytical methods for the determination of prazosin in different matrices. The spectrophotometry, chromatography, pharmacopeial and electroanalytical methods were presented in a systematic way in Table 1, 2, 3 and 4 respectively. This review is helpful for the scientists engaged in the study of Prazosin.

References


[57] USP29-NF24, United States Pharmacopoeial Convention, Rockville, USA, pp. 1784-1785.


