

Analytical Methods for the Determination of Anti-Psoriatic Drugs - A Review

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Abstract

Psoriasis is a long-lasting autoimmune disease characterized by patches of abnormal skin. Typical psoriatic scales are in thick, red patches. Sometimes, these patches will crack and bleed. Psoriasis is the result of a sped-up skin production process. Some of the drugs used in the treatment of psoriasis are Acitretin, Etretnate, Bergapten, Methoxsalen, Tazarotene, Calcipotriol, Anthralin etc. A brief review of the analytical methods developed for the determination of drugs used for the treatment of Psoriasis was discussed in the present study.

Keywords: Acitretin; Etretnate; Bergapten

Introduction

Psoriasis is a chronic autoimmune condition that causes the rapid build-up of skin cells. This build-up of cells causes scaling on the skin's surface. Typically, skin cells grow deep in the skin and slowly rise to the surface. The typical life cycle of a skin cell is one month. Some of the drugs used in the treatment of psoriasis: Acitretin, Etretnate, Bergapten, Methoxsalen, Tazarotene, Calcipotriol, Anthralin and the chemical structures of these drugs were given in figure 1. The analytical methods so developed for the determination of these drugs were summarized in table 1.

Acitretin ($C_{21}H_{26}O_3$) is an oral retinoid used in the treatment of severe resistant psoriasis and is generally used in only very severe cases of psoriasis that have been unresponsive to other treatments [1,2]. Acitretin is available with brand names ACERET, ACETEC, ACITRIN, ACROTAC. Analytical methods such as HPLC [3-5], HPTLC [6], LC-ESI-MS/MS [7] were developed for the determination of Acitretin (Table 1).

Etretnate ($C_{23}H_{30}O_3$) is a medication used to treat severe psoriasis. It is a synthetic aromatic retinoid. The mechanism of action of Etretnate is still not understood but the action may be due to the interference with the terminal differentiation of keratinocytes [8]. Etretnate is available with brand names TEGISON (10 mg), TEGI-

Figure 1: Chemical structures of Anti-psoriatic drugs.

Method	Mobile phase (v/v) / Reagent	Ref
Acitretin		
HPLC	Glacial acetic acid: Acetonitrile: Iso propyl alcohol (0.3: 70:30)	[3]
HPLC	Ethanol: Water: Glacial acetic acid (7: 2.97: 0.03)	[4]
HPLC	Acetic acid buffer: Methanol: THF (12:85:3)	[5]
HPTLC	Acetonitrile: Chloroform (1:9)	[6]
LC-ESI-MS/MS	20 mM Ammonium acetate buffer: Acetonitrile (5:95)	[7]
Etretinate		
HPLC	Mobile phase A: 10% Ammonium acetate: Water: Acetonitrile: Acetic acid (8: 72: 20: 0.8). Mobile phase B: consists of two components (i) 10% Ammonium acetate: Water: Acetonitrile: Acetic acid (0.4: 29.6: 70: 0.3) (ii) 10% Ammonium acetate: Water: Acetonitrile: Acetic acid (0.4: 14.6: 85: 0.1)	[9]
Bergapten		
LC-MS/MS	Methanol: Water (75:25)	[11]
Methoxsalen		
HPLC	Methanol: Acetonitrile: Water (2: 30:68)	[13]
HPLC	Acetonitrile: 0.01 M Phosphoric acid (34:66)	[14]
LC/MS and NMR	Methanol: 6% THF (aqueous)	[15]
Tazarotene		
HPTLC	Toluene: Methanol (9: 1).	[17]
UV	Benzene: Chloroform: Ammonia (5: 5: 0.01)	[18]
HPLC	Mobile phase A: Buffer: Organic modifier (40:60) Mobile phase B: Organic modifier Buffer: 10 mM KH ₂ PO ₄ with pH 3.0 by ortho phosphoric acid Organic modifier: Methanol: THF (95:5)	[19]
Calcipotriol		
HPLC	Methanol: Water (80:20)	[21]
Anthralin		
HPLC	Acetonitrile: Methanol: Buffer (20:20:60)	[23]
HPLC	Acetonitrile: Water: Acetic acid (58:37:5)	[24]

Table 1: Review of analytical methods published for the drugs used in psoriasis.

SON (25 mg) and only one analytical method i.e. HPLC [9] was developed for the determination of Etretinate along with other compounds in plasma (Table 1). Bergapten (C₁₂H₈O₄) is used to treat more pigmentary diseases involving sun exposure [10] and LC-MS/MS [11] were developed for the estimation of Bergapten (Table 1).

Methoxsalen(C₁₂H₈O₄) is a drug used to treat psoriasis, eczema, vitiligo, and some cutaneous lymphomas. Methoxsalen modifies the way of skin cells to receive the radiation for treating the disease [12]. Methoxsalen is available as Maxlen, Meladerm, Octamop, Vitilen. Analytical methods such as HPLC [13,14], LC/MS and NMR [15] were developed for the estimation of Methoxsalen (Table 1).

Tazarotene (C₂₁H₂₁NO₂S) is a third generation prescription topical retinoid sold as a cream, gel, or foam. Tazarotene belongs to acetylenic class of retinoids. It is available in two concentrations: 0.1% and 0.05% [16]. Tazarotene is most commonly used topically to treat acne, psoriasis and to reduce skin wrinkling and liver spots. Tazarotene is available as TAZORAC, ZORAC, AVAGE, and FABIOR. Analytical methods such as HPTLC [17], UV [18], RP-HPLC [19] were developed for the estimation of Tazarotene (Table 1).

Calcipotriol or Calcipotriene, is a derivative of vitamin D used in the treatment of psoriasis and safe for long-term application. [20].

Calcipotriol, is available as DAIVONEX, PSOTRIOL. HPLC [21] was developed for the estimation of Calcipotriol (Table 1).

Dithranol is a hydroxyl anthrone applied to the skin of patients with psoriasis. It is available as cream, ointment or paste in 0.1 to 2% strengths with brand names DRITHOCREME, DITHROCREA,, MICANOL, PSORLIN, DRITHO-SCALP, ANTHRAFORTE, ANTHRANOL and ANTHRASCALP. Dithranol has a slow onset of action in controlling psoriasis, typically several weeks, compared to glucocorticoid steroids but is without the potential for rebound reaction on withdrawal [22]. Analytical methods such as HPLC [23,24] were developed for the estimation of Anthralin (Table 1).

Conclusion

The present review is very much helpful for the authors working in the field of analytical chemistry for method development and validation of drugs used in the treatment of psoriasis.

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