Review on analysis of interesting whitening agents in cosmetics products

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Review on analysis of interesting whitening agents in cosmetics products

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Abstract. The skin whitening as known as skin lightening or skin bleaching is the most commonly used skincare treatment that helps to achieve a lighter and healthier skin complexion by reducing the melanin concentration in the skin in the practice of using chemical products. Several chemicals are effective in skin whitening, while some of them are toxic or have problematic safety profiles. The products requiring to contain either kind of whiting agents were seen to display labeling issues. Such an elevated number of differences suggested concerns of whether such differences between stated and revealed content of whiting agents. The Analytical chemical measurements of these objects look necessary, no reliable analytical methods have been recorded to determine most of these chemicals. Just the measurement of hydroquinone and some of its ethers is treated by a method registered by the European Commission.

Introduction

Skin whiting or skin bleaching is the material used to improve the appearance of skin as well as the lighting of the skin through artificial such as creams, lotions, soaps and injections [1,2]. whiting agents contain the most popular compound like arbutin, ascorbic acid, azelaic acid, hydroquinone, and its derivatives, kojic acid, phytic acid, retinoic acid, and among others[3]. The skin is the largest organ in the human body. Chromophores cause skin colour, the present and ratio of several pigments in human skin control in skin colour. The central pigments of the epidermis are melanin derivatives. Oxyhaemoglobin, reduced haemoglobin and bilirubin are the secondary pigments, are present in small blood vessels of the dermis[4]. Melanin produced in special cells in the skin and protect against ultraviolet of sunlight, DNA damage and oxidative stress as well as give the certain colour skin[5][6].there are two important types of melanin are eumelanin (black\dark brown) and phaeomelanin(yellowish\brown) which are produced in melanogenesis process[7]. melanogenesis is a physiological pathway responsible for the production of melanin. The melanin produced at melanocyte cells by melanogenesis and then it is transported to keratinocytes. melanocytes in the skin are found on the layer

which is situated between dermis and epidermis .every melanocyte cell is surrounded by about 36 keratinocytes[8].

Figure 1 Most important ingredient in skin care products

Hydroquinone

Hydroquinone(1,4-dihydroxy benzene)(fig. 2) is an aromatic compound used in cosmetics as a skin bleaching, hair dye and as a drug to treat melasma[9]. is the most popular drug to reduce melanogenesis. Hydroquinone inhibits tyrosinase enzyme which controls the tyrosinase formation and its activity, melanization and degradation of melanosomes and modulates[10,11]. Hydroquinone has been forbidden in several countries because of its cytotoxic and mutagenic[12].

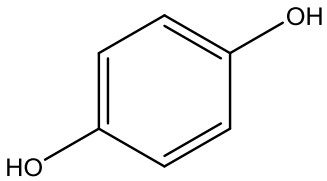

Figure. 2 Chemical structure of hydroquinone.

Tretinoin

Tretinoin (trans-retinoic acid)(fig. 6) is a bioactive form of vitamin A. It is called retinoic acid and it is a retinoid. Typical derivatives of retinoids are retinol, retinal, retinoic acid, retinyl palmitate and retinyl acetate. Tretinoine and its derivatives have been popularly used in skin treatment due to its ability in the treatment of dermatological diseases, such as skin cancer , ichthyosis , psoriasis, anti-ageing effects and acne[13, 14].

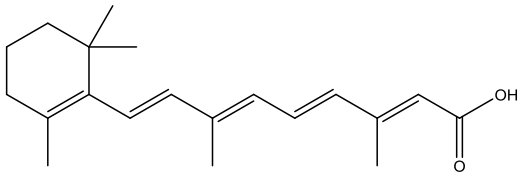

Figure. 3 Chemical structure of arbutine

Determination of Hydroquinone and tretinoin

Several procedures have been revealed to determine hydroquinone and tretinoin in skin whiting products. Spectrophotometric methods have been advanced to determine hydroquinone[15– 17], while Mallik had developed a spectrophotometric method to determine tretinoin[18].

Recently, researchers have developed RP-HPLC[19, 20] and anew HPLC-DAD techniques to determine hydroquinone and tretinoin[21], in addition to applying a voltammetric based nanoparticle and ionic liquids to determine hydroquinone[22].

Arbutin

Alph-arbutins (4-hydroxyphenol β-D-glycopyranoside) (Fig. 3) and Beta-arbutins (4-hydroxyphenol α-D-glycopyranoside) are glycoside derivatives of hydroquinone (fig. 1). The derived compound occurs naturally in many plants of wheat, cranberries and blueberries.It is an efficient agent for the treatment of hyperpigmentation disorders and shows less melanocyte cytotoxicity than hydroquinone[23,24]. An additional, it is beneficial for the treatment of dispels phlegm, urinary tract infections, relieves cough, and prevents asthma. The need for arbutin in recent years developed these diverse benefits rapidly[25]. Arbutin is a tyrosinase inhibitor, which chelates with its vital copper ion and thus leads to inhibits the tyrosine enzyme and crushing the tautomerization from dopachrome to 5, 6-dihydroxyindole-2-carboxylic acid (DHICA)[26]. Several analytical methods have been published for the measurement of arbutin in cosmetics. The most important method is high-performance liquid chromatography (HPLC), in addition, microdialysis sampling coupled to HPLC and HPLC with chemiluminescence detection, gas chromatography-mass spectrometry, micellar electrokinetic capillary chromatography (MEKC), MEKC with amperometric detection, simultaneous determinations of arbutin in cosmetics using HPLC and MEKC and online derivatization followed by disposable electrochemical sensing.There is no previous study in the literature on the decomposition of arbutin to hydroquinone, in arbutin-containing creams[23].

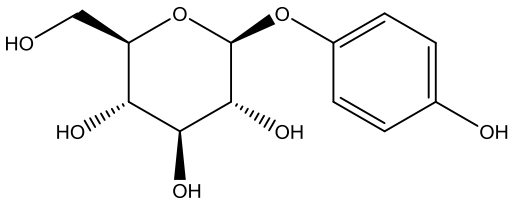

Figure. 3 Chemical structure of arbutine

Vitamin C

vitamin C (Fig. 4) is now popularly used in the food and cosmetic products as an antioxidant and skin whitener[27,28]. in the pharmaceutical industry have been using Vitamin C derivatives such as ascorbyl palmitate, magnesium ascorbyl phosphate, and ascorbyl tetraisopalmitate which are more stable than ascorbic acid beside emulsion formulation[29]. Vitamin C acts as an effective antioxidant , strengthens protection against Ultraviolet (UVB) rays, the treatment of hyperpigmentation , as an immunostimulant, to prevent carcinogenic changes to the skin, an anti-wrinkling agent[30]. Vitamin C concentration and the pH of the cosmetics determinate the degree of its absorption whereas a concentration (10%-20%) and pH equal to (3-3.5)[31].

Rapid determination had been provided to determine vitamin C such as near-infrared techniques, diffuse reflectance, and FT-Raman spectroscopy[32].in the other hand, the atomic force microscope had been used to determine ascorbyl tetraisopalmitate and l-ascorbic acid[30].

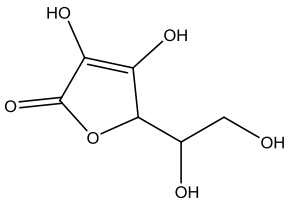

Figure. 4 Chemical structure of Ascorbic acid.

Glutathione

Glutathione (fig. 5) is a tripeptide consisting of glycine, cysteine, and glutamate, which is popularly used in cosmetics products for skin whiting, mainly in the Asian market. Glutathione is functions as a potent antioxidant in the body and represents important functions in keeping intracellular thiol situation and in Glutathione protects thiol protein groups from oxidation and is involved in cellular detoxification for the keeping of the cell environment. Reduced glutathione (GSH) has a skin-whitening effect in humans through its inhibition melanin production, but in the oxidized glutathione (GSSG), its role is unclear (Fig 5). In the human body, GSSG is readily converted to GSH via glutathione reductase [33,34].

HPLC-UV techniques and fluorescence detection had used to determine glutathione in pharmaceutical and cosmetics products[35] .No other official methods have been published to estimate GSH , GSSG in cosmetics products.

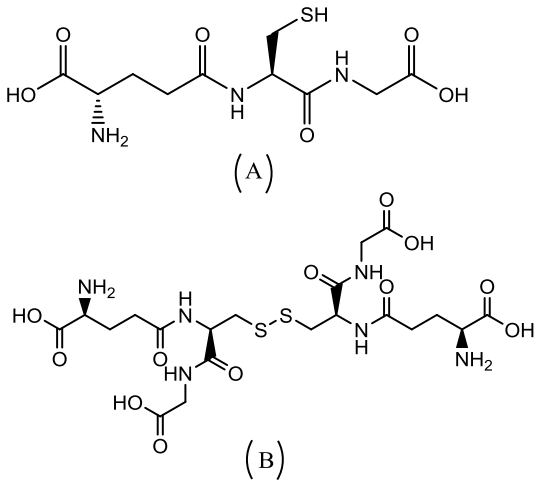

Figure. 5 chemical structure of GSH (A) and GSSG (B).

Conclusion

Whiting cosmetics products are very popularly nowadays all over the world, especially in oriental countries due to the damage which causes by the weather and the nature of the skin which is darker than in the other countries. In the markets, there are numerous products put individual health at risk hence the need to analysis methods has developed to control handling these products.

the most four important compounds were argued in this article. Hydroquinone and tretinoin were discovered by spectrophotometric methods, high-performance liquid chromatography techniques and voltammetric based nanoparticle and ionic liquids. Arbutin is a derivative of hydroquinone was determined by high-performance liquid chromatography techniques, gas chromatography-mass spectrometry , micellar electrokinetic capillary chromatography. Vitamin C the most famous compound has used as skincare was determined by near-infrared techniques, diffuse reflectance, and FT-Raman spectroscopy and the atomic force microscope. finally, glutathione HPLC-UV techniques and fluorescence detection had used to determine GSH.

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