# Spectral Study of Some Pharmaceuticals and Cosmetics

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**Revised on: 8/4/2014 & Accepted on: 8/1/2015**

**ABSTRACT**

The current study deals with hazards and safety precautions of some pharmaceutical and cosmetic creams used extensively in Iraq. UV absorption - related diseases of these products and people unawareness of side effects and the weak quality control are other reasons for conducting such study. Spectral study of fourteen pharmaceuticals and cosmetics was carried out within a wavelength range of (200 – 700)nm. The maximum absorption percentage of UV region was 5% for Tetraderm and and 3.66% for Nivea cream.

**Keywords:** pharmaceuticals and cosmetics, UV – VIS, absorption spectrum.

## دراسة طيفية لبعض المستحضرات الطبية والتجميلية

**الخلاصة:**

تناولت الدراسة الحالية الأخطار واحتياطات السلامة لبعض الكريمات الدوائية ومستحضرات التجميل المستخدمة على نطاق واسع في العراق . الصلة بين قابلية امتصاص الأشعة فوق البنفسجية لهذه المنتجات والامراض و جهل الناس للآثار الجانبية و ضعف مراقبة الجودة اضافة الى أسباب أخرى هي الدافع لإجراء مثل هذه الدراسة .وقد أجريت الدراسة الطيفية على أربعة عشر نوع من المستحضرات الطبية ومواد التجميل ضمن نطاق الطول الموجي من (200-700) نانومتر وكانت اعلى نسبة امتصاص للأشعة فوق البنفسجية هي 5٪ لـ Tetradermand و3.66٪ لـNivea cream .

## INTRODUCTION

Since life evolved under the influence of sunlight, it is not surprising that the human have developed a variety of physiological responses to the spectral characteristics of solar radiation and to its daily and seasonal variations [1]. The sun is our main source of UV radiation and light. In modern human life, other photon sources such as lamps and solaria play important roles. Humans are exposed to UV radiation and light in outdoor activities like sport, sunbathing and mountaineering. [2]

At the beginning of the 20th Century, a link between the exposure to sun and the development of cancer was first established by Norman Paul from Sydney, Australia. A few years later two Germans, Karl Eilham Hausser and Wilhelm Vahle, proposed that light within the ultraviolet-B zone (UVB) (280–315 nm) was responsible for sunburn. At the time, it was concluded that UVB induced sunburn was solely responsible for the development of sun-induced skin cancer and consequently exposure to wavelengths other than UVB was considered safe [3]. The penetration of UV radiation and light into human tissue is limited by scattering and absorption. Just as in the atmosphere, the scattering in tissue follows the rules for Mie scattering (cells, blood vessels, fibers, granules, etc.) and Rayleigh scattering (organelles, molecules). The main absorbers of visible light in tissue are haemoglobin and its degradation products, melanins, flavins and carotenoids [4, 5]. The penetration depth is defined as the distance into the tissue at which the space irradiance of a wide, parallel beam of radiation is reduced to $e^{-1}$ of its value close to (below) the surface. Biological effects of UV radiation and light can be classified as either direct effects or indirect effects. Direct effects are those for which the biological alterations take place in the tissue where the photons are absorbed. Indirect effects are those for which signals are transmitted from the organ or tissue where the photons are absorbed via nerves, hormones or other molecules to the organ where the biological effect is manifested. Regulation of circadian rhythms is an example of an indirect effect. Light is absorbed in the retina of the eye, nerve signals are transmitted to the organs that control the synthesis of melatonin and other substances involved in maintaining the diurnal circadian rhythms. When we speak about health, balance, and physiological regulation, we are referring to the function of the body's major health keepers; the nervous system and the endocrine system.

These major control centers of the body are directly stimulated and regulated by light, to an extent far beyond what modern science…has been willing to accept [6].

Ozone present in the earth's atmosphere absorbs completely the solar radiation of wavelength below 290nm and protects our biosphere from the harmful solar UV insolation. Any reduction in atmosphere ozone causes an increase incoming solar UV radiation, thus enhancing the harm due to this radiation [7]. Any reduction in Atmospheric ozone causes an increase in the UV radiations, and hence the harms increase due to increase the exposure of radiations [8]. The existence of lower total columnar ozone over the tropics lets this region receive a relatively large dose of solar UV radiation throughout the year in relation to the regions in the higher latitudes [9]. Effects of solar UV radiation on the biosphere are well known and a lot of studies are going on to reduce its dangerous effects on human beings. Atmospheric ozone layer is not uniform over the globe, so that less ozone over tropics makes it receive more UV

insolation, than high latitude places. People in the tropics are continuously exposed to high UV dosage, leading to skin reddening and the dangerous sun stroke [10].

**Materials and Methods**

Fourteen types of commercial pharmaceuticals and cosmetics available in the Iraqi market Were taken directly and placed uniformly on the quartz slice .Each type of pharmaceuticals and cosmetics was sliced to weight 0.1 mg. later by using dual beam UV.visible absorption spectrophotometer type SP800 product of metertech. The absorption spectrum in each of pharmaceuticals and cosmetics was determined.These pharmaceuticals and cosmetics were tabulated in table 1 and table 2. Respectively.

**Table (1). Pharmaceuticals types used in this investigation.**

| Trade name | Scientific content | Indication |
|---|---|---|
| Panthon | Metabolite of dexpanthenol | antiflammatory |
| Tetraderm | Betamethasone as valerate 0.5mg+ gentamycin as sulphate 1mg + clioquinol 10mg + tolnaftate 10mg/g cream | Sever inflammatory skin disorder |
| Polyderm | Polymyxin B+bacitracin zinc | Antibiotics |
| Viramed | acyclovior | Antiviral |
| Fugidin.cream | clotrimazole | Anti-fungal, bacterial skin infections |
| Nystacort cream | Triamcenolone acetonide+gramicidin+neomycin as sulpha | Steroidal comp. |
| Celavex cream:25G&15G | Cetrimide 0.5% | Emolient &disinfectant |

**Table (2). Cosmetics types used in this investigation.**

| Trade name | Physical State | Indication |
|---|---|---|
| nivea | cream | Skin cream |
| jonson | cream | Skin cream |
| olay | cream | Skin cream |
| panteen | cream | Hair cream |
| petroleum jelly | cream | Hair cream |
| Garuier | cream | Hair cream |
| Vatica | cream | Hair cream |

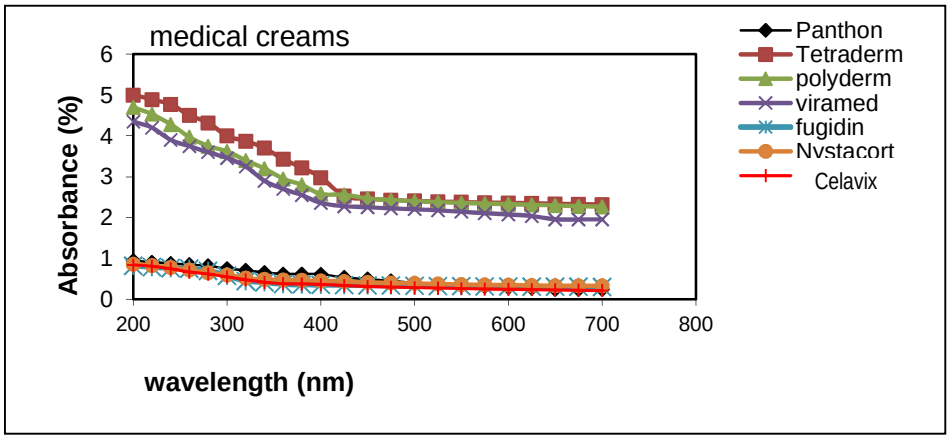
**Results and Discussion**

Figure 1 represents the absorbance of all types of Pharmaceuticals as a function of wave length included the ultraviolet and visible regions. One can notice that the absorbance percentage of all types at UV region is more than that of at visible region but the absorbance values vary from one type to another, where we note that the value of the absorbance of the Pharmaceutical type tetraderm takes the highest values at UV range

(5% at 200nm and 3.22% at 380nm) and at visible range takes (2.98% at 400nm and 2.32% at 700nm) while the Pharmaceutical type celaveks taking less value at UV range (0.854% at 200nm , 0.378% at 380) and at visible range takes (0.366% at 400nm and 0.216% at 700nm) and that this disparity between the values gives us a clear indication that the amount of radiation affecting the human skin if you use type tetraderm (highest absorbency) be greater than the amount of radiation in the case of the use of the other type celaveks (less absorbency) and this leads to the therapeutic efficiency affected and the skin harmful increase . The absorbance of other five Pharmaceuticals fall between the values mentioned above.

Figures 2 and 3 shows the relations between the absorbance percentage and wavelength for different types of cosmetics as a skin and hair creams respectively. From fig.1 can be seen that the highest value of the absorbance was (3.66% at 200nm and 2.60% at 380nm) for skin cream type Nivea within the range of UV and within the visible range (2.55% at 400nm and 2.4% at 700nm). The minimum value for absorbency within the same ranges was (1.10% at 200nm, 0.78% at 380nm) and (2.55% at 400nm and 2.4% at 700nm) for skin cosmetic type Jonson. This result gives us an indication that type which has a higher value of absorbance (Nivea) needs to add other material within the composition to be protective of UV as well as to minimize the effect of visible light on human skin.

Fig.3 shows clearly the absorbance behavior for hair cosmetics and as mentioned previously. The maximum absorbance value of can be recorded of cream type Garuier within UV range (0.9% at 200nm , 0.74% at 380nm) and at visible range was (0.733% at 400nm and 0.433% at 700nm) , while lower values of absorbency showed for the type of Petroleum Jelly within region ultraviolet and visible regions (0.63% at 200nm , 0.36% at 380nm) and (0.357% at 400nm , 0.268% at 700nm) respectively . All results obtained represent a simplest attempt to see how effective the commercial pharmaceuticals and cosmetics studied in reducing the impact of UV and visible on humans.




**Figure(1). The absorbance of medical creams as a function of wavelength.**

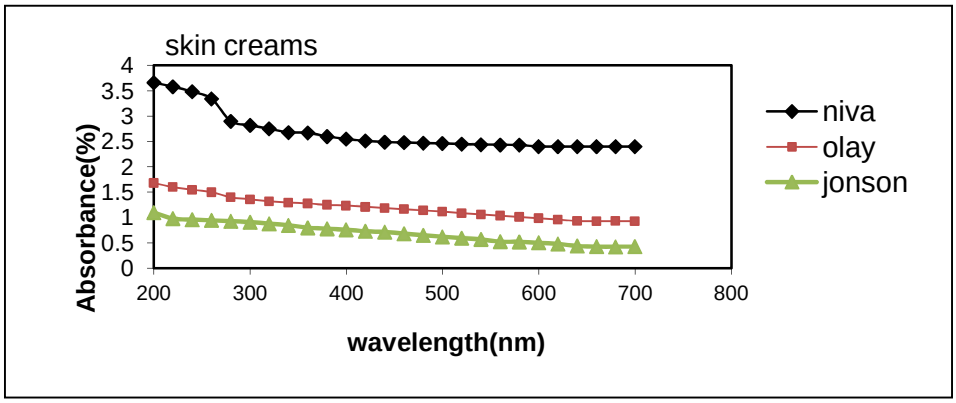



**Figure (2). The absorbance of cosmetics skin creams as a function of wavelength.**

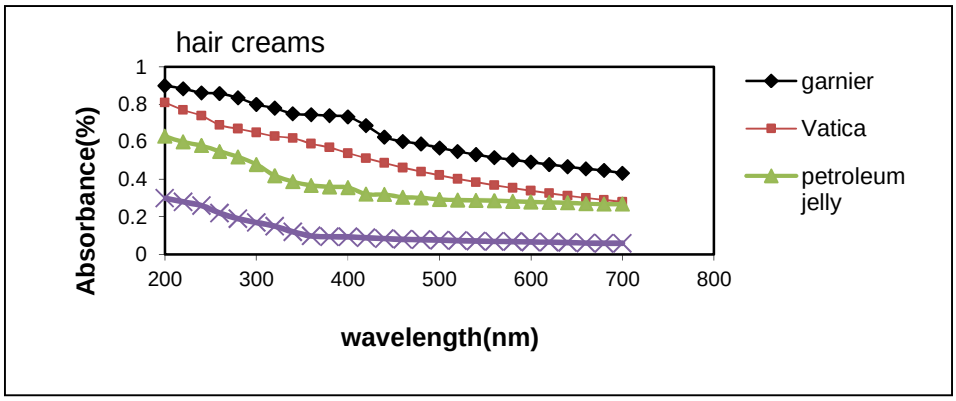



**Figure (3). The absorbance of cosmetics hair creams as a function of wavelength.**

**Conclusions:**

The best commercial pharmaceutical product tested was celavex and the worse was tetraderm According to the findings from this work .While the best product cosmetics skin cream was Jonson and the worse was Nivea, but the best cosmetics hair cream was Panteen and the worse was Garuier. Most of the pharmaceuticals and cosmetics used in this work need to add protective materials from the sun or prefer to use them during the night, especially, which owns the highest values of absorbency such as tetraderm and Nivea skin cream.

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