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ASSESSMENT OF NANOTECHNOLOGY'S APPLICATION IN PREVENTION OF PHOTO AGING AND DERMATOSES IN UKRAINE

The article describes the problem of photo aging, which is relevant in the world, and also analyzed dermatoses that are exacerbated by the action of sunlight. Assessment of morbidity and mortality from melanoma and dermatoses are given and it is shown growth of the indexes in recent years in Ukraine and abroad. Application of photo-protectors (sunscreens), in particular in the cosmetic products, is the basis of prevention of conditions that were investigated. It is founded that global approaches to the creation of modern photo-protectors include the usage of nanotechnology. The author has analyzed the domestic market of nanocosmetics, among which were not found photo-protectors, which on the results of research should be used to prevent photo aging, melanoma and other types of dermatoses.

Key words: photo aging, melanoma, photo-protectors (sunscreens), nanotechnology, pharmaceutical market.

FORMULATION OF THE PROBLEM

Analysis of global trends in dermatologically cosmetological practice shows great interest of the community to the process of photo aging, namely to the features of usage of the medical and cosmetic products that can prevent premature and slow natural photo aging. Photo aging or photoageing (also known as «Dermatoheliosis») is a term used for the characteristic changes induced by chronic UVA and UVB exposure. The deterioration of biological functions and ability to manage metabolic stress is one of the major consequences of the aging process. Aging is a complex, progressive process which also leads to functional and esthetic changes in the skin. This process could result from both intrinsic, such that it is genetically determined, as well as extrinsic processes which include environmental factors [1].

Photo aging is a process of aging of the skin attributed to continuous, long-term exposure to ultraviolet (UV) radiation of approximately 300-400 nm, natural or synthetic, on an intrinsically aged skin. Photo aging is thus also known as aging of the skin of the face, ears, neck and hands, caused by UVA and UVB rays.

Current approaches to the creation of medicines, including dermatological and cosmetic products include the use of nanotechnology in the above-mentioned products.

ANALYSIS OF RECENT RESEARCH AND PUBLICATIONS

Analysis of modern publications on this issue among national researchers showed that the problematic issues of population's photo aging is denied, but science-based approaches to the use of nanotechnology for its decision are absent.

FORMULATION OF PURPOSE OF THE ARTICLE

Thus, the purpose of the study was the analysis and evaluation of the problem and photo aging and covering of the population with the dermatological diseases in Ukraine and search for solution, through the using of the nanotechnologies.

PRESENTATION OF THE MAIN MATERIAL

According to the theory of photo aging, the most dangerous effect on the skin ultraviolet light, it damages skin cells (affects DNA) and leads to the formation of free radicals. Excessive, uncontrolled stay under the sun causes photo aging, which is ahead of chronological aging. During the process of photo aging ultraviolet (UV) spectral plot sunlight damages the elastin fibers of the skin that causes dry skin, loss of elasticity, nascence of age spots, skin picture is sharp pointed and rude. Effects of photo aging are spots, sunburns. Preventing photo aging – premature unnatural aging – is possible in two cases: complete exclusion of being in the sun, or usage of cosmetics containing photo-protectors.

For adequate protection against UV, preventing photo aging and successful photo procedures with photo-protectors with the level of protection (SPF) of at least 30-40 units are used.

It is known, most harmful sun for people with fair skin and blond hair. These people belong to I and II phototypes and at risk of malignant skin tumors. They need to use sunscreens with the highest degree of protection 40-50. Swarthy by nature, dark-haired (IV-VI phototypes) dermatologists recommend products with a degree of protection 20.

Outer skin protection from the sun provides exogenous photo-protectors - special creams, sprays, emulsions, oil. According to the latest trends in cosmetic science and practice outer photo-protectors are parts of the variety of cosmetics such as remedies for skin care, skin around the eyes, lips, hair, and so on. Technologies such cosmetics usually include such chemical filters as skinoren (azelaic acid) and retinoids (adapalene, tretinoin), as well as natural filters. Fundamentally, that their long-term (at least six months) use leads to improved skin relief, reduction of lentigines and wrinkles, pale pigment local areas, so there is no need to apply remedies for skin whitening.

Thus, the modern world dermatocosmetology as the most effective method of preventing and combating photoaging specifies the use of photo-protectors. Another area of application of dermatologically cosmetological photo-protectors is the prevention and treatment of malignant tumors of the skin, photodermatoses and dermatoses that are exacerbated by the action of sunlight. The use of cosmetic photo-protectors is possible in combination with surgical treatment of photodermatoses, in combination with photodynamic therapy, or, if the need for intensive care (surgery, photodynamic therapy) is absent, as an independent method of treatment.

To the photodermatoses and dermatoses, which are exacerbated by the action of sunlight include: polymorphic photodermatose, prurigo solar, solar urticaria, light pox, solar herodermia, senile lentigines, solar keratosis, porphyria, pellagra, erytematoz, dermatomyositis, rozartsea, peryoral dermatitis, acne Mallorca, multiform exudative erythema, Darier disease, xeroderma pigmentosum, Bloom syndrome, syndrome Rotmund-Thomsen, Cockayne syndrome, herpes, psoriasis summer, vitiligo patients with I-II phototypes.

A major problem of domestic medicine is the growth of morbidity from skin cancer, melanoma among the population of Ukraine. In 2012, Ukraine had almost 3 thousand new cases of skin cancer and 1,100 deaths reported [2]. The average in Ukraine incidence of melanoma is 6,18 cases per 100 thousand population [3]. Prevention of this disease includes proper use photo-protectors (according phototype and the necessary frequency of application of the product). During the complex treatment of photodermatoses expert advice include consistent usage of sunscreens (photo-protectors). At various photodermatoses and diseases that are exacerbated by exposure to the sun, it is recommended maximum level of protection means «50 +».

According to the national standards of care («DERMATOLOGY» III-IV level of care) therapeutic measures in case of therapy, for example, discoid lupus erythematoses in children include sunscreen creams (photo-protectors). Prevention of urticaria caused by the action of low or high temperature (L50.2), pigment scleroderma (Q82.1) also includes sunscreen creams (state standards of care). Protocol of care for patients with vitiligo involves the usage of masking makeup (possibly clarify that it is appropriate to include cosmetics exactly sunscreen (photo-protectors) products).

Thus, the most practical and actual areas of photo-protectors' application includes: complex of actions to prevent and eliminate photo aging, prophylaxis and therapy of photodermatoses and dermatoses that are exacerbated by the action of sunlight, and the prevention of skin cancer.

In accordance with the objectives, next step of the study included analyses of the global market of nanotechnology. Nanotechnology has become increasingly global in scale in recent years, with cooperative efforts involving multiple countries becoming more the norm than the exception. International consulting firm «Lux Research» has developed a framework (called the Nations Ranking Grid) for analyzing nanotechnology globally. According to estimates of the Lux Research by 2015 the demand for pharmaceutical products (medicines, cosmetics) containing nano occupy third place in the world after nanosubstantsiy and nanoelectronics (Fig. 1).

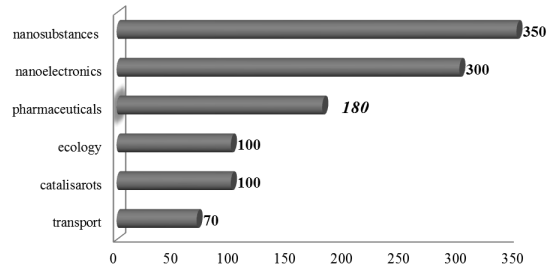

Fig. 1 *Prediction of the potential demand for nano in 2015, mln $*

On results of the study it is founded that the domestic market of cosmetic products, created using of nanotechnologies is represented by several do-

mestic manufacturers, including «NanoSvit» company (Kyiv), «Kharkov Pharmaceutical Factory» company (Kharkov) which have produced a series of creams containing nanosubstants. It should be noted that the domestic market contains cosmetic products that are developed using a patented method of nanotechnologies using, however, photo-protective products are absent among them.

In the domestic nano-cosmetics assortment there is a core group of biologically active and important for human life metals: silver, copper, magnesium, zinc, iron, manganese, cobalt, and molybdenum [4, 5].

One of nano-cosmetics were analyzed (RESULT Skin Care, NanoSvit) – contains microelement Zinc, but is not positioned as photo-protector (sunscreen). Typically, imported cosmetics containing zinc (zinc oxide) are defined by manufacturers as those that have photo-protector properties.

It is well known that zinc oxide and titanium dioxide (ranging from 10 nm to 100 nm) used in cosmetics as a physical (syn.: mineral barrier, UV blockers) UV filters. They create a protective screen on the skin that scatters and partially reflects the whole spectrum of UV radiation.

Their main advantage is that it is a solid substance that is very stable and not inclined to react when added to the cosmetics or dissolve in the last. Thus, UV blockers are not absorbed into the skin and act on the surface. So practically do not cause of allergies, so is widely used in the manufacture of products from sunburn for sensitive skin and children.

At the same time, the application only natural cosmetics filters usually have a low level of protection – SPF 20. Thus, for cosmetic products with a high degree of protection and those which are used in medical practice, the combination of both physical and chemical UV filters.

Summarizing, we can conclude that the domestic industry does not produce photo-protectoral nanocosmetics that, given the results of the review of international trends in prevention of photo aging and increasing of photo-protectors' usage, makes relevant and appropriate the implementation on the pharmaceutical market in Ukraine the national quality photo-protector cosmetics based on nanotechnologies.

CONCLUSION

1. Problem of photo aging is relevant and one that needs to be resolved globally and in Ukraine, as photo aging ahead and accelerates biological aging. As the main method of preventing and slowing of photo aging international community defines an application of photo-protectors.

2. Analysis of dermatological incidence and study of legislation on the matter confirmed the need for photo-protectors' using, such as cosmetic products, for the prevention of socially dangerous dermatologic diseases, including melanoma.

3. Application of nanotechnologies in the international pharmaceutical market is the most promising direction for the coming years, where demand is projected at $ 180 million.

4. Application of nanotechnologies to create photo-protectors has a fast development that meet modern trends of photo aging and skin diseases preventing.

5. Analysis of domestic cosmetics' created using nanotechnology assortment has indicated the absence in the market of photo protective dermatocosmetical products based on nanosubstantses.

The results of the research has shown lack of domestic sunscreen (pfoto-protective) products for prevention of photo aging and skin disorders on Ukrainian pharmaceutical market that leads to using imported products.

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ОЦІНКА ЗАСТОСУВАННЯ НАНОТЕХНОЛОГІЙ У ПРОФІЛАКТИЦІ ФОТОСТАРІННЯ ТА ДЕРМАТОЗІВ В УКРАЇНІ

У статті описано проблему фотостаріння, яка є актуальною у всьому світі, а також проаналізовано дерматози, що загострюються під дією сонячних променів. Оцінка захворюваності та смертності від дерматозів та меланоми свідчить про ріст показників за останні роки в Україні та світі. Застосування фотопротекторних засобів, зокрема у складі косметичної продукції є основою профілактики станів, що досліджувалися. Встановлено, що світові підходи до створення сучасних фотопротекторів включають використання нанотехнологій. Автором здійснено аналіз вітчизняного ринку нанокосметичної продукції, серед якої не виявлено засобів фото протекторної дії, які, за результатами дослідження, доцільно використовувати для запобігання фотостарінню, меланомі та іншим видам дерматозів.

Ключові слова: фотостаріння, меланома, фотопротектори, нанотехнології, фармацевтичний ринок.

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ОЦЕНКА ИСПОЛЬЗОВАНИЯ НАНОТЕХНОЛОГИЙ В ПРОФИЛАКТИКЕ ФОТОСТАРЕНИЯ И ДЕРМАТОЗОВ В УКРАИНЕ

В статье описано проблему фотостарения, которая является актуальной во всем мире, а также проанализированы дерматозы, обостряющиеся под действием солнечных лучей. Оценка заболеваемости и смертности от дерматозов и меланомы свидетельствует о росте указанных показателей за последние годы в Украине и мире. Применение фотопротекторных средств, в частности, в составе косметической продукции, является основой профилактики состояний, которые исследовались. Установлено, что международные подходы к созданию современных фотопротекторов включают использование нано технологий. Автором осуществлен анализ отечественного рынка нанокосметической продукции, среди которой не выявлено средств фотопротекторного действия, которые, по результатам исследования, целесообразно использовать для предотвращения фотостарения, развития меланомы и других видов дерматозов

Ключевые слова: фотостарение, меланома, фотопротекторы, нанотехнологии, фармацевтический рынок.

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