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COSMECEUTICAL IMPACT ON ACNE VULGARIS

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ABSTRACT

Acne vulgaris is a common chronic inflammatory disease of the pilosebaceous unit. It is characterized by the formation of non-inflammatory comedones and inflammatory papules, pustules, nodules and cysts. Acne is extremely common and usually starts during the teenage years but can start for the first time in their 20s and 30s. The lesions usually involve the face, back and chest. Severe inflammation may lead to scarring after healing. Psychosocial impact of acne can be tremendous and lead to a poorer quality of life. Proper understanding of pathogenesis of acne will lead to better management.

KEYWORDS: *Cosmeaceutical, Acne vulgaris, pathogenesis, Propionibacterium acnes.*

INTRODUCTION

The world of cosmeceuticals exists as a gray zone between cosmetics and pharmaceuticals. A cosmeceutical is a cosmetic product whose active ingredient is meant to have a beneficial physiologic effect resulting from an enhanced pharmacologic action when compared with an inert cosmetic.[1]

The term cosmeceutical was first introduced by Albert Kligman1 during a meeting about 20 years ago. It is a category of cosmetic products claimed to have biologically active ingredients with medicinal or druglike benefits. Furthermore, they satisfy the needs of beauty and health.

Many substances, either chemically synthesized or extracted from plants or animals, can be used as functional ingredients. Cosmeceuticals are intended to carry out their functions as protection, whitening, tanning, antiwrinkling, deodorants, antiaging, and nail and hair care.

Cosmeceuticals may, however, cause some unwanted problems.[2] Cosmeceuticals are used to improve and nourish the skin appearance and known to treat different dermatologic conditions.

Cosmeceuticals products of herbal origin are most liked among clients as they are mostly nontoxic and holding strong antioxidant activity.[3] The recent explosion and fast-paced growth of the cosmeceutical market have left both consumers and dermatologists confused. Patients often receive unregulated information and efficacy claims for products from the internet and the media.[4] The product should have a defined benefit for minor skin disorders (cosmetic indication).[8] The procedure for registration of a cosmeceutical should not be as cumbersome as for drugs.[9] The safety evaluation is mandatory for cosmetics in Europe, according to articles 2, 12, and 13. In the United States, this would mean that a subclass of drugs (cosmeceuticals) are registered in a similar manner as over-the-counter products.[10]

Cosmeceutical is a pragmatic term that enables us to state without pretense the benefits of a product. It is not an invitation to pass new laws.[11]

COSMECEUTICALS INDICATIONS

- Anti-aging in general
- Treatment of photomelanosis and photo tanning
- Treatment of pigmentation-related disorders like melasma or freckles
- Rhytide reduction
- Anti-inflammatory
- Fat loss
- Hair growth
- Hair fall prevention
- Maintenance of skin tone and clarity of complexion

CLASSIFICATION of COSMECEUTICALS

There is no single/accepted classification of cosmeceuticals. Broadly, they fall into categories based on their chief etiological indication, i.e., the condition for which a person would use them, or based on their source or biochemical structure.

COSMECEUTICAL CATEGORIES

1) Skin lightening or depigmenting

2) Sunscreens
3) Moisturizing agents Anti-wrinkle/aging
4) Scar-reducing
5) Antioxidants
6) Hair strengthening
7) Specific disorder-related, e.g., acne, rosacea, melasma
8) Miscellaneous.[5,6]

Applications

The following list enumerates a large number of commonly used and prescribed cosmeceuticals. The full list is too exhaustive and beyond the scope of this activity.

- Alpha-lipoic acid, oral
- Coenzyme Q10, oral
- Vitamin B-complex, oral
- Vitamin C, oral and topical
- Vitamin E, topical and oral
- Hydroquinone, topical
- Alpha and beta hydroxy acids, topical
- Polyunsaturated fatty acids, oral
- Peptides, topical
- Retinoids, oral
- Retinaldehyde, topical
- Retinal esters, topical
- Retinol, topical
- Comfrey, topical
- Feverfew, topical
- Jojoba oil, topical
- Licorice topical
- Pune bark extract and topical
- Rose, topical
- Turmeric, topical and oral
- Milk thistle, topical
- Lavender, topical
- Grapeseed, oral

- Green tea, oral
- Lycopene, oral
- Pomegranate: oral
- Arbutin: topical
- Kojic acid: topical
- Soya: oral and topical
- Aloe vera, topical and oral
- Chamomile: oral
- Caffeine: oral and topical
- Polypodium leucotomos, oral
- Glutathione, oral, parenteral, topical
- Phytosterols, oral and topical
- Proanthocyanidin, oral
- Panthenol, topical
- Ceramides, topical
- Zinc, topical and oral
- Licorice plant [glycyrrhiza] - glabridin
- Tyrowhite, topical
- Ellagic acid, topical
- Sunscreen ingredients
- Resveratrol
- Hyaluronic acid
- Glucosamine
- Azelaic acid
- Niacinamide
- Allium cepa
- Allantoin
- Marine protein supplements (MPS).[7]

Role of Nanotechnology in Cosmeceuticals

Nanotechnology is regarded as the most imminent technology of 21st century and is contemplated as a big boon in the cosmetic industry. Te term nanotechnology is the combination of two words: namely, technology and the Greek numerical “nano” which means dwarf. Tus, nanotechnology is considered as the science and technology used to

develop or manipulate the particles in the size range of 1 to 100 nm.[12,13]

The present article reviews the diverse classes of nanocarriers like liposomes, niosomes, solid lipid nanoparticles, nanostructured lipid carriers, nanoemulsion, and so on which are being used for delivery of nanocosmeceuticals, marketed products, and positive and negative aspects.

Advantage

There are a number of advantages of nanocosmeceuticals.

1. They provide the controlled release of active substances by controlling the drug release from carriers by several factors including physical or chemical interaction among the components, composition of drug, polymer and additives, ratio, and preparation method.
2. These make the skin care formulations more effective and increase the efficacy of sunscreens by improving UV protection in them.
3. Occlusion provides the enhancement in the penetration and skin hydration is increased.
4. These have high entrapment efficiency and good sensorial properties.
5. These are more stable than the conventional cosmetics.

Uses

Nanomaterials are widely used in the preparation of antiwrinkle creams, moisturizing creams, skin whitening creams, hair repairing shampoos, conditioners, and hair serums.[14,15]

Acne vulgaris

HIGHLIGHTS

- Acne vulgaris affects approximately 200-300 million people in India alone.
- It occurs in people between 15 and 40 years of age.
- Its common symptoms include bumps, rashes, boils, pimples, redness, and tenderness.
- Treatments for this condition include antibiotics, creams, cleansers peels and laser therapy.

INTRODUCTION

Acne vulgaris is a chronic inflammatory disease of the pilosebaceous unit (comprising the hair follicle, hair shaft and sebaceous gland.[18,19] Acne vulgaris or simply known as acne is a human skin disease characterized by skin with scaly red skin (seborrhea), blackheads and whiteheads (comedones), pinheads (papules), large papules (nodules), pimples and

scarring.[20] Acne, also known as Acne Vulgaris (AV), is a long-term skin disease that occurs when hair follicles are clogged with dead skin cells and oil from the skin.[21]

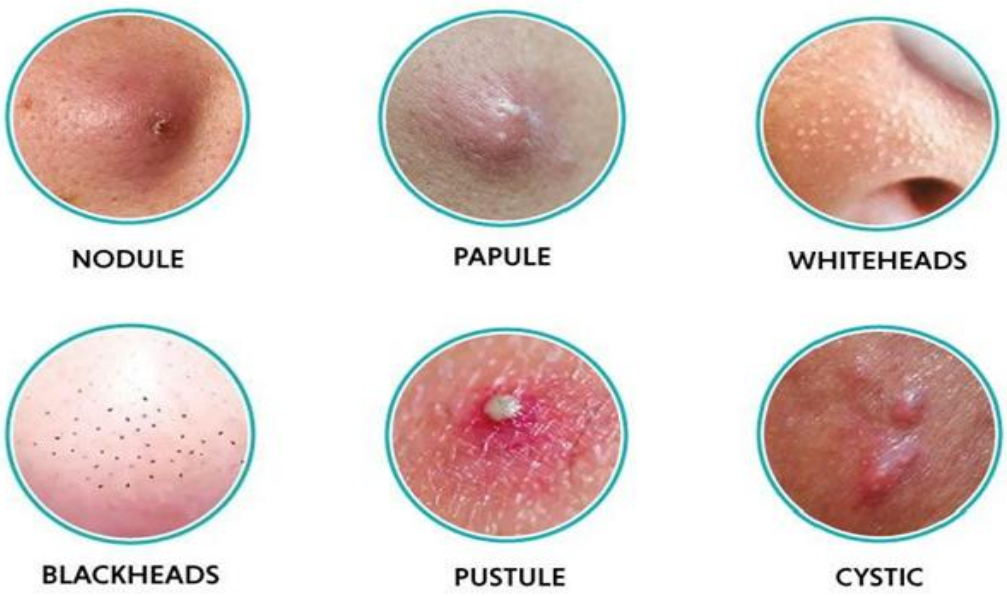
The clinical features of acne include seborrhoea (excess grease), non-infl ammatory lesions (open and closed comedones), infl ammatory lesions (papules and pustules), and various degrees of scarring.[22] Acne has clear detrimental psychosocial effects and may lead to permanent scarring.[23]

The importance of acne should not be underestimated because the disease can have important negative psychosocial consequences for the affected individual, including diminished self-esteem, social withdrawal due to embarrassment, depression, and unemployment.[24] Provision of adequate therapy is therefore important, especially because satisfactory results from treatment can be achieved in most cases.[25]

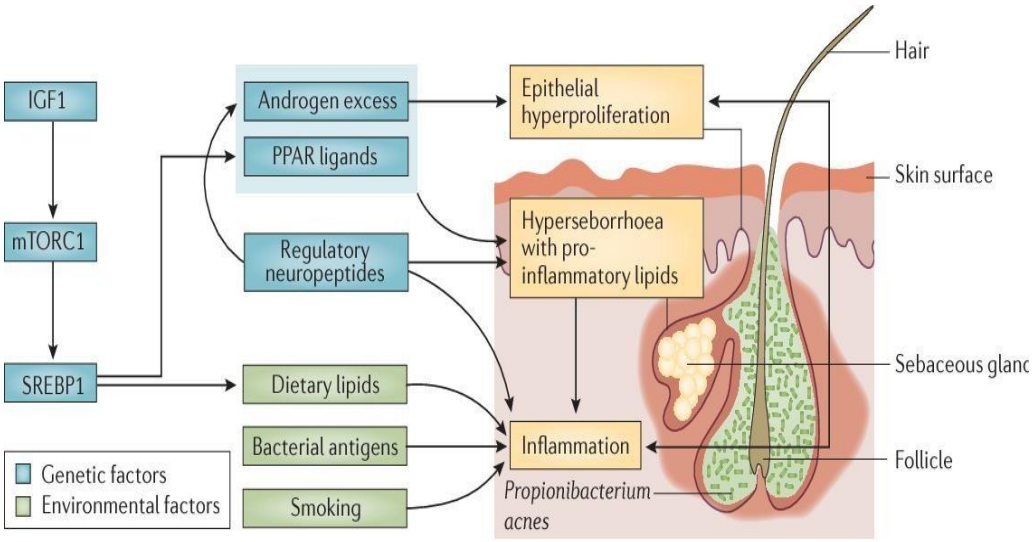
Types of Acne

- **Grade 1 –** Includes blackheads, whiteheads and few papules.
- **Grade 2 –** Consists of multiple papules and pustules, aggravated blackheads and whiteheads.
- **Grade 3 –** Comprises of numerous papules, pustules and inflamed nodules occasionally.
- **Grade 4 –** Constitutes of multiple, large and painful pustules, nodules, cysts and abscesses.

Check out the acne vulgaris pictures to know what the skin condition looks like



Pathogenesis(Causes)



Several factors contribute to the pathogenesis of acne—sebum, abnormal follicular differentiation, Propionibacterium acnes, and inflammation. Each of these factors provides a potential target for treatment.[25] Sebum, the lipid-rich secretion product of sebaceous glands, has a central role in the pathogenesis of acne and provides a growth medium for P acnes.

People with acne have higher rates of sebum production than unaffected individuals. Moreover, the severity of acne is generally proportional to the amount of sebum production.[25]

Enlargement of the sebaceous glands and increased production of sebum is stimulated by the increase in production of adrenal and gonadal androgens that precedes the clinical onset of puberty.

The first signs of acne vulgaris commonly occur during this time, which may be as early as age 7–9 years.[26] Conditions, such as polycystic ovarian syndrome, congenital adrenal hyperplasia, and various endocrine tumors, result in a higher circulating level of androgens and are associated with the development of acne vulgarish.[27]

Diet

Historically, dietary advice was commonplace as part of acne therapy. Because early studies hinted that patients with acne had impaired glucose tolerance and altered carbohydrate metabolism, patients were advised to avoid excessive carbohydrate and sugary foods.[28,29]

Glycaemic index

The GI quantifies the effect of ingested carbohydrates on blood glucose levels and is calculated by a 2-h blood glucose response curve after a 50-g carbohydrate load in 10 subjects.[30]

Glycaemic load is a function of the GI and portion size relating to carbohydrates.[31] The absence of acne in native non-Westernized people in Papua New Guinea and Paraguay have led to the proposal that high glycaemic loads in the Western diet could have a role in acne.[32]

Chocolate

There is a well-recognized belief that chocolate causes or exacerbates acne, particularly among adolescents.[33,34] There is, however, limited evidence backing up such a claim. Two very small earlier studies had such methodological shortcomings that it was difficult to draw any conclusions.[36]

Hygien

There is a common perception that poor levels of hygiene lead to the development or exacerbation of acne vulgaris.[37] An unblinded, randomized controlled trial of 120 patients with acne reported less inflammatory lesions in those using acidic soaps than those using alkaline soaps.[38] Some have suggested that sweat can trigger or exacerbate acne.[39]

However, a single-blind, randomized pilot study found no association between exercise induced sweat and truncal acne. The evidence does not provide clear advice for or against washing as a means of helping acne, and there is certainly no robust evidence that acne is caused or propelled by a lack of hygiene.[40]

Cigarettes

Whether or not acne is caused by, exacerbated, improved, cured, or is not associated with smoking remains controversial. An earlier case series suggested an inverse relationship between acne and smoking, suggesting an antiinflammatory effect of a component found in cigarettes.[41]

Obesity

Relatively few studies have evaluated the possible relationship between obesity and acne vulgaris. One study of 3000 patients between the ages of 6 and 11 years found the mean body mass index of patients with acne to be slightly higher than in individuals without acne, although the clinical significance of such a small but statistically significant difference is questionable.[42]

Stress and Picking

Stress is perceived to be a major trigger factor in exacerbating acne vulgaris and this has been supported by early retrospective studies. An interventional study in biofeedback training, relaxation training and stress reduction techniques found that patients with acne had an improvement in severity compared with their controls, and when relaxation techniques were stopped, open and closed comedones recurred.

Infection

The exact role of bacteria such as P. acnes in the pathogenesis of acne vulgaris is subject to much speculation. Propionibacterium acnes was first implicated in acne pathogenesis in 1896 when the microorganism found in acne lesions was thought to be the main cause of acne; this was supported by another study in 1909.[43]

Diagnosis

The initial acne lesion is the microcomedone, which is an invisible (to the naked eye) microscopic structure. Acne is diagnosed based on clinical examination.

Modern diagnostics through imaging

Various photographic methods have been proposed over the years to visualize acne and grade its severity, and to assess response to treatments. Standard photographs are a useful and reliable tool but need to use the same lighting, distance from the patient, camera and processing procedures.

Modern imaging methods have provided new opportunities for optimizing acne visualization and improving the accuracy of the assessment of acne severity and response to treatments. Digital photography provides various advantages, such as supervised or automatic image analysis and ease of storage of large numbers of photographs.

Advanced imaging techniques include parallel polarization and orthogonal polarization imaging, stereoimage optical topometer imaging to construct three- dimensional stereoimages, and fluorescence photography.

Parallel polarization imaging enhances the visualization of skin surface features, such as papules, pore size, skin oiliness and acne scars. Orthogonal polarization (or cross-polarization) photography enhances the visualization of inflammatory acne lesions, erythema and skin brightness.

Parallelpolarized and cross-polarized photography with video microscopy and sebum production measurement can be combined. Fluorescence photography using short wavelengths (long ultraviolet A or blue-range light) can be used to visualize P. acnes density based on the porphyrin production and the corresponding orange– red fluorescence intensity.[44]

Effects

Acne results in physical symptoms such as soreness, itching, and pain, but its main effects are on quality of life. Psychological morbidity is not a trivial problem, and it is compounded by multiple factors: acne affects highly visible skin—a vital organ of social display; popular culture and societal pressures dictate blemishless skin; acne can be dismissed by health-care professionals as a trivial self-limiting condition; and acne peaks in teenage years, a time crucial for building confidence and self-esteem.[45]

Prevention and Management

Here are the top skincare tips for acne-prone skin recommended by leading dermatologists for the prevention and management of acne:

- Wash your face twice a day with a mild cleanser, especially after a sweaty workout.
- Avoid using makeup or skincare products containing harsh chemicals. Opt for products labelled non-comedogenic and oil-free.
- Never pop, squeeze or pick pimples as this may aggravate the inflammation and lead to permanent scarring.
- Always use a sunblock cream suitable for your skin type before going out in the sun. Do not forget to use it even on rainy days.
- Maintain cleanliness and change your pillowcases every week.
- Stay hydrated to flush out toxins from your body and minimise acne.[45]

Treatment

First generation	Second generation	Third generation
Retinol	Etretinate	Arotinoid
Tretinoin	Acitretin	Adapalene
Isotretinoin		Tazarotene

Topical retinoids

Topical retinoids are vitamin A derivatives. The binding of retinoids to their receptors — the retinoic acid receptors and the retinoid X receptors — in keratinocytes reduces follicular hyperkeratinization and decreases adhesion. This effect not only results in inhibition of comedogenesis but also might enhance the penetration of other topical acne medications. Retinoids have anti- inflammatory effects by inhibiting the activation of the transcription factor API.

Topical antimicrobials BPO.

BPO, an organic peroxide derived from a byproduct of coal tar, has become the most widely used topical acne medication in dermatology. BPO treatment alone improves inflammatory acne and its mechanisms of action include antimicrobial, antiinflammatory and keratolytic effects and wound-healing activity.

Topical Antibiotics

Erythromycin and clindamycin are the most commonly used topical antibiotics in acne treatment, both of which are available in different formulations. Antibiotics (either topical or oral) are not intended to be a monotherapy for acne. For example, topical antibiotics should only be used in combination with BPO to help prevent the development of antibioticresistant bacteria. Fixed-dose combination gels of topical antibiotics with BPO are also available, as well as a combined gel formulation of clindamycin with tretinoin.

Other topical agents

Salicylic acid is a topical medication present in many over-the-counter products, which has comedolytic effects but may be less effective than retinoids.

Another topical agent, azelaic acid, has antibacterial, comedolytic and anti- inflammatory properties and is considered as a potential first-line monotherapy for female adult patients with acne, and a good choice for maintenance therapy owing to its good tolerability and safety.

Oral antibiotics

Doxycycline and minocycline have replaced tetracycline and erythromycin in most cases of acne therapy.

Azithromycin is not commonly used owing to the risk of increasing resistance, which is a crucial issue in other diseases.

As tetracyclines control acne through their direct anti-inflammatory effects in addition to their antibiotic property, using subantimicrobial doses of doxycycline is promising, but more investigation is needed in this field. Although minocycline is effective in acne treatment, its superiority to other tetracyclines has not been proven.

Oral tetracycline is usually prescribed at a dosage of 500 mg twice a day. The absorption of tetracycline is reduced by food and dairy products; therefore, it must be taken on an empty stomach. Adverse effects include gastrointestinal tract dyspepsia, vaginal candidiasis in women, and a small risk of photosensitivity. In children younger than 10 years, tetracycline can cause enamel hypoplasia and a yellowish discoloration of the forming teeth.

Hormonal therapy

Hormonal agents that reduce androgen activity can be given to reduce sebum production in women.

Oral contraceptives and, in some countries, spironolactone are commonly prescribed hormonal therapies.

The use of anti-androgen treatment is not limited to acne induced by hyperandrogenism; this therapy also improves acne in women with normal serum androgen levels.

Hormonal therapy can be prescribed in combination with other acne medications for postmenarcheal to premenopausal women with moderate-to- severe acne who do not intend to become pregnant. It takes 6–12 months before one can evaluate hormonal therapy results.

Oral Isotretinoin

Oral isotretinoin has effects on all four pathophysiological pathways of acne and can have a permanent effect on the disease course.

With a 90% reduction in sebum production 9 and almost 85% cure rate (that is, resolution without relapse)190, isotretinoin is a highly effective drug to treat acne, but not a 'miracle' for every patient.

Adjunctive therapies

Comedone extraction might help to relieve resistant comedones but should be used in conjunction with conventional therapeutic medications. Microdermabrasion, a technique that uses minute crystals to exfoliate the skin, does not have sufficient medical literature support to be considered effective in the management of acne, and future studies are needed.

Light therapy

Light therapy methods include broad-spectrum continuous-wave visible light sources (such as blue light or red light), intense pulsed light, laser sources (such as potassium titanyl phosphate lasers, pulsed dye lasers and infrared lasers) and photodynamic therapy. These modalities work through inhibition of P. acnes and/or thermal damage to the sebaceous glands.

Oral contraceptives

Combined oral contraceptives (COCs) contain an oestrogen (ethinylestradiol) and a progestogen. COCs are frequently prescribed for women with acne because oestrogen suppresses sebaceous gland activity and decreases the formation of ovarian and adrenal andro gens.

Progestogen-only contraceptives often worsen acne and should be avoided in women who have no contraindications to oestrogen-containing preparatios.

Panel

Important developments in understanding acne and its treatment

- Acne is a chronic disease that can persist into adulthood
- Acne causes significant psychological morbidity
- Immune-mediated inflammatory changes precede follicular hyperkeratinisation and Propionibacterium acnes colonisation
- The possible association between acne and diet remains uncertain
- Comparative effectiveness research could help reduce the plethora of current therapeutic options for initiation and maintenance treatment

- Prolonged use of oral antibiotics might contribute to bacterial resistance in the community
- Oral isotretinoin results in significant clearing of acne, but it is limited by teratogenicity and other side-effects

DISCUSSION

Acne vulgaris significantly affects the QOL and, for many years, has been shown to be associated with psychiatric morbidity. Emotional stress can exacerbate acne, and patients with acne can develop psychiatric problems as a consequence of their condition.

The results of the present study reveal the negative effects of acne vulgaris on patients' QOL and self-esteem. In addition, they indicate the psychiatric symptoms that may be associated with acne vulgaris, such as somatization, obsession, sensitivity, depression, anxiety, hostility, phobia, paranoid ideation, and psychoticism.

In our study, surprisingly, the QOL of male acne patients was found to be more impaired than that of female acne patients. The more severe the acne and the longer its duration, the worse the QOL.[48]

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