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NANOGEL FROM POLY VERDANT AS COSMETICS – A COMPREHENSIVE REVIEW

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ABSTRACT
Nanogels are nanostructured hydrogel particles, typically 1 to 100 nano-meters in size, made of crosslinked polymer networks. They exhibit high surface area-to-volume ratio, porosity, and responsiveness to external stimuli like pH, temperature, or light. These properties enable diverse applications such as targeted drug delivery, tissue engineering, and sensing. With precise control over drug release kinetics and efficient cellular uptake, nanogels hold promise for personalized medicine and regenerative therapies. [2]
Acne is a common skin condition characterized by pimples, blackheads, whiteheads, and sometimes cysts or nodules. It happens when hair follicles become clogged with oil and dead skin cells, leading to bacterial growth and inflammation. Factors contributing to acne include hormones, genetics, medications, diet, and stress. Hormonal changes, like those during puberty or menstruation, can increase sebum production, worsening acne.
Formulation of Anti acne nanogel by using herbal constituents have many advantages like: Natural Ingredients Gentle on the Skin Anti-inflammatory Properties Antibacterial and Antimicrobial Effects Balanced Oil Control Antioxidant Benefits Promotes Healing and Regeneration Reduced Side Effects Environmental Friendliness.[11]

Key words: Nanogel, Cosmetic, Polyverdants

INTRODUCTION

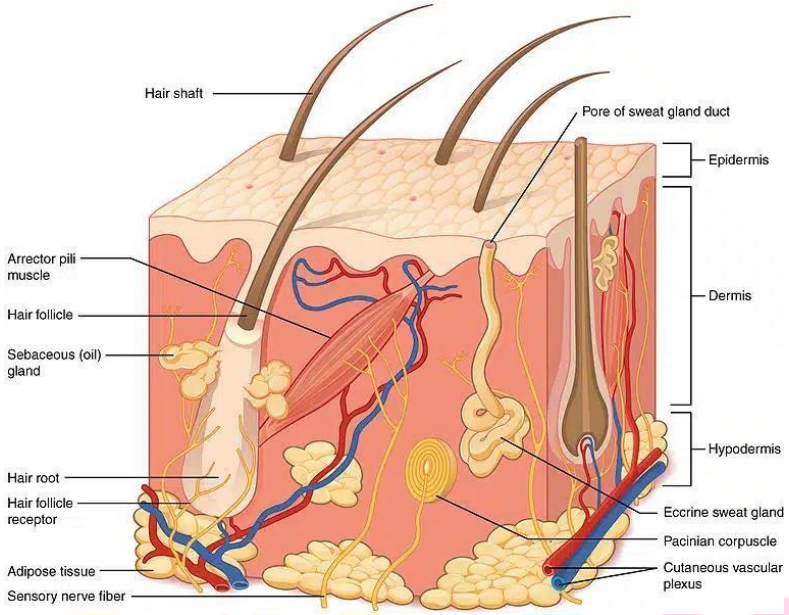
The term 'Cosmetic' originates from the Greek word 'cosmetics', meaning 'to adorn'. Since ancient times, any materials used for beautification or enhancing appearance have been referred to as cosmetics. The word "cosmetics" finds its roots in Ancient Rome, where they were typically crafted by female slaves known as "cosmetic," giving rise to the term "cosmetics."

Cosmetics serve the purpose of enhancing appearance, a practice dating back centuries. The Egyptians were among the earliest known users of cosmetics for beauty enhancement. Initially, makeup consisted of simple eye colouring or body adornments. Over time, makeup evolved significantly, becoming an integral part of grooming for both men and women.

Today, cosmetics play a vital role in society, with an increased emphasis on maintaining youthfulness and attractiveness. A wide range of cosmetics is readily available, including creams, lipsticks, perfumes, eye shadows, nail polishes, and hair sprays. Products like face powder impart a radiant glow to the skin after applying a base cream, while lipsticks, crafted from wax and cocoa butter, are popular among women of all ages.

Cosmetics such as creams, gels, and colognes are used daily by both men and women. These products contribute to self-expression, confidence, and overall well-being, reflecting the evolving standards of beauty and personal care practices in contemporary society.[1]

Functions of skin



source: Research gate

Protection:
An anatomical barrier from pathogens and damage between the internal and external environment in bodily defence, Langerhans cells in the skin are part of the adaptive immune system

Sensation:
Contains a variety of nerve endings that react to heat and cold, pressure, touch, vibration, and tissue injury, see soma to sensory system and haptics.

Heat regulation:
The skin contains a blood supply far greater than its requirements which allows precise control of energy loss by radiation, convection and conduction. Dilated blood vessels increase perfusion and heat loss, while constricted vessels greatly reduce cutaneous blood flow and conserve heat.

Control of evaporation:
The skin provides a relatively dry and semi-permeable barrier to fluid loss. Loss of this function contributes to the massive fluid loss in burns.

Aesthetics and communication:
Others see our skin and can assess our mood, physical state and attractiveness.

Storage and synthesis:
Acts as a storage centre for lipids and water, as well as a means of synthesis of vitamin D by action of UV on certain parts of the skin.

Water resistance:

The skin acts as a water-resistant barrier so essential nutrients aren't washed out of the body.[3]

TYPES OF HERBAL PRODUCTS FOR SKIN

Herbal Cleansers: These are formulated with natural extracts like neem, tea tree oil, or aloe vera to cleanse the skin without stripping away its natural oils.

Herbal Toners: Toners are used to balance the skin's pH after cleansing. Herbal toners often contain ingredients like witch hazel, rose water, or green tea extract, known for their soothing and astringent properties.

Herbal Moisturizers: Herbal moisturizers are enriched with botanical extracts like chamomile, calendula, or shea butter to hydrate and nourish the skin.

Herbal Face Masks: Face masks infused with herbal extracts such as turmeric, clay, or rosehip oil can help detoxify, brighten, and rejuvenate the skin.

Herbal Serums: Serums are concentrated formulations designed to target specific skin concerns. Herbal serums may include ingredients

like vitamin C, hyaluronic acid, or botanical oils such as jojoba or argan oil.

Herbal Sunscreens: Sunscreens made with herbal extracts like aloe vera, green tea, or coconut oil offer protection against harmful UV

rays while providing additional skin benefits.

Herbal Acne Treatments: Herbal acne treatments often contain ingredients like tea tree oil, neem, or willow bark extract, known for their antibacterial and anti-inflammatory properties.

Herbal Exfoliants: Exfoliating products with herbal ingredients like papaya enzymes, oatmeal, or citrus extracts help remove dead skin cells, leaving the skin smoother and more radiant.

Herbal Anti-Aging Products: These products typically contain ingredients like retinol from natural sources, antioxidant-rich botanicals such as grapeseed extract or vitamin E, which help to reduce the appearance of fine lines and wrinkles.

Herbal Body Oils: Herbal body oils are made from natural oils like coconut, almond, or olive oil infused with herbs such as lavender, chamomile, or rosemary. They can be used for massage or as moisturizers for the body. [5]

TYPES OF SKIN GELS

Skin gels come in various types, each formulated to serve different purposes and address specific skin concerns. Here are some common types of skin gels:

Moisturizing Gels: These gels are designed to hydrate the skin and prevent dryness. They often contain ingredients like hyaluronic acid, glycerine, or aloe vera to lock in moisture and keep the skin soft and supple.

Acne Treatment Gels: Formulated with ingredients such as salicylic acid, benzoyl peroxide, or tea tree oil, these gels target acne-causing bacteria, unclog pores, and reduce inflammation to treat and prevent breakouts.

Anti-Aging Gels: These gels typically contain ingredients like retinol, peptides, or vitamin C to stimulate collagen production, reduce fine lines and wrinkles, and improve skin texture and tone.

Cooling Gels: Designed to soothe irritated or inflamed skin, cooling gels often contain ingredients like menthol or cucumber extract to provide a refreshing sensation and reduce redness and swelling.

Eye Gels: Specifically formulated for the delicate skin around the eyes, these gels aim to reduce puffiness, dark circles, and fine lines. They may contain ingredients like caffeine, vitamin K, or peptides to improve circulation and firm the skin.

Hydrogel Masks: These sheet masks are infused with a gel-like serum that delivers concentrated ingredients to the skin. They come in various formulations targeting different concerns, such as hydration, brightening, or firming.

Sunscreen Gels: Lightweight and non-greasy, sunscreen gels offer protection against harmful UV rays while providing a matte finish. They are suitable for oily or acne-prone skin and are available in various SPF levels.

After-Sun Gels: Formulated to soothe and hydrate sun-exposed skin, these gels often contain ingredients like aloe vera, cucumber extract, or vitamin E to relieve sunburn and replenish lost moisture.

Barrier Repair Gels: These gels are designed to repair and strengthen the skin's natural barrier function. They may contain ceramides, fatty acids, or niacinamide to restore the skin's protective layer and prevent moisture loss.

Exfoliating Gels: Formulated with gentle exfoliating ingredients like alpha hydroxy acids (AHAs) or enzymes, these gels help remove dead skin cells, unclog pores, and improve skin texture and brightness.

ADVANTAGES OF GEL OVER OTHER FORMULATION

- Gels are easy to formulate as compared to other semisolid dosage forms.
- A gel is an elegant non-greasy formulation.
- It can be used as controlled release formulation by entwining the polymer more than once.
- Gels have good adherence property to the site of application.[6]

SEVERE PROBLEMS OF SKIN

- Severe Acne: Acne can range from mild to severe, with severe cases involving deep cysts, inflammation, and scarring. It can affect not only physical appearance but also mental health.
- Psoriasis: This is a chronic autoimmune condition that causes the rapid buildup of skin cells, leading to scaling and inflammation. It can be very uncomfortable and may require ongoing management.
- Eczema (Atopic Dermatitis): Eczema is a chronic condition that causes dry, itchy, and inflamed skin. It can be severe in some cases, causing significant discomfort and impacting quality of life.
- Cellulitis: This is a bacterial skin infection that can be severe, causing redness, swelling, warmth, and pain. If left untreated, it can lead to serious complications.
- Dermatitis Herpetiformis: This is a chronic skin condition linked to celiac disease, characterized by intensely itchy, blistering skin rashes. It can be severe and require strict dietary management.
- Vitiligo: Vitiligo is a skin disorder that causes the loss of skin color in patches. While not physically painful, it can be emotionally distressing, especially in severe cases where large areas of skin are affected.

- Epidermolysis Bullosa (EB): This is a rare genetic disorder characterized by fragile skin that blisters and tears easily. Severe forms of EB can be life-threatening and require specialized care.
- Stevens-Johnson Syndrome (SJS) and Toxic Epidermal Necrolysis (TEN): These are severe, rare skin reactions typically triggered by medications or infections. They cause widespread blistering and skin loss, potentially leading to life-threatening complications.
- Necrotizing Fasciitis: This is a severe bacterial skin infection that affects the deep layers of skin and subcutaneous tissues.
- It progresses rapidly and can be life-threatening if not treated promptly.

AVAILABLE GELS AND ITS DRAWBACKS

Nano Gel: Enhanced drug delivery with small size for targeted therapy, though synthesis can be complex and concerns about toxicity exist.

Hydrogel: Water-based gels for skincare, wound dressings, and drug delivery, but may contain additives causing irritation, not suitable for all skin types.

Alcohol-based Gel: Effective for killing germs but can dry out and damage skin with frequent use, especially for sensitive or dry skin.

Acrylic Gel: Used in art and nail care for long-lasting results, but challenging to remove and can damage natural nails.

Silicone Gel: Used in scar treatment, may feel greasy and cause skin irritation in some individuals.

Topical Medication Gels: Effective for delivering medications but may cause side effects like dryness and redness.

Hair Styling Gels: Provide hold and control but may contain drying agents causing hair and scalp issues with excessive use.[8]

CONCLUSION

Nano gels offer promising prospects for advanced drug delivery systems due to their small size and ability to penetrate biological barriers for targeted therapy. While their biocompatibility and biodegradability are advantageous, the complexity of synthesis and concerns about potential toxicity and environmental impact require careful consideration. Further research and development in nano gel preparation techniques are essential to harness their full potential while addressing safety and sustainability concerns in pharmaceutical and biomedical applications.

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