Pharmaceutical and Cosmetic preparations
Third stage

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SUNSCREENS

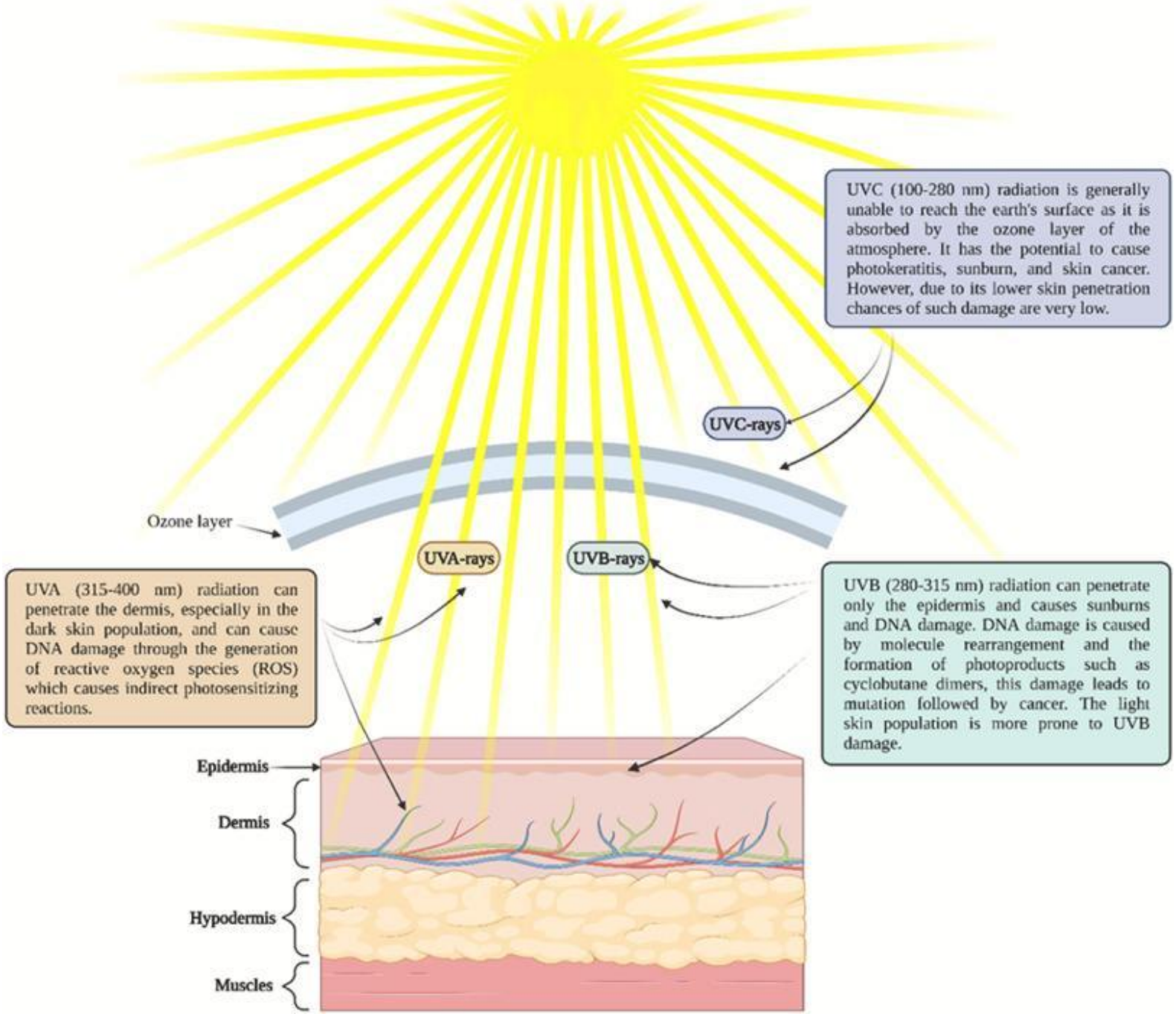


Sunscreens

Sunscreens are cosmetic preparations applied to the skin to protect it from the harmful effects of ultraviolet (UV) radiation from sunlight. Excessive exposure to UV radiation can cause sunburn, premature skin aging, and increase the risk of skin cancer.

Ultraviolet radiation is divided into three main types:

- UVA (320–400 nm): penetrates deeply into the skin and causes photoaging.
- UVB (280–320 nm): responsible for sunburn and skin damage.
- UVC (100–280 nm): mostly absorbed by the ozone layer and does not reach the earth’s surface.


UVC (100-280 nm) radiation is generally unable to reach the earth's surface as it is absorbed by the ozone layer of the atmosphere. It has the potential to cause photokeratitis, sunburn, and skin cancer. However, due to its lower skin penetration chances of such damage are very low.
UVC-rays
Ozone layer
UVA-rays
UVB-rays
UVA (315-400 nm) radiation can penetrate the dermis, especially in the dark skin population, and can cause DNA damage through the generation of reactive oxygen species (ROS) which causes indirect photosensitizing reactions.
UVB (280-315 nm) radiation can penetrate only the epidermis and causes sunburns and DNA damage. DNA damage is caused by molecule rearrangement and the formation of photoproducts such as cyclobutane dimers, this damage leads to mutation followed by cancer. The light skin population is more prone to UVB damage.
Epidermis
Dermis
Hypodermis
Muscles

Types of Sunscreens

1. Chemical Sunscreens work by absorbing ultraviolet radiation and converting it into a small amount of heat. They contain organic compounds that absorb UV light.

Examples include:

Avobenzone Chemical / UVA filter

Oxybenzone Chemical / UVB & UVA-II filter

Octinoxate Chemical / UVB filter

Types of Sunscreens

2. Physical (Mineral) Sunscreens act by reflecting and scattering ultraviolet radiation away from the skin surface.Common physical sunscreen agents include:

Zinc oxide

Titanium dioxide

These agents are often preferred because they provide broad-spectrum protection and are generally less irritating to the skin.

Sun Protection Factor (SPF)

- Sun Protection Factor (SPF) is a measure of the effectiveness of a sunscreen in protecting the skin from UVB radiation.
- It is defined as:
- A higher SPF value indicates greater protection against sunburn.

$$\frac{\text{Period of protection(with sunscreen)}}{\text{Period of natural protection(without sunscreen)}}$$

SPF LEVELS

SPF	% UVB Blocked	Burn Time	Best for Skin Type
SPF 4	75%	45 minuts	dark or very dark skin
SPF 15	93%	2,5 hours	medium to dark skin
SPF 30	97%	5 hours	light to medium skin
SPF 50	98%	8 hours	fair or light skin

Skin Types & SPF Recommendations

Fitzpatrick Scale

Type I



Very Fair Skin

Always Burns

SPF 50+

Type II



Fair Skin

Usually Burns

SPF 30~50

Type III



Medium Skin

Sometimes Burns

SPF 30

Type IV



Olive Skin

Tans Easily

SPF 15~30

Type V



Brown Skin

Rarely Burns

SPF 15~25

Type VI



Dark Skin

Never Burns

SPF 15~25

Sunscreen Formulations

Sunscreen products are commonly formulated as:

Creams

Thick, occlusive, oil-rich, slow absorption,
heavier on skin.



Sunscreen Formulations

Lotions

Light, water-based or oil-in-water emulsion, easy to spread, absorbs quickly, less greasy.



Sunscreen Formulations

Gels



Sprays



Experimental work

Ingredient	Quantity
Zinc oxide	5 g
Stearic acid	6 g
Liquid paraffin	10 g
Glycerin	5 g
Triethanolamine	1 g
Distilled water	q.s to 100 g

Zinc oxide is widely used as a physical sunscreen agent because it provides effective protection against both UVA and UVB radiation. It acts by reflecting and scattering UV rays, forming a protective barrier on the skin surface.

Experimental work

Procedure

1.Prepare the oil phase by mixing stearic acid and liquid paraffin in a beaker and heat to about 70°C.

2.Prepare the aqueous phase by dissolving glycerin and triethanolamine in distilled water and heat to 70°C.

3.Disperse zinc oxide in a small amount of water or glycerin to form a smooth paste.

4.Slowly add the aqueous phase to the oil phase with continuous stirring.

5.Add the zinc oxide dispersion and mix thoroughly.

6.Continue stirring until the mixture cools and forms a smooth sunscreen cream.



MOISTURIZERS

MOISTURIZERS

A moisturizer is a topical cosmetic or pharmaceutical preparation applied to the skin to increase hydration, improve texture, and prevent water loss.

Main Functions

1. Hydration – Adds water to the outer layers of the skin.
2. Barrier Function – Forms a protective layer to reduce transepidermal water loss (TEWL).
3. Skin Softening – Smooths rough or dry skin.
4. Improves Skin Appearance – Makes skin look healthy and supple

Types of Moisturizers

Moisturizers are classified based on mechanism of action and formulation type.

1.Occlusive Moisturizers

Mechanism: Form a physical barrier on the skin to prevent water loss.

Examples: Petrolatum, Mineral oil, Lanolin, Dimethicone.

Best for: Dry skin or very dry areas.

Notes: Can feel greasy; excellent for nighttime use.

2. Humectant Moisturizers

Mechanism: Attract water from the environment or deeper skin layers to the outer skin.

Examples: Glycerin, Hyaluronic acid, Urea, Sorbitol.

Best for: Most skin types, especially dry or normal skin.

Notes: Often combined with occlusives to reduce water evaporation.

Types of Moisturizers

3. Emollient Moisturizers

Mechanism: Smooth the skin by filling gaps between skin cells, making it soft and supple.

Examples: Fatty acids, Esters, Squalene.

Best for: Rough, flaky, or scaly skin.

Notes: Often part of creams or lotions; improve skin texture.

4. Combination Moisturizers

Many commercial moisturizers combine humectants + emollients + occlusives for maximum effect.

Formulation examples: Creams, Lotions, Gel-Creams.

Best for: General daily skin care; suitable for most skin types.

Anti-Aging Skin Products



Anti-Aging Skin Products

Aging of the skin is a natural biological process influenced by

intrinsic factors (genetics, hormonal changes) and

extrinsic factors (UV radiation, pollution, smoking, lifestyle).

Anti-aging skin products aim to reduce the visible signs of aging, such as wrinkles, fine lines, loss of elasticity, and pigmentation.

Mechanisms of Skin Aging

1.Intrinsic (Chronological) Aging. Occurs naturally with time.
Features include:
Thinning of the epidermis
Loss of collagen and elastin
Decreased skin hydration
Fine wrinkles
2.Extrinsic Aging (Photoaging). Caused by environmental factors, mainly UV exposure.
Features include:
Deep wrinkles
Hyperpigmentation (age spots)
Loss of elasticity
Rough texture

Types of Anti-Aging Skin Products

1. Moisturizers:

Maintain skin hydration and plumpness.

Humectants: like Glycerin, Hyaluronic acid draw water into the skin.

Emollients: smooth rough skin and fill gaps between cells.

Occlusives prevent water loss.

2. Sunscreens

Protect skin from UV-induced aging (photoaging).

Physical sunscreens: Zinc oxide, Titanium dioxide

Chemical sunscreens: Avobenzone, Octinoxate

Broad-spectrum sunscreens reduce wrinkles, pigmentation, and collagen breakdown.

Types of Anti-Aging Skin Products

3. Anti-Wrinkle Agents Retinoids: The Most Effective Anti-Aging Agents they are derivatives of Vitamin A and are widely regarded as the most potent and well-studied anti-aging skin products. They act at the cellular level to reverse signs of aging, including:

Fine lines and wrinkles

Hyperpigmentation

Loss of elasticity

Mechanism of Action

1.Stimulate fibroblasts to produce collagen types I and III.

2.Enhance Skin Cell Turnover replacing old and damaged skin cells with new ones. Reduces fine lines, and hyperpigmented spots.

3.Regulate Melanin Production. Helps fade age spots and improves skin tone.

4. Anti-Inflammatory Effects.

Types of Retinoid

Retinoid	Strength / Availability	Notes
Retinol	Mild, OTC	Converts slowly to active form; less irritating; suitable for beginners.
Retinaldehyde	Moderate	Intermediate potency; faster than retinol.
Tretinoin (Retinoic acid)	Strong, prescription	Most potent; proven anti-aging; may cause irritation initially.
Adapalene	Moderate, prescription/OTC	More stable; less irritating than tretinoin.
Tazarotene	Strong, prescription	Very potent; used for severe photoaging; high irritation potential.

Types of Anti-Aging Skin Products

Retinoids Use: Usually formulated in creams, gels, or serums. Often combined with moisturizers to reduce irritation.

Start gradually: 2–3 times per week, then increase frequency.

Apply at night (retinoids are unstable under UV light).

Side Effects and Considerations

Initial irritation: redness, peeling, dryness (“retinization”).

Sun sensitivity: always use sunscreen during the day.

Pregnancy: prescription retinoids (like tretinoin) are contraindicated.

Types of Anti-Aging Skin Products

4. Antioxidants: Neutralize free radicals that damage skin proteins and lipids, Reduce oxidative stress and prevent early aging. common antioxidants:

Vitamin C (Ascorbic acid)

Vitamin E (Tocopherol)

Coenzyme Q10

Green tea polyphenols

5. Peptides and Growth Factors: act by

A. Promote collagen and elastin production.
B. Improve skin firmness and elasticity.
C. Often included in high-end serums and creams.

Types of Anti-Aging Skin Products

6. Alpha-Hydroxy Acids (AHAs) and Beta-Hydroxy Acids (BHAs):

Exfoliants that remove dead skin cells.

Promote skin renewal and improve texture and tone.

Examples:

AHAs: Glycolic acid, Lactic acid

BHA: Salicylic acid

PowerPoint

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