



Cosmetic Science

UNIT I

1. Classification of cosmetic and cosmeceutical products
2. Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals from cosmetics, cosmetics as quasi and OTC drugs
3. Cosmetic excipients: Surfactants, rheology modifiers, humectants, emollients, preservatives. Classification and application
4. Skin: Basic structure and function of skin.
5. Hair: Basic structure of hair. Hair growth cycle.
6. Oral Cavity: Common problem associated with teeth and gums.

Introduction

3

- ❖ The study of cosmetic is called as “cosmetology”.
- ❖ A person who is licensed in cosmetology is called as “cosmetologist”. Product cover under cosmetic range from hair care, oral care, skin care, lipstick
- ❖ Classification of cosmetics base on the site of application and present the product category.

Type of cosmetic

4

Facial cosmetics	Hair cosmetics	Eye cosmetics	Dental and oral cavity cosmetics	Deodorants	Miscellaneous cosmetic
Cleansing preparations	Hair dye	Eye liners	Tooth paste	Lotion, powders	Blackhead removers
Skin nourishing	Hair oil	Eye gloves	Mouth washes	Creams	Toilet soaps
Skin tonic	Hair creams	kajal	Teeth whitening		Anti-stress marks removers

Herbal Cosmetic

- ❖ The history of herbals is really the history of humankind, for every culture throughout time has relied upon herbs for its medicines and cosmetics.
- ❖ Today however interest in herbal products has increased ones again
- ❖ Herbal cosmetic represent cosmetics associated with active bio ingredients nutraceuticals or pharmaceutical.
- ❖ The use of bioactive phytochemicals from a variety of botanicals has dual functions.

Ideal Properties Of Cosmetics

1. Non-toxic, non- irritant and acceptable
2. Physically and chemically inert
3. Economical
4. Long lasting property
5. Ability of masking the imperfection of skin
6. Stable and good appearances
7. Easy to removed from skin

Classification of cosmetics

- Cosmetic are classified into 4 main categories
 1. According to their use
 2. According to their functions
 3. According to their physical nature
 4. According to state

1. Classification of cosmetics according to their use

Based on the skin of application cosmetics are classified into 5 categories

1. Use for skin
2. Use for nails
3. Use for teeth and mouth
4. Use for hair
5. Use for eyes

1. Use for skin

The skin mainly to protect human beings against environmental aggressions.

The cosmetic product that are poured, rubbed or applied on skin are known as skin cosmetic.

e.g. creams, powder, lotions.

2. Use for nails

The nails in particular the nails plates of the fingers of hands and feet have been subjects of decoration in terms of shine or colour.

e.g. nail lacquers, nail lacquers remover.

3. Use for teeth and mouth

Dental care products are meant for keeping the dental structure healthy, strong and protected against any infections (oral).

e.g. dentifrices, mouthwash

4. Use for eyes

Since eyes are very sensitive and important part of our body and also required high lightening during beautification.

e.g. eyeliners, mascara, eye shadow.

5. Use for hairs

Hair cosmetics are the range of products that are used for hygiene of hairs involving hairs grows from human scalp, facial, pubic and other body hairs.

e.g. shampoo, hair dyes, hair sprays.

2. Classification of cosmetics according to their function.

1. Curative and therapeutic

e.g. antiperspirants and hair preparation

2. Protective

e.g. sunscreens

3. Corrective

Which improve tone and mask the imperfection either from face, hairs, heals

e.g. .crack creams

4. Decorative

Gives the person a feeling of confidence, happiness

e.g. lipsticks, nail lacquer,

3. Classification of cosmetics according to their physical nature

1. Aerosols : pressurized dosage forms. e.g. hair perfumes,
2. Cakes : semi solid preparations which are formed by applying accurate pressure. E.g. rouge compact, makeup compact
3. Emulsions : biphasic liquid dosage form. E.g. cold cream, cleansing cream
4. Pastes : semisolid preparations for external application to the skin. E.g. tooth paste
5. Powder : solid dosage forms which are use internally and externally. E.g tooth powder, talcum powder.
6. Soaps : sope is a salt of fatty acids. E.g shaving soap, bathing soap.

4. Classification of cosmetics according to their function state

1. Solid
2. Liquid
3. Semisolid

Definition of cosmetics as per Indian regulations

As per section 3 of the drug and cosmetics act 1940 and rule 1945 cosmetics means any article intended to be rubbed, poured, sprinkled, or sprayed on or introduced promoting attractiveness or altering the appearance and includes any article intended for use as a component of cosmetic.

Can a product be both a cosmetic and a drug?

Some products meet the definitions of both cosmetics and drugs. this may happen when a product has two intended uses.

e.g. shampoo is a cosmetics because its intended use is to cleanse the hair and antidandruff treatment is a drug because its intended use is to treat dandruff. Consequently an antidandruff shampoo is both a cosmetic and a drug.

The scope of effects/efficacies of general cosmetics products

1. To clean hair and scalp.
2. To reduce dandruff and itching.
3. To improve skin texture.
4. To tighten skin.
5. To maintain health of nails
6. To improve texture of lips.
7. To whiten teeth.

Cosmetics Regulation In US

The FD&C act defines cosmetics by their intended use as “articles intended to be rubbed ,poured, sprinkled, or sprayed on introduced into or otherwise applied to the human body for cleansing, beautifying, promoting attractiveness, or altering appearance”

The two most important laws pertaining to cosmetics marketed in the US are the FD&C act and fair packaging and labelling act (FPLA).

Definition of cosmetics regulations in the European Union

- ❖ The European Union cosmetic directive defines a cosmetic as “any substance or preparation intended to be placed in contact with the various external parts of the human body (epidermis, hair system, nails, lips and external genital organs) or with teeth and the mucous membranes of the oral cavity with a view exclusively or mainly to cleaning them, perfuming them changing their appearance and/or correcting body odours and /or protecting them or keeping them in good condition”
- ❖ The 27 European union member states have transposed the EU cosmetics which then regulate cosmetics within their respective national boundaries according to the law.

The United States And European Union Regulation Safety

17

Both work to ensure the safety of cosmetics for consumers through rigorous regulation.

- US
- CIR (Cosmetic ingredient review) expert panel conducts independent safety reviews of ingredient as a part of cosmetic safety process
- and results published in the international journal of toxicology and CIR website.
- US has required extra regulatory hurdles because they are classified as drug
- EU
- Eu scientific committee on consumer safety is responsible for reviewing all special and active cosmetic ingredients and assessing conditions for safe use.
- And result published on committee website.
- In EU ban/ red flag certain chemicals from use in cosmetics approximately 1300 ban ingredients
- E.g jet aircraft fuel, carbon monoxide.
- EU allows the marketing of cosmetic products with certain medicinal effects.

Cosmeceutical

History

The Egyptians were the first to recognize the health properties of cosmetics.

Cosmeceuticals rapidly expanded in the 1980s due to hydroxy acid.

The term cosmeceutical was coined in 1980 by the dermatologist Albert Kligman.

Albert Kligman reactivated interest in cosmeceuticals by developing a formula to improve the appearance of UV damaged and wrinkled skin using retinoic acid.



Skin Cosmeceutical

- ▶ Protecting and preserving the skin is essential to good health.
- ▶ Uv radiations from sunlight penetrate the skin and accelerate damage due to free radicals which includes inflammation wrinkling and hyper pigmentation.
- ▶ Types of cosmeceutical product

Types of cosmeceutical product	Effect
shampoo	Prevent dandruff and itching Clean hair and scalp Maintains health of hair and scalp
Beauty lotion	Treat rough skin, oily skin Maintain health of skin
Sunscreen	Prevent skin roughness Prevent sunburn

1. Olay vitamin

20

2. In general , vit, herbs, oils, botanical extracts may be used in cosmeceuticals.

Cosmeceutical agent	Purporated action	source	Commercial preparation
Aloe vera	Softens skin	Aleo vera asphodelaceae	Lotus herbal moisturizer
Licorice extract	Skin whiening, anti oxidant, anti microbial	Glycyrrhiza glabra	Liquorice balm
Neem oil	Antimicrobial	Azadirachta indica	Hemalaya neem face wash



Hair Cosmeceutical

1. Hair care, color, and style play an important role in individuals physical appearance and self perception.
2. In ancient Greece and rome countless ointments and tonics used for beautification of hair.
3. Shampoo have primary products to cleaning the hair and scalp.
4. Cosmetics for the treatment of hair applied topically to the scalp and hair. While they can never be used for therapeutic purposes.
5. Hair cosmeceutical product includes
 - Conditioning agents
 - Special care ingredients
 - Hair growth stimulants



Regulatory aspects

- Cosmetic products are now considered not less than pharmaceutical products in terms of increasing selection and its quality control.
- The mfg of these is required to follow cGMP.
- Cosmetic science is a fast moving area. Rapid and extensive changes in worldwide regulatory context of cosmetics .
- According to USFDA cosmeceutical is cosmetic and drug.
- In India a well define D&C act 1940 operate the regulation of cosmetics under authority of CDSCO

Classification Of Cosmeceutical Products

23

Based on their function comeceuticals are classified as follows

1. Skin whitening and depigmenting comeceuticals
2. Moisturizing comeceuticals
3. Anti-wrinkle comeceuticals
4. Sunscreen comeceuticals
5. Anti-photoaging comeceuticals

Based on various products presently on the market, comeceuticals can be divided into the following broad categories.

1. Antioxidant
2. Growth factors
3. Peptides
4. Metals
5. Anti-inflammatories/botanicals
6. Polysaccharides
7. Pigmentlightening agent

1. Antioxidant

- ▶ Antioxidants are **man-made or natural substances that may prevent or delay some types of cell damage.**
- ▶ Antioxidants are compounds that inhibit oxidation, a chemical reaction that can produce free radicals and chain reactions that may damage the cells of organisms.
- ▶ Antioxidants neutralize damaging free radicals by quenching reactive molecules.
- ▶ Examples vitamin A,B,C and E
- ▶ Alpha Lipoic acid (ALA)
- ▶ Coenzyme Q-10

Example vitamin A

Forms

Several forms of vitamin A are used cosmetically in particular retinol, retinyl esters, retinaldehyde.

Mechanisms

Retinol (vitamin A) is oxidized into retinaldehyde and then into retinoic acid, the biologically active form of vit A

In vivo studies two randomized trials reported significant improvement in fine wrinkles after 12 and 24 week of treatment.



- ▶ **Alpha Lipoic acid (ALA)** : anti inflammatory properties act as an exfoliant In a split face study, topical 5% ALA applied for 12 weeks reduced skin roughness lentigines and fine wrinkles.
- ▶ **Ascorbic acid (vitamin C)** : there is clinical data to support the use of topical vit C to improve fine lines and reduce both pigmentation and inflammation and many cosmeceutical formulations contain this antioxidant.



- **Niacinamide (vitamin B3) :** it is a potent antioxidant.

It improves the lipid barrier component of the epidermis, thus reducing trans epidermal water loss and acts as an inhibitor of melanosome transfer, resulting in reducing, hyper-pigmented spots, red blotchiness and sallowness as well as improve skin elasticity.



- **alpha tocopherol (vitamin E) :** taken orally it protects membrane lipids from peroxidation.
- It has been shown to reduce sunburn cell after UV exposure, neutralize free radicals and act as a humectant.



- **Grape seed extract** : it is potent antioxidant and has been shown to speed wound contraction and closure.
- **Other examples ubiquinone (CoQ10)**
- **N- acetyl glucosamine (NAG)**

2. Growth Factors

- ▶ A **growth factor** is a naturally occurring substance capable of stimulating cell proliferation, wound healing, and occasionally cellular differentiation. Usually it is a secreted protein or a steroid hormone. Growth factors are important for regulating a variety of cellular processes.
- ▶ They often promote cell differentiation and maturation, which varies between growth factors.
- ▶ For example, epidermal growth factor (EGF) enhances osteogenic differentiation,
- ▶ fibroblast growth factors and vascular endothelial growth factors stimulate blood vessel differentiation (angiogenesis).
- ▶ Transforming growth factor (TGF).

3. Peptides

- ▶ Cosmeceutical peptides are improve the appearance of aging skin.
- ▶ Topical peptides are regarded as **cellular messengers** that are formed from amino acid and peptide fragments with endogenous biologic activity.
- ▶ **E.g KTTKS (palmitoyl-lysine-threoninethreonine-lysine-serine)** are comprised of a subfragment of type I collagen propeptide and play a role signalling fibroblasts to produce collagen in skin and improve the appearance of wrinkles.
- ▶ **E.g pal-KKTKS** was tested in women and improvement in wrinkles.

4. Metals

- Forms

There are many metals, cosmetic products typically contain only a few, among them zinc, copper, selenium, magnesium, manganese

- Mechanism

Metals have specific functions in skin and associated with their role as required co factors in the activity of metalloenzymes

Certain metalorganic compound like pyrithione-zinc and selenieum sulfide are antifugal agents that effective as antidandruff agents

5. Anti-inflammatories/botanicals

- ▶ No of cosmeceuticals have been researched to treat sensitive skin
- ▶ Skin affected by rosacea, and photodamage to reduce the redness associated with inflammation.
- ▶ Licochalcone A from the licorice plant has Anti-inflammatory properties.

6. Polysaccharides

- ▶ Polysaccharides includes the family of hydroxy acid
- ▶ Alpha hydroxy acid (AHA) – includes glycolic acid (grapes), lactic acid(milk), malic acid (apple), citric acid (citrus fruits)
- ▶ Beta hydroxy acid (BHA)
- ▶ Poly hydroxy acid (PHA)

7. Pigment lightening agent

- ▶ Pigment lightening cosmeceuticals effect on out skin tone.
- ▶ Pigment lightening agent is hydroquinone which works by throsinase activity.
- ▶ Ascorbic acid : found in citrus fruits and leaf green vegetables.
- ▶ Kojic acid: commonly used bleaching agent
- ▶ Licorice extract : several studies on melasma have shown good efficacy with mild irritation

Cosmetics As Quasi Drug

- ▶ Quasi Drugs are a unique product classification in Japan.
- ▶ A Quasi Drug is defined in Japan as a product that has minimal to moderate pharmacological activity, but is restricted in use to specific indications.
- ▶ Quasi Drugs in Japan include categories of product that are often defined as drug cosmetics or over-the-counter (OTC) products in other regions.
- ▶ In this class include some **energy drinks containing taurine**, **some vitamin preparations**, hair tonic, **bath preparations**, skin whitening products, **acne products**, anti dandruff shampoo, **fluorinated toothpaste**, **hair dyes and many others**.
- ▶ These products are conceded as **borderline medicinal products**, which is categorized differently in various markets.

- Manufacture of quasi drugs need to be accredited by the Minister of health, Labor and Welfare (MHLW) according to article of the Japanese pharmaceutical affairs law (JPAL).
- This applied to domestic manufacturing as well as to foreign manufacturers when importing products into to japan.
- Mfg according to cGMP conditions
- Pre marketing approval is required by pharmaceutical and food safety bureau of MHLW.
- For the application of the marketing approval a foreign mfg must appoint a drug marketing authorization holder (MHA) in japan who performs all procedures with MHLW on behalf of the applicant
- The MAH can as well apply for the mfg license of the manufacturer and authorized market products.
- All summary documentation and forms filed for market authorization applications is required to be submitted in Japanese.

- ▶ Information required for marketing approval e.g **manufacturing information, stability, storage.**
- ▶ In additionally detailed description of the mfg site of the ingredients.
- ▶ All ingredients of quasi drug **must have monograph in Japanese pharmacopoeia.**
- ▶ Must have active ingredients declared (times takes 8 months)
- ▶ When the dose of active ingredients is higher than previously approved additionally non clinical data to evaluate the safety, efficacy, and stability (times takes 2 year)
- ▶ Change to the after approval can take 2 weeks for very simple modifications to more than 8 months for major changes.
- ▶ Quasi drug have restrictions to volume of the product sold to limit the exposure to consumers
- ▶ Quasi drug product cannot be sold in volumes of greater than 100 ml in volume.

Labelling of quasi drug

1. Name and address of manufacturer
2. Product trade name
3. Manufacturers serial no
4. Listing of all ingredients
5. Weight or volume of the unit of use
6. Expiration date
7. Category name
8. Warnings regarding use and handling
9. Description of the container

1. Whitening quasi drugs

- ▶ Skin lightening or whitening quasi drug (QDs) a category in japan for functional cosmetics, contain active ingredients that prevent or improve hyperpigmentation in disorders such as melasma
- ▶ But still unknown about the cause of hyperpigmentation
- ▶ Skin lightening QDS developed in japan
- ▶ Example ascorbic acid (vit C) and placental extract were used as skin lightening QDS developed in japan

1. Ascorbic acid and its derivatives

Table 1.4: Ascorbic acid and its derivatives used as popular skin lightening QDs in Japan

Ascorbic acid derivative	Mechanism	QD approval obtained by	Year
Magnesium L-ascorbic acid 2-phosphate	Prevents polymerization of melanin monomers involved in the immediate pigment darkening of the skin	Takeda Pharmaceutical Company Limited	1988
Sodium L-ascorbic acid 2-phosphate, L-ascorbic acid 2-glucoside	Antioxidation	Shiseido Co., Ltd. and Kaminomoto Co.	1994
L-ascorbic acid ethyl ester	Antioxidation	Shiseido Co., Ltd.	2005

2. Placental extracts

- It is used active ingredients for skin lightening QDs together with ascorbic acid and derivatives.
- Various amino acid and minerals are at high concentration in placental extracts and the inhibition of melanin synthesis and the enhancement of melanin removal from skin occurs due to increase epidermal turnover.

3. Kojic acid

- Pyron derivative obtained from the fermentation process of Japanese liquor is known to have an antibacterial activity.
- 1% Kojic acid containing formulation are effective for treatment hyperpigmentary disorders, such as melasma, post anti-inflammatory hyperpigmentation, age spot.

4. Ellagic acid

- It is naturally occurring polyphenol found of plants such as strawberries, geraniums, green tea.
- Ellagic acid inhibits tyrosine activity by chelating copper atom in active site.
- 0.5 % Ellagic acid containing cream was shown UV hyperpigmentation of skin.

5. Arbutin

- It is naturally occurring β - D-glycopyranoside derivatives of hydroquinone is found in cowberry leaves.
- 3 % Arbutin containing formulation are effective for treating hyperpigmentary disorders

Cosmetics OTC drugs

- ▶ The FDA has the authority to regulate personal care products that contain active ingredients that are Over-The-Counter (OTC) drugs.
- ▶ It is used in personal care products including cosmetics are subject to FDA approval.
- ▶ OTC drug are often marketed side by side with cosmetics and some products qualify both as cosmetics and as OTC.
- ▶ It is happen when product as two intended use.

1. Anti dandruff agents (e.g. shampoos)

- Dandruff occurs on the scalp. Because product build up in the hair like shampoo, conditioner, hair spray, gel etc.
- The reason is abnormally high level of a fungus called as *malassezia globosa*.
- Anti dandruff agents can be used to break and wash any product build up in your hair.
- Anti dandruff agents includes zinc pyrithione, ketoconazole, coal tar etc.



2. Fluorides(e.g. toothpastes)

- Fluoride helps prevent tooth decay by slowing the breakdown of enamel and increasing the rate of the remineralization process.
- Fluoride toothpastes make up more than 95% of all toothpaste sales.
- Fluoride compounds and their combination which have been tested for the control of dental decay including sodium fluoride ,sodium mono fluorophosphates.
- The amount of fluoride contained in Fluoride toothpastes should be indicated on the toothpaste tube.
- Previously fluoride contain was given as a % W/V, and now a days ppm F.



3. Sun protecting agent (e.g. in sunscreens)

- Sunscreen is also known as sunblock like lotion, spray, gel and other topical product that absorbs or reflects some of the UV radiation and thus helps to protecting against sunburn.
- Depending upon the mode of action sunscreen can be classified into physical sunscreen and chemical sunscreen



4. Anti perspirant agents (e.g. deodorants)

- Anti perspirants are personal hygiene products
- It contain ingredients that control sweat and body odour safely and effectively.
- When Anti perspirant is applied to the skin surface (aluminium salt) dissolved in the sweat or moisture on the skin surface of the armpit.



Cosmetic excipients: Classification and application

1. Surfactants,
2. Rheology Modifiers,
3. Humectants,
4. Emollients,
5. Preservatives.

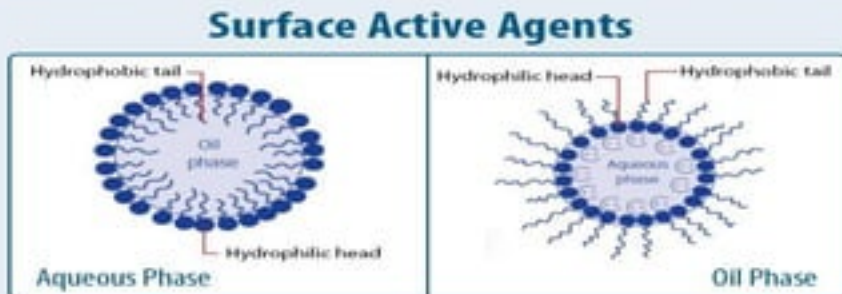
1. Surfactants

surfactant, also called **surface-active agent**,

Surfactants are compounds that lower the surface tension between two liquids.

Surfactant structure All surfactants are characterized by having two regions in their molecular structure:

- A) a hydrophobic tail
- B) a hydrophilic head that are important determinants of lowering the surface tension.



- The concentration of surfactant at which micelles are formed is designated as critical micelle concentration
 - Surfactant may act as detergents
 - Wetting agents,
 - Emulsifiers
 - Foaming agents
 - Dispersants.

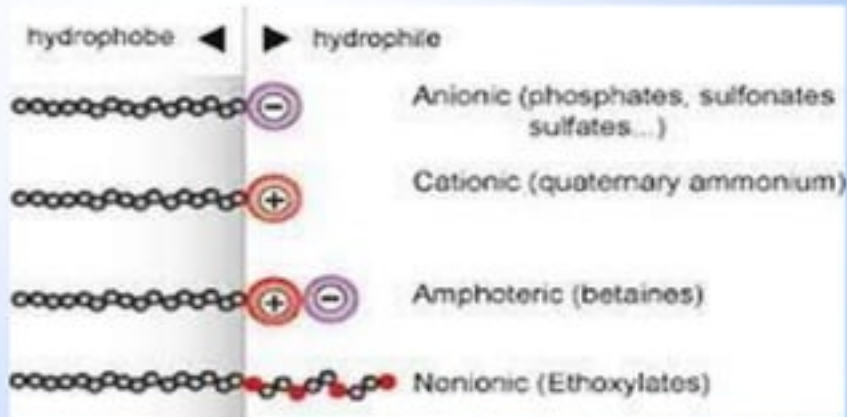
One common feature of all surfactants is that they all are amphipathic molecules.

Common types of surfactants in cosmetic products

1. Alkyl sulphates
2. Alkyl sulphonates
3. Phosphate esters
4. carboxylates

Classification of surfactants

- There are 4 types of surfactants there are 4 types of surfactants
 1. Anionic
 2. Cationic
 3. Non-ionic
 4. Amphoteric



1. **Anionic:** those surfactants in which surface active ion is negatively charged in solution are anionic surfactants. e.g is soap (sodium oleate)
- Anionic groups may be directly connected to hydrophobic parts or connected through ester, ether, amide.

Trade name	Structure/name	Applications
Pentex 99	Dioctyl sodium sulfosuccinate (DOSS)	Wetting agent – coatings, toothpaste
PFOS	Perfluorooctanesulfonate (PFOS)	Scotchguard™, Skydrol™
Calsoft ®	Linear alkylbenzene sulfonates	Laundry detergents, dishwasher detergents
Texapon ®	Sodium lauryl ether sulfate	Shampoos, bath products
Darvan ®	Lignosulfonate	Concrete plasticizer, plasterboard, DMSO
N/A	Sodium stearate	Handsoap, HI&I products

2. **Cationic** : Those surfactants in which surface active ion is positively charged in solution are anionic surfactants. These can be further subdivided into nitrogenous anionic surfactants and non-nitrogenous anionic surfactants.

1. nitrogenous anionic surfactants e.g

Permanently charged quaternary ammonium cations
Alkyltrimethylammonium salts:

cetyl trimethylammonium bromide (CTAB)

cetyl trimethylammonium chloride (CTAC).

2. non-nitrogenous anionic surfactants e.g

Sulphonium salt

Phosphonium salts

3. **Non-ionic:** these are gentler than anionic surfactant and have inferior foaming properties than anionic surfactants

Trade name	Structure/name	Applications
<i>Triton</i> TM X-100	Polyoxyethylene glycol octylphenol ethers: $C_8H_{17}-(C_6H_4)-(O-C_2H_4)_1-25-OH$	Wetting agent – coatings
Nonoxynol-9	Polyoxyethylene glycol alkylphenol ethers: $C_9H_{19}-(C_6H_4)-(O-C_2H_4)_1-25-OH$	Spermicide
<i>Polysorbate</i>	Polyoxyethylene glycol sorbitan alkyl esters	Food ingredient
<i>Span</i> ®	Sorbitan alkyl esters	Polishes, cleaners, fragrance carriers
<i>Poloxamers</i> , <i>Tergitol</i> TM , <i>Antarox</i> ®	Block copolymers of polyethylene glycol and polypropylene glycol	Various

4. **Amphoteric:** Zwitterionic (amphoteric) surfactants have both cationic and anionic centers attached to the same molecule.
- ▶ They help to boost the foam formation when combined with other surfactants.
 - ▶ e.g cocaamidopropyl betaine, coco betaine.

Uses of Surfactants

1. **Emulsifying agents:** a large no of cosmetics are emulsions and surfactants have been used as Emulsifying agents. 3 type of surfactants are usually as Emulsifying agents, i.e anionic, cationic, non-ionic surfactants.
2. **Foaming and cleaning agents:** surfactants for their Foaming and cleaning properties are used in shampoos.
3. **Wetting agents**
4. **Solubilisation**

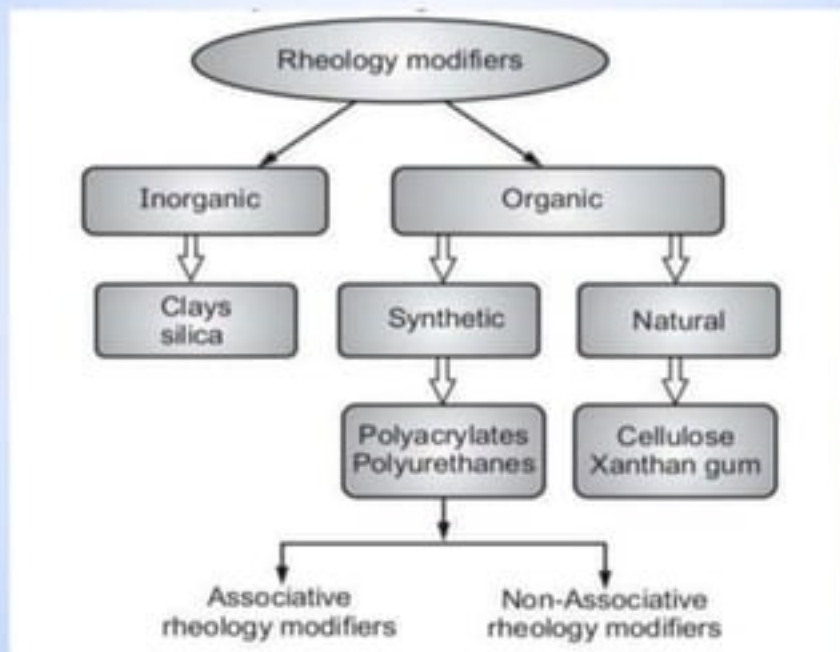
2. Rheology Modifiers

Rheology can be defined as the science or study of flow things flow.

The terms rheology modifier, thickeners and gelling agents but these have different functionalities.

Thickening agents	Gelling agents	Rheology modifiers
Thickening Agents are added to increase the viscosity of a formulation (e.g. emulsion) without any other significant change to performance of emulsion behaviour. Some thickeners will help to stabilize your emulsions while de-stabilize. Almost none of these are waxes, though they are usually in solid form.	Gelling Agents are ingredients that turn water, or oil phase into a gel, which is thickened, but without stiffness. The gels may be thixotropic in nature. These gels make it possible to create thick products, which can be shaken, or stirred under high shear, for easier bottling, or for spraying.	Rheology Modifiers are ingredients that alter the flow of a product. Additionally, they also alter the feel, offering increased slip and silkiness, and behaviour. They usually improve the suspension capability of any gel while also creating a more fluid product that flows easily. Most rheology modifiers will also improve absorption rates, and depth, while eliminating dryness.

Rheology Modifiers Classifications



Applications

1. Lipid thickeners: primarily composed of lipophilic materials. they are used most often in creams and lotions.
2. Naturally derived thickeners: cellulose derivatives like hydroxyethylcellulose are frequently used in liquid cleansing products such as shampoo or body wash.
3. Mineral thickeners : it is occurring naturally, it can absorbed water or oil and increases viscosity.
4. Synthetic thickeners : e.g. carbomer are used in lotion and cream.
5. Ionic thickening: e.g NaCl

3. Humectants

- ▶ Humectants or moisturizers are important cosmetic ingredients that prevent loss of moisture thereby retaining the skin natural moisture.
- ▶ It is key ingredients in skin care and hair care products.
- ▶ It is used in conditioner, body lotion, lip balms.
- ▶ Examples propylene glycol, aloe vera gel, egg white, honey, etc,

Classification of Humectants

1. Synthetic humectants : it is use in skin care products withdraw water from the deeper levels of skin without replenishing it.
 1. Propylene glycol
 2. PEG
 3. Silicones
2. Natural humectants : not only help attract water to the surface of skin but also deliver hydration and nutrients to the deeper layer and help the skin to keep itself hydrated on regular basis
 1. Aloe
 2. Honey
 3. Hyaluronic acid
 4. glycerine

► **Humectants for hairs**

It is added to hair care products because they attract water to the hair to keep the moisture content high.

Example : glucose, fructose, glycerine

► **Hair penetrating oils**

Oil helps to keep the hair moisturized in a two fold process. These oils absorb into the hair preventing the loss of proteins that bind water molecules.

Example : coconut oil, olive oils.

4. Emollients

- ▶ The term of Emollient refers to material that are able to soften skin.
- ▶ Emollients are considered ingredient which have smoothing or softening properties.
- ▶ Example plant oils, minerals, cocoa butter, fatty acid etc.

Classification of Emollients

1. Hydrophilic Emollient : glycerin, sorbitol
2. Lipophilic Emollient : section depends on properties such as polarity, emolliency scores, spreading behaviors.

5. Preservatives.

- Preservatives are not only necessary to stabilize our food supply; they play a crucial role in keeping our cosmetics safe.

Need Preservatives In Cosmetics

- A pH level refers to the acidity or alkalinity of an environment. Knowing the pH level is essential because many microorganisms (e.g., bacteria, fungi, yeasts) cannot live in an environment with a pH level below 4 or above 10 but thrive in a pH environment similar to our skin.
- While we can design products on the extreme ends of the pH scale to prevent microorganism growth, the products would likely irritate or damage our skin.

- Microorganisms grow readily in water, and most cosmetic products contain water as the largest or one of the largest ingredients.
- Additionally, the nutrients, vitamins, and many of the active ingredients in cosmetics can make excellent microorganism food. Thus, providing a prime environment to fuel their growth.

Common Cosmetic Preservatives

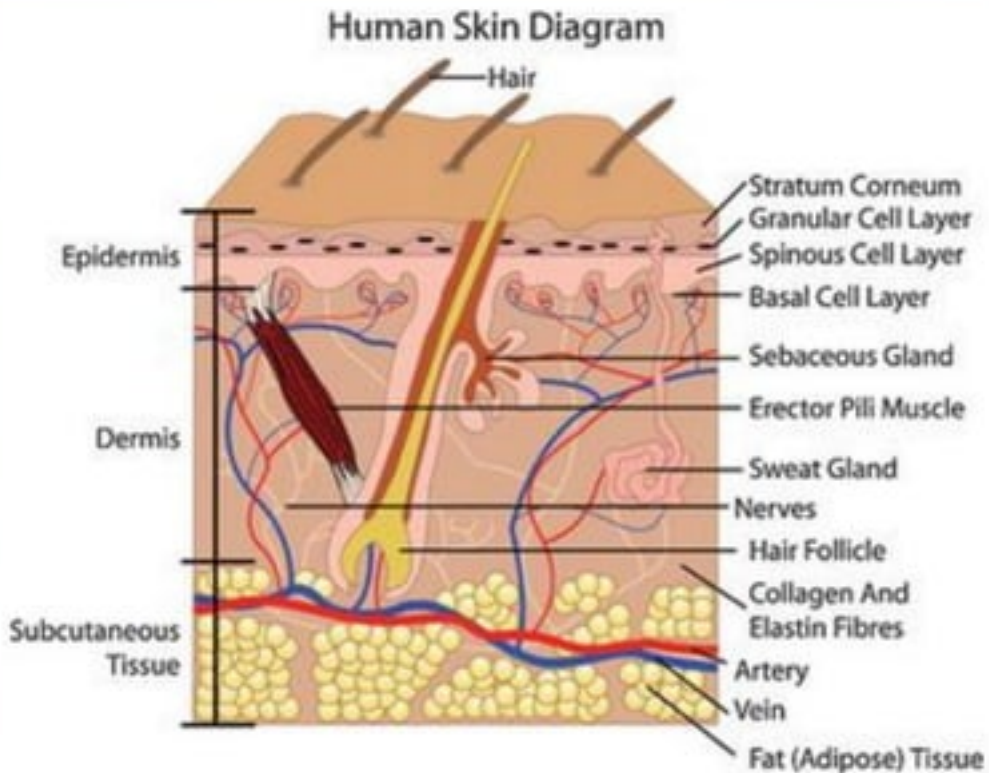
- **Aldehydes**, such as formaldehyde, imadiazolidinyl urea, diazolidinyl urea: safeguard against bacteria and some fungi
- **Glycol ethers**, such as phenoxyethanol and caprylyl glycol: safeguard against some bacteria
- **Isothiazolinones**, such as methylisothiazolinone: safeguard against bacteria and fungi
- **Organic acids**, such as benzoic acid, sorbic acid, levulinic acid, anisic acid: safeguard against fungi and some bacteria
- **Parabens**, such as methylparaben, ethylparaben, propylparaben, butylparaben, isobutylparaben: safeguard against fungi and some bacteria

Skin: Basic Structure And Function Of Skin.

Skin Components & its Functions

There are mainly three major components of skin:

- a) Hypodermis, subcutaneous layer just beneath the skin which functions as insulation & padding for the body).
- b) Dermis which provides support & structure &
- c) Epidermis, which functions as a protective shield for the body.



1. Epidermis:

- The overlying outer layers are called epidermis.
- It consists of anywhere between 50 cell layers(in thin areas) to 100 cell layers (in thick areas).
- The average epidermal thickness is 0.1 mm & renews itself approx. every 28 days.
- The layers of epidermis are:
 - 1.stratum germinativum(growing cells)
 - 2.malphigion layer(pigment layer)
 - 3.stratum granulosum(granular layer)
 - 4.startm lucidum(clear layer)
 - 5.stratum corneum(horny layer)

1. **Stratum granulosum/basale**

- Deepest layer of epidermis, single layer of cube shaped cells.
- New epidermal skin cells called keratinocytes are formed here through cell division.
- Melanocytes are found in this layer which contains a skin pigment called melanin which is photo protective & helps protect the skin against ultraviolet radiation (sun exposure).

2. **Stratum spinosum or Malphigion layer**

- It is also called prickle cell layer.
- Composed of 7-8 layers of polygonal keratinocytes, where the keratinocytes begin to become flattened.

3. **Stratum granulosum**

- Third layer of epidermis

- Composed of 3-5 layers of flattened keratin.
- Cells die in this region as they remain far from the dermis to receive nutrients.

4. **Stratum Lucidum**

- below stratum corneum , Present only in finger tips, palms & feet.
- 3-5 layers of extremely flattened cells.

5. **Stratum Corneum**

- Fifth layer or horny layer.
- Top, outermost layer of epidermis. Consists of 25-30 layers of dead keratinocytes.
- The nuclei are absent
- Thickness of skin surface of body range 1 mm to 5 mm

2. Dermis

- The layer between epidermis & hypodermis is called dermis.
- Contains a network of sweat glands, blood vessels, sebaceous glands & hair follicles.
- Dermis provides resilience & structure to the skin with dermal thickness of about 2 mm thick.
- Components of dermis work as network composed of collagen, elastin, lymph, blood vessels, mast cells & fibroblasts
- The most common structural component within the dermis is the protein collagen which gives the strength & flexibility of the skin.
- Blood vessels help in thermoregulation of the body by constricting or dilating to conserve or release heat.
- They also aid in immune function & provide oxygen & nutrients to the lower layers of the epidermis.

3. Hypodermis

- The hypodermis is the deepest section of the skin.
- It generally refers to the fat tissue below the dermis that insulates the body from cold temperature & provides shock absorption.
- The fat cells of hypodermis also stores fat & nutrients.

Function of skin

- ▶ Production of vitamin D.
- ▶ Acts as a sensory organ (touch, detects temperature).
- ▶ Provides a protective barrier against mechanical, thermal and physical injury and hazardous substances.
- ▶ Prevents loss of moisture.
- ▶ Reduces harmful effects of UV radiation.
- ▶ Helps regulate temperature.
- ▶ An immune organ to detect infections etc.

Hair: Basic Structure Of Hair.

- ▶ Hair is simple in structure made of the root and shaft.
- ▶ The root is enclosed in the hair follicle, submerges into the skin in inclination and ends down to the bulb while hair shaft is the part of the hair seen above the skin.
- ▶ Hair is made up of tough protein called keratin that decides the strength of hair
- ▶ Hair structure is made up of different layers and structures
 1. Follicle
 2. Shaft

Structures of the Hair Root

1. **Hair follicle**- tube-like depression or pocket in the skin or scalp that contains the hair root
2. **Hair bulb**- lowest part of a strand of hair; thickened, club-shaped
3. **Dermal papilla**- small, cone-shaped elevation located at the base of the hair follicle that fits into the hair bulb
4. **Arrector pili muscle**- small, involuntary muscle in the base of the hair follicle; when it contracts, we get goose bumps
5. **Sebaceous glands**- oil glands in the skin that are connected to the hair follicles; secretes sebum (fatty, oily substance)

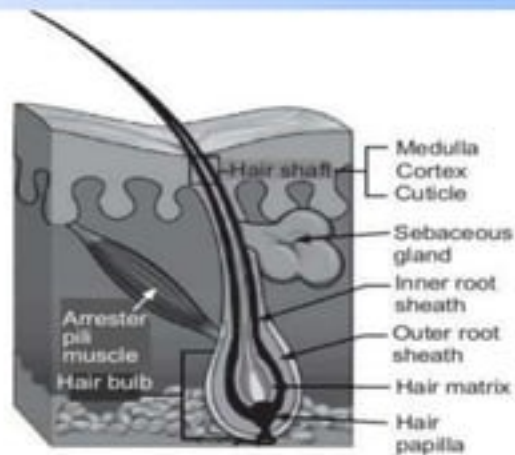
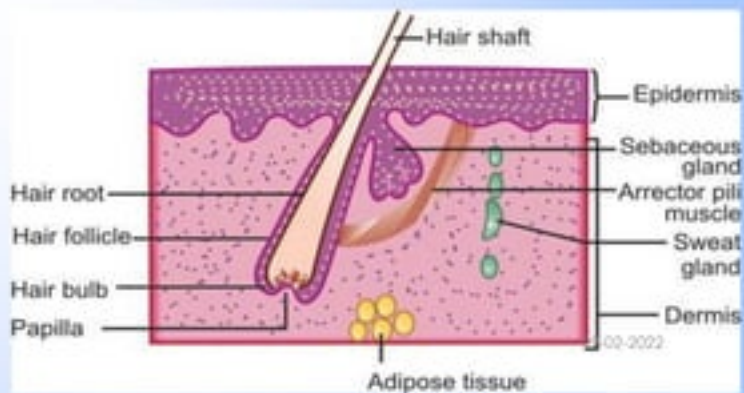
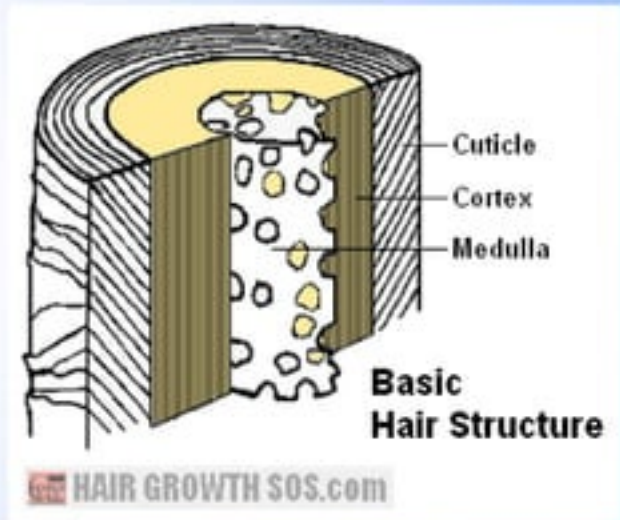


Fig. 5.1: Structure of Hair



Structures of the Hair Shaft

1. **Hair cuticle**- outermost layer of hair; consists of a single, overlapping layer of transparent, scale-like cells; protects inner structure of hair; creates shines and smoothness
2. **Cortex**- middle layer of the hair; 90% of total hair weight comes from the cortex; elasticity and color are the result of protein in the cortex
3. **Medulla**- innermost layer of hair; generally only thick, coarse hair contains a medulla.



Hair Growth Cycle.

76

The 4 stages of hair growth

1. Anagen Phase
2. Catagen Phase
3. Telegen Phase
4. Exogen Phase



- Each strand of hair on the human body is at its own stage of development.
- Once the cycle is complete, it restarts and a new strand of hair begins to form.
- The rate or speed of hair growth is about 1.25 centimetres or 0.5 inches per month, or about 15 centimeters or 6 inches per year.

Anagen Phase

- ▶ The anagen phase is known as the **growth phase**. This is the phase where the hair physically grows approximately 1 cm per month.
- ▶ It begins in the papilla and can last from two to six years. The span at which the hair remains in this stage of growth is determined by genetics.
- ▶ The longer the hair stays in the anagen phase, the longer it will grow.
- ▶ During this phase, the cells in the papilla divide to produce new hair fibers[contradictory], and the follicle buries itself into the dermal layer of the skin to nourish the strand.
- ▶ About 85% - 90% of the hairs on one's head are in the anagen phase at any given time

CATAGEN PHASE

- ▶ The catagen phase, also known as the **transitional phase**, allows the follicle to, in a sense, **renew itself**. During this time, which lasts about two weeks, the hair follicle shrinks due to disintegration and the papilla detaches and "rests," cutting the hair strand off from its nourishing blood supply.
- ▶ Signals sent out by the body (that only selectively affect 1 percent of all hair of one's body at any given time) determine when the anagen phase ends and the catagen phase begins.
- ▶ The first sign of catagen is the cessation of melanin production in the hair bulb and apoptosis of follicular melanocytes. Ultimately, the follicle is 1/6 its original length, causing the hair shaft to be pushed upward.
- ▶ While hair is not growing during this phase, the length of the terminal fibers increase when the follicle pushes them upward.

TELEGEN PHASE

- During the telegen or **resting phase (also known as shedding phase)** the follicle remains dormant for one to four months. 10 to 15% of the hairs on one's head are in this phase of growth at any given time.
- In this phase the epidermal cells lining the follicle channel continue to grow as normal and may accumulate around the base of the hair, temporarily anchoring it in place and preserving the hair for its natural purpose without taxing the body's resources needed during the growth phase.
- At some point, the follicle will begin to grow again, softening the anchor point of the shaft initially. The hair base will break free from the root and the hair will be shed.
- Within two weeks the new hair shaft will begin to emerge once the telegen phase is complete. The process results in normal hair loss known as shedding

Oral Cavity: Common problem associated with teeth and gums.

- ▶ Oral cavity defined as the part of mouth behind the teeth and gums that is bounded above by the hard and soft palates and below by the tongue and the mucous membrane connecting it with the inner part of the mandible.
- ▶ The state of oral cavity is of considerable importance for an individuals well being and is designated as “oral health”
- ▶ Two main diseases which affect oral health
 1. Dental caries (tooth decay)
 2. Periodental (gum diseases)

Common diseases of oral cavity

1. Tooth decay
2. Periodontal disease
3. Thrush
4. Trench mouth
5. Dry mouth
6. Hepatic gingivostomatitis
7. Mumps
8. Mouth ulcer
9. Tooth erosion
10. Stain teeth
11. Cavities
12. Hyperdontia- Extra teeth

Care of teeth and gums

- Brushing, Flossing, Rinsing, Eating right, Visiting the dentist

Gum Problems

- Gum disease is an inflammation of the gum line that can progress to affect the bone that surrounds and supports your teeth.
- The three stages of gum disease — from least to most severe — are gingivitis, periodontitis and advanced periodontitis.

Cause

- Bacteria in plaque, a sticky, colorless film that constantly forms on your teeth, cause gum disease.
- If plaque is not removed it can harden and turn into tartar (calculus). Additionally, dental plaque will continue to form on the tartar.
- Brushing or flossing cannot remove tartar; a dental professional will need to conduct a dental cleaning to remove it.

3 stages of gum diseases

83

Stages Of Gum Disease

1

HEALTHY GUMS
& TOOTH



2

GINGIVITIS



Calculus builds up on teeth and gums are inflamed (red).

3

PERIODONTITIS



Inflammation causes gums to separate from tooth, forming pockets. Early to moderate bone loss.

4

ADVANCED
PERIODONTITIS



Severe bone loss, deep pockets. Tooth is in danger of falling out.

Treatment

- ▶ A professional cleaning by your dentist or dental hygienist is the only way to remove plaque that has built up and hardened into tartar.
- ▶ If gum disease is more advanced, scaling and root planning can be performed to treat diseased periodontal pockets and gum infection.
- ▶ A dental hygienist uses an ultrasonic scaling device to remove plaque, tartar and food debris above and below the gum line.