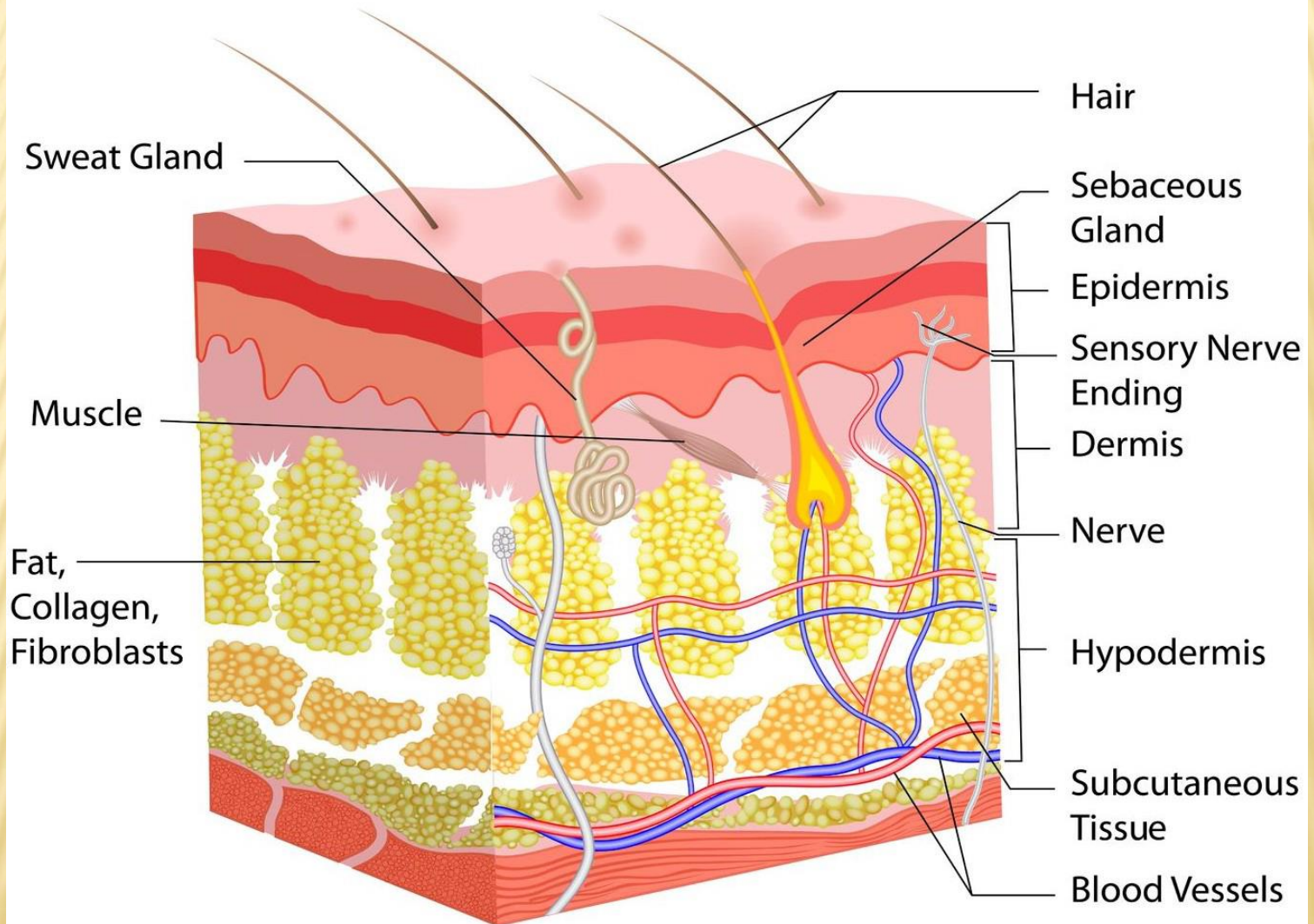




TOPICAL AGENTS

PHARMACEUTICAL CHEMISTRY 1
UNIT II (SECTION-C)

SKIN STRUCTURE



CONTENTS

TOPICAL AGENTS

PROTECTIVE

ANTIMICROBIAL

ASTRIGENTS

Definition: Topical means pertaining to a particular locality or place or simply it means “local”. Substances which are applied directly on the skin or mucous membrane or any other surface.

Protective and adsorbents:

drugs which adsorb intestinal toxins, bacteria etc, and give a protective coating to the inflamed mucus memb.



TALC

Talcum, French Chalk, Purified talc

3MgO , 4SiO_2 , H_2O

Test for Purity

- Acidity or alkalinity
- Water-Soluble substances
- Acid-Soluble substances
- Iron
- Carbonates
- Loss on drying
- Organic compounds
- Chloride



Storage:

Talc is an inert substance not affected by acids or bases or other chemicals. So store in a well closed container.

Medicinal and pharmaceutical Uses:

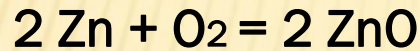
Pharmaceutical aid (dusting powder).
Used as a filtering and distributing medium in the preparation of aromatic waters etc.

Main ingredient in talcum powders and dusting powders

Zinc oxide/ZnO

Preparation

- Zinc oxide is prepared on a large scale by burning zinc metal in a current of air.



Storage:

Since it absorbs CO₂ from the air, store it in a well closed container.

Medicinal Use:

- Astringent and topical protective. ZnO is a mild antiseptic and astringent. In the form of ZnO ointment or dusting powder, it is used in the treatment of eczema, ringworm, pruritus and psoriasis.
- It is also widely used in the mfg of plasters.
- ZnO



Zinc Oxide Paste

Zinc Oxide:	250 gm
Starch:	250 gm
White Soft Paraffin:	500 gm

Zinc stearate/ $(C_{17}H_{35}COO)_2Zn$

Mixture of Zn salts obtained from commercial **stearic acid** which itself is prepared from the **hydrolysis of fats**. It consists mainly of variable proportions of Zinc stearate and Zinc **palmitate**.

Medicinal and Pharmaceutical Uses:

Dusting powder. Since zinc stearate is a mild antiseptic and astringent, it is used in the form of dusting powder or ointment in several skin conditions. Sometimes it is used as solid diluents.



CALAMINE

- **Calamine BP:** Basic $ZnCO_3$ suitably colored with ferric oxide.
- **Calamine IP:** ZnO colored with Ferric oxide. It is an amorphous, **reddish** brown powder and the color depends on the **variety** and **amount** of ferric oxide present and the **method** by which it is **incorporated**. It is practically **insoluble** in water and **completely soluble** in **mineral acids**.
- Since there is a possibility of adulteration with dyes, there are tests for water soluble dyes and alcohol soluble dyes.

Medicinal and Pharmaceutical Uses:

Topical **protective**. Widely used in **lotions**, ointments and dusting powders as **soothing agent**. It is used in **sunburns**, **eczema** and **urticaria** and some other skin conditions.



Antimicrobial Agents and Astringents

- These are the chemicals & their preparations used in reducing or preventing infection due to microorganisms.
- Antiseptic: Inhibit the growth of MO (used for living object)
- Disinfectant: Destroy the Pathogenic MO (used for non living object)
- Germicides: Kill Bacteria, Fungi, Viruses, Spores
- Bacteriostatic: Primarily inhibit the Bacteria – Only arrest their growth not kill them.
- Sanitizers: For maintaining the health for sanitization purpose

Uses of antimicrobial agents

1. 1% solution used for using into the eyes of newborn babies, as prophylactic measure against ophthalmia neonatorum.
2. Effective against gonococcal organisms.
3. 0.5% aqs soln in the form of wet dressing applied to third degree burn.

Mechanism Of Action

- 1: Oxidation
- 2: Halogenation
- 3: Protein Precipitation

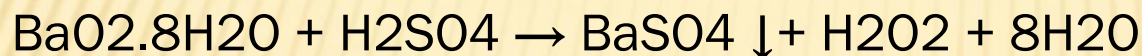
CLASSIFICATION OF DISINFECTANTS AND ANTISEPTICS

1. **Halogens** (Chlorinated Lime, Chloramine B, Chlorhexidine, Iodovidone)
2. **Oxidizing agents** (Hydrogen Peroxide, Potassium Permanganate)
3. **Acids** (Boric Acid)
4. **Phenol derivatives** (Phenol, Cresol,)
5. **Aldehydes and alcohols** (Formaldehyde, Ethanol, Isopropanol)
6. **Metallic salts** (Silver Nitrate, Zinc Sulfate, and Copper Sulfate)
7. **Dyes or tints** (Brilliant green, Methylene Blue)
8. **Detergents** (Decamethoxinum, Soaps)

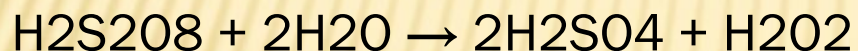
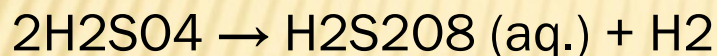
Oxidative Anti-microbial Agents

Hydrogen peroxide, H₂O₂

Laboratory method:



Industrial method:



Uses of H₂O₂

(i) Antiseptic and germicide for washing wounds, teeth and ears, under the name of perhydrol.

(ii) In the mfg of sodium perborate, sodium percarbonate. These are used in high quality detergents.

(iii) As an antichlor.



Zinc peroxide, ZnO₂

- It is odorless white or yellowish solid.
- It is produced by adding ZnO or zinc hydroxide to a solution of H₂O₂.
- It can also be synthesized through the reaction of zinc chloride and hydrogen peroxide.
- It is stable, insoluble in water and dissolves in acid forming H₂O₂ . It decomposes at 150 OC to release O₂
- Storage: Oxidiser, store in cool, away from light
- Away from incompatible materials (organic and reducing subs)
- Use: Anti-microbial agent in topical preparation, additive for aseptic products
- It was historically used as a surgical antiseptic.



Potassium Permanganate, KmnO_4

Salt consisting of K^+ and MnO_4^- ions. Formerly known as **permanganate of potash** or **Condy's crystals**, it is a strong oxidizing agent.

Test for Purity:

Cl and SO_4

Water-insoluble matter

Color of the solution

Storage:

should be kept separated from oxidizable substances. Store in wellclosed containers.

Uses:

As an oxidant, antiseptic

Permanganate washes were once used to treat **gonorrhoea** and are still used to treat **candidiasis**.

Antidote for **strychnine**

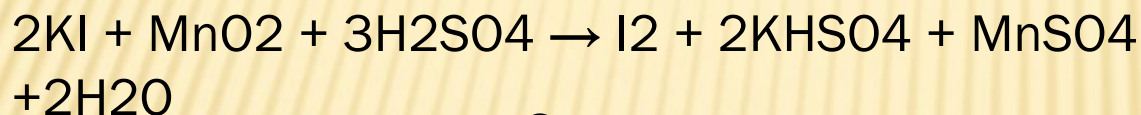


Iodine, I₂

A dark violet (Greek, ioeides, violet) non-metallic halogen element belonging to Group VIIb of the periodic table.

Preparation:

Prepared by heating KI or NaI with dil. H₂SO₄ and manganese dioxide.



Storage:

It is **volatile** in nature. Iodine topical solution should be stored in light-resistant containers at a temperature not exceeding 35 °C and iodine tincture should be stored in air-tight containers.

Uses:

solution in alcohol, called "**tincture of iodine**" is used as antiseptic

Povidone-iodine (PVP-I) is a stable chemical complex of polyvinylpyrrolidone (povidone, PVP) and elemental iodine. It contains from 9.0% to 12.0% available iodine, calculated on a dry basis.



Astringents

- Are protein **precipitant** with limited penetration power
- It **coagulates the protein on the surface** of the cell and brings out hardening effect.
- It **constricts the tissue**: Small Blood vessels
- These are mild **Antimicrobial Agents**

USES:

- Styptic to **arrest minor bleeding** by coagulation of blood
- **Anti-perspirant** to reduce perspiration by constricting pores of skin
- **Anti-inflammatory** action
- At high concentration to **remove unwanted tissue** growth
- Internally they can be used in **diarrhea**
- As cosmetic as **skin tone** and bring out the **hardening** effect
- In dental products it can promote **hardening of the gums**
- It **reduces the cell permeability**

Astringents

Aluminum Compound

- **Alum:**
- Potash Alum:[$KAl(SO_4)_2, 12H_2O$]
- Ammonia Alum:[$NH_4Al(SO_4)_2, 12H_2O$]
- Formula: $AlK(SO_4)_2, 12H_2O$

- **Synonyms:**
- Aluminium Potassium Sulphate, Potash Alum, Potassium Alum

- **Uses:**
- Large dose gives irritation and gives **Gum Necrosis, GI**
- **Haemorrhage, adjuvant with vaccine (DTP)**
- Alum precipitate proteins
- To apply on sores
- Used as **mordant in dyeing industry.** (a substance, that
- combines with a dye or stain and thereby fixes it in a material.)



Zinc Sulfate ZnSO4

- Three forms are official - Heptahydrate, Hexahydrate, monohydrate
- Formula: $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$
- **Preparation:**
 - $\text{Zns} + 2\text{O}_2 \rightarrow \text{ZnSO}_4$
 - $\text{Zn} + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + \text{H}_2$
- **Properties:**
 - Colorless, transparent crystals, odorless
 - Very soluble in water; practically insoluble in ethanol
- **Uses:**
 - In variety of **Skin condition** (keratosis), viral infection of genitals, pityriasis (skin rash).
 - Water soluble Zn is used as supplements for Zn deficiency.



Protein precipitant antimicrobial agents

Silver Nitrate, AgNO₃

- Inorganic compound with chemical formula AgNO₃.
- **Test for Purity:**
 - Clarity and color of the solution
 - Acidity and alkalinity
 - Foreign salts
- Al, Bi, Cu and Pb
- **Storage:**
 - Affected by light, store in tightly closed light resistant containers.
- **Uses:**
 - Antiseptic properties. Until the development of antibiotics,
 - Dilute solutions of AgNO₃ used to be dropped into newborn babies' eyes at birth to prevent contraction of gonorrhoea from the mother.

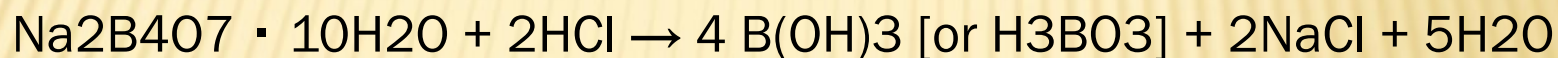


Boric acid, H₃BO₃, B(OH)₃

aka hydrogen borate, boracic acid, orthoboric acid & acidum boricum.
Colorless crystals or a white powder that dissolves in water

Preparation of boric acid:

Reacting borax (sodium tetraborate decahydrate)
with a mineral acid:



Uses:

- Antiseptic for minor burns or cuts and is sometimes used in dressings.
- Very dilute solution as an eye wash.
- Dilute boric acid can be used as a vaginal douche to treat bacterial vaginosis due to excessive alkalinity.
- For acne treatment. For prevention of athlete's foot, by inserting powder in the socks or stockings.



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