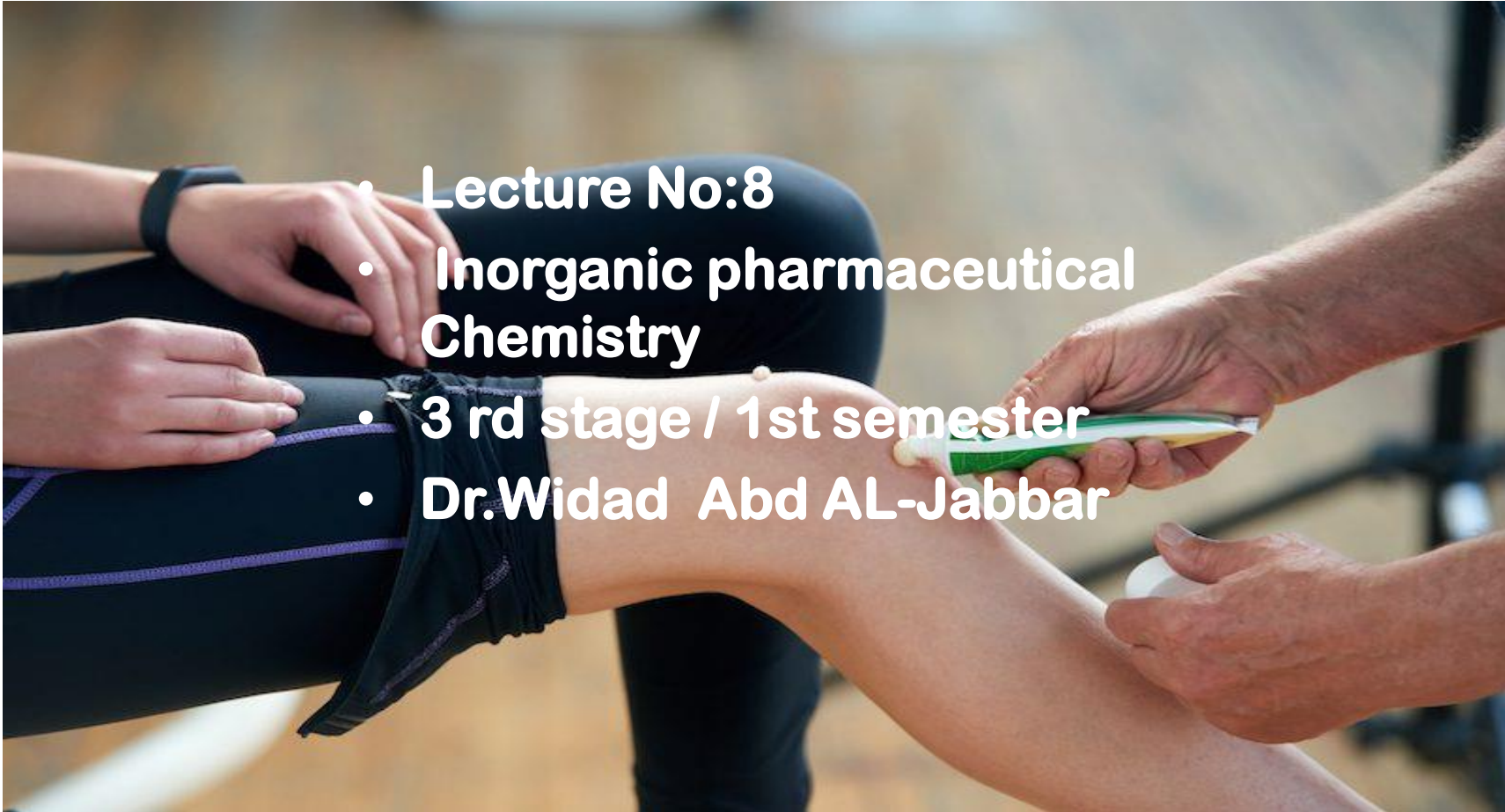


# TOPICAL AGENTS

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- A photograph showing a person's leg being treated with a topical agent. A hand is applying a green and white tube of cream to the skin. Another hand is holding a white container, possibly a jar of ointment. The person is wearing black athletic wear with purple stripes. The background is blurred, suggesting an indoor setting like a gym or clinic.
- Lecture No:8
  - Inorganic pharmaceutical Chemistry
  - 3 rd stage / 1st semester
  - Dr.Widad Abd AL-Jabbar

## Topical Agents: Definition

- Topical agents :the use of these drugs or compounds on the surface e.g.: Antiseptic
- Systemic: The drugs are absorbed into circulatory system and distributed to various organs or tissues

### Types of inorganic topical agents

There are Three types:

- 1- Protective agents.
- 2- Antimicrobial agents.
- 3- Astrigents

# Protective agents

- Are substances which may be applied to skin to protect certain areas from irritation.
- **Properties of protective agents** are insoluble in water (  $H_2O$ ), and chemically inert (unreactive), in order to prevent interactions between the protective substance and the tissue.
- Also, small fine particles (large surface area).

# Classification of protective agents

1- Dusting powders.

2- Suspensions.

3- Ointments



# Talc powder

- **[MgO.4SiO<sub>2</sub>.H<sub>2</sub>O ]**Hydrous magnesium silicate, very fine white powder, smoothly, greasy feeling to the touch (soapstone). □Talc is characterized as fine powder, mesh particle size, odorless, insoluble in water but react with dil. HCl & bases.
- **Uses of Talc**
- 1– It is useful in lubricating, protective dusting, Can be prevent any friction.
- 2–Used for wound & surgical incision because can produce sterile abscesses
- 3– Used in medical gloves.( plastic disposable)
- 4– Used in cosmetic may be perfumed

**Medical Talc by mixing boric acid with talc as antimicrobial agents.**

# Zinc oxide

- The chemical formula for Zinc oxide is [ZnO ]
- Is a very fine, odorless, amorphous , white or faint yellow powder, can be heated 400–500 °C
- ZnO is insoluble in water, alcohol, but reacts with dil. HCl
- $\text{ZnO} + \text{HCl} \longrightarrow \text{ZnCl}_2 + \text{H}_2\text{O}$

## Uses of Zinc Oxide

- 1- Is a mild astringent and weak antimicrobial agent.
- 2- Used as powder, ointments to protect the skin.
- 3- Dusting powder used in the treatment of skin ulceration & other dermatological problems.

**Medicated zinc oxide by mixing with boric acid as antimicrobial agents.**

# Calamine

- The formula is  $\text{ZnO} \cdot \text{Fe}_2\text{O}_3$
- Can be synthesized by mixing ZnO with ferric oxide.
- It is a fine powder, water insoluble, alcohols, adhering to the skin.

## Uses of Calamine

- Calamine can be used as topical protective agent.
- It is USP product used as dust powder, calamine lotion ( applied to skin )pink color.
- Calamine is applied to the skin for its adsorbent, protective properties, used in dermatological problems.

The calamine lotion contain ZnO and ferric oxide equally mixed Bentonite magma in the solution of Calcium hydroxide.

- Phenolated calamine lotion( USP ) contains 1% liquid which provide a local anesthetic and anti-itching action.

## Titanium Dioxide

- TiO<sub>2</sub> as topical protective agent, it is characterized by off white powder color, tasteless, odorless.
- 1 to 10 aqueous suspension of the solution is neutral to litmus paper.
- It is insoluble in water , HCl, HNO<sub>3</sub>, dil H<sub>2</sub>SO<sub>4</sub>.

It is soluble in Conc. H<sub>2</sub>SO<sub>4</sub>

- $\text{TiO}_2 + \text{H}_2\text{O}_2 \longrightarrow \text{TiO}_3$  ( Titanium trioxide)



- **Uses of TiO<sub>2</sub>**

- TiO<sub>2</sub> is a protective agent, topically, used as Sun screen light ( UV light radiation) due to its highly refractive index.
- Many pharmaceutical preparation as TiO<sub>2</sub> cream, 5, 10, 25% ointments.
- Other organic sun screen agent p- amino- benzoic acid ( PABA).
- TiO<sub>2</sub> used in cosmetic and paints.

- **Aluminum**

- Aluminum ( Al ) is a silver- white metal as protective agents , highly affinity to O<sub>2</sub> forming Al<sub>2</sub>O<sub>3</sub> as protective layer.

- It is insoluble in water, alcohols, and uncreative towards HNO<sub>3</sub>,H<sub>2</sub>SO<sub>4</sub>

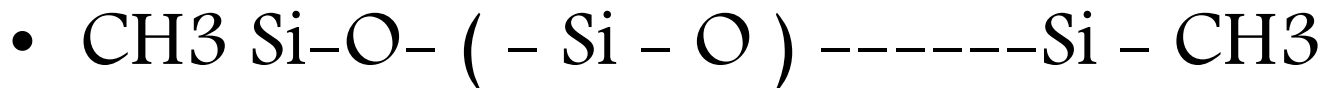
- It react rapidly with dil HCl

- $\text{HCl} + \text{Al} \longrightarrow \text{AlCl}_3 \cdot 6\text{H}_2\text{O}$

- Aluminum, paste ( ZnO with base ) used to prevent irritation.

- **Silicon Polymer**

- There are inert protective substances occurring in liquid form known as Silicon oils; e.g. dimethyl silicon ( Dimethicon, or Simethicone )



- Very well adhere to skin, but not wound, be avoided contact to the eyes.

# 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% solution using into the eyes of newborn babies, as prophylactic measure against ophthalmia neonatorum.
- Effective against gonococcal organisms.
- 0.5% aqueous solution in the form of wet dressing applied to third degree burn.

## **Mechanism of Action of antimicrobial agents**

1: Oxidation 2: Halogenation 3: Protein Precipitation

# 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 to improve skin tone and bring out the hardening effect
- In dental products it can promote hardening of the gums
  - It reduces the cell permeability