Topical Dermatological Therapy

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PHARMACY DEPARTMENT
FMUI
Topical Application

- Mucous Membranes
- Skin
Mucous Membrane

- Conjunctiva
- Nasopharynx
- Oropharynx
- Vagina
- Colon
- Urethra
- Urinary bladder
Mucous Membrane

- Local effect (primary)
- Systemic absorption (occasionally)
  - Application of synthetic antidiuretic hormone to the nasal mucosa
- Absorption → occurs readily
  → systemic toxicity !!
Skin

- Few drug readily penetrate to the skin, why? → the epidermis behaves as a lipid barrier

(→ anatomy and physiology of the skin)
Variations in Human Skin

Human skin is not all the same. There are numerous differences among patient groups as well as between various regions of the body.

Permeability varies among individuals based upon:

• Age: The skin of neonates and the elderly is more permeable than that of other age groups
• Ethnicity: For example, the skin of Caucasians is more permeable than that of African-Americans
Permeability

- Permeability varies among regions of the body:
  - The most permeable areas are the mucous membranes, scrotal skin, and eyelids
  - Areas of intermediate permeability include the face/head, chest/back, buttocks, abdomen, and upper arms/legs
  - The least permeable areas are the palmar/plantar surfaces and nails
Permeability varies according to skin status or conditions:

- Hydration: Hydrated skin is more permeable than dry skin.
- Broken or irritated skin: Drugs can more easily bypass the stratum corneum, increasing permeability.
- Temperature: Warmer skin is more permeable.
- Sunburn: Initially skin is less permeable; after peeling occurs it becomes more permeable.
- Eczema: Regions exhibit increased permeability.
- Psoriasis: Areas are thicker and show decreased permeability.
- Thermal burns: Skin is more permeable.
- Chemical peels: Removal of the stratum corneum increases permeability.
LOCAL vs TOPICAL

Local

- effect on certain area
  - e.g. antiseptic, antacid, laxan, etc.

Topical

- application
  - Mucous Membrane,
  - Skin
  - Eye
  - transdermal delivery systems etc
Transdermal delivery systems:

Transdermal devices are system that are use to deliver drugs to the systemic circulation via the skin. Not every drug can be given by this method.

e.g. - nitroglycerin ciim for the treatment of angina ~
    - scopolamine1 for motion sickness
Penetrasi obat topikal di kulit

melalui:

Stratum korneum
↓
Epidermis
↓
papila dermis
↓
aliran darah
For the best result of topical dermatologic therapy, it is necessary to:

1. be able to assess the type of eruption accurately
2. understand the principles of using topical preparations
3. know the differences between dermatologic formulations and its usage
4. be acquainted with the structure and presumed mode of action of many drugs for topical use
The reasons to use the drug for topical therapies are

1. Accurate diagnosis and type of eruption

2. Drug of choice:
   - safety
   - efficacy
   - cost
Aims:

- a. Prophylactic
- b. Diagnostic
- c. Therapeutic
A. Anti infection

Principles:
1. effectivity due to bacterial causal
2. do not use as a systemic drug
3. do not stimulate sensitization
<table>
<thead>
<tr>
<th>The Name of Drug</th>
<th>Concentration</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cloramphenicol</td>
<td>2%</td>
<td>Gram positive</td>
</tr>
<tr>
<td>Fusidat</td>
<td>2%</td>
<td>Infection of <em>Staphylococcus sp.</em></td>
</tr>
<tr>
<td>Mupirocin</td>
<td>2%</td>
<td>Gram positive &amp; negative</td>
</tr>
<tr>
<td>Gentamycin</td>
<td>0.1 %; 0.3% (forte)</td>
<td>mainly gram negative</td>
</tr>
<tr>
<td>Neomycin Sulfat</td>
<td>0.5%</td>
<td>Gram positive &amp; negative</td>
</tr>
<tr>
<td>Basitrasin</td>
<td></td>
<td>Gram positive</td>
</tr>
<tr>
<td>Polimiksin B</td>
<td></td>
<td>Gram negative except <em>Proteus &amp; Serratia</em></td>
</tr>
<tr>
<td>Framisetin</td>
<td>1%</td>
<td>Gram positive &amp; negative</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>2%</td>
<td>Acne vulgaris</td>
</tr>
</tbody>
</table>
## Anti-fungi

<table>
<thead>
<tr>
<th>The Name of Drug</th>
<th>Dosage form / Preparation</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Derivat imidazol</td>
<td>Cream 2%</td>
<td>Dermatomycosis</td>
</tr>
<tr>
<td>Asam Undesilenat</td>
<td>Ointment/cream 5%</td>
<td>Dermatomycosis</td>
</tr>
<tr>
<td>Balsam Peru</td>
<td>cream 0.1 %</td>
<td></td>
</tr>
<tr>
<td>Asam Salisilat</td>
<td>cream/Ointment 3-20%</td>
<td></td>
</tr>
<tr>
<td>Asam Benzoat</td>
<td>cream/Ointment 6-12%</td>
<td></td>
</tr>
<tr>
<td>Terbinafin HCl</td>
<td>cream 1 %</td>
<td>Dermatofytosis</td>
</tr>
<tr>
<td>Nystatin</td>
<td>cream 100.000 IU/gram</td>
<td>Candidiasis</td>
</tr>
<tr>
<td>Selenium Sulfida</td>
<td>Shampoo 1 %, lotion 2.5%</td>
<td>Mild Antifungal</td>
</tr>
</tbody>
</table>
Antiparasite

- Gamma benzen heksaklorida
- Benzil benzoas 20-25% : Skabisida and pedikulosida
- Krotamiton : cream/solution 10% for skabies
- Permetrin 5%
- Sulfur
ACTIVE AGENTS

B. Anti inflammatory

1. Corticosteroid topical

- **Effects**: anti-inflammation, anti-alergic, anti-pruritic, anti-mitotic, vasoconstriction
- **Potenciacy**: weak, mild, strong
- **Indication**: - Topical : dermatitis, mild psoriasis
  - Intralesion: keloid, parut hipertrophy
  - alopecia areata, acne cistik, prurigo
- **Contra Indication**: Infection, ulcus
- **Time of application**: - mild: 4 - 6 weeks
  - strong: 2 weeks
C. Keratolytic

- Salicylic acid
- Wetting agent: 0.1 %
- Keratoplasti: 1 – 2 %
- Keratolitik: 3 – 20 %
- Destructif: 30 – 60 %
- Penetration enhancer: 3 – 5 %
### ACTIVE AGENTS

- **C. Analgesic**
- **D. Antiseptic and Disinfectant**

<table>
<thead>
<tr>
<th>Active Agents</th>
<th>Composition</th>
<th>Indication</th>
</tr>
</thead>
</table>
| Alkohol       | 70%         | - Antiseptic for open wet dressing  
|               |             | - (bakteriostatic)  
|               |             | - (fungisidal)  
|               |             | - (antipruritic)  
|               |             | - ( desinfectant)  
|               |             | - (anti bacteria, antimicotic, Keratolitic. antisebhoric)  
|               |             | - (gram positive)  
| Fenol         | 1%          | -  
|               | 1-3%        | -  
|               | 1-2%        | -  
|               | Timol 0.5%  | -  
|               | Resorcin 2-3% | -  
<p>|               | Heksaklorofen 3% | -  |</p>
<table>
<thead>
<tr>
<th>Halogen</th>
<th>Povidon Iodin 1 %</th>
<th>Antibakteria, antimicotic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxidative agent</td>
<td>Kalium permanganat 1:10.000</td>
<td>• Wet dressing for dermatitis madidans</td>
</tr>
<tr>
<td></td>
<td>Kalium permanganat 1:5.000</td>
<td>• Ulcus, lesi supuratif and deep.</td>
</tr>
<tr>
<td></td>
<td>Benzoil peroksida 2.5-10%</td>
<td>• Antiseptic, stimulus granulation tissue, keratoplasty, Comedolitic.</td>
</tr>
<tr>
<td></td>
<td>Hidroksi peroxide 3%</td>
<td>• Mild Bakterisidal</td>
</tr>
<tr>
<td>Senyawa logam berat</td>
<td>Merkuri (no use again, because sensitisation dan toxic)</td>
<td>• Gram negative</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Hipergranulation</td>
</tr>
<tr>
<td></td>
<td>Perak nitrat 0.25-0.5%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Perak nitrat 20%</td>
<td></td>
</tr>
<tr>
<td>Color agent</td>
<td>Akridin laktat (Rivanol) 1 %</td>
<td>• Astringent, antiseptic</td>
</tr>
<tr>
<td></td>
<td>Metil rosanilin klorida (Gentian</td>
<td>• Infection of <em>Candida</em></td>
</tr>
<tr>
<td></td>
<td>Violet) 1-2%</td>
<td></td>
</tr>
</tbody>
</table>

Active Agent
ACTIVE AGENTS

F. Others:
- Sulfur presipitatatum
- Boric acid 3 %
- Asam vitamin A (retinoic acid)
- Benzocaine 0.5-5%
Sulfur presipitatum

- Anti Sebhorroea
- Anti Acne
- Anti Scabies
- Anti Bacteria (Gram +) - Anti Micotic

Concentration: 4 - 20 %
Boric acid 3 %

- Antiseptic, toxic, mainly for wide lesion and erosif
Asam vitamin A (retinoic acid)

- cream 0.05%, gel 0.01 %, to increase differentiation of cel-cel epidermis, to stimulate synthesis of fibroblast and collagen,
- to increase of local vascularisation
Benzocaine 0.5-5%

- Benzocaine 0.5-5%/ Lidocaine
- For anesthesia
Fingertip units required for one application

- Face and neck: 2.5 FTU
- Trunk (front or back): 7 FTU
- One arm: 3 FTU
- One hand (both sides): 1 FTU
- One leg: 6 FTU
- One foot: 2 FTU

<table>
<thead>
<tr>
<th>Weight of ointment required for one application</th>
<th>Tube size to dispense for complete coverage of area for b.i.d. application, 10 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.25 gm</td>
<td>30 gm</td>
</tr>
<tr>
<td>3.5 gm</td>
<td>60 gm</td>
</tr>
<tr>
<td>1.5 gm</td>
<td>30 gm</td>
</tr>
<tr>
<td>0.5 gm</td>
<td>15 gm</td>
</tr>
<tr>
<td>3 gm</td>
<td>60 gm</td>
</tr>
<tr>
<td>1 gm</td>
<td>30 gm</td>
</tr>
</tbody>
</table>

**Fingertip Unit (FTU)**
The amount of ointment expressed from tube applied to the fingertip. One FTU weighs about 0.5 gm.

**Hand Unit (one side of the hand)**
1/4 FTU covers 1 side of the hand
1/2 FTU weighs 0.25 gm
0.25 gm x Number of hand units = Weight of cream required for one application
Skin and Percutaneous Absorption

Sweat Gland

- Hair Follicle
- Stratum Corneum
- Epidermis
- Sebaceous Gland
- Dermis
- Subcutaneous Tissue
- Blood Vessel
The absorption of substances from outside the skin to positions beneath the skin, including entrance to the blood stream, is referred to as **percutaneous absorption**.

Permeation of the layers of skin can occur by diffusion via:

- transcellular penetration (across the cells)
- intercellular penetration (between the cells)
- transappendageal penetration (via hair follicles, sweat and sebum gland, and pilosebaceous apparatus)

**Factors Affecting Percutaneous Absorption**

- Drug concentration
- Surface area
- Drug's attraction to the skin vs. attraction to the vehicle
- Vehicle
- Hydration of the skin
- Rubbing or inunction
- Statum corneum (thin vs. thick)
- Time of application
- Multiple application