



MSS

Pharmacology

LEC no.1 V2



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Skin Pharmacology

Dr. Alia Shatanawi

Some Important Notes

The doctor has mentioned that she wants you to remember the spectrum of activity for each drug, whether it's gram-positive or gram-negative, **without** the need to know the specific names of the bacterial species.

Also, The formulation of drugs (cream, ointment, etc.) **is not required**.

Additionally, the doctor stated that what is needed is to memorize the scientific names of medications, not their commercial brands. If u asked why, the answer is that commercial medicines can vary by region, being either local or international. In the future, if a patient is prescribed a medicine by its brand name, the patient might insist on purchasing that specific brand, refusing alternatives even if the cost exceeds his budget.

She also mentioned that many medications share common side effects, such as dryness and burning(as u'll see in the slides). Therefore, there will be a greater emphasis on the distinctive ones

ركز على الأعراض الجانبية المميزة الخاصة بالدواء دون غيره) :

The introduction to this lecture was somewhat lengthy. I'll cover its contents in the next slides. Let's start?

بسم الله نبداً

As you may recall from Dr. Suhail's materials, we learned that there are many routes for administering a drug, including IV (intravenous), IM (intramuscular), orally, and **topically**.

So, what are the advantages of the topical route?

- It avoids first-pass metabolism.
- It minimizes systemic side effects.
- Topical drugs directly reach the target site. For instance, when applied to the skin, they immediately start working at the intended area

Let's discuss the difference between absorption and penetration. Absorption refers to the process of a drug entering the bloodstream from the site of administration, while penetration is about the drug moving through biological barriers to reach its target site. These barriers can include the cell membrane, the blood-brain barrier, or the skin (in our course we're interested in skin only). For example, when we apply a cream to our skin, we aim for it to penetrate, not to be absorbed. The success of penetration depends on factors such as the area of the skin, its thickness, and the drug's content. Inhalers used by asthma patients serve as another example of topical administration. Why? Because they deliver the drug directly to the lungs, their site of action, aligning with the definition provided above. It's crucial to understand that in most cases of topical administration, we do **not** desire the drug to be absorbed, as it may lead to serious side effects.

Although transdermal patches are applied topically, their mechanism of action is systemic, aiming to achieve effects throughout the body rather than just at the surface of the skin.

As a continuation of our introduction...

It's worth mentioning that to enhance the moisturizing properties of dermatological drugs, we sometimes add molecules, such as **urea**.

Why? Because urea has 'hygroscopic properties,' meaning it attracts and retains water, playing a significant role in moisturization.

Therefore, we include it in the formulation when we aim to create a moisturizing drug

In pharmacology, a "**vehicle**" refers to the substance in which a medication is dissolved, suspended, or mixed, to facilitate its administration and absorption by the body. It's basically the carrier that delivers the active drug to the site of action in the body

مثال من الدكتوراة : حبة البنادول لما يتم تصنيعها بالمختبرات بتكون بالأساس مادة طعمها مَرَّ جدًا هل المريض يتناولها بهاد الشكل؟ لا
بضيفوا عليها أشياء ومواد ثانية لحتى يسهل تناولها ويتحسن مذاقها
هاي الأشياء الاضافية تسمى vehicle

Antibiotic vs antibacterial:

- Antibiotic: comes from a **natural** source or microorganisms, it can work against a wider spectrum of microorganisms.
- Antibacterial: they come from the factory, and it works only against bacteria.

Adverse Effects of Dermatologic Preparations:

- **Burning or stinging sensation.**
- **Drying and irritation**
- **Pruritus. حكة**
- **Erythema. احمرار**
- **Sensitization.**
- **Staining**
- **Superficial erosion. (التآكل السطحي)
(للجلد)**

These symptoms happen especially when water content is low and alcohol content is high.

If u're interested why, this bcz Alcohol is a potent desiccant, meaning it can dehydrate skin cells by drawing out moisture

Topical Antibacterial Agents

- **Gram-positive bacteria**
 - **Bacitracin**
 - **Gramicidin**
 - **Fusidic acid**

- **Gram-negative bacteria**
 - **Polymyxin B Sulfate**
 - **Neomycin**
 - **Genatamicin**

Let's get to know these medications one by one!

additional information: Bacitracin is pronounced as "**bas-ih-TRAY-sin.**"

BACITRACIN

- **Active against streptococci, pneumococci, and staphylococci**
- **Also , most anaerobic cocci, neisseriae, tetanus bacilli, and diphtheria bacilli are sensitive .**
- **MOA???**

- **Side effects: Toxicity???**

Allergic contact dermatitis occurs frequently, and immunologic allergic contact urticaria rarely. Bacitracin is poorly absorbed through the skin, so systemic toxicity is rare.

Urticaria: is an allergic reaction that can be triggered by exposure to an allergen, characterized by swollen, red, and itch. These can appear on any part of the body, not necessarily where the drug or allergen was applied. On the other hand, allergic contact dermatitis is a localized reaction that occurs exclusively at the site of contact with an allergen or irritant.



" **NEO** " stands for " neomycin " but why we add it to BACITRACIN ? because neomycin targets gram negative bacteria so we get broader spectrum than BACITRACIN alone.

this drug is reserved for topical administration because if it gets absorbed it will cause **nephrotoxicity**.. luckily because the structure of this drug is polar so we don't worry about getting absorbed.

- Frequently used in combination with other agents (polymyxin B and neomycin)
- Form: creams, ointments, and aerosol preparations
- Usually antiinflammatory agents added
 - (Hydrocortisone)



Why we add anti-inflammatory agents ? because even though we've prescribed the patient two antibiotics (bacitracin and neomycin in this context), it's also crucial to manage the body's inflammatory response. These agents help alleviate symptoms such as pain, swelling, and redness, but they address only the symptoms, not the underlying cause, which the antibiotics target.

***A student asked the Dr in the lec about the use of corticosteroids to reduce inflammation, noting their side effect of immune suppression. The answer was that corticosteroids are used only when the patient is experiencing severe symptoms and they are administered in carefully balanced doses to minimize risks.**

POLYMYXIN B SULFATE

Again, you only need to know the general type of activity (which is g-ve)

- **gram-negative :Pseudomonas aeruginosa, Escherichia coli, enterobacter, and klebsiella.**
- **Proteus and serratia are resistant, as are all gram- positive organisms.**
- **Side effects: total daily dose applied to denuded skin or open wounds should not exceed 200 mg in order to reduce the likelihood of toxicity**
“neurotoxicity and nephrotoxicity”
 - **Allergic contact dermatitis NOT common.**

This drug is sometimes used by **burn** patients, as their skin is more susceptible to infections, necessitating the use of antibiotics. However, this approach can be risky because their superficial skin is **denuded**, increasing the likelihood of the drug being **absorbed systemically**, which could lead to severe side effects such as neurotoxicity and nephrotoxicity. The risk escalates (increase) with the increase in the area of damaged surface.

Fusidic acid

This drug is not listed in our reference book because it is not available in the USA; however, it is commonly used in Jordan.

- acts as a bacterial protein synthesis inhibitor
- Staphylococcus species, Streptococcus species, and Corynebacterium species.
- often used topically in creams and eyedrops

***It deals mainly with g+ve .**

***Remember that formulations of the drugs is not required (creams, eyedrops)**

Additional info(Not required) : It's interesting to note that the uses of this medication vary depending on the color indicated on the packaging. If you have enough time, you can learn more from this link

If u don't , skip

[استخدام فيوسيدين حسب اللون](#)



NEOMYCIN & GENTAMICIN

Neomycin

Protein synthesis inhibitors

- **Aminoglycoside antibiotics**
- **gram-negative :E coli, proteus, klebsiella, and enterobacter.**
- **SE (side effects): allergic contact dermatitis**

- **Gentamicin generally shows greater activity against P aeruginosa than neomycin .**
- **Gentamicin more active against staphylococci and group A β -hemolytic streptococci.**
- **Be careful with systemic toxicity : esp in renal failure**
- **Hospital acquired resistant**

We need to modify the dosages for patients with kidney issues, as these drugs can cause nephrotoxicity.

Acne treatment

✚ **One of the most common skin diseases presenting to family physicians**

✚ **Considerable psychological impact on the quality of life**

✚ **Four main factors cause acne:**

- **Excess oil (sebum) production.**
- **Hair follicles clogged by oil and dead skin cells.**
- **Bacteria.**
- **Inflammation**



Propionibacterium acnes – The old name

Cutibacterium acnes – The new one

BTW: This change took place around 2016.

✚ **The anaerobic bacterium Cutibacterium acnes (Propionibacterium acnes) is believed to play an important role in the pathophysiology of the common skin disease acne vulgaris.**

let's learn about the stages of acne
as knowing the stage helps us to detect the most suitable treatment

Blackheads

Comedonal Lesions



Additional info : Comedonal refers to a type of acne that is characterized by the presence of comedones. Comedones are skin-colored, small bumps frequently found on the forehead and chin of those with acne. They are formed by the blockage of hair follicles with sebum (the oil produced by the skin), bacteria, and dead skin cells, and all this **before body's inflammatory response to them**

Inflammatory Lesions

**When Body exacerbated
response to comedonal lesions**



Nodulocystic Lesions

This describes a more severe stage of acne, characterized by large, pus-filled pimples and presence of cysts that produce sebum, need for aggressive treatment.



Scarring

we should treat acne as early as possible to not develop to this stage



As a doctor, when a patient presents with acne, it's important not just to address the physical symptoms but also to consider the psychological impact, especially in children and teenagers.


Topical Therapy (Indications)

 **comedonal acne**
mild to moderate inflammatory acne



Topical Therapy (Treatment Vehicle)

 **cream** **sensitive or dry skin**

 **lotion** **any skin type**

 **gel** **oily skin**

 **solution** **oily skin**

Topical Therapy (Anti Comedonal Agents)



Topical Retinoids 0.025% - 0.5%



Azelaic acid



Salicylic acid



**these drugs are vitamin A derivative,
"مقشر"**

They work By promoting skin regeneration, it's common to observe an initial flare-up of pimples during the early phase of using these medications.

ظُهُوفَانُ الْأَقْصَى

اللهم إنا نستودعك فلسطين وأهلها
سمائها وأرضها رجالها ونسائها أطفالها
وشبابها اللهم انصرهم وثبت أقدامهم