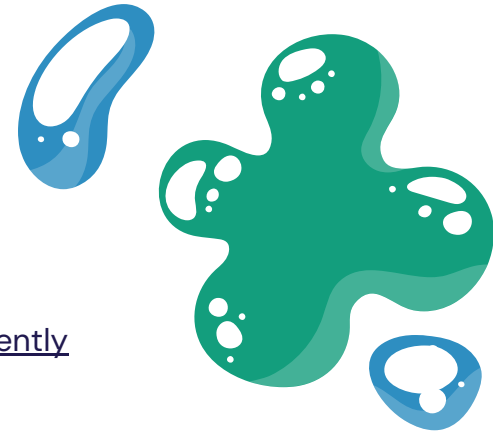


# Clinical and laboratory Aspects of skin and soft tissue infection

## Color Index :

- Main text
- Important**
- Girls Slides
- Boy Slides
- Notes
- Extra

Any future correction will be in the editing file , so please check it frequently



# Objectives :



Describe the anatomical structure of skin and soft tissues.



Differentiate the various types of skin and soft tissue infections and their clinical presentation



Name bacteria commonly involved in skin and soft tissue infections



Describe the pathogenesis of various types of skin and soft tissue infections



Recognize specimens that are acceptable for different types of skin and soft tissue infections



Describe the microscopic features and colony morphology of *Staphylococcus aureus* and group A *Streptococcus* and how to differentiate them from other bacteria

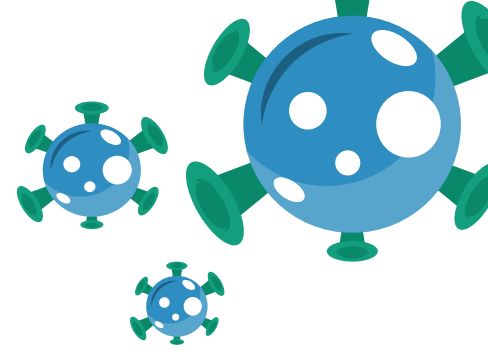


Discuss non-microbiological investigations

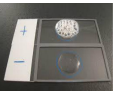
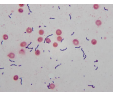
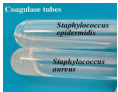
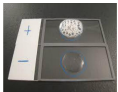
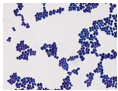
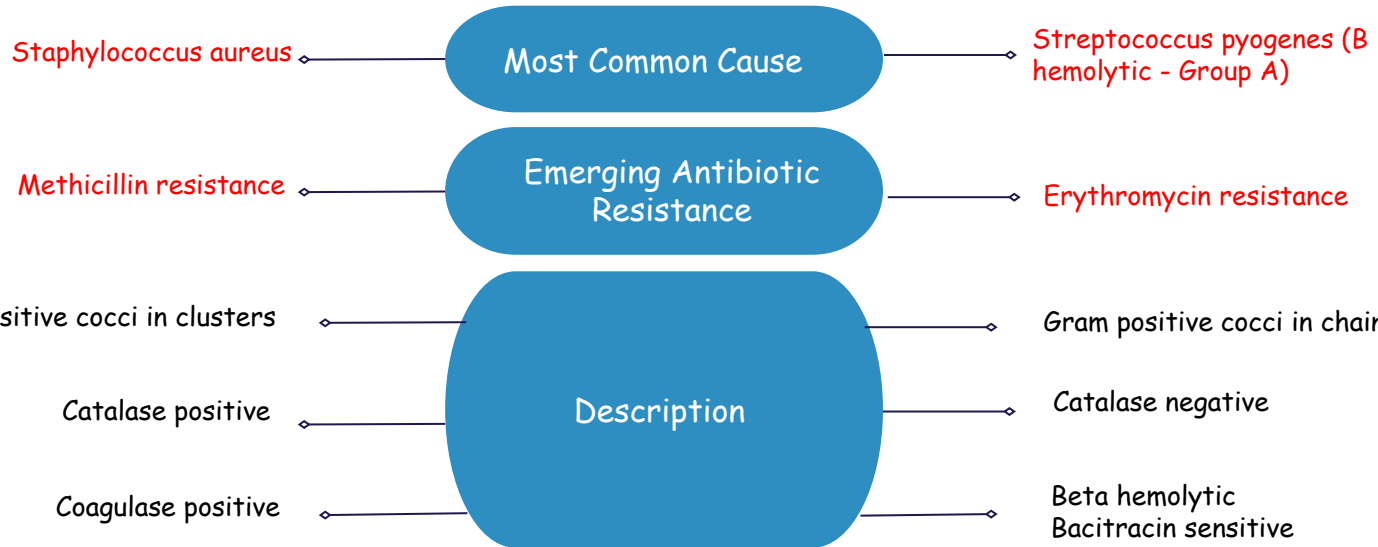


Describe the major approaches to treat of skin and soft tissue infections either medical or surgical

# Introduction



- ☼ Skin and soft tissue infections are common.
- ☼ **Can be mild to moderate or severe.**
- ☼ muscle, bone, lungs and heart valves can be infected.



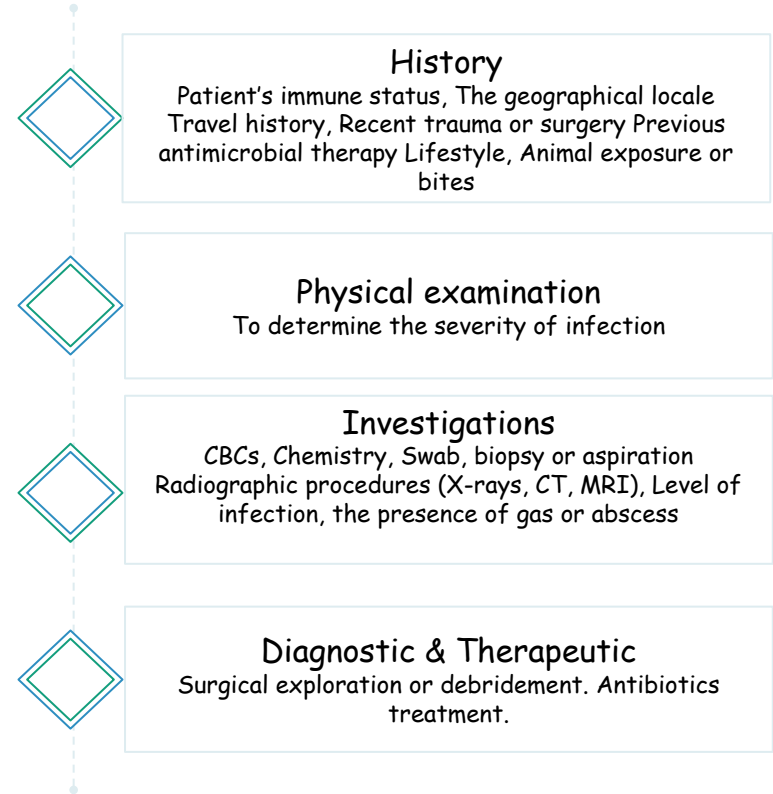
# Virulence Factors

43 note: The Factors that make *Staphylococcus aureus* and *Streptococcus pyogenes* have the ability to cause infection



	<i>Staphylococcus aureus</i>	<i>Streptococcus pyogenes</i>
Cell surface	<ul style="list-style-type: none"> <li>- Capsule</li> <li>- Protein A</li> <li>- Clumping factor</li> <li>- Teichoic acid</li> </ul>	<ul style="list-style-type: none"> <li>- Capsule</li> <li>- M-Protein</li> <li>- Lipoteichoic acid</li> </ul>
Toxins & Enzymes	<ul style="list-style-type: none"> <li>- Hemolysin</li> <li>- Coagulase</li> <li>- <b>Leucocidin*</b></li> <li>- Epidermolytic toxins</li> <li>- Enterotoxins</li> <li>- TSST-1 (toxic shock Staphylococcus toxin-1)</li> </ul>	<ul style="list-style-type: none"> <li>- Streptolysin O &amp; S</li> <li>- <b>Streptococcal pyrogenic exotoxins (SPE)*</b></li> </ul>

## Key to developing an adequate differential diagnosis requires

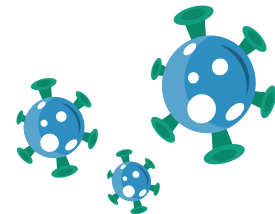


# Impetigo ( pyoderma )

443: For better understanding, [click here](#)  
special thank for

Overview	<ul style="list-style-type: none"><li>- A common skin infection</li><li>- Usually infects Children 2-5 Years old in tropical or subtropical regions</li><li>- Very superficial skin infection</li></ul>
Causes	<ul style="list-style-type: none"><li>- Nearly always caused by <math>\beta</math>-hemolytic streptococci (GAS) group A.strept</li><li>- In some cases <math>\beta</math>-hemolytic streptococci (GAS) and S. aureus.</li><li>- Rarely by S. aureus only</li></ul>
Clinical features	<ul style="list-style-type: none"><li>- Nonbullous (Streptococcus) or Bullous (S. aureus ). bullous means abscess formation</li><li>- Consists of discrete purulent lesions.</li><li>- Exposed areas of the body( face and extremities). Dr:Around mouth and nose*</li><li>- Skin colonization (yellowish), Inoculation by abrasions, minor trauma, or insect bites.</li><li>- Systemic symptoms are usually absent.</li><li>- Poststreptococcal glomerulonephritis.</li><li>- Localize infection</li></ul>
Diagnosis	anti-DNAse B, ASO
Treatment	Dr: Topical antibiotics because it's a mild infection <ul style="list-style-type: none"><li>- Cefazolin, Cloxacillin , or erythromycin.</li><li>- Mupirocin</li></ul>

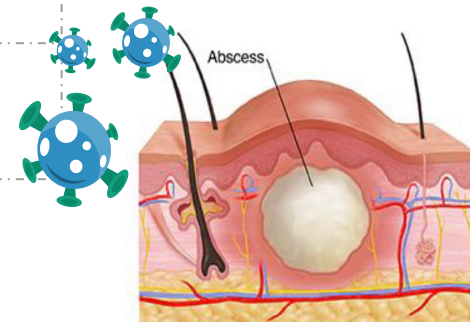
43 Note: remember that after skin & soft tissue infections caused by streptococcus, there will be a high chance of kidney inflammation (PSGN)



# Cutaneous abscesses

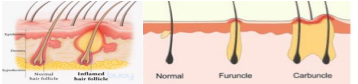
443: For better understanding, [click here](#)  
special thank for


Overview	Collections of pus within the dermis and deeper skin tissue
Causes	<ul style="list-style-type: none"><li>- Typically: <b>Staph. aureus</b> with other organism (polymicrobial)</li><li>- 25% of the cases: Staph. aureus alone (monomicrobial)</li></ul>
Clinical features	<ul style="list-style-type: none"><li>- Painful, tender, and fluctuant.</li><li>- Multiple lesions, cutaneous gangrene, severely impaired host defenses, extensive surrounding cellulitis or high fever.</li></ul>
Diagnosis	Gram stain, culture, and systemic antibiotics
Treatment	Incision and evacuation of the pus( <b>draining</b> )



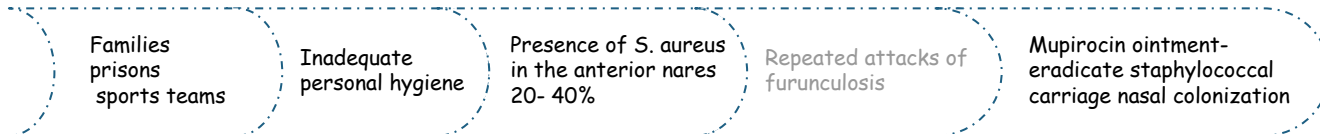
# Furuncles & Carbuncles



	Furuncles (boils)	Carbuncles
		
Definition	Infections of the hair follicle ( folliculitis ) single	Extension to involve several adjacent follicles Dr: Multiple once next to each other
Caused by	Mainly Staph. Aureus	
Characteristics of affected area	Suppuration extends through the dermis into the subcutaneous	coalescent inflammatory mass back of the neck especially in diabetics
Treatment	Large furuncles & all carbuncles require incision and drainage. Systemic antibiotics are usually unnecessary.	

 443 Note: regarding skin layers, impetigo is very superficial compared to furuncles & carbuncles.

## Outbreaks of furunculosis caused by MSSA and MRSA :



# Erysipelas and Cellulitis :

- ❑ Diffuse spreading skin infections, excluding infections associated with underlying suppurative foci.
- ❑ Most of the infections arise from streptococci, often group A, but also from other groups, such as B, C, or G.

## Methicillin Resistant Staphylococcus 4 Aureus "MRSA"

### "CA-MRSA"

- Carry Panton-Valentine leukocidin gene
- More sensitive to antibiotics
- Can lead to severe skin and soft tissue infection or septic shock

### "HA-MRSA"

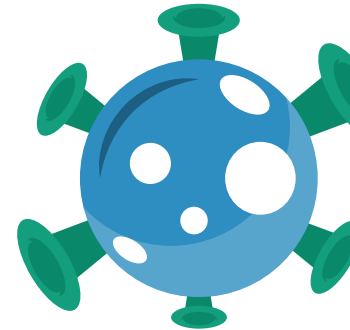


Erysipelas



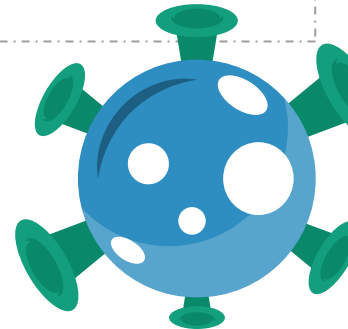
Cellulitis

Note: CA-MRSA is more likely to have leucocidin





	Erysipelas	Cellulitis
Skin & soft tissue involved	Upper layers (dermis)	Deeper dermis and subcutaneous tissue
Characteristics of affected area	Raised-clear line of demarcation, Red area affected area tender, Painful plaque	Acute and spreading (not well demarcated)
Causes	<ul style="list-style-type: none"> <li>&gt; <b>Group A: <math>\beta</math>-hemolytic streptococci</b> or (strep.pyogenes) Streptococcus pyogenes is susceptible to penicillin so</li> <li>&gt; <b>IV or Oral penicillin</b></li> </ul>	<ul style="list-style-type: none"> <li>&gt; <b><math>\beta</math>-hemolytic streptococci group A</b>, and ( group B in diabetic patients).</li> <li>&gt; <b>Staph. aureus</b>: commonly causes cellulitis (penetrating trauma)</li> <li>&gt; <b>Haemophilus influenzae</b>: causes periorbital cellulitis in children.</li> </ul>
Risk factors	Age group: infants, young children, and older adults (elders)	Obesity, venous insufficiency, lymphatic obstruction (operations), preexisting skin infections, ulceration, eczema.



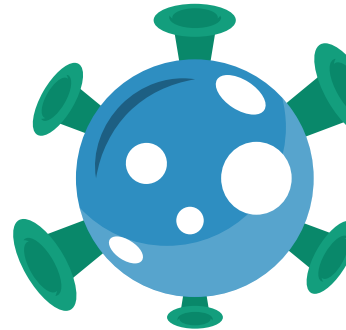
## Clinical Diagnosis

- High WBCs. However, blood culture rarely needed
- Aspiration and biopsy might be needed in diabetes mellitus, malignancy, animal bites, neutropenia (*Pseudomonas aeruginosa*), immunodeficiency, obesity and renal failure.
- Observe for progression to severe infection (increased in size with systemic manifestation ie. fever, leukocytosis).

## Treatment

You have to cover both *Streptococcus* and *Staphylococcus*

- Penicillin, cloxacillin, cefazolin (cephalexin) 1st generation of cephalosporins, clindamycin.
- Vancomycin or linezolid in case of MRSA.
- Clindamycin, TMP-SMZ (Trimethoprim-Sulfamethoxazole) for CA-MRSA.



# Necrotizing fasciitis :

(flesh eating disease)

## □ introduction:

- It is a rare deep skin and subcutaneous tissues infection.
- Most common in the arms, legs, and abdominal wall and is fatal in 30%~40% of cases

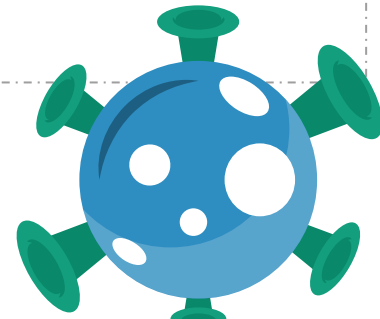
## □ Classified into:

- Polymicrobial (type 1)
- Monomicrobial (type 2)



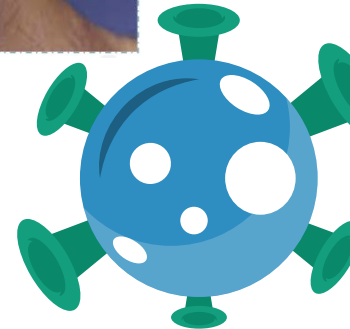
## □ Causing microbes :

	Polymicrobial (Caused by aerobic and anaerobic.)	Monomicrobial
1	<b>Fournier's gangrene</b> (perineum and genital area)	<b>Group A streptococcus</b> ( <i>Streptococcus pyogenes</i> ) (most common one)
2	<i>Bacteroides fragilis</i>	<b>Staphylococcus aureus</b> or CA-MRSA
3	- <i>Streptococcus</i> (other than group A) - Gram-negative bacteria (synergy): <i>E. coli</i> , <i>Klebsiella</i> , <i>Pseudomonas</i> ncommonly fungi.	<b><i>Vibrio vulnificus</i></b> (liver function) <b><i>Clostridium perfringens</i></b> (gas in tissues) (Type III)



# Necrotizing fasciitis Cont. :

<b>Risk factor</b>	<ul style="list-style-type: none"><li>❖ <b>Immunosuppression</b></li><li>❖ <b>Chronic diseases:</b> ( diabetes, liver and kidney diseases, malignancy ) ❖ <b>Trauma:</b> ( laceration, cut, abrasion, contusion, burn, bite, subcutaneous injection,operative incision)</li><li>❖ <b>Recent viral infection rash (chickenpox)</b></li><li>❖ <b>Steroids, Alcoholism and Malnutrition</b></li><li>❖ <b>Idiopathic</b></li></ul>
<b>Pathophysiology</b>	<ul style="list-style-type: none"><li>❖ <b>Destruction of skin and muscle by releasing toxins:</b><ol style="list-style-type: none"><li>1- <b>Streptococcal pyrogenic exotoxin</b></li><li>2- <b>Superantigen</b></li></ol></li><li>❖ <b>Non-specific activation of T-cell.</b></li><li>❖ <b>Overproduction of cytokines</b></li><li>❖ <b>Severe systemic illness (Toxic shock syndrome)</b></li></ul>
<b>Signs &amp; Symptoms</b>	<ul style="list-style-type: none"><li>❖ <b>Rapid progression of severe pain with fever, chills (typical)</b></li><li>❖ <b>Swelling, redness, hotness, blister, gas formation, gangrene and necrosis</b></li><li>❖ <b>Blisters with subsequent necrosis, necrotic eschars Diarrhea and vomiting (very ill)</b></li><li>❖ <b>Shock organ failure</b></li><li>❖ <b>Mortality as high as 73 % if untreated</b></li></ul>



Doctor's note :

Necrotizing fasciitis هذا تلميح rapid progression لو لقيتو كلمة

# Necrotizing fasciitis Cont.. :

## □ Diagnosis :

- A delay in diagnosis is associated with a grave prognosis and increased mortality.
- Clinical-high index of suspicion.

### Microbiology

- > Culture & Gram's stain (blood, tissue, pus aspirate)
- > Susceptibility tests

### Radiographic studies

- > X-ray: subcutaneous gases.
- > Doppler CT or MRI

### Surgery debridement:

- > Amputation

### Blood test

- > CBC-WBC, differential, ESR
- > BUN (blood urea nitrogen)

## □ Treatment :

- if clinically suspected patient needs to be hospitalized OR require admission to ICU.
- Start intravenous antibiotics immediately
- Antibiotic selection based on bacteria suspected.

Broad spectrum antibiotic combination against

- ❖ Methicillin-resistant Staphylococcus aureus (MRSA)
- ❖ Anaerobic bacteria
- ❖ Gram-negative and gram-positive bacilli

Antibiotics combination

Penicillin-clindamycin-gentamicin  
Ampicillin/sulbactam  
Cefazolin plus metronidazole  
Piperacillin/tazobactam  
Clostridium perfringens - penicillin G

Surgeon Consultation

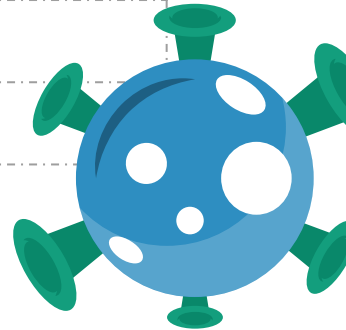
- ❖ Extensive surgical debridement of necrotic tissue (amputation) & collection of tissue samples.
- ❖ Can reduce morbidity and mortality

Hyperbaric oxygen therapy (HBO) treatment

A type of treatment used to speed up healing of carbon monoxide poisoning, gangrene, stubborn wounds, and infections in which tissues are starved for oxygen

# Pyomyositis :

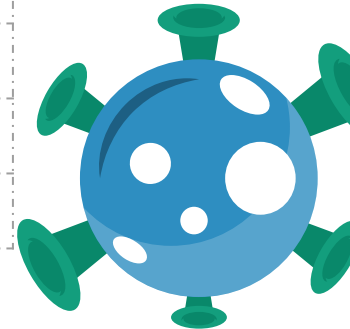
Definition	Acute bacterial infection of skeletal muscle,
Caused by	usually by <i>Staphylococcus aureus</i>
Characteristics	<ul style="list-style-type: none"><li>❖ No predisposing penetrating wound, vascular insufficiency, or contiguous infection.</li><li>❖ Most cases occur in the tropics.</li><li>❖ 60% of cases outside of tropics have predisposing RF: DM, EtOH liver disease, steroid rx, HIV, hematologic malignancy.</li></ul>
History	<ol style="list-style-type: none"><li>1. Blunt trauma or vigorous exercise (50%), then period of swelling without pain.</li><li>2. 10-21 days later, pain, tenderness, swelling and fever, Pus can be aspirated from muscle.</li><li>3. 3rd stage: sepsis, later metastatic abscesses if untreated.</li></ol>
Diagnosis	X-ray, US, MRI or CT
Treatment	Surgical drainage + Antibiotics



# Other specific skin infection:

Not important according to male's doctor

Epidemiology	Common pathogen (s)	Therapy
Cat/dog bites	<i>Pasteurella multocida</i> ; <i>capnocytophaga</i>	Amox/clav (Doxy;FQ or SXT + Clinda)
Human bites	Mixed flora <i>eikenella corrodens</i>	Hand Surgeon; ATB as above
Freshwater injury	<i>Aeromonas</i>	FQ; Broad spectrum beta-lactam
Salt water injury (warm)	<i>Vibrio vulnificus</i>	FQ; Ceftriaxime
Thorn, moss	<i>Sporothrix schenckii</i>	Potassium iodine
Meat-packing	<i>Erysipelothrix</i>	Penicillin
Cotton sorters	Anthrax	Penicillin
Cat scratch	<i>Bartonella</i>	Azithromycin



# MCQs:

Q1:A 40 year old patient came to the ER, with erythema in his right leg that progressed over the last two days, low grade fever and tenderness over palpation. what is the diagnosis ?

A)Erysipelas

B)Cellulitis

C) fasciitis

D)Carbuncle

Q2:3-year-old child develops acute glomerulonephritis following impetigo. The bacterium is a catalase-negative, Gram-positive coccus. What is the most likely causative agent?

A) S.aureus

B)Streptococcus pyogenes

C) S.epidermidis

D) Enterococcus

Q3:A 40 year old patient came to the ER with erythema in his left leg that progressed rapidly, high grade fever and severe pain. what is the diagnosis ?

A)Boils

B) Impetigo

C ) Necrotizing Fasciitis

D) Furuncles



# MCQs:

Q4: A patient came to the ER with collection over his right thigh, 2-3 cm in diameter. What is the diagnosis ?

A) Abscesses

B) Fasciitis

C) Impetigo

D) Carbuncles

# SAQ:

Q1: A 30-year-old patient came to the hospital with a fever. He was complaining of a collection of fluid under his skin which is painful and fluctuant. Blood culture revealed gram positive cocci in clusters. What is the diagnosis, the most likely organism and treatment?

Q2: A 75-year-old diabetic patient male, came to the ER with excessive redness (erythema), and **rapidly progressing** pain that has been occurring for 12 hours. He appears to have plaque-like erythematous and tenderness, the doctor performed surgery and sent a sample to the microbiology lab and it showed: gram positive, catalase negative, which is beta-hemolytic streptococcus (bacitracin sensitive). What is the diagnosis, the most likely organism?

- 1) B
- 2) B
- 3) C
- 4) A

Q1: Cutaneous abscesses, Staphylococcus aureus, Incision and evacuation of the pus, systemic antibiotics.

Q2: Necrotizing fasciitis, Group A streptococcus (Streptococcus Pyogenes)

# Meet The Team :



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**Al Jawharah Alyahya**

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