

Title of Lecture: The ***Staphylococcus***

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Sheet no.:**12**

Refer to slide no.: **9**

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\*\* ***Staphylococcus*** change the penicillin binding protein , and they become resistance to beta lactam any so they called penicillin resistance ***Staphylococcus aureus***

Pathogenesis :  
pathogenicity factor can be :  
1- part of microorganism cell : ( fimbria , capsule “ it allowed the bacteria to stick to surface; as cougulase negative : u can get pathogenesis because it adhere to plastic surfaces ! )  
2- secretion or product of bacterial cell

***Staphylococcus aurous has a variety of these exotoxins*** :

**TOXIN**

1)Cytotoxins : make membrane damage

- 5 type : -alpha, beta, gamma, delta and leukocidin🡺these are ***Staphylococcus***  infection , what would we have ?   
1- death of cell   
2- neutrophils   
3- production of pus .   
so ***Staphylococcus***  infection lead to produce pus , that is why it is pyrogenic infection and ***Staphylococcus***  is pyrogenic organism . why ?   
-Any bacteria that causes the formation of a pus is known as pyrogenic “pyro means producing a pus” so in cases of staphylococcus forming a pus, we call it pyrogenic also Cytotoxins are coded either by genes in the chromosome or genes present in the plasmids so they are coded by genes found inside the bacteria

2)Exfoliative toxin “epidermolytic toxin” :  
Exfoliative : بالعربي يقشر .  
- in the granular layer of the skin “stratum granulosum” we have desmosomes “attach the cells to each other forming bridges in between them” and this toxin will break the desmosomes and break the bridges between these cells , lead to separate cell and form gaps that causes fluid accumulation in the skin forming what we call blisters.   
- antibody will neutralize toxin .   
متلا اللي بيشتغل بالارض وماسك الفاس وعم يشتغل وهو اصلا مو متعود فبيصير ع ايده في علامة او اشي متل التقشير او حدا مو متعود يمشي ويروح يمشي مسافة .   
- You don’t have to be inflamed to get blisters because the bacteria is not the cause of it…it’s the toxins that forms it…”local poisoning” .   
- Mainly in children because they have no acquired immunity .   
- It is not serious disease.  
- It called SSS; - Scaled skin Stap. syndrome   
-called scolded cause the appearance of the patient who is infected with it is like someone who has been exposed to boiling water “blisters full of fluid + eventually they will heal but the skin will start to peel   
  
3)Toxic shock syndrome “toxin one”:  
- toxin produce by some ***Staphylococcus***  and this is act as a super antigen.   
super AG : normally when you have an antigen that is recognized by the T cells (TCR) “antigen presenting cell”… the antigen is present on the MHC molecule …the antigen will only activate cells of the T cells variety that are specific for that antigen Super antigen links the MHC molecules with the TCR nonspecifically and they activate a large # of T cells maybe so this will cause intense immune response with a production of a lot of interluken1 , interleukin 6 and these cytokines that are going to produce the shock .  
- because any toxin produce excessive stimulation of T cells will result in toxic shock .   
-ptn will have pain , temperature , bleeding , multi organ failure ,may lead to die .   
- serious disease   
-in old days , associated with tampons , women who use tampon which is high absorb a lot of blood , which looks as good culture media for the production of cytotoxin , toxin absorb in the menstruating women so will get the diseases .   
- Nowadays women and men can infected although it was first discovered in women.

4)Enterotoxins :  
-6 type ( A-F ) .  
-they are heat stable so if they are present in the food and you warm it they‘ll not be destroyed unlike the bacteria they are resistant to heat.  
-they act on the GIT “gastro intestinal tract” and produce a diarrhea, also they might go systemically and produce a lot of vomiting. ( D+V)   
-known as food poisoning, notice that the disease caused by entertoxin not by “staphylococcus “ itself .   
-they grow at room temperature, so if you left your food outside the fridge a few hours and it get contaminated by staphylococcus aurous and even you warmed your food you’ll get rid of the bacteria “staphylococcus aurous” .but the enterotoxins will remain there ,so when you eat the food it’ll be absorbed at the GIT then it’ll produce an infection “they induce vomiting and diarrhea.   
-Symptoms appear within 2-3 hours, so the onset is very quick because the toxins are already there we don’t need multiplication of the bacteria…etc .   
-its self limiting in which the symptoms might subside by itself within few hours “8-24 hours”. so no need for treatment by antibiotics cause there’s no bacteria anyway. but what we must be careful about is dehydration specially “elderly + babies” and give them IV fluids to replace what they have lost…so its just a food poising not an infection…for ex. you might get it from the ice cream and probably the milk content was contaminated with staphylococcus  
- diarrhea is watery, there is no blood in it .  
-coagulase negative may produce enterotoxin .

**Enzymes:**1)catalase :   
- help to protect bacteria by : neutralize the effect of hydrogen peroxide on the bacteria by converting it into water.   
 2)coagulase :  
 2 types “bound to the cell (bound to the bacteria itself)+ soluble(free/secreted around the bacteria)”.   
3)hyaluronidase :  
- it is a pathogenic factor , why ?   
It dissolve and splits hyaluronic acid…it functions in the inter cellular matrix Of the tissues between the cells so it helps in the spread of the infection by breaking the tissues and allowing the infection to spread in between the tissues .   
4)fibrinolysin (staphylokinase) :  
- it breaks and dissolve the fibrin “breaks the clot”. used to help in the spread of the infection  
 5)lipase  
6)nuclease :  
7)beta lactamase : very imp. Pathogenicity factor cuz it gives the bacteria resistance against antibiotics by splitting the beta lactam ring   
  
***Diseases caused by staphylococcus aurous are classified into two types :***  
1)due to the presence of the bacteria at the site of infection “direct effect of the bacteria”. …ex. :  
  
**a. Local lesion of the skin :**- the common cause of any infection of the skin is usually staphylococcus .  
-any wound may contaminated, the most common cause by staphylococcus.   
-infection may extend inside and then will cause pus production .   
-we have : superficial infection, subcutaneous infection,,,   
  
**b. deep abscesses :   
c. systemic infection**

2) Due to toxin mediated “not by the bacteria itself so the bacteria doesn’t have to be present there but its toxins what causes it” ex’s:  
a. Food poisoning: we talked about it  
b. toxic shock syndrome: we talk about it   
c. scalded skin syndrome: we talk about it

**SSSS “Staphylococcus Scolded Skin Syndrome**

-we talk about it .   
- the common sign is a nikolsky sign : in which if ptn scratches his skin it will peel and blisters will start to appear in that area “blisters” will appear followed by desquamation of the epithelium then it will fall off.   
-the patient will not suffer from pain cuz its not an inflammatory process its just the toxins that are producing these effects…usually it happen in babies because they are not immune to it but eventually they will buildup antibodies against them and become immune …  
-abrupt onset in which it can cover the whole body within two day .

**Toxic shock syndrome : “due to toxic shock toxin one”**

-we talk about it   
-was discovered and described initially in menstruating women.

**Food Poisoning :**

We talk about it .

**Cutanous infections .**

-are infections caused by the bacteria itself and usually it’s a pyrogenic infection:  
1)abscess-boils-furuncles-carbuncles “terms of description of different sizes and varieties of abscess”  
- abscesses can go deep and go down under the tissues.  
- and some time the infection might get spread under the skin which make the skin very tender and red and with pus underneath it and this is known as the cellulites and this might be caused due to styphylococcus or other microorganisms like streptococcus pyrogenase…

Impetigo appear in kids with poor hygiene. this type of infection might spread in the area of the chin and sometimes it might reach to the ear. but we are not supposed to confuse between it and the herpes virus “7amu” that appear at the mucocutanous junction of the mouth.   
- stye”sha7adeh” caused by infection at the glands in the eyes.

-Wound infection wither its surgical or trauma or any cut in the skin will cause infection

**Systemic infection**

-we said before that we have a Varity of places in the body that can be infected.   
-1- osteomyelitis which means inflammation of the bone.   
-2- arthritis caused by bacteria or other causes, but the ones that are caused by bacteria are called septic arthritis. Either bacteria found in the bone or the joint it self .   
-can by induced after trauma or car accident with contaminated wounds and combined fractures with bone sticking out and becomes contaminated and then of course you’ll get inflammation of the bone. sometimes it can be due to hematogenesis in which it enter through a small cut in the skin and then go through the blood to the bone and causes osteomylitis .

- inflammation in heart and brain due to staphylococcus :  
- 3- We can get inflammation in the brain with production of an abscess that might also cause some neurological problems due to these abscesses. It is not meningitis .

-4- Sub acute endocarditic “**infective endocarditic”** :  
- inflammation in the valves  
-caused by staphylococcus  
- the valve usually is normal , the bacteria can settle on the lumen and lead to inflammation >> this is acute **bacterial endocarditis.**    
- we have another **endocarditis** which is subacute bacterial endocarditius : caused by another bacteria which is not as very rid as staphylococcus why ?   
because the valve is already damage and the bacteria there it can be staphylococcus and streptococcus , the valve have been damage by exposed to previous inflammatory condition known as rheumatic fever .these bacteria goes to blood and cause subacute bacterial endocarditius . we will talk about that later , but know you should be able to differentiate between this 2 type .   
- turbulent blood flow helps bacteria to stick to valve .  
- when the valve damage by rheumatic cause , the valve will become course and turbulent blood flow helps settle bacteria in the valve , so rheumatic cause is not bacterial . we will talk about it later .   
**-4- septicemia :** from the staphylococcus it self  
-5- inflammation in the lung : pneumonia: due to staphylococcus and usually since its pyrogenic you’ll get an abscess.   
- aspiration pneumonia :when ptn inhales vomiting or any contents in his pharynx which may contain staphylococcus .   
-rare .   
-**Empyema : pus or abscess in lung**

MRSA : we talk about it   
is most probably acquired in hospitals and these are nosocomial infections because many of the staphylococci present in the hospitals are usually resistant to the beta-lactam antibiotics because they produce the beta lactamases but sometimes they can go out of the hospital environment and they spread in the community so you will have community infections from MRSA

**CONS :   
we talk about it**- associated with foreign bodies : canula ,,,

**DIAGNOSIS : as slide .**-gram stain and then culture to know the antibiotic sensitivity   
- we use blood culture

  
  
lubna abu rumman .