Host-Pathogen Interaction (Immunology)
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Lecture: 30
Introduction of Innate Immunity-Skin

Hi, So, in previous session we have initiated the innate immunity. We have discussed why innate immunities needed and how the innate immunity is playing a crucial role in our everyday defense~~difference~~ everyday defense against array of microbes which include microbial pathogen as well. And then we have discussed about various component of innate immunity. We have looked at the physical barrier which is also known as mechanical or anatomical barrier.

We have discussed chemical and biochemical barriers and we have discussed the I just introduced this chemical and biochemical barrier and microbial or microbiological barriers. So, in previous session I have discussed in great length about the skin which is a mechanical or anatomical barrier today I will take you further and I will discuss in more detail about the mucosal surfaces. So, this is also anatomical barrier.

And I will also talk about some of antimicrobial enzyme or protein or peptides how it works and I will also discuss maybe in this session or next session about the microbiological barrier. Let us begin with mucosal surfaces.

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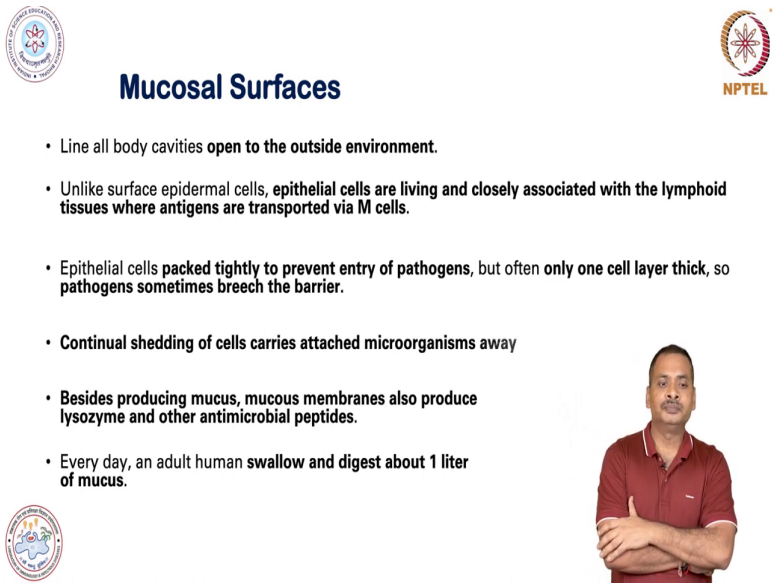

And mucosal surfaces is quite huge right if you remember I have discussed these surfaces and it is a huge space it is a huge area which constitute about 400 square meter . So, these mucosal surfaces are present in the egut in respiratory tract and eurogenital tract and gut is a one of the biggest place. So, what is this mucosal surfaces this is a line all this is a lining all body cavity which opens to the outside environment.

So, the lining which is present inside and this lining basically opens outside, outside means if you look at Oral act over oral cavity if you take eurogenital tract or respiratory tract it opens a outside the environment. Unlike skin it is a the epithelial cell which is present in this area basically this is a lieaving and this is a lieaving and there is a few more things are associated that is just beneath these layers there is a some loose lymphoid tissues are there.

And you will you may remember that in order to transport the antigen in the to the lymphoid tissue there is some specialized cells are there which we call it as a Mm cell I have discussed during discussion about mucosal Associated lymphoid tissue or mucus Associated lymphoid tissue epithelial cells in this mucosal area the epithelial cells are again very tightly packed like a skin and this tight packing of the cell is basically prevent the entry of any microbe.

I want to say microbe it could be a pathogenic or non-pathogenic but since it is a only single cell thick it is a only single layer of a cell. So, several pathogens they can bridge or they can break and Enter in the in deep tissues. So, there are several pathogens which is a infecting through oral root those pathogens develop some mechanism and some of these pathogens they have some anchor-like protein which hooks up with these epithelial layer.

And then they enter they gain asseeess inside the inside the tissue and then they can infect. So, most of these microbes especially the pathogenic microbe which causes some disease they have this unique feature they have some or other way by which they can hook up to these cells and then they can enter but on another hand the host defenses side if you see these cells are quite quickly removed and whatever pathogen which is adhered to these surfaces they are thrown out.

So, I am just trying to explain there is a Evolution from both sides the pathogen side as well as from the microbe side. So, this is a kind of battle and when more interesting thing is that these microbial pathogen they are they are kind of their ability to cause disease is basically depend on the dosage. So, that is why we always emphasize the number of bacteria or initial dose of infection.

So, that also determines whether it will infect or cause disease or not although in if the dose is very low they can in fact but they may not cause the disease because if the dose is very low maybe our initially the defense system will wash off all these microbial pathogen and then we will be free from the disease. But if the dose is too high then there is a high probability that in some case these microbes or these microbial pathogens gain assess in the tissues and then that will cause the disease.

So, this is all there are. So, many parameters try to understand it is not only one thing. So, as I have already told you that these layers are con continuously shedding off and whatever microbes are attached they will be they will be thrown out in addition there are some cells which produce a lot of amount of mucus. I will show you in subsequent slide. Besides this there is a some these cells or the layer of these cells or they basically produce a variety of antimicrobial enzyme such as lysozyme which is very well characterized and there are some antimicrobial peptides.

I will discuss in this session or maybe next session the about few antimicrobial peptide and how they work. So, all these things basically protect these mucosal surfaces from invasion of microbial microbes or microbial pathogens as I told you there is a continuous production of mucus and this mucus if it is very interesting that if you know that we produce about a liter of mucus every day and we should swallow that that much amount of mucus .

So, this is a very good defense mechanism you are protecting against this variety of microbe as well as microbial pathogen. Because our body is or our epithelial layer there are some cells which keep on producing this mucus which has a washing action and this washing action prevent from lot of infection. But as I told you this microbial pathogen they have some unique system by which they can hook up and then they can gain access it is a true for bacteria as well as fungi sorry bacteria and viruses.

Fungi and fungal infection in gut is not so, common it is very rare I never heard. So, it is a it is a not fungal infection mainly bacterial and viral infection.

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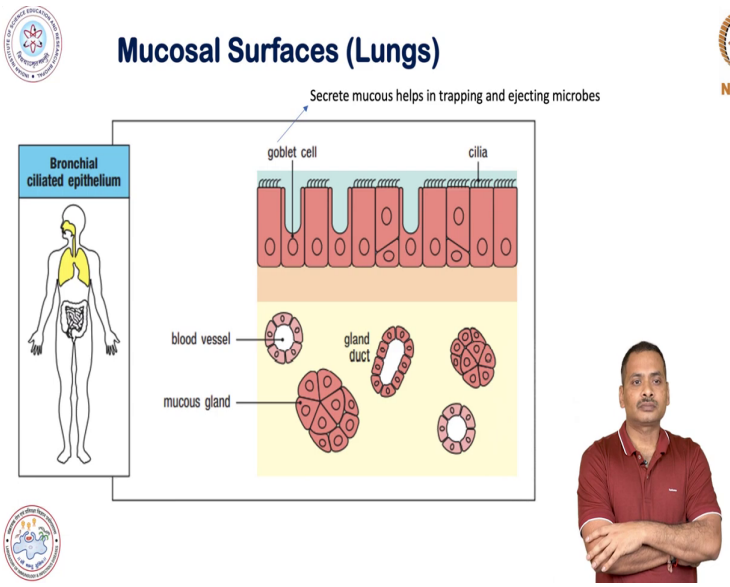

Now I will take you to the mucosal surface lung. We will let us look at the lung here you can see that lung is a quite a big area and there is a this is a lining of lung epithelia and here you can see there is a one specialized cell which keep on producing mucus which we call it as a goblet cells and this secret mucus. And this mucus basically helps in trapping the microbe and ejecting the microbes and the production of mucus along with the ciliary movement of this epithelial lining they have a cilia and they the cielia is keep on moving.

So, this the mucus coupled with the ciliary movement of these epithelial cells basically throughout the microbes and by this way we can protect the host from infection.

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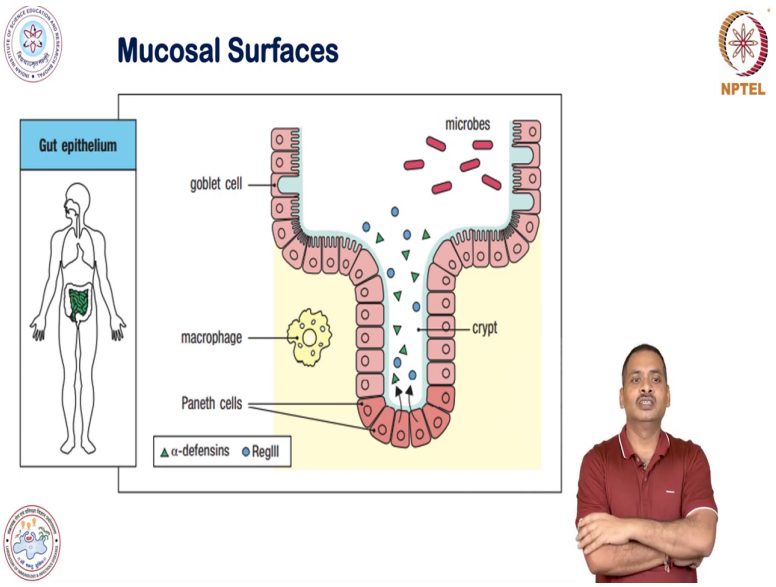

Now I will show you the mucosal surfaces in gut which is a quite huge area here also you can see there is a goblet cells which is producing mucus. There is a planeth cell and these panethplanet cells basically produce a variety of antimicrobial peptides or protein that like Alpha defensin reugglle and there is a crypt and this mucus is keep on moving. So, the microbe cannot attach and if it will be attached then yeah it will be taken to the to the lymphoid tissue which is just present beneath this thing.

You probably remember there is a Pieyer's patch lamina properia over there, there is a lymphoid tissue and this will be taken care by that. So, this is a the mucosal surfaces are also protected by a variety of microbes I told you in previous session there is a commensal bacteria and there are some bacteria which has a mutualism or Mutual relation means both are getting benefit.

So, those microbes are also present and due to those microbesmicrobes, the infection by pathogenic microbes relatively less. So, I will I will discuss in microbiological barrier. So, so this is about the mucosal surfaces.

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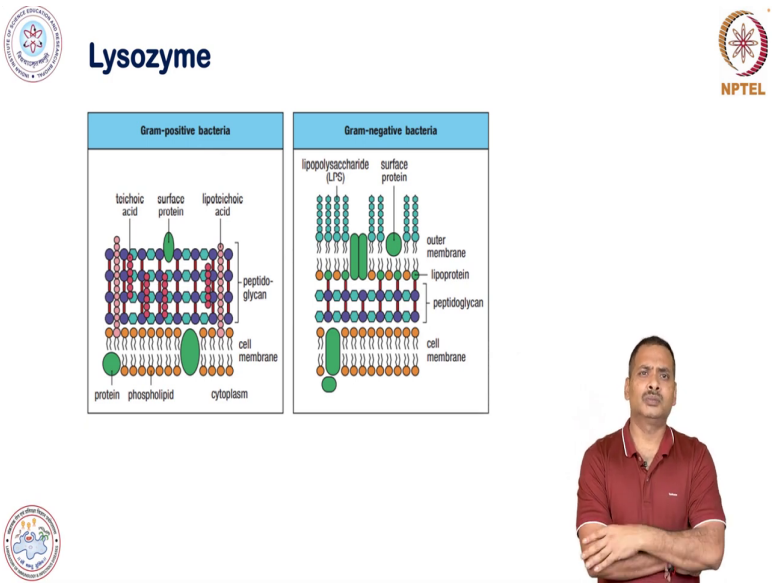

And now I will talk about some or other antimicrobial protein enzyme or peptide. So, first is the lysozyme. So, lyso here you can see the structure of gram positive and gram negative bacteria here you can see there is a in gram-positive bacteria there is a very thick layer of peptidoglycan and this peptidoglycan is very thin in case of a gram negative bacteria and this gram-negative bacteria has one more additional structure which we call it as the outer membrane here you can see there is outer membrane.

So, and this outer membrane contains your the most ~~immuno~~immune-potent molecule which we call it as a lipopolysaccharide . So, this lipos-polysaccharide is present in in gram-negative bacteria as you might know in in previous classes that the gram-negative bacteria has outer membrane and this outer membrane contain the lipopolysaccharide.

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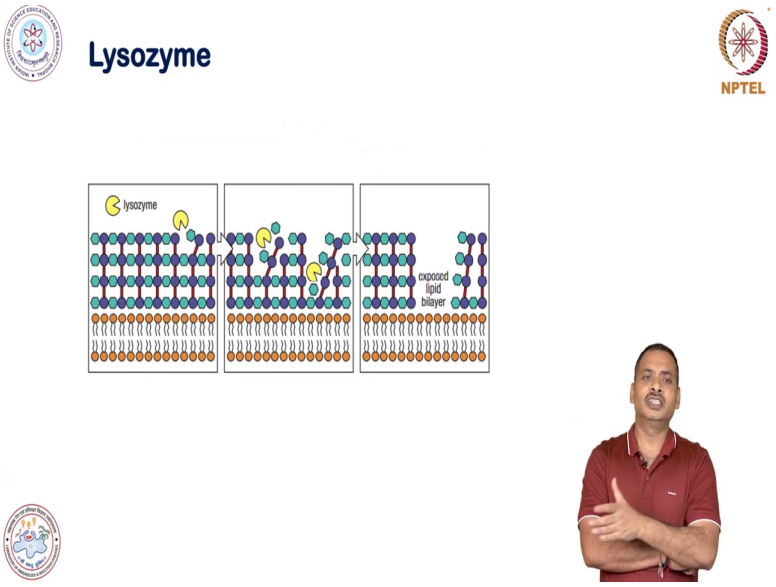

So, what lysozyme is doing here you can see this is a very nice cartoon. And lysozyme basically cleave this peptidoglycan and breaek or disrupt the this peptidoglycan layer and and open the membrane part of bacteria to the environment and then there is a several ways by which this can be disrupted once the wall will be disrupted then bacteria will be no more live. So, this is about the lysozyme in next session I will talk about some more antimicrobial peptide protein and I will also discuss about the microbiological barriers, thank you.