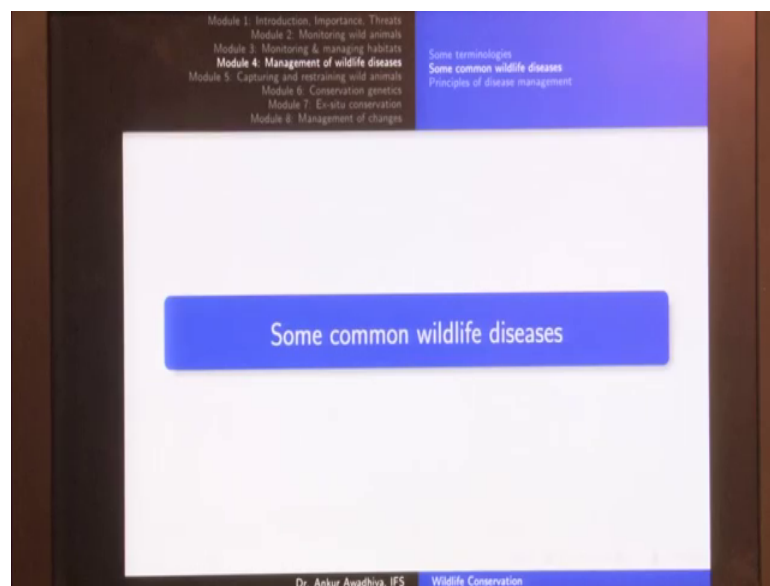


**Wildlife Conservation**  
**Dr. Ankur Awadhiya**  
**Department of Indian Forest Service, M.P**  
**Indian Institute of Technology, Kanpur**

**Lecture – 16**  
**Some common wildlife disease**

[FL] In today's lecture will have a look at some common wildlife diseases and some important wildlife diseases.

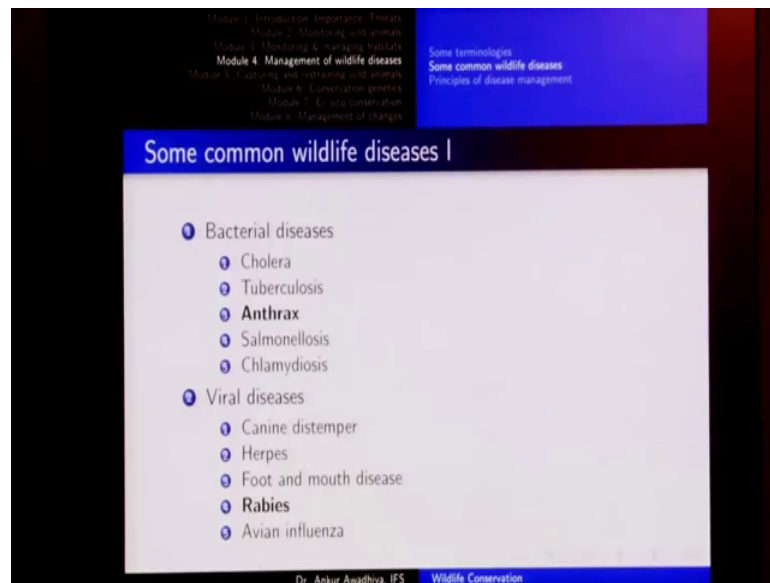
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Now before we begin it is important to note that when we talk about communicable and non communicable diseases most of the non communicable diseases like hereditary diseases or congenital diseases are not that important when we talk about wildlife management. This is because an animal that has a hereditary disease or say is malformed will not be able to move for and would become prey to predator in a preferential manner and so, would be automatically and naturally removed from the system.

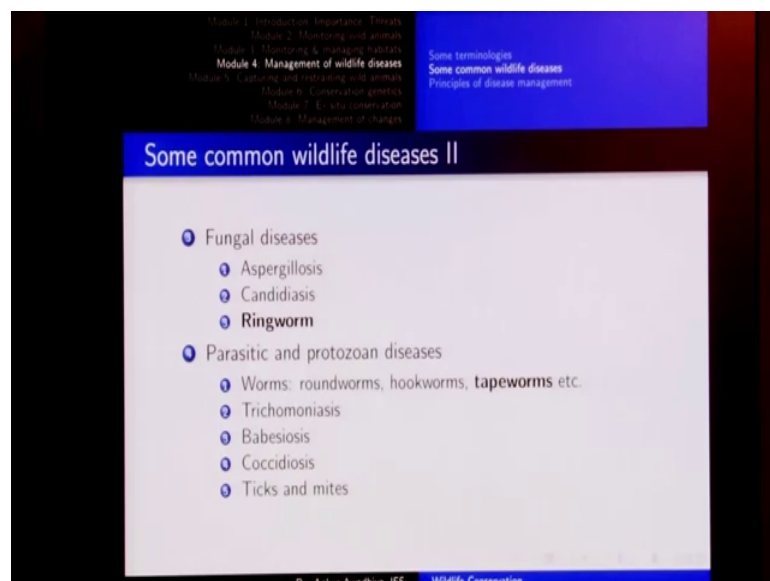
On the other hand when we talk about infectious diseases and communicable diseases, they become extremely important because they can infect other animals that are there in the population. They can even impact other animals that are there of different species in the same community. And might even lead to decimation of large population and so, they become extremely crucial for in the case of wildlife management.

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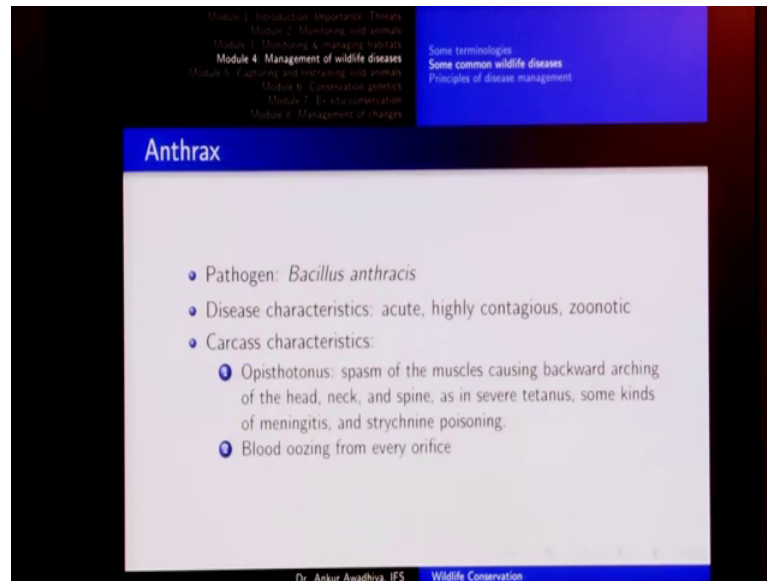
So, when we talk about communicable diseases we have these categories we can have bacterial diseases such as Cholera, Tuberculosis, Anthrax, Salmonellosis and Chlamydia. Now in the case of bacterial diseases in the case of all these important bacterial diseases we will take anthrax as a case study of how this disease spreads in the system. And how do we tackle this disease. In the case of viral diseases we have canine distemper, herpes, foot and mouth disease, rabies and avian influenza and will take rabies as a case study.

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In the case of fungal diseases we have Aspergillosis, Candidiasis and Ringworm which are important disease of wildlife and we will take ringworm as a case study. And in the case of parasitic and protozoan diseases we have worms like roundworms, hookworms, tapeworms etcetera, we have Trichomoniasis, Babesiosis, Coccidiosis, ticks and mites and then this case we will take tapeworms as a reference example for our case study.

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So, let us begin with anthrax. Anthrax is caused by a pathogen which is a bacterium known by the name of *Bacillus Anthracis*. Now disease characteristics, now whenever you read about disease characteristics we will just come across these words that we discussed in the previous lecture. Acute, acute means that when any animal is exposed or gets this disease then the disease would develop the symptoms very fast in a very short span of time. Highly contagious, now contagious means that this disease is not only communicable but it can also be spread just by touching.

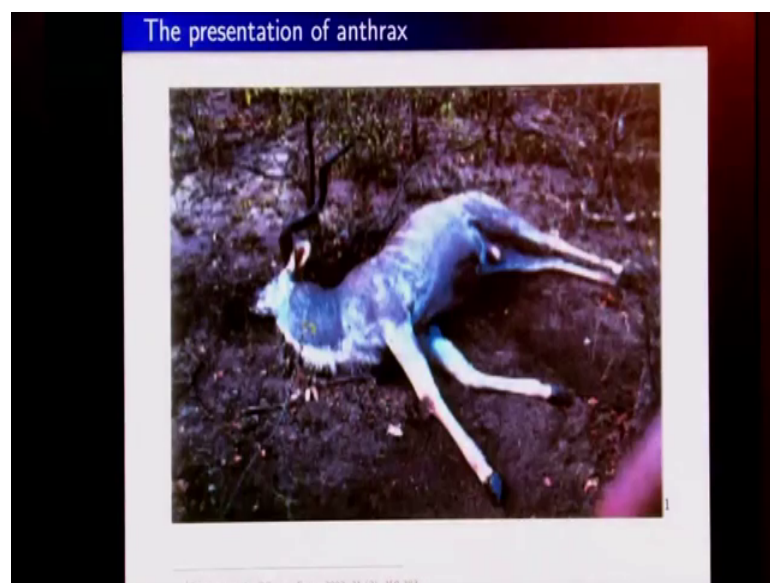
And highly contagious means that even if you come into contact for a very brief amount of time you might very easily get this disease or the animal might very easily get this disease. Zoonotic is another term which means that this disease can even be transmitted from animals into humans. So, which makes it even more important for us wildlife managers to be worried about these diseases.

Now, in most cases of anthrax we do not actually see the animal that has the anthrax, but because this is a very acute disease we generally see a dead animal or its carcass.

So, the carcass characteristics become very important to know the incidence of to know the prevalence of anthrax in a population. In the carcass characteristics we consist of opisthotonus. Opisthotonus is the spasm of the muscles causing backward arching of the neck, head and spine, as in severe tetanus and some kinds of meningitis and strychnine poisoning.

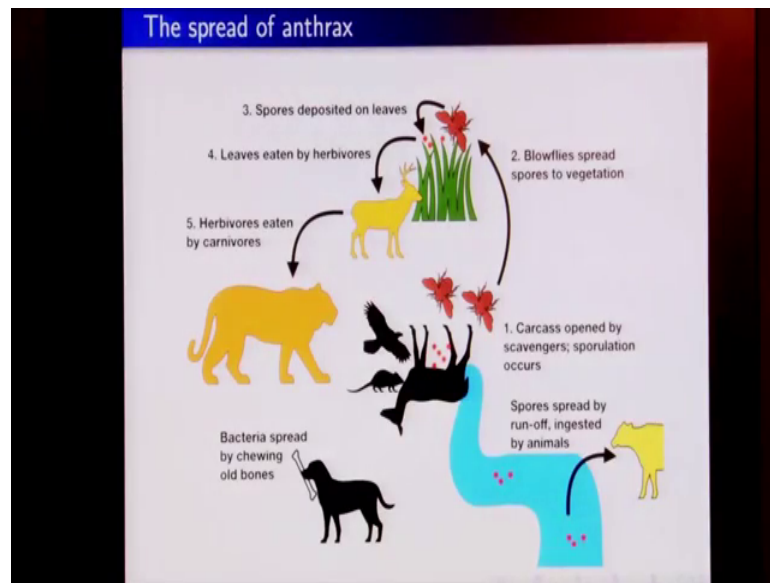
So, basically if you have in a carcass that is showing opisthotonus what you will observe is that the head is moved backwards as much as possible.

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So, look at a carcass, this is the carcass and we can observe here that this is a carcass of Kudu which is an animal that is found in Africa and this is a case of anthrax. And this head is turned back. So, this is classic characteristics of anthrax. Also we would observe blood that is oozing out from every orifice. And this blood is also highly contagious. So, essentially any animal or human being that comes into contact with this blood might also catch the disease. In most cases it is fatal. So, there is a very large motility whenever this disease occurs.

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Now, how does this disease spread in a wildlife ecosystem? So, basically this is a carcass of an animal that died out of anthrax. So, the first step there happens is that you have blood that is oozing out and that blood itself is contiguous, but at the same time very quickly after this animal dies, the carcass is opened by scavengers which also leads this sporulation.

So, essentially we will have ventures, we will have animal such as hyena that would come to this carcass and will open this carcass to eat the meat. And as soon as the bacterium comes into contact with air it creates spores.

Now, they would also be some flies in this case in this particular example we have talking about blowflies. So, these blowflies would then come onto the carcass and then they would after the while they would go and also set on vegetation. Now blowflies just because of there because on their legs they are able to carry this spores in to the grasses. So, this is an example of vectors that we discussed in the previous class.

So, blowflies act as vectors to carry the pathogens from the carcass into the nearby vegetations. Now this vegetations also becomes another vector when the spores get deposited on the leaf and then these leaves are eaten up by the herbivores.

So, blowflies are vectors and then the grass also becomes another vector. So, this is a biological vector and this is a living vector and this is the non living vector or an inanimate vector. In the case of blowflies also they are acting as mechanical vectors.

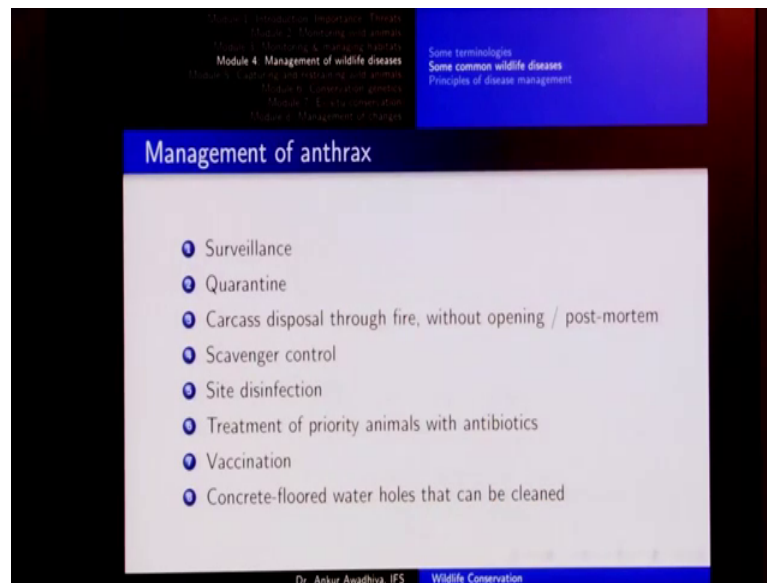
So, once these spores have reached into the grasses or on the leaves then these leaves are eaten up by the herbivores. Now, when the herbivores eat these leaves, so, they also catch up the disease anthrax. Now they might also die in a short while say in a period of a few days, but also when they are when they have these pathogens in their bodies and they are developing this disease when they are in the incubation phase they may also get eaten up by the carnivores that are present in the system.

So, in the African system we have lions in our system we have tigers or leopards. Now when these animals that have the pathogen inside and they are in the incubation phase and they are eaten up by the carnivores. So, they are able to transmit this disease into the carnivores as well.

So, in this case the herbivore is acting as a carrier is specifically and incubation carrier. Also when the carcass was opened and when there was blood all around. This blood can also be spread by runoff. Run off means that when we had any amount of rain in that area, so, along with the water these spores are also transmitted to other locations. And then there are animals that are drinking from this water they also get infected.

Also long after this animal is dead and when most of the meat has been taken away by the scavengers even the bones of the animals would carry the bacteria and then these bacteria can also spread by the chewing of old bones by animal such as hyena or jackals or even dog if they are there in the system. So, this is a very acute disease and this is the very important disease. How do we manage it?

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We do not have a number of options, but things that work most are surveillance and quarantine. So, surveillance means that you keep your eyes open if there is any case of anthrax you come up with a very strong level of countering of this disease and whenever you have bringing any animal from outside you should protect into a quarantine. So, essentially when we talk about the translocation of barasingha's say from one tiger reserve to another tiger reserve. As soon as you get the barasingha's, you should not just let them open into your system, but may be put them into an enclosure for some time just observe them for some time and if the animals are healthy then they can be let out.

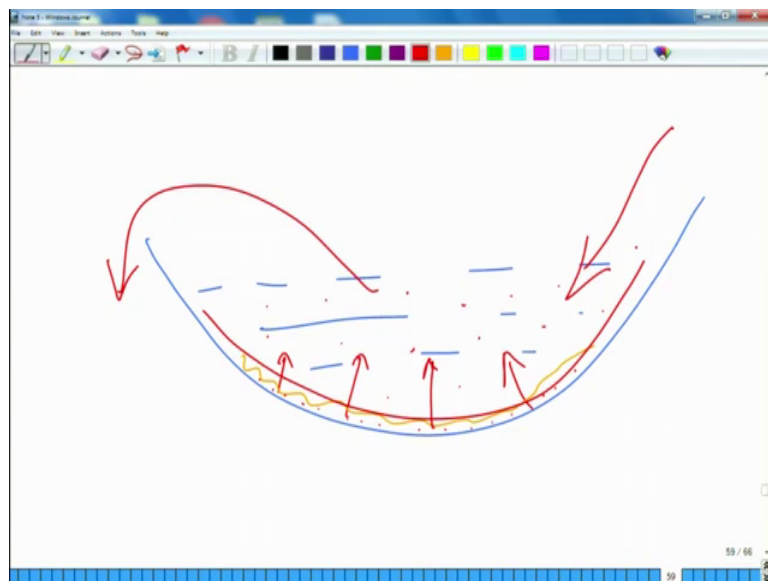
Because in the case of anthrax this being an acute disease, we would not need to keep them in the included for very long time, then it is also important that the carcass disposal of through fire without opening of post mortem. Because as we saw in the previous picture if there is a carcass, you saw that the head is bent back there is blood coming out from all the orifices. And if you order a post mortem of this carcass when as soon as the carcasses is opened then we would have a lots of spores that are hanging around.

So, in these cases we should not order any post mortem of the carcass. And there should be carcass disposal through fire. So, in that case what we do is that we put dry logs on top of the carcass we also put dry logs or say kerosene in the surrounding area and we burn the whole area, so, as to burn the bacterium from the system.

Then it is also important here to maintain Scavenger control in that area. So, essentially if we have carcasses that we suspect could be having anthrax then it is important to keep these scavengers out otherwise they would spread the infection to other animals. Then we also have site disinfection of the area, so, which can be done using number of chemicals then if there is a priority animal that is gotten this disease.

So, for instance there was a deer in the incubation phase and it was eaten up by a tiger. And we suspect that are tiger might be getting these disease or if it is showing some symptoms of a disease then these priority animal should be treated with antibiotics. Vaccination against anthrax is available and is diploid in some cases. Also it is very important to have concrete floored water holes that can be cleaned because what happens in the case of anthrax is that in the case of natural water hole so, we would be having water here and then there is soil in the bottom.

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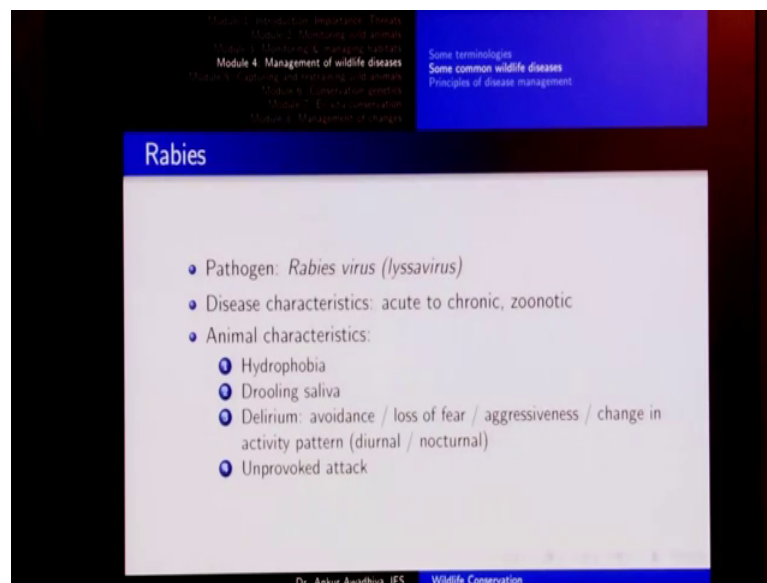
Now, the anthrax spores when they have reached these water bodies, they can reside in anaerobic environment down below for quite a long period of time. Now suppose this water is being used by a barasingha. Now a Barasingha would getting to the water and would weight through the water body and in that case the whole water will turn muddy.

So, essentially what is happening is that all of this mud is now mixed up with the water and all these spores have come back into the system. And now if any animal drinks this water it would get anthrax.



So, basically we opt for concrete floored water holes that can be cleaned. So, essentially whenever we have these situations of anthrax you also clean up the nearby water bodies. So, all of these water will be taken out, this whole area would be dried, the bottom would be scraped out and dried or may be even burnt. And this water hole filled up again with fresh water. So, this is an important thing to know when if you have anthrax in the system.

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Next case study that we will discuss is Rabies. Rabies as we know is the viral disease it is caused by the rabies virus which is a form of lyssavirus. Disease characteristics acute to chronic; acute to chronic means that in certain situations we can have this disease in an acute manner. So, an animal gets this disease and say within a few weeks it shows the symptoms or in some cases we can even have chronic cases.

So, in the case of some animal they could be bitten by rabid animals and then not show symptoms for years together. So, see even after 6 or 7 years this animal might suddenly start showing the start showing the symptoms. So, it can be acute or it can be chronic. Again it is the zoonotic disease which means that it can be spread from the animal to human beings.

Now animal characteristics if an animal has rabies it would show hydrophobia hydro is water phobia is fear. So, the animal shows a fear of water because whenever this animal tries to solve anything there are very strong spasm in its throat which have extremely

painful. So, it tries to avoid eating or drinking anything and especially drinking water. So, it shows hydrophobia.

It shows drooling of saliva. So, essentially its mouth would show saliva that is dripping out, it would show Delirium. So, Delirium is a state of confusion. So, it would either avoid the animal avoid the human beings or other animals or else it in certain situations it would show a loss of fear.

So, basically this animal would start coming towards human beings when earlier it was extremely shy of human beings. It could become extremely aggressive and try to bite everyone or they could be a change in the activity patterns.

So, an animal that is a nocturnal animal for instance that is act of during the night time, it would start showing up in the daytime. So, it shifts from nocturnal to diurnal or diurnal to nocturnal. So, essentially it is in a state of very heavy confusion which we also call as Delirium.

And then it could also show unprovoked attack. So, essentially if there is an animal in the forest and if you have provoking it with something if you have throwing stones at and it is comes and attacks you that is a provoked attack. But if you just went there and it came and attack you it would be called an unprovoked attack.

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Module 4 Management of wildlife diseases  
Some terminologies  
Some common wildlife diseases  
Principles of disease management

### Stages of rabies

- 1 Incubation: no symptoms
- 2 Prodrome: fever, anorexia, headache, pain, numbness
- 3 Acute neurologic phase: anxiety, hydrophobia, delirium, hallucinations, paralysis
- 4 Coma: hypotension, cardiac arrhythmia, pituitary dysfunction
- 5 Death

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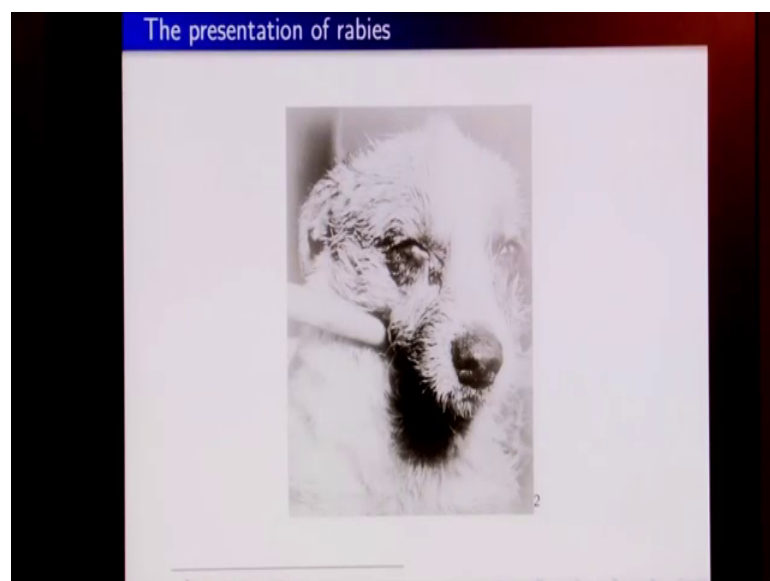
The disease moves in five stages. So, when an animal is bitten. So, this disease spreads by biting, if an animal is bitten the first stage is incubation stage which will not show any symptoms. The second stage is called the prodrome stage. And in the prodrome stage the animal would show the same symptoms as you get when you get a influenza or common cold. They would be fever, they would be anorexia; anorexia means that the animal avoid eating food, it would have a headache, pain, numbness.

Then after the prodrome stage we would have the acute neurological phase. Now in this phase we are getting symptoms in the brain. So, the animal would show anxiety, it would show hydrophobia, it would show delirium which has the confusions, it would show hallucinations and it would also have paralysis.

Now, once an animal has started showing these neurological symptoms then there is a very little chance that we would be able to recover the animal and in most cases we have to kill this animal to avoid this spread of this disease into the surroundings. After this neurological phase you would have the phase of coma in which we would have hypotension which is low bp, cardiac arrhythmia which means that the heart beats become out of sync, we would have pituitary dysfunction.

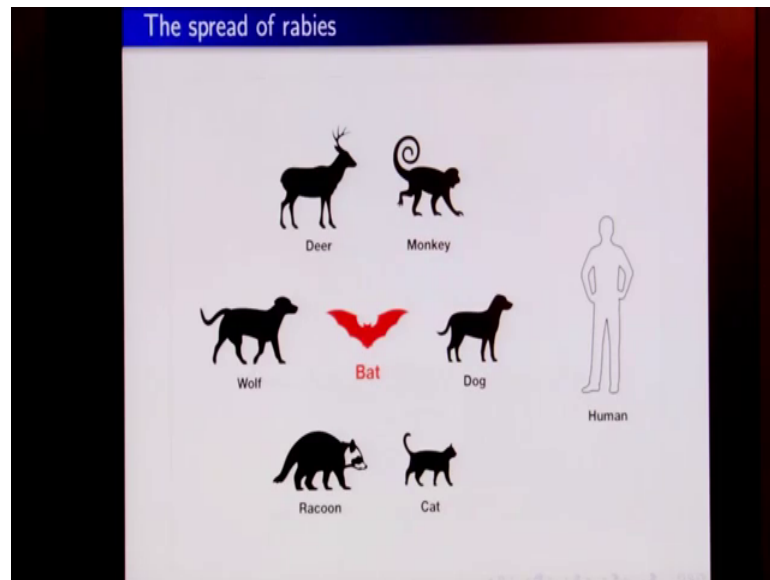
So, we would also the getting hormonal changes in the body and this coma phase would in habitably lead to death.

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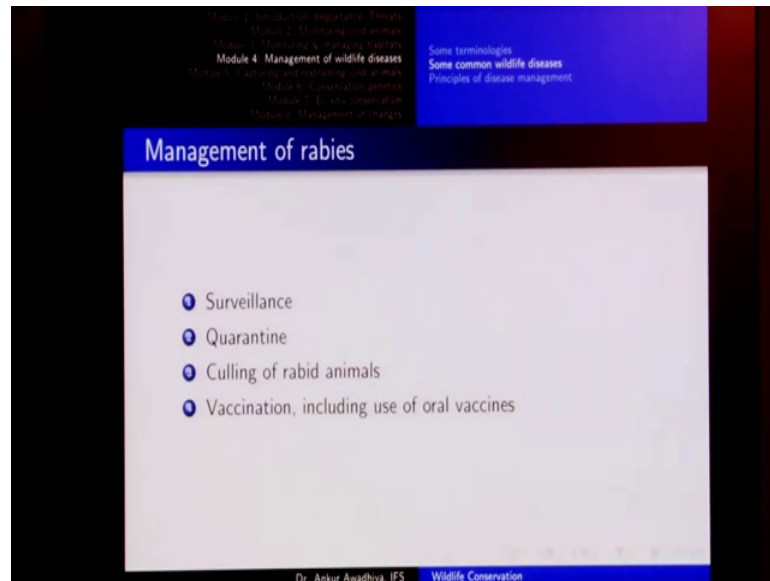
Now, this is a picture of dog showing Rabies and this is in the neurological phase and in the neurological phase as well you can observe that this animal is having quite a lot of saliva around it is mouth and it is showing a very reduced level of activity.

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In the forest system that is happen to be the reservoirs of rabies because they are quite immune to this disease, but they have the virus in their bodies. And then they can spread it to all the animals that are nearby, they can spread it to deer, monkeys, wolf, raccoons and when humans are nearby this disease can also be spread to dogs and cats or even directly to humans. And these animals can also spread diseases to the human beings. So, essentially when you are seeing a bat somewhere which is lying down on the ground, it is always advisable not to touch that animal. So, that it is not able to bite you.

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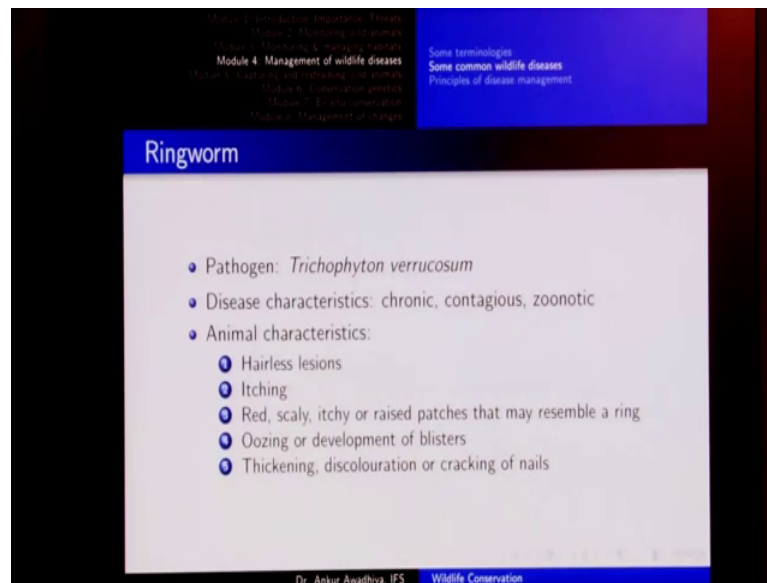


Now, how do we manage this disease? Well, as before surveillance and quarantine are of primary importance. So, you keep your eyes and ears open. If there is any case of Rabies in the system then we have to give a very strong attack to the system. Then quarantine we are bringing any animals from another system into our system. They should be kept in an inclusion and watch for some time whether they are showing symptoms of this disease.

If there are animal that are showing these symptoms then those animals need to be culled. So, culling means killing of those animals because there is we do not have any techniques so far to cure these animals once they have started showing the neurological symptoms. So, the only option left is to cull these animals.

And fourth is vaccination including the use of oral vaccines. So, this is being tried in a number of countries . In this case we place baits into the forest system and these baits have oral vaccines and any animal that eat this baits get this vaccine and become immunized against the virus. So, this is also another way in which we can do the management of Rabies.

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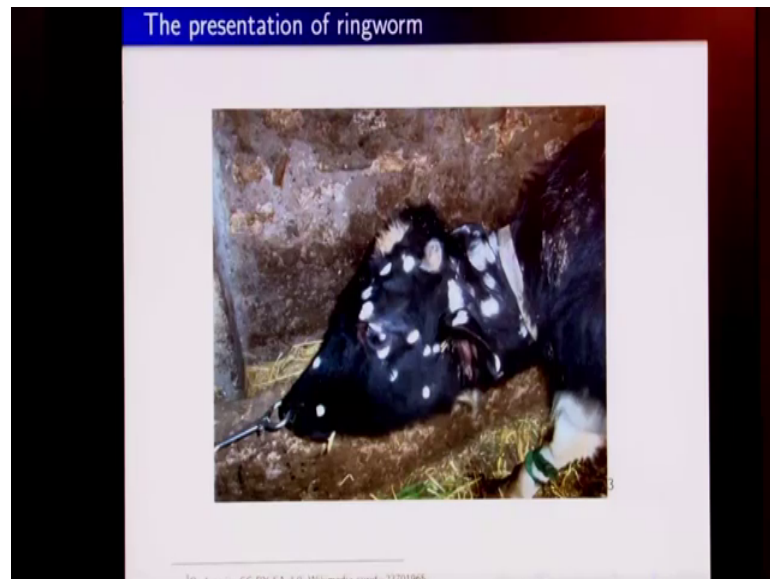


Next disease that we will consider in detail is Ringworm. Now ringworm is a fungal disease, it is caused by the pathogen *Trichophyton verrucosum*. The disease characteristics are chronic.

So, when an animal gets this disease it will take a very long time for this disease to progress fully. It is contagious. So, it can spread by touch and it is also zoonotic which means that it can spread from animals to human beings. Now how would an animal look when it has a ringworm? There would be hairless lesions. So, there would be lesions on the body and there would be a loss of hair in those lesions. It would be itching a lot because this disease causes a lot of itching sensations. They would be red scaly itchy or raised patches that may resemble a ring which is by it goes by the name of ringworm.

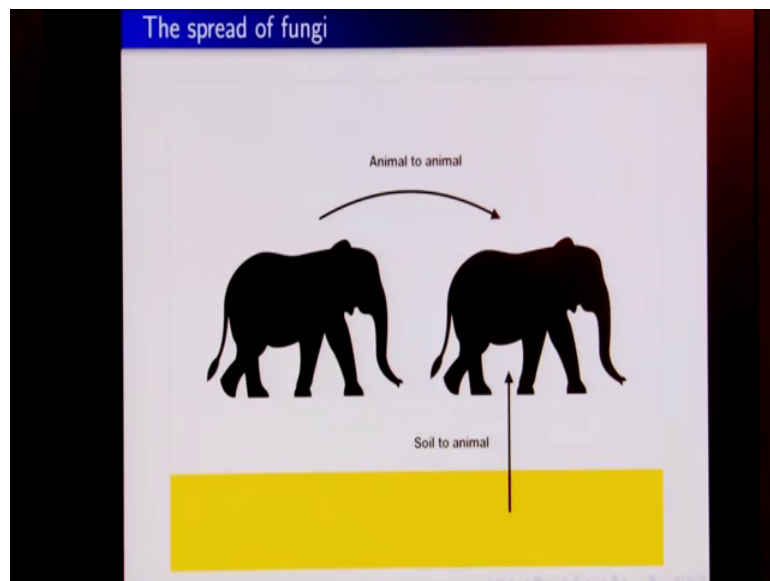
So, they would be red scaly itchy and raised patches. They would be oozing or development of blisters. So, all these patches might also shows some amount of oozing. And then there would be thickening, discoloration or cracking of nail. If this disease has spread into the nails because the animal is using its nail to itch itself then we would also observe thickening and discoloration or cracking of nails.

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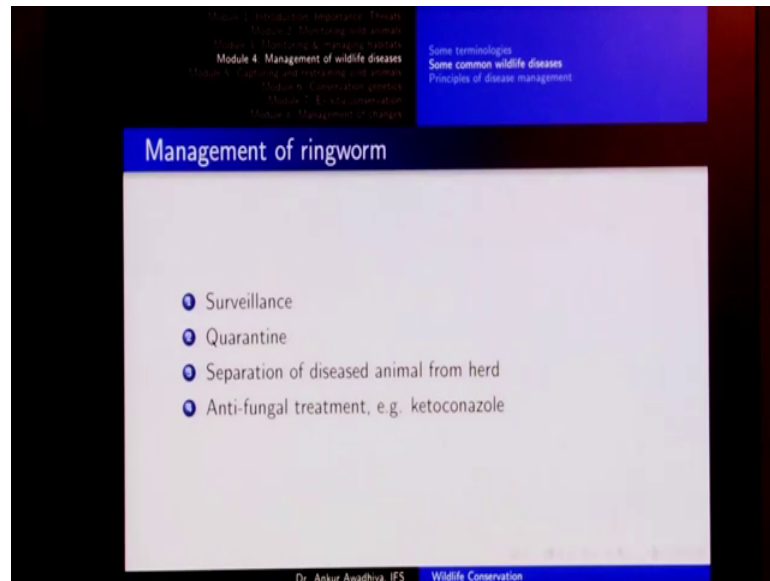
So, this is how an animal would look like. So, it has a number of patches in which there is no hair and this animal is showing ringworm in this system.

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Now how does ringworm spread in the system? In the system we can have an animal to animal spread of ringworm because it is a contagious disease. So, it can spread from one animal to another through touch. Also the pathogen is stored in the soil and so, it can also spread from soil to the animal. So, even if we do not have any animal that is showing symptom of ringworm, but there also this disease can again occur back in the system by coming from the soil.

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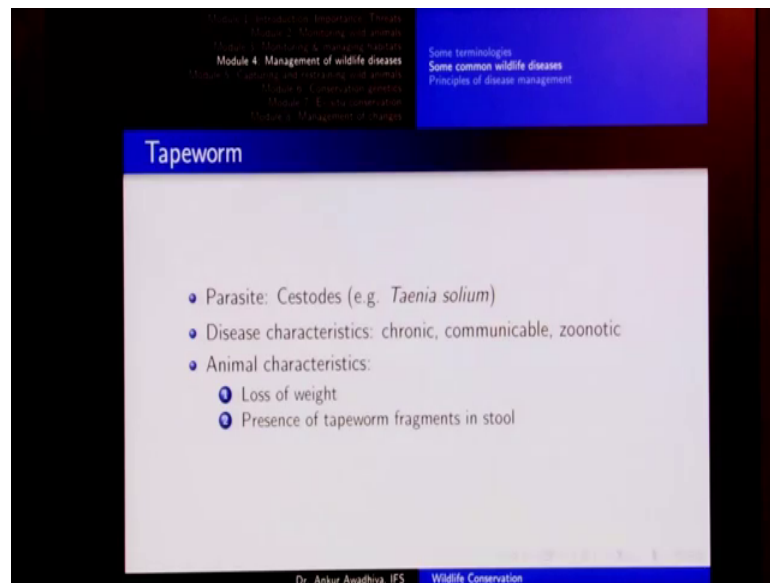


Now, how do we manage this disease? Again the first two things are common; surveillance, keep your ears and eyes open for any cases of ringworm. And quarantine whenever you are bringing any new animals into the system. Then separation of disease animal from the herd; this disease spreads by touch. So, if you separate the animal from the herd then the chances of spreading reduce then also anti fungal treatment, example ketoconazole.

Now, this cannot be done in most of the wild animals, but for those animals that are kept in captivity. So, for those animals that are say kept in the temples for example, temple elephants or camp elephants that we use for the (Refer Time: 20:42) purposes or those animal that are kept in the zoos, we can if they develop framework we can give them an anti fungal treatment example of ketoconazole which is a chemical that is used for the treatment of ringworm.



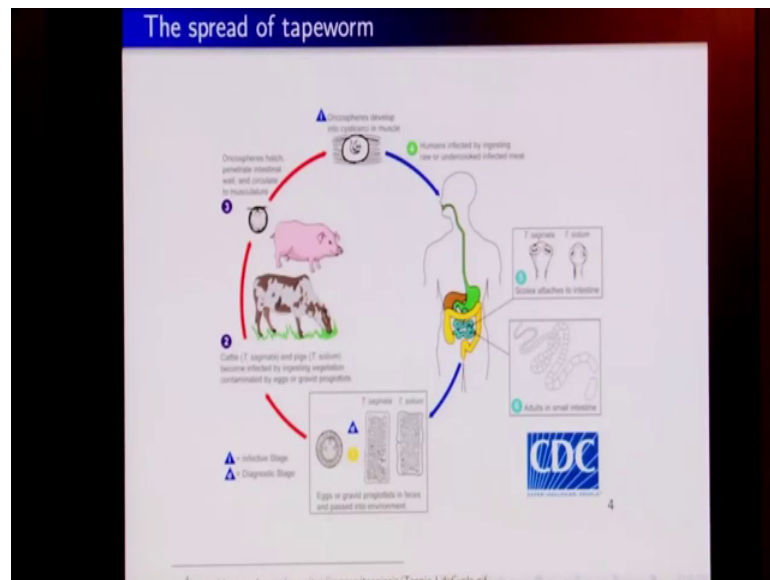
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Now, the next disease that will consider is a parasitic disease it is called Tapeworm. The parasite is Cestode for example, *Taenia solium* we say example here because there are a number of different parasites that can spread ringworm the disease characteristics are chronic communicable and zoonotic it is chronic. So, it take a long time to develop that is communicable. So, it can spread from one animal to another animal, but it is not contagious. So, it does not spread by touch and it is also zoonotic. So, it can spread from the wild animal to human beings. How does an animal look when it has tapeworm. It will show a severe loss of weight and also it will show presence of tapeworm fragments in this stool. So, when we see the dung of the animal will see that it has tapeworm fragments.

Now, loss of weight is something that we will consider in the next lecture regarding how we make sense of it.

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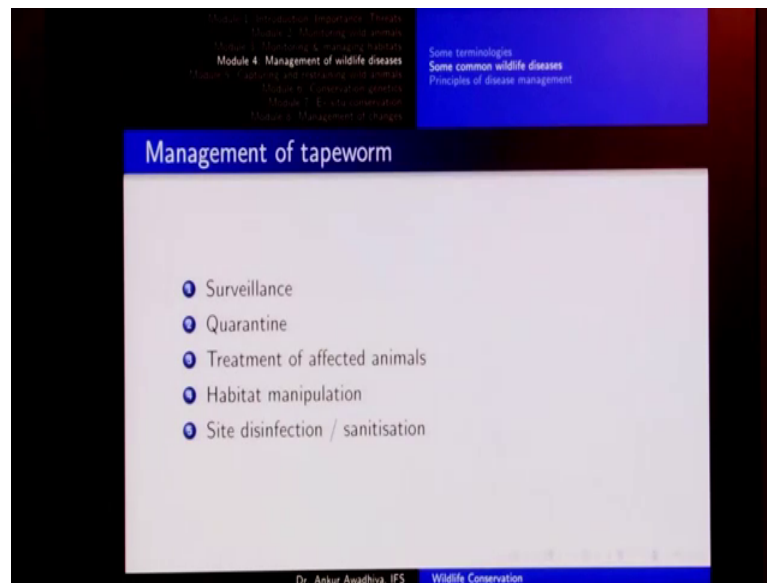
Now, how does this disease spread in the system and how does this disease even reach human beings? So, basically a human being or any animal that has a tapeworm infestation would be having Tapeworm in its intestines. And at times fragments would come out of this stool. And when they come out of the stool, so, there is any animal that had tapeworm, so, when it gives out dung droppings then those dung droppings would get into the grasslands.

Now, these grasslands now have the pathogen and if any herbivore feeds on these grasses specially cattle or pig or such other herbivores in our forest system they would get these fragments or even the eggs of the Tapeworm into their bodies.

Now, these animals act as amplifier host. So, by amplifier host we mean that these animals have the pathogen into their bodies and the pathogen is able to grow itself, it is able to multiply itself and after while it will not just infect the intestines, but will also move and infect the muscles. So, essentially we will have these oncospheres that will develop in the muscles of the animal.

Now if these animals are then predated upon, if human beings eat these animals or say or tiger or a leopard they eat these animals. So, from the muscles these oncosphere would get and these oncospheres have these cysticerci which have the pathogenic organism. And when other animals or humans eat those then they would then develop in the intestines and then the cycle continues again and again.

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So, how do we manage this disease? As before surveillance and quarantine are the first two tools that we can use. So, keep your ears and eyes open for any incidence of this disease. Whenever you are moving in a forest ecosystem if you see a pile of dung it is always useful to take a stick and then probe that dung at times to have some sample of this disease in the area. If you are bringing any new animal into your system place it in an enclosure for some time, keep a watch on this animal use quarantine principles.

Then treatment of affected animals; now treatment of affected animals is possible in the case of those animals that are kept in captivity. So, when we talk about things like temple elephants or camp elephants or zoo animals those animals that are kept in a captive breeding facility they can be treated, but often treatment in the wild situations is difficult.

So, treatment of affected animals if possible, then we also go for habitat manipulation and site disinfection or sanitization.

So, when we talk about habitat manipulation and site disinfection what we are saying is that we need to reduce the load of the pathogens from the system. In most of the situations it is not essential that we exterminate the pathogen from the system altogether. Why? Because even these pathogens are parts of the biodiversity even they are playing a role in the ecosystem.

So, for instance if there is a situation in which all the herbivores are perfectly healthy then a predator such as a tiger will find it very difficult to eat any of these animals, but when any animal gets a disease it becomes weak, it is not able to run that fast and so, it becomes an easy prey for the predator species.

So, in most situations it is neither advisable to get rid of all the pathogens that are there in the system. Nor in most cases is it possible to get rid of all the pathogens that are there in the system? So, we normally go for a management route. So, in the case of management of ringworms, if we have some animals, so for instance if there is an elephant and if we saw that this elephant has a severe injury.

So, we immobilize this animal and then we treat this injury and at the same time if we saw that this animal has a huge parasitic load. Then we might even give it some medicines to reduce the parasitic load.

So, that it does not spread these diseases to other animals, but we cannot go on capturing every animal checking it up completely and giving it a complete dose of antibiotics or other medicines.

So, basically sanitization means that if you know of some animals that are acting as the reservoirs or that are acting as carriers then we can reduce their numbers. In cases where we have some diseases that are being spread by flies we could go for some measure of control of the fly population. We cannot exterminate the fly population, but we will put in measures. So, that the flies say get caught in traps or are caught because of some light with a net and so on, but will not exterminate the flies from the system.

So, sanitization and habitat manipulation can be used for the management of most of these diseases including ringworm. Now, in this lecture we did not go through each and every disease because we have a number of diseases and going into each and every of those would not serve the mandate of this particular course on wildlife conservation.

So, we saw four different case studies of a bacterial disease anthrax, a viral disease rabies, a parasitic disease tapeworm and also a fungal disease that was the ringworm. Now, the ways in which these diseases progress in the system and the ways in which we manage these diseases are the same that can also be used for other diseases. Now that

being said will look at principles of disease management in greater detail in the next lecture. So, that is all for today.

Thank you for your attention. [FL].