

Animal Physiology
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Lecture – 01
An introduction to Anatomy & Physiology

Good morning, and welcome you all for the course in Animal Physiology. So, all those who have taken up this course: I have been teaching this course for a while and every time I teach this course new way of thinking about physiology. So, I believe again this time where I will be teaching giving you 60 lectures; that is a 12 week course and every week will be having 5 lectures which will be heard & seen across wherever our viewers are. So, I will be believe it will be another set of new experience about teaching Animal Physiology.

So, whenever we talk about animal physiology there are few things which comes in mind; say for example, in our day to day life we hear several words relevant to our health. We hear somebody is having diabetes or somebody suffers from an accident had had a blood clotting or a hemorrhage, or somebody has urinary tract infection or as simple as diarrhea. So, these are several words which comes very frequently or a simple fever where the temperature of the body rises. So, some of us understand, some of us goes to the doctor and doctors explain certain things part of part of it we understand part of it we do not understand.

So, the aim of this course will be to educate our self about our own body, in a very simple way. In order to understand our own body; say for example some bodies having diabetes. So, we all have a rough idea it has something to do with sugar, sugar is not absorbed or some issues, but what it is. Or when to have it hemorrhage; when we understand something to do with blood, but what is blood what is blood clotting, what is hemorrhage, what is sugar doing, what sugar has to do with diabetes. These are simple words, but physiologist will be able to put this word in a sequence so that it make sense to a lay person.

That is precisely, will be my goal in this course whenever you come across a situation related to your body. You should be able to, if not diagnose you should be able to tell the doctor exactly what are the symptoms and where you believe if things are happening and of course, you can leave it to the doctor to think over it and diagnose it properly with

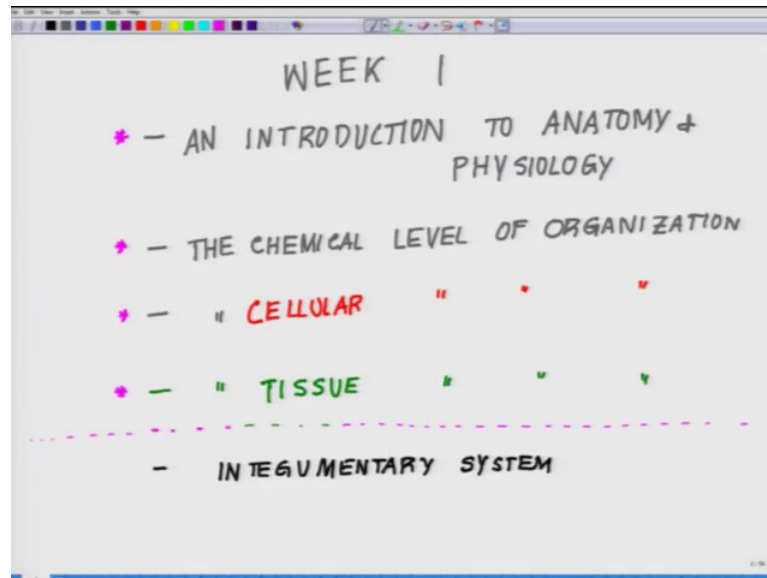
series of tools, diagnostic tools to figure out what is happening. So, in a sense or say for example, let me give you another situation many a times doctors prescribe medicine and as the Indian citizen nature we never ask that nature of the medicine how it is going to react in our body. But, to tell you a fact from my own life while I was in U S I used to see that everybody used to ask the doctor and even I also develop that habit of asking the doctor how this medicine is going to work in my body, what it is going to do, and the doctor is compelled or it is part of that to explain this, because end of the day it is your body.

But something what we will lack here in India is that we do not ask this question. Not asking this question is either you are fully trusting or you are really ignorant which is not good. It is good to know because I am not asking that you become a doctor, but at least you ask the doctor at least increase your understanding about your own self and that understanding can only happen when you have some basic understanding of basic physiology or about your body and how your body functions.

So, once again let me welcome you all. Today is our first lecture. So, the first five lectures or the first week will lay the foundation stone of the structure of the course, in other word what all topics will be following in the first five weeks will give us a direction. So, I strongly recommend you all that go through these first five lectures very carefully, so from that point onward you will be able to correlate things at what level we are talking about; and we will come what I meant by level and complexities and what kind of control mechanism we will be talking about. So this first five lectures, and there will be some degree of all over at different times I will mention that wherever such a spell over takes place.

So, let us enumerate what all topics we will be touching during this first week, during the first five lectures. So, as the title of the course Animal Physiology and we are starting with week 1.

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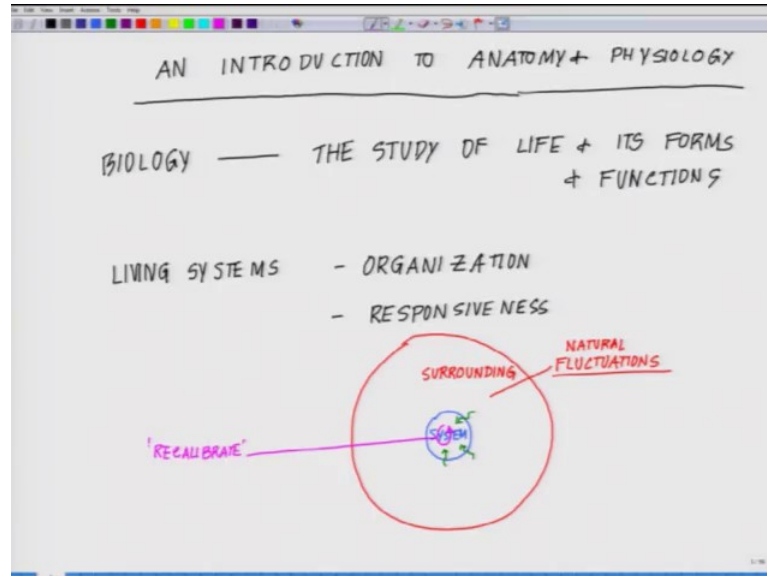
So, these are the topics what will be covering during week 1. The first is: An Introduction to Anatomy and Physiology, second one will be The Chemical Level of Organization, next one is The Cellular Level of Organization- the (Refer Time: 07:51) the color so the cellular level of organization, next will be The Tissue Level of Organization, and fifth one will be the beginning of a system; the very first system will be dealing with will be Integumentary System.

Now, as you see I have put three level of organization: a molecular level of organization or chemical level which will boil down to the basic molecules of life including DNA, proteins, lipids, and carbohydrates. Next level where these simple molecules self assembled to form the smallest functional machinery of our body called a cell, a individual cell and post that next level of organization where several cells perform a specific function and such colony of cells which perform a specific set of function is called tissue. So, there are three levels: chemical or molecular level of organization, the cellular level of organization, and the tissue level of organization and we will enumerate these different levels.

And the first system everything integumentary system: in the first week of these five lectures what will be covering our major thrust will be on these four topics, and we will be closing on within integumentary system or if time does not permit we will move it on

to the next week, but definitely our goal will be to understand these parts second out to this.

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So, to start off with will be starting off with an introduction to anatomy and physiology. Let us move to the first topic: An Introduction to Anatomy and Physiology.

Before I get into this topic I must say that these are specialty topics of biology and what really biology is? It is the study of life. So, when you talk about the study of life, we have to distinguish between living and nonliving. Say if we live into our basic understanding a living system, a life form has certain unique features. And if you have those features we call that as a life form, which includes there are certain parameters let us enumerate some of these parameters to start of it. I just now I talk to you about biology which is the study of life forms- life and its forms and functions. This is what biology is all about.

And there are certain features of any living system and what are those features. Let us enumerate those features of living system. It has something called a level of organization, we will talk about that just few minutes back we talked about one level of organization: the chemical level, cellular level and the tissue level. Next is responsiveness, this organize structure is responsive. What does that mean? Responsiveness means a system respond to external stimulus. So, you are walking or you are standing somewhere, all of us sudden starts raining, so if will wet and either you get

more into the rain or you run away from the rain- it means you are responding to the rain, it means you have sensors on your body by which you are sensing it. So, that is called responsiveness.

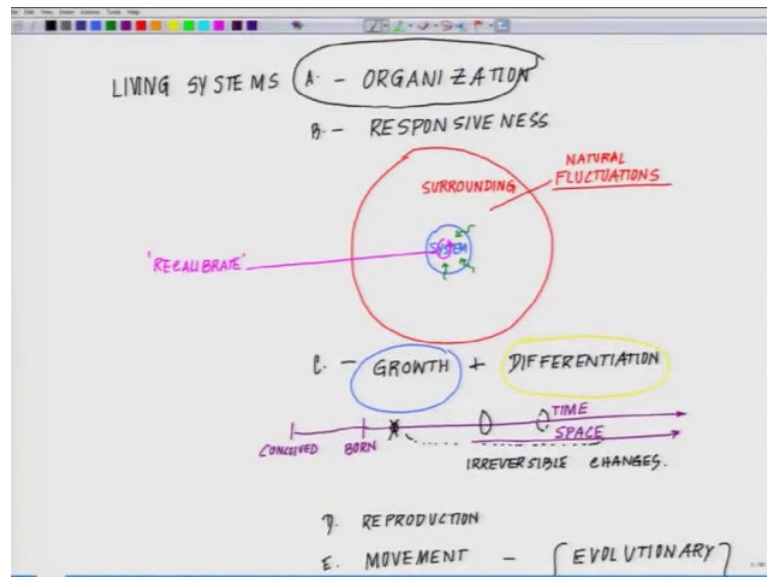
Why this responsiveness is essential? It is a very simple term, but try to think slightly beyond the scope. So, we live in a system which is continuously changing, what does that mean? That means, we live in a system where the temperature is varying, where the precipitation is changing, where it may be possible that you are climbing to the pressure is changing and the system the organized structure which has developed it could be any life form is a function of these external changes, it has to adapt itself according to the changing environmental constrains. It may be very sunny, it may be very hot, or it may be very cold, or it may be very rainy, or you may be in the water, or you may be walking up in the mountains, or you may be walking down the slope, or you may be in a vehicle.

So, based on the surrounding physical parameters which include temperature, a wind, oxygen level, precipitation, light, our body adjust itself. In order to adjust itself it needs to have a series of sensors on its surface, and these sensors respond to several stimulus; series of stimulus. We respond to smell, we respond to noise, we respond to light, we respond to touch, so many of these things and that is what makes us responsiveness.

In other word if we considered in a diagrammatic way, if we considered our self this as this first circle as the system which is you me or any other living system. And if this is the surrounding, this is the second circle what I am draw drawing as the surrounding. So, the surrounding has lot of fluctuations happening, fluctuation like in terms of as I mentioned in terms of temperature, in terms of pressures, environment fluctuations or natural fluctuations. So, these fluctuations are sensed by the system and the system within itself this recalibrated it is a status. What does that mean it recalibrate? Suppose you are feeling very cold, do you like this, right? You are recalibrating, your system is generating heat in order to protect yourself; that is called a recalibration. But then how you do this? Say for example, outside you go outside the room and the temperature is very low, so all your sensors across this skin senses the temperature is low you started feeling cold so you start doing your hands like this, right. That is exactly is the whole process.

So, that is called a responsiveness post reaction to a particular stimulus. That is what I meant by responsiveness. It is very important, that these words are very important. So, keep a tab try to think beyond that what does these simple words means. So, a system is responsive it can re or just itself according to the situation.

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So the next the theme line is, third property of the system is it grows does a growth and differentiation. In other word we all grow, when we are born we are small and then we grow up and in that process we have develop several faculties within our system. We became intelligent, our nerve system grew up, and we develop our reproductive potential. There are several changes which are happening within the system and those changes are called, this is the this second word which is important which I am putting in yellow is the differentiation and the first word is the growth which means we are growing over period of time.

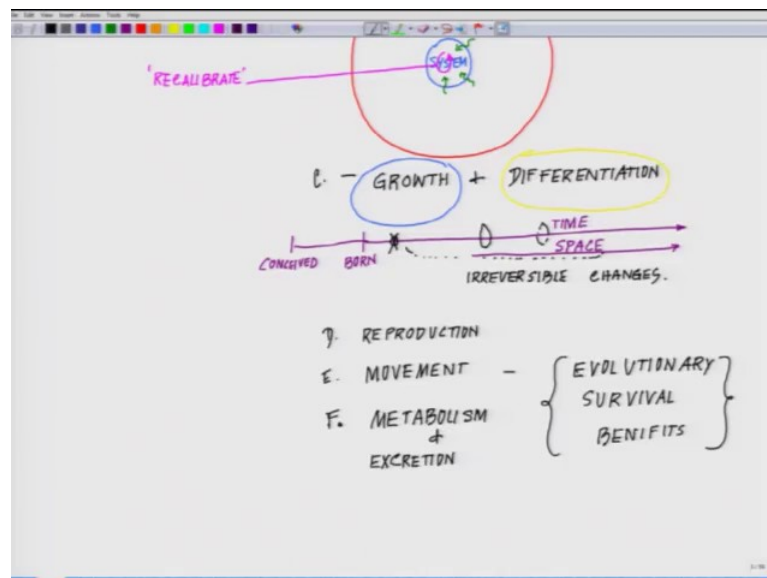
So, in other word this is means there are changes in within your system with respect to time and space, your body space there are changes which are happening within you. So, in other word when you are born or rather let us even if you go back when you are conceived in the mother's womb, when you are born and as you grow old there are irreversible changes- mark my words 'there are irreversible changes happening in your system'.

Say for example, easiest example comes from nervous system. In your childhood if you are traumatized or your scared of something that memory continuous. Say for example, at some point you have a event taking place, your are scared of something. So, this memory will continue to haunt you all your life unless otherwise you do some means to get rid of it, but which is very tough, but you cannot wipe it away.

In other word your system has already stored a piece of information at some point and it will continue to use that experience to modulate your next acts, you understand. So, if it happens today this event is going to modulate or influence your activities in the years to come, in the days to come, the next moment, because there is a permanent change, permanent imprint of that event which has taken place in your system. So, that is what it meant by in the time and space within your own system there are permanent changes and those changes are very critical, not only from survival instinct but from the evolutionary prospector.

So, this is third aspect. So, let us number them A organization, B is the responsiveness, C is growth and differentiation. And let us move to the next one that is our reproduction.

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So, for the success of a species: so remember this basic term rule- the success of a species is governed by the number of off springs we have, how much they can reproduce which determines their evolutionary success. The more you are more chances that you will gather more food and you will have more control over the resources. So, this aspect

of reproduction is very critical from the survival and evolutionary success and equal advantage for an organism.

And again this reproduction process is a time dependent curve. Just like growth in differentiation, so this process happens at some specific point in a depending on the species when they become mature and they reproduce. The next aspect in it is movement; all living forms have some form of a movement including the plants. I am not talking about a plant is walking from one point to another, but they move towards sun light: phototropism, geotropism. These are following the gravity or following the sun, these are movement from one place towards a stimulus.

Similarly, but again in case of human or other animal also movement is very discrete you really can see they can move. And these movement gave them a evolutionary advantage in terms of a avoiding their pray, avoiding their predators, avoiding their enemies and hunting for food or going after the resources or gathering together. So, this movement has several benefits in terms of; and whenever I talk about benefits I talk about this word evolutionary benefits. How it helps in survival benefits, evolutionary survival benefits. So, these are not really benefits in terms of some financial benefits I am talking, I am talking about what are the advantages or benefits it accrues by having these features in built in its system.

So, the next in that line is post movement is metabolism and excretion. So, metabolism and excretion these two are very critical. In a sense that biological system which is a self assembled unit of cells and tissues has the potential to either harvest energy by taking some energy rich molecules or it can directly harvest solar energy in case of plants. So, there are two kinds of systems: the plant and the animal. In case of plants they harvest energy directly from sunlight, and they convert simple molecules into carbohydrates. Whereas, those are called autotrophs; whereas we are heterotrophs, we consume these different plant material which are free with energy rich a or we can even consume animal proteins or animal fats and we convert these molecules to other bi products and in that process we harvest energy from them. And those bi products which are no more needed by the body are thrown out of the body.

But this process of converting these molecules to different kind of bi products and extract the energy from it falls under a big topic called metabolism which is summation

of two words: anabolism and catabolism. Anabolism is where small molecules are made to form a heavy molecule led in energy average bonds, whereas catabolism is the process where such big molecules had been broken down catabolic process. And the system is equate the machinery by virtue of which you can throw away those bi products or waste products which body does not need. So, these are basically the features which are defined for a living system. And as we will go through you will realize all these things will come one-by-one that well you talk about physiology of different systems.

So, this is our first lecture when I am closing today. In the next lecture we will talk about the different aspect of physiology, different level of organization as we remembered in the very first fragment I have showed you organization. So, will be in the very next lecture we will start with different level of organization and different functional aspect and different classification of an atom. Thank you, and once again welcome you all for this journey in to our own body.

Thank you.