Dairy and Food Process & Products Technology
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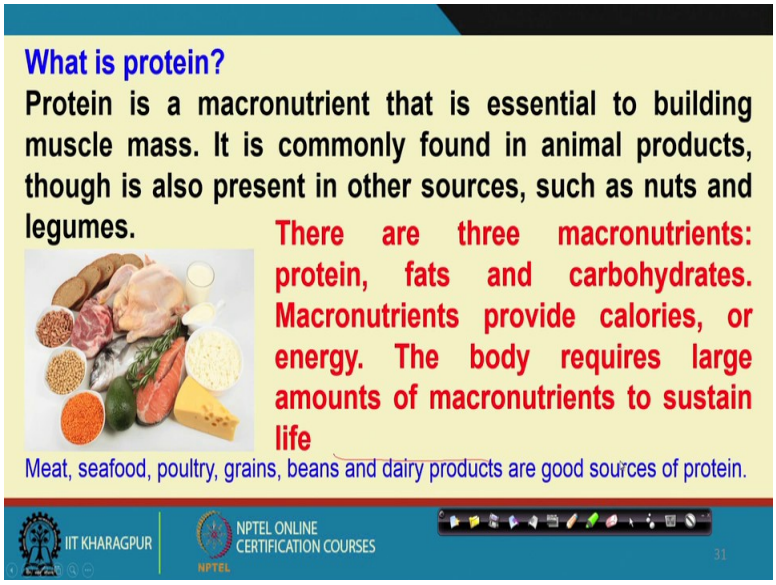
Lecture - 25
Protein

So, we have finished fat as a whole and milk fat in particular right? Now in this Dairy and Food Process and Product Technology in lecture 25, we start with Protein, right? Some basics of protein because as we said that unless this; these are macronutrients fat, protein, carbohydrates these are macronutrients. And unless we know this macronutrients; this chemistry a little, then there is less difference between you and people or engineer or scientist from other disciplines.

So, you must also know some little chemistry of the fat, protein, carbohydrate as such; otherwise it will be very difficult to differentiate and this being a course; where we can also impart a little knowledge on that. So, why do not we take that chance that is my objective that ok there is no prerequisite, but understanding also need some; so when we say casein micelle that time we will be in the deap soup that what is that.

So, we to understand that and protein fat, they are so complex as you have seen in the fat also; they are so complex in molecule, in size and in it is behavior, in its reactions that unless some chemistry is taught about or some chemistry background is created; it is very difficult to follow right? So, we come to protein right. Protein what it is? Protein is a macro nutrient that is essential to build muscle mass right.



So, that this muscle we have right. So, this muscle mass is comprised of protein. So, this muscle mass is comprised of protein and this is true for any living unit right. Any living unit this is true; whether it is human, animal or any micro macro or micro; this is true right. So, where from it comes? That is the primary thing right. So, protein is a macronutrient that is essential to build the muscle mass, it is commonly found in animal products through. It is may commonly found in animal products, though is also present in other sources such as nuts and legumes.

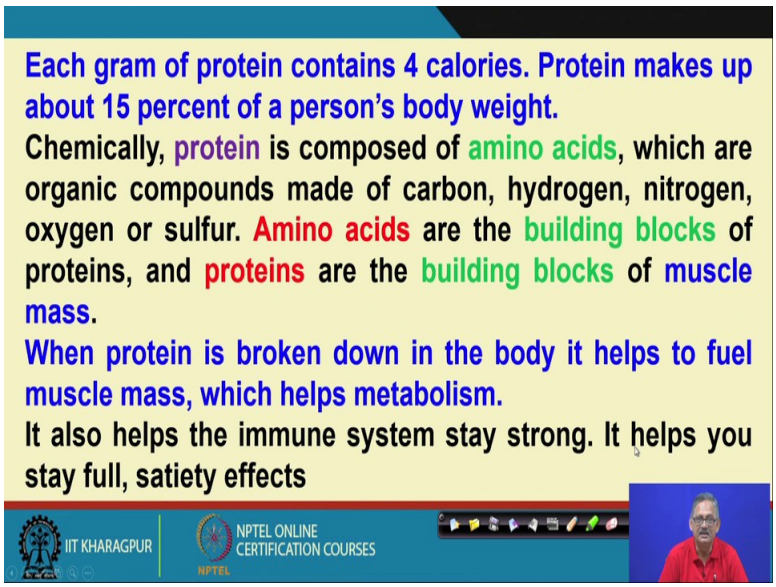
So, commonly this protein comes from the animals products, because animal protein is more available. And you will not get plant origin food much in protein, other than this like nuts, legumes, then cereal, little cereals, pulses they do also have good quantity of proteins right. So, primarily it comes from the animal source as well from the plants source.

So, in the beginning we had said if you remember that we get everything from both animal sources and plant sources right. And there is no such distinctions in science about the vegetarian and non vegetarian, but protein also comes from both plant origin and animal origin. Animal origin it is more, because they come from the muscle where major part of the protein is being coming from the muscles of the animals right.

So, to build those animals muscles these are required, to maintain those muscles this is required; the material which is required is called protein. There are three macro nutrients protein, fats and carbohydrates and these macronutrients provide calories or energy.

The body requires large amounts of macronutrients to sustain life and they come from different sources as it is appearing from this picture that, it is mixture of these animals. So this is the plant sources and these are some animal sources, which have come this may be from some dairy sources also. Like meat, seafood, poultry, grains, beans, dairy products they are good sources of protein right.

So, many dairy products they do also have lot of protein and many plant origin products like beans, grains, they do have lot of proteins as well the poultry, seafood and meat. Of course, this poultry includes all like chicken, duck then many others right. So, protein is the primarily the building block of the muscles right. Then it comes what protein is made of. Automatically it comes if the building block of muscles is protein, then what is the building block of animal this protein right?



So, each gram of protein contains 4 calories which we have seen earlier their fat contains 9; fat gives rather 9 kilo calories of each gram contains 4; this should be kilocalories not calorie right 4; make this change and this C should be capital right ok. So, each gram of protein contains 4 kilo calories right? Like as we have seen each gram of fat gives 9 kilo calories and each gram of carbohydrate gives again 4 kilo calories.

And the reason why we are saying in M K S; kilo calories we had said earlier also that these numbers are whole numbers to remember ok. So, proteins makes up about 15 percent of any persons weight. Around 15 percent of the body weight is from the protein

of the person right? And we said that this protein is building your muscle muscle building block is the protein ok.

So, chemically protein is composed of amino acids right; so amino acids means amino acid that is having both acid as well as amino group together right? Both acid as well as amino group together; some day if pulse will in some class, I will also tell about the amino acids because there are 20 amino acids right? 20 amino acids out of which some are essential amino acids and some are not essential.

Now, what we also said about essential? Earlier also we said about this essential and non essential that was in terms of if you remember fat we said or in terms of in terms of your that in the fat, we had said this essential part essential oil, we had said that those which we are our body cannot synthesize. Here also those amino acids which body cannot synthesize is called the amino essential amino acids; someday will come to that a little detail so, that the encompassing of the entire thing is rightly done.

However, let us for the time being take it that, protein is made of amino acids which are organic compounds made of carbon, hydrogen, nitrogen, oxygen or sulphur sometimes; it may also called carrying sulphur along with that. So, the basic elements hydrogen, oxygen, nitrogen, sulphur and nitrogen, hydrogen carbon all these all these constitutes the amino acids.

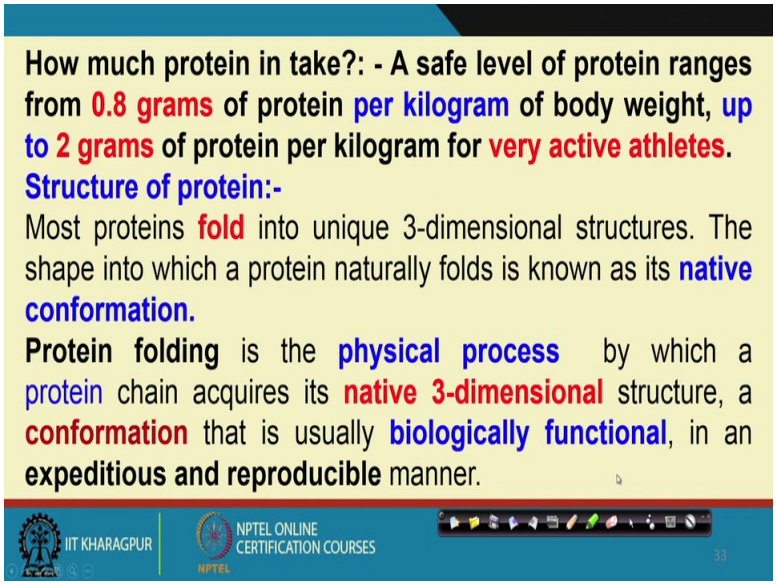
Amino acids are the building block of these proteins and proteins are the building block of the muscle. So, muscle our muscle is built by the protein; protein is built by the amino acids right? So, they are the building block of amino acids; I remember if during your childhood I hope during your childhood you have played with many building blocks right.

So, if you consider those building blocks as one of the different amino acids, then the blocks which you had made they also constitute like different proteins right. So, they are depending on your imagination as many proteins you as many blocks you could have designed or developed. So, here also as many proteins you can think of with the help of these amino acids in combinations you can make as much that is called as the amino acid sequence, we will come gradually right.

So, amino acids are the building blocks of the proteins and proteins are the building blocks of the muscle. When protein is broken down in the body, it helps to fuel muscle mass which helps metabolism right. So, whenever we are consuming; we are taking something and that is the food. So, in that food we are taking maybe some amino some proteins directly. So, and those proteins are to be assimilated by the body and in that case we do with the help of; our body rather our body heat takes with the help of different other enzymes and different other supporting materials, they break them and then make them as per requirement of the body right?

So, this is the body building that mass is being built from the protein. So, in the metabolism this helps and when you are getting the in the metabolism of the protein; we get the energy of working, energy of talking, energy of reading; all these do come from them right. It also helps to immune our system and it allows to stay strong it helps to stay full and also satisfy your satiety right. Satiety is that the appetite to take food; appetite to take food that is the satiety. So, if that gets full then you don't wish to; you don't want to take more.

So, this protein when you are consuming this also gives you that satiety that is the feeling for that the fullness of the consumption that is also an indicator. So, it also helps to make you full or have satisfied with the content you have consumed that is called satiety right?



So, how much protein we should take? That is and coming; and how much protein we should take? A safe level of protein ranges from say around 0.8 grams protein per kilogram of the body weight of the person.

This is roughly right, 0.8 gram per kilogram right. So, roughly we can say 1 gram per kilogram right and it may go up to 2 gram per kilogram body weight for the people who are very active right; like sports persons right. They do work; much much more than you or me normally right? Because they are running around like the those players football players, cricket players they are running around typically or basket or in any such badminton or any such sports persons they do need or athletic, they do need lot of energy, lot of protein and they can go up to 2 grams per kg body weight right.

So, if somebody is roughly say 100 kg body weight say then 1 kg body weight 2 gram; so, 100 kg body weight is 20 gram; you can take right that is the daily intake roughly this is right; just to have some idea ok. And this from 1 gram to 2 gram; this varies from person to person right? This; obviously, varies from person to person and that is why you see some people are thin and some lean and thin and some people are very healthy stout.

So that primarily because the building block that is the protein was different for the persons and body requirement also are quite different for this big and thin and heavy and stout person. So, we come that roughly 1 to 2 gram per kg; it could be a intake for the person right. And to get this quantity of protein say 20 gram of protein is not that in a milk; is not that easy because to get 20 gram of protein, you may have to have may be 200 grams or even more some material and then only because none of the materials are full of protein right none of the materials; materials I mean the food is full of protein.

So, to get 20 gram you may have 2 gram 200, 400 grams of the total other total quantity and you as such you never may not be able to consume so, much quantity; that is why that limit ah. Because you cannot have only protein in I; I remember in one of our there in when we were student and we were being taught by our teachers.

And that time one day one teacher he said like this that ok the way things are proceeding, the way science is progressing maybe someday it will come that you take one spoon of one spoon of protein, one spoon of fat, one spoon of carbohydrate or all put together maybe one bigger spoon and your entire body requirement is over or though it may not

be like; I give a similar example that computer science is also progressing I mean like a rocket right.

So, now everything is in your hand even pumped up things are also there and everything you are able to do right. But you imagine that the keyboard that size is like this right? This keyboard size cannot be made that small; the reason being the limiting factor is your finger because you are keying this; you are typing this; so that is the limiting factor right?

Similarly, there if you can isolate protein fat carbohydrates like that and make a concentrate like that your body requirement is this much. So, 1 spoon or 2 spoon you have taken and your things are over; may not be the reason being your body is so, much built up that it is not only that some other materials are also required and also you need to satisfy your hunger. So, it is not only energy, but also hunger is also another part.

So, that time it was said it just came to my mind; I am sharing with you that it was said, but yes someday it may come land up to that level that you have segregated all the requirements and concentrated to that level that only you take a spoon of the entire think and your body requirement is over as per as nutrition is concerned. But that is not all because you have to have the feeling that you have consumed something; after eating if you feel still hungry that your satiety is not over that is not; right? But science is progressing into that extend someday it may come forward or someday it may be like that ok.

Then we come to the structure what is the protein made of we have seen; it is made of the building block is the amino acids right. So, more proteins fold into unique 3 dimensional structures; the shape into which a protein naturally folds is known as its native conformation right? Here on in this statement, we have said many things which we need to explain also right?

We have said most proteins fold; now we know folding of papers, we know folding of papers right. So, what do we understand by the term fold? We also said and native conformation right. So, these things have to be also elaborated; otherwise if they are not understood then the whole understanding of the whole will not come forward, will not be achieved right or; obviously, I will try to explain them as and when it is possible right.

So, this is like that new terms will come up and we will try to explain them, we will try to elaborate them so that our understanding becomes much easier ok. Then protein by the by the by the by when we it has come conformation this is an English word of course, conformation that is the shape and structure shape and structure of anything that is sent in terms of conformation right.

So, shape and structure of anything in terms of conformation that will come; protein is or protein folding is the physical process right by which a protein chain acquires its native 3 dimensional structure; that is conformation that is usually biologically functional in an expeditious and reproducible manner right. So, again some more terminologies we have brought right; like physical process that is one what is holding by to explain what is folding; we brought into physical process, we have brought into again native and 3 dimensional. 3 dimensional we understand that is x y z that is the 3 dimensional space right, x y z that is 3 dimensional understandable.

So, it has a one all these 3 direction because now this TV; which you are watching that is also not 3 dimensional, that is 2 dimensional right? The third dimension is in your our mind and mind gradually makes it at par with that is why you see my face to be like that 3 dimension, but the TV is 2 dimensional right x and y; no z, but that z comes from the mind ok.

So, 3 dimensional we understand; physical process we have to say native, we have to say. Then biological functional, biologically functional means that when all the things because we have said that protein is the building block of all the living part right? Not only muscle; protein maybe the building block of all the living part. So, it is part of the life ok that we will come up when subsequently when we are also explaining the DNA, RNA; so that the building block of life.

So, from there it is also there; so everywhere it is again the amino acids which are coming into. So, another term which we have just said that expeditious; reproducible we understand that the same thing that is called reproducible; the same thing if you can recur that is called reproducible means you can bring same thing, same exactly one to one identical then it called reproducible. But what is expeditious? That expeditious meaning that it is number 1; absolutely accurate and number 2; very speedy, highly speedy.

So, accurate as well as PD; reproducible manner if it is doing in a biological manner or biologically functional; that means, what we said the other day that it is not only chemistry, but also biochemistry that you come across along with this food. Because whenever you are consuming, it is going to your stomach which is the; which is nothing, but a reactor, chemical reactor like that it is a reactor where everything whatever you are consuming is going in and then getting digested.

So, in that digestion process lot of breaking making things are happening; with lot of many others associated submitted things right? So, those could be called as the biologically active functions right or functions which are doing by biologically things have being done biologically right.

So, we will explain the other native and physical process in the next class ok.

Thank you.