Dairy and Food Process & Products Technology
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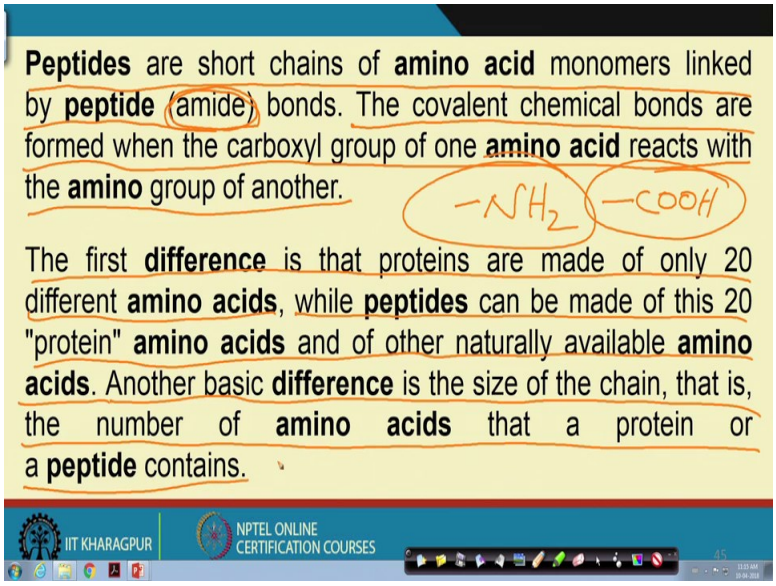
Lecture - 27
Amino Acids

So, we completed what is protein right and its structures those we have completed. We also said if you remember that amino acids are the building block of protein and protein is the building block of your body muscles right. So, we said protein so let us also look quickly amino acids, what is that right. So, today in our this class Dairy and Food Process and Products Technology; lecture number 27, we go to amino acids.



Now, in that protein you might have heard different things like peptides right; peptides, peptide bonds right. So, let us also have a some light or mild or recapitulation or may be brushing up of your knowledge that what peptides are, what are then proteins are and what the peptide bonds are?

Because these are some basic things which normally students do make mistakes and for understanding as much as you recapitulate or you brush it up, it becomes more permanently stable in your mind right. So, let us look into that what is peptide?

Peptides are short chains amino acids. Peptides are short chain amino acid right and this is amino acid monomer. I hope monomer, dimer, polymer we understand. Monomer is the basic unit which cannot be further broken; can be broken, but not normally that is the

if we break a protein, we will come to that monomer not beyond that then, it is no longer a altogether different compound.

So, we can come up to the monomer which polymerises as depending on how many of them are. If it is 2; then, we call dimer. If it is more than 2; then, we call it to be polymer right. So, that is how polymerisation. I gave the example of ethylene and then, your polyethylene that which we get every; nowadays, every day you get to the from the market sub polybatgs, polyethylene right; made of polymers of ethylene right like teflon that is also a polymer. But a double bond ethane right and tetrafluoroethane for that is teflon; however, those are beyond our scope at the moment.

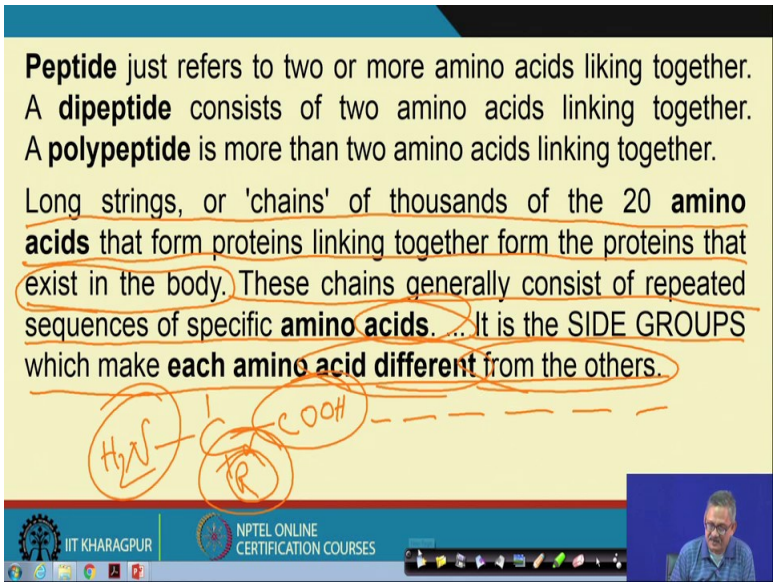
So, peptides are short chains of amino acid monomers linked by peptide chain. Now, peptide chain is also called amide chain or amide bonds peptide bonds or amide bonds. Now, how the bonding is done? The covalent chemical bonds are formed when the carboxyl group of one amino acid reacts with the amino group of another right.

So, amino group, we know this is the amino group NH 2 and carboxylic group, we know this is the carboxylic group. So this carboxylic group of one amino acid and the amino group of another amino acid, when they are forming a bond then and this bond is a covalent bond that bond is called peptide bond or we also called amide bond, peptide bonds. Generally peptide bond or peptide bonds are said right. Then, it comes what is the difference between a peptide and amino acids? It is like that that you are made of many cells.

So, what is the difference between you and the cell? Yes, cell is very small and you are the agglomeration or aggregation of those cells like that. The first difference is that the that their proteins are made of only 20 different amino acids, while peptides can be made of this 20 protein amino acids and of other naturally available amino acids. So, proteins are made of 20 different amino acids; whereas, peptides can be more that that right.

So, proteins are those which are made of 20 amino acids whereas, peptides can be many of them. Those 20 plus sub naturally available some other amino acids; another basic difference is that the size of the chain, that is, the number of amino acids that a protein or a peptide contains right. Normally, if it is made of peptide is made of out of this 20 amino acids right; then, that peptide is a monomer of the protein.

So polymer of those peptides form the proteins; so, it is number of amino acids which are presents that size is also a basic difference between the peptide and proteins. So, peptides are smaller, proteins are much bigger molecules basically right and both are made of amino acids. But when the chains are small, chain lengths are small; then, we call to be peptide. When the chain lengths are big polymers or dimer or polymer of this amino acid peptide, we call that to be protein right.



Now, then it comes that the peptide just refers to two or more amino acids linking together. So, a dipeptide contain consists of two amino acids linking together; whereas, a polypeptide is more than two amino acids linking together right. This is n; this is n right, make the correction.

So, more than two amino acids linking together is a polypeptide. Then, long strings or chains, the one of the best example of giving this is that you know girls or ladies they wear this chains right and they are they can be made of pearl this that beads.

So, assume that each bead is a amino acid and those beads are linked through the thread. In this case this is the link through the chain right. So, bond; this is linked to through the bond. So, that linking makes it a complete or whole of the protein. So, this is one of the good examples that the garland or necklace or whatever though those girls or women; nowadays, people men also do wear.

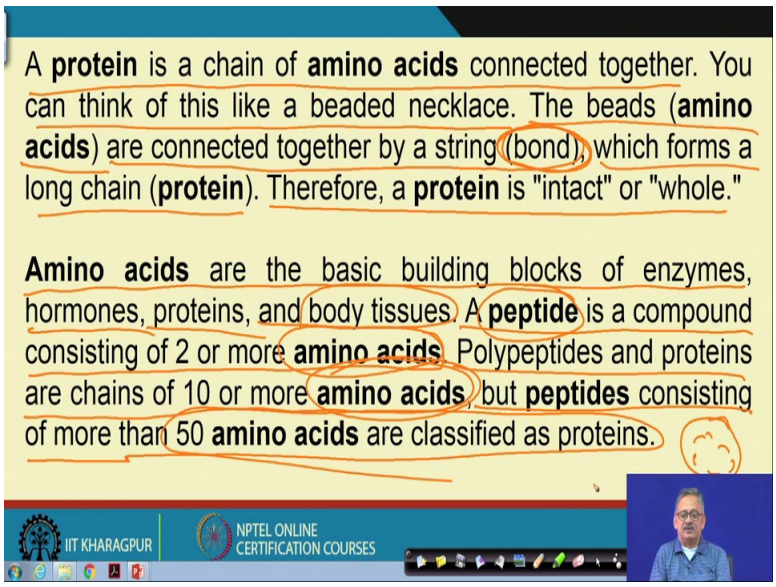
So, they are of course, they do not wear men's we I as far as I have seen only chains of gold, but girls do wear many types like may be made of many beads as I referred pearl

this that I am not conversed; so, many. However, so, those beads if we assume them to be individual amino acids; then, these amino acids are like the beads are linked through a thread and it becomes a complete garland. Flower garland is also like each flower like that beads or like that amino acid. So, they are linked through the thread and here it is linked through the peptidic bonds right.

So, long strings or chains of thousands of long chains strings or chains of thousands of the 20 amino acids that form proteins linking together from the proteins that exit in the body right. These chains generally consist of repeated sequences of specific amino acids right. These amino acids are like that repeated sequence depending on what? When we come to the amino acids typically that time we will see there are how many and in what way they are different right.

So, it is the side groups which make each amino acid different from the others. So, because each amino acid will have 1 COOH group and 1 central carbon or called alpha carbon and we will have 1 amino group right. So, this one amino group and you will have 1 this R; that is this makes the difference that this is called the side chain group right and this can be ok at the moment this is this may be joined or may not be joined depending on that.

So, this 3 are the units for the amino acid; this R can be the side chain group and based on that the difference in the amino acids occur right.



So if then, if we look at a protein is a chain of amino acids. A chain of amino acids connected together.

So, you can think of like a bead a just like I said that beaded necklace, the beads which are just like amino acids are connected together by a string that is the bond. This string is nothing but the bond right peptidic bond, which forms a long chain protein. Therefore, a protein is intact or whole like the beads which we are saying like this right.

So, they are forming the entire chain; this is the complete or whole protein right. So, like the beads these are connected through the thread, in this case through the bond and these bonds are that bond can be N-type different we will come afterwards right. So, this long chains are forming the proteins right.

Now, amino acids are the basic building blocks of enzymes, hormones, proteins and body tissues of our system right. So, it is the basic building block of enzyme because we know all enzymes are a kind of proteins right; all enzymes are kind of proteins, hormones, they are also proteins; then proteins itself and the body cells or tissues.

So, they are all composed of amino acids; so, amino acids has a great function in the body right. Fortunately or unfortunately you will see some of which our body can synthesize and some of which our body cannot synthesize right and that makes the difference between essential and non-essential amino acid.

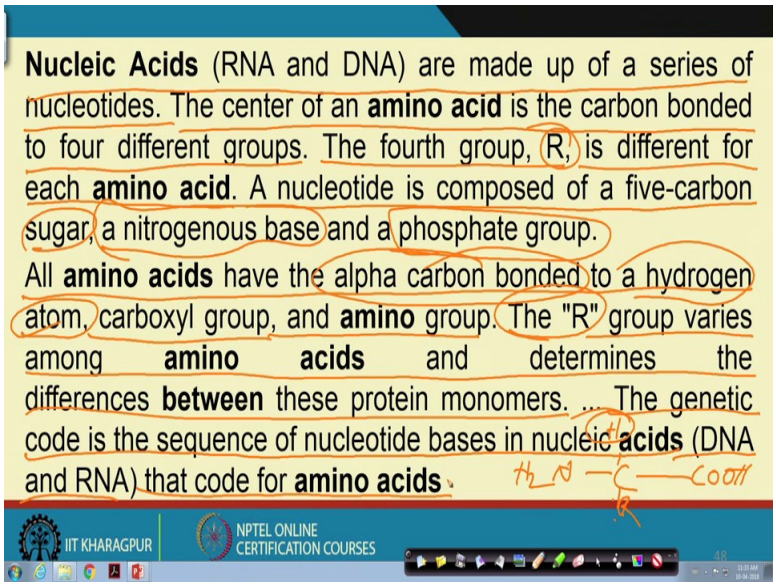
So, this is when I said earlier also with respect to fat also that essential; yes, the term essential. This essential is essential means essential by the body, essential by the body system; be it fat, be it protein right. Be it fat, be it protein; body cannot synthesize.

Body, our body system I referred earlier also if you go through biochemistry leninzer, you get more detailed things into that that if our body system cannot synthesize that particular thing is called essential, like essential fat or essential amino acid or yeah, essential amino acids and this and in that case essential carboxylic acids which we said fatty acids right, essential fatty acids ok.

Now so, a peptide is a compound; a peptide is a compound consisting of 2 or more amino acids; consisting of 2 or more amino acids that is a peptide; whereas, polypeptides and proteins are consisting of 10 or more amino acids right. So, peptide is small proteins

or polypeptides are bigger in size. So, that is the basic fundamental difference between a peptide and the protein. Both are made of amino acid building block is same amino acid. But 1 in size wise very small and other that function is also a quite little different right.

Because peptide may have some side effects; somebody may have some of itching or this that. So, those are beyond our purview right. Peptides consisting of, but peptides consisting of more than 50 amino acids are classified as proteins right. Peptides consisting of more than 50 amino acids are called proteins right.



Now, let us look into the difference between nucleic acid the earlier day, earlier classes we discussed about this when we were talking about proteins right. So, there we have seen the nucleic acid right. You remember nucleic acid also had one 5 member carbohydrate or sugar right one 5 member carbohydrate or sugar it had, 1 amino group or 1 phosphate group right; these 3 or nitrogenous group and 1 phosphate group. These 3 were the building block of the nucleic acid right.

If you remember, out of it is if the carbohydrate is ribose; then, we call it to be ribonucleic acid or RNA. And if the carbohydrate or sugar is made of deoxyribose; then, we call it to be deoxyribonucleic acid or DNA right. So, what is the difference between that and the amino acid? Because the amino acid also we have seen, there are 3 such building blocks in amino acid. One is amino group, another is carboxylic acid group and third one is the R that is the that is a functional group; I should say like it could be it

could be any type of R, as you think of depending on that R; it is it is different amino acid which is coming in.

Because other two remain same carboxylic acid, amino group, they are identical for all the amino acids. But these are varies right though that could be alkyl or many we will come into that ok. So, nucleic acid, nucleic acid or RNA or DNA are made up of a series of nucleotides right. We said that nucleotide is the unique or unit or building block of the nucleic acid right.

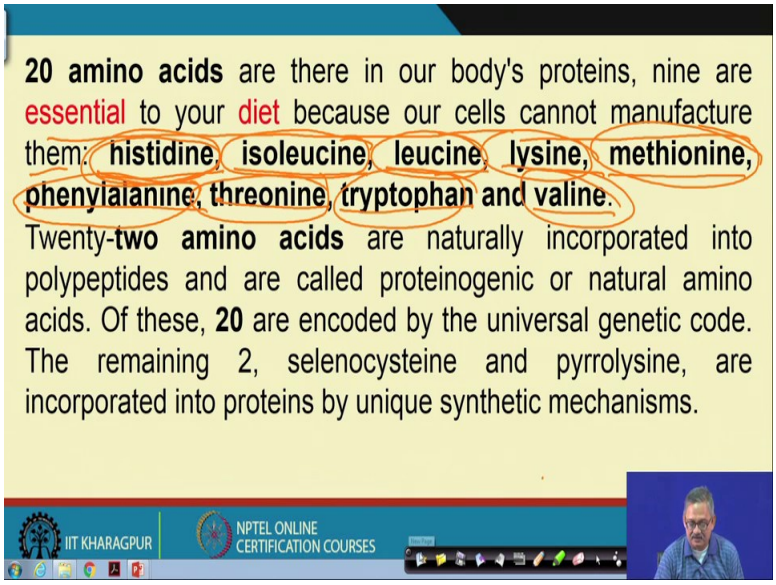
So, the centre of an amino acid is the carbon bonded to 4 different groups. The fourth group is the R right and this R is different for different amino acids right. A nucleotide is also composed of five-carbon sugar, a nitrogenous base and a phosphate group right. So, both are you see similarity, but functional group wise they are different.

So, one contains carboxylic acid group right; whereas, another contains and carboxylic acid group, then your amino group and this R or that alkyl group or similar like that. This is the amino acid; whereas, there it is a sugar group and a nitrogenous group and a phosphate group right. Functional groups are then different, but the similarity in unit building is there right.

So, all amino acids have the alpha carbon bonded to a hydrogen atom right. All amino acids have the alpha carbon bonded to a hydrogen atom. So which we were saying that C, this was COOH and this was NH 2 and this was your R and this fourth one is all the time associated with hydrogen right.

And then, to hydrogen and carboxyl group and amino group right. The R which we are referring to group varies among amino acids and determines the difference between these protein monomers. So, these we are called colleague protein monomer right because from that monomer dimmer or polymers are being made. So, that is the basic unit amino acid right.

So, the genetic code is the sequence of nucleotide based in nucleic acids or DNA and RNA that code for amino acids right. So, they also do have like in amino acid in nucleic acids, this DNA, RNA they do have some genetic code. Here also in amino acids, they do have some code. So, this coding will be there also a similarity right, but the coding are all together different right.

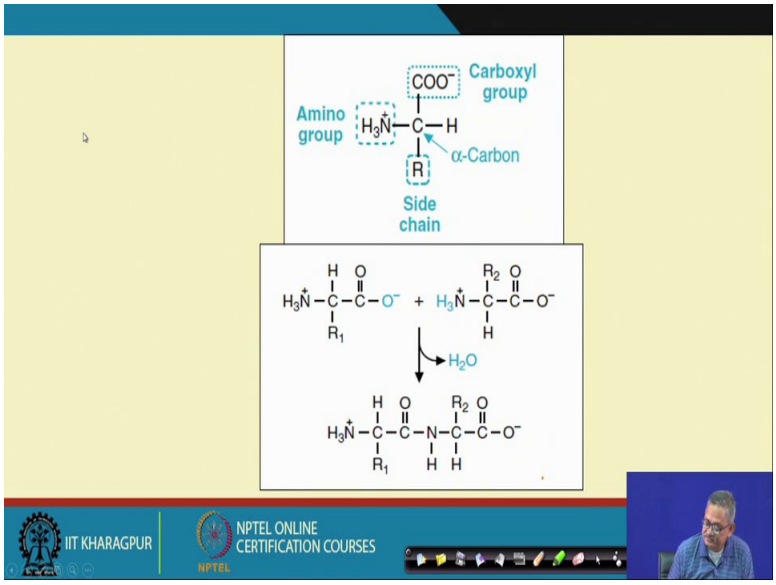


So, then we come that there are 20 amino acids and these 20 amino acids are there in our body systems right; body proteins do have this 20 amino acids out of which nine are essentials.

Earlier it was in our time we use to hear that 8 was the essential amino acids, but with time different things are getting invented and yeah, at the moment it is said to be 9.

9 essential amino acids are there right and these 9 amino acids must be there in our diet right. Because our body when it is doing some exercise or building the protein, that time if these amino acids are not being built by the body or produced by the body; then that protein that typical protein cannot be synthesized, cannot be built.

So, you will lack of those things. So, that is why that in your diet it has to be supplemented such that our body can get those amino acids and can make it very easily right. So, the proteins can be built.



Now, this 20 amino acids are there in our body out of which 9 are essential and we get this 9's in our diet right. Because our cells cannot manufacture them and these 9's are histidine, isoleucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine.

And you will see all of them do have different naming right, all of them do have different code; so that you can identify them right like lysine though it begins with L, but it has a code of k be a to z; there are 20 our alphabets are 26. So, 6 can be omitted. So, like that O is one omitted like that L, because L is another leucine right.

So, already there so that is why lysine is not given that code. It is k like that they are different. So, we finish this class with repetition that the basic amino acids which our body cannot synthesize are called essential amino acids. And they are histidine, isoleucine, leucine, lysine, methionine and phenylalanine threonine, tryptophan and valine right. These are our basic essential amino acids right. So, time is up.

Thank you.