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Paper of Biochemistry
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Q1) Write note on steroid Hormones?

Ans: Steroid Hormones: A steroid Hormones is a steroid that acts as a hormones. Steroid Hormones can be grouped into two classes

Corticosteroids Typically made in the adrenal cortex.

Sex steroid typically made in the gonads or placenta with in those two classes are five types according to the receptor to which they bind Glucocorticoid and mineralocorticoid and androgen, estrogen,and progestogen vitamin D derivative are a sixth closely related Hormones system with homologous receptor. They have some of the characteristics of true steroid as a receptor ligands.

Steroid Hormones help control metabolism inflammation, immune, salt and water balance development of sexual characteristics and the ability to withstand illness's and injury. The term steroid describe both hormones produce by the body and artificially produced medication that duplicate the action for the naturally occurring steroid.

Synthesis:

The natural steroid Hormones are generally synthesized from cholesterol in the gonads and adrenal glands. These forms of hormones are lipids they can pass through the cell membrane and as they are fat soluble and then bind to steroid Hormones receptor which may be nuclear or cytosolic depending on the steroid Hormones to bring about changes with in the cell.

Synthetic Steroid and sterols;

A variety of synthetic Steroid and sterols have also been contrived most are steroids but some non Steroidal molecules can interact with the steroid receptor because of a similar of shape. Some synthetic Steroid are weaker or stronger than the natural steroid whose receptor they activate.

Example of steroids hormones;

- Glucocorticoid, alclometasone, Prednisone, dexamethasone , triamcinolone, cortisone
- Mineralocorticoid, fludrocortisone
- Vitamin D
- Androgen: oxadrolone, oxabolone, testosterone, nandrolone.
- Oestrogen
- Progestins.

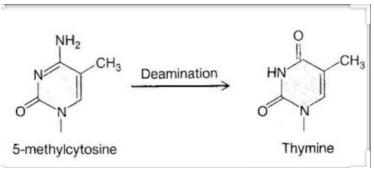
Transport:

Steroid hormones are transported through the blood by being bound to Carrier proteins serum proteins that bind them and increase the hormones solubility in water some example are sex hormones binding globulin and albumin.
Steroid can effect cells when they do not bound by serum proteins.

Q2) What is transamination and daemination?

And: 1) Daemination;

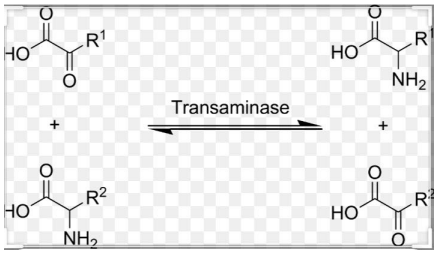
It is the removal of an amino group from a molecules. Enzymes that catalyze this reaction are called deaminase in the human body deamination take place primarily in the liver however it can also occure in the kidney



The rest of amino acid is made up mostly carbon and hydrogen and is recycled or oxidized for energy. Ammonia is toxic to the human system and enzymes convert it to urea or uric acid by addition of carbon dioxide molecules in the urea cycle which also take place in the liver.

2) Transamination:

A chemical reaction that transfer an amino group to a ketaacid to form new amino acid. This pathway is responsible for the Daemination of most amino acid. This is one of the major degradation pathway which convert essential amino acid to non essential amino acid.



Transamination in biochemistry is accomplish by enzyme called transminases or aminotransferase ketoglutarate acts as the predominant amino group receptor and produce glutamate as the new amino acid.

Q3) Write down the metabolism of protein?

Ans: Metabolism of protein;

Protein metabolism denotes the various biochemical processes responsible for the synthesis of protein and amino acid and the break down of protein by catabolism. The step of protein synthesis include

Transcription

Translation

Post translation modifications

During transcription RNA polymerase transcribes a coding region of the DNA in a cell producing a sequence of RNA. Specifically massenger RNA (mRNA). This mRNA sequence contains codons 3 nucleotide long segments that code for a specific amino acid. Ribosome translate the codons to their respective amino acids in human non essential amino acid are synthesized from intermediate in major metabolic pathways such as the citric acid cycle essential amino acid must be consumed and are made in other organisms.

The amino acids are joined by peptide bonds making a polypeptide chain this polypeptide chain then goes through post transitional modifications.

Protein breakdown: Proteolysis

Protein catabolism is the process by which proteins are broken down to their amino acids. This is also called proteolysis and can be followed by further amino acid degradation.

Protein catabolism via enzymes

Proteases

Originally thought to only disrupt enzymatic reactions, proteases (also known as peptidases) actually help with catabolizing proteins through cleavage and creating new proteins that were not present before. Proteases also help to regulate metabolic pathways. One way they do this is to cleave enzymes in pathways that do not need to be running (i.e. gluconeogenesis when blood glucose concentrations are low). This helps to conserve as much energy as possible and to avoid futile cycles. Futile cycles occur when the catabolic and anabolic pathways are both in effect at the same time and rate for the same reaction. Since the intermediates being created are consumed, the body makes no net gain gains. Energy is lost through futile cycles. Proteases prevent this cycle from occurring by altering the rate of one of the pathways, or by cleaving a key enzyme, they can stop one of the pathways. Proteases are also nonspecific when binding to substrate, allowing for great amounts of diversity inside the cells and other proteins, as they can be cleaved much easier in an energy efficient manner.
Possible mechanism for Aspartyl Protease cleaving a peptide bond. Only the peptide bond and active site
Because many proteases are nonspecific, they are highly regulated in the cell. Without regulation, proteases will destroy many essential proteins for physiological processes. One way the body regulates proteases is through protease inhibitors. Protease inhibitors can be other proteins, small peptides, or molecules. There are two types of protease inhibitors: reversible and irreversible. Reversible protease inhibitors form non-covalent interactions with the protease limiting its functionality. They can be competitive inhibitors, uncompetitive inhibitors, and noncompetitive inhibitors. Competitive inhibitors compete with the peptide to bind to the protease active site. Uncompetitive inhibitors bind to the protease while the peptide is bound but do not let the protease cleave the peptide bond. Noncompetitive inhibitors can do both. Irreversible protease inhibitors covalently modify the active site of the protease so it cannot cleave peptides.

Exopeptidases

Exopeptidases are enzymes that can cleave the end of an amino acid side chain mostly through the addition of water.[3] Exopeptidase enzymes exist in the small intestine. These enzymes have two classes: aminopeptidases are a brush border

enzyme and carboxypeptidases which is from the pancreas. Aminopeptidases are enzymes that remove amino acids from the amino terminus of protein. They are present in all lifeforms and are crucial for survival since they do many cellular tasks in order to maintain stability. This form of peptidase is a zinc metalloenzyme and it is inhibited by the transition state analog. This analog is similar to the actual transition state, so it can make the enzyme bind to it instead of the actual transition state, thus preventing substrate binding and decreasing reaction rates.Carboxypeptidases cleave at the carboxyl end of the protein. While they can catabolize proteins, they are more often used in post-transcriptional modifications.

Q4) Explain briefly translation of DNA in eukrayotes?

Ans: Translation Of DNA in Eukrayotes;

It is the process in which the protein is synthesized from the information contained in a molecule of messenger RNA (mRNA).

Translation Process;

In a eukaryotic cell, the translation occurs in the cytoplasm. Translation involves three major steps

1. INITIATION 2. ELONGATION 3. TERMINATION

1:INITIATION;

The initiation of translation in eukaryotes is complex, involving at least 10 eukaryotic initiation factors (eIFs) & divided into 4 steps:

a. Ribosomal dissociation.

b. Formation of 43S preinitiation complex.

c. Formation of 48S initiation complex.

d. Formation of 80S initiation complex.

a. Ribosomal Dissociation

The 80S ribosome dissociates to form 40S & 60S subunits. Two initiating factors namely eIF-3 & eIF-1A bind to the newly formed 40S subunit & thereby block its reassociation with 60S subunit.

b. Formation Of 43S Preinitiation Complex

A ternary complex containing met-tRNA′ & eIF-2 bound to GTP attaches to 40S ribosomal subunit to form 43S preinitiation complex. The presence of eIF-3 & eIF-1A stabilizes this complex.

c. Formation Of 48S Initiation Complex

The binding of mRNA to 43S preinitiation complex results in the formation of 48S initiation complex through the intermediate 43S initiation complex. eIF-4F complex is formed by the association of eIF-4G, eIF-4A with eIF-4E. The eIF-4F (referred to as cap binding protein) binds to the cap of mRNA.

9. Then eIF-4A & eIF-4B bind to mRNA & reduce its complex structure. This mRNA is then transferred to 43S complex. For the appropriate association of 43S preinitiation complex with mRNA, energy has to be supplied by ATP. The ribosomal initiation complex scans the mRNA for the identification of appropriate initiation codon. 5'-AUG is the initiation codon.

d. Formation Of 80S Initiation Complex

48S initiation complex binds to 60S ribosomal subunit to form 80S initiation complex. The binding involves the hydrolysis of GTP (bound to eIF- 2). This step is facilitated by the involvement of eIF-5. As the 80S complex is formed, the initiation factors bound to 48S initiation complex are released & recycled.

2. ELONGATION :

Ribosomes elongate the polypeptide chain by a sequential addition of amino acids. The amino acid sequence is determined by the order of the codons in the specific mRNA. Elongation, a cyclic process involving certain elongation factors (EFs). Elongation may be divided into three steps.

a. Binding of Aminoacyl t-RNA to A-site.

b. Peptide bond formation.

c. Translocation.

a. Binding of Aminoacyl t-RNA to A- site

The 80S initiation complex contains met tRNA′ in the P- site & A-site is free. Another Aminoacyl-tRNA is placed in the A-site. This requires proper codon recognition on the mRNA & involvement of elongation factor 1a (EF-1a) & supply of energy by GTP. The Aminoacyl-tRNA is placed in the A-site, EF-1a & GDP are recycled to bring another Aminoacyl-tRNA.

b. Peptide bond formation

The enzyme Peptidyl transferase catalyzes the formation of peptide bond. The activity of this enzyme lies on 28S RNA of 60S ribosomal subunit. It is therefore the rRNA (and not protein) referred to as ribozyme that catalyzes peptide bond formation. Net result of peptide bond formation is the attachment of the growing peptide chain to the tRNA in the A-site.

c. Translocation

The ribosome moves to the next codon of the mRNA (towards 3'-end). This process called translocation, involves the movement of growing peptide chain from A-site to P-site. Translocation requires EF-2 & GTP. GTP gets hydrolyzed and supplies energy to move mRNA. EF-2 & GTP complex recycles for translocation. About six amino acids per second are incorporated during the course of elongation of translation in eukaryotes.

3. TERMINATION;

One of the stop or termination signals (UAA, UAG and UGA) terminates the growing polypeptide. When the ribosome encounters a stop codon, - there is no tRNA available to bind to the A site of the ribosome, - instead a release factor binds to it. In eukaryotes, a single release factor- eukaryotic release factor 1 (eRF1)-recognizes all three stop codons, and eRF3 stimulates the termination events. once the release factor binds, the ribosome unit falls apart, - releasing the large and small subunits, - the tRNA carrying the polypeptide is also released, freeing up the polypeptide product. Ribosome recycling occurs in eukaryotes.

Q5) Write clinical significance of Cholesterol?

Ans: Clinical Significance of Cholesterol:

1 Hypercholesterolemia; Diabetes mellitus nephrotic syndrome (is a kidney disorder that cause your body to pass too much protein in urine)

2 Hypothyroidism; is a condition in which thyroid gland doesn't produce enough to certain crucial Hormones.

3 Hyperlipidemia: High level of Cholesterol or triglycerides in your blood

4 Atheroclerosis; buildup of fats, cholesterol,and other substance in and in artery wall plaque which can restrict blood flow.

Additional factors for coronary artery disease include lifestyle , cigarettes smoking, coffee drinking, emotional stress, obesity , lack of exercise, high blood pressure.