BIOCHEMISTRY- BP203T

UNIT: 1 BIOENERGETICS

CLASS: 8

TOPIC: BIOLOGICAL SIGNIFICANCE OF ATP

BIOLOGICAL SIGNIFICANCE OF ATP:

The most common source of energy for cells is ATP. Adenosine triphosphate (ATP) is composed of carbon, nitrogen, hydrogen, oxygen, and phosphorus.

A large amount of energy is released in reactions when ATP undergoes hydrolysis because it contains unstable, high-energy bonds.

As an enzyme removes a phosphate group from ATP to form ADP, it generates a significant amount of energy, which can be used by the cell for a variety of metabolic processes.

Proteins, as well as other macromolecules, can be synthesized with it. By removing a second phosphate group from ATP, adenosine monophosphate (AMP) is formed as well as a further energy release.

AMP and ADP are added back to phosphate to form ATP when the organism does not require energy, which is hydrolyzed when needed.

Therefore, ATP serves as an efficient energy source for cellular pathways.

CYCLIC AMP

Cyclic AMP plays a key role in hormone action through the action of epinephrine. The "Fight or flight" hormone is released by the adrenal glands in response to stress.

As a result of the hormone, blood pressure increases, and glucose is broken down for energy. Engaging in physical activity helps humans deal with a situation.

In response, the body displays high blood pressure, rapid heartbeat, and a dry mouth. Biochemical reactions are responsible for these responses.

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Epinephrine remains outside cells on membrane-bound receptors when it binds to them. Adenylate cyclase manufactures cyclic AMP, the second messenger.

The adenylate cyclase enzyme system consists of two components. It catalyzes adenylate cyclase when it's bound to a hormone-bound receptor and when a regulatory protein, a stimulatory G-protein (guanylate nucleotide binding protein), is bound to it and activated.

As an intermediary between the receptor and cyclic AMP synthesis, the G-protein plays an important role. It depends on the guanylate nucleotide that is bound to G-proteins whether they are active or inactive.

G-protein binds to GDP when it is inactive. Once the G-protein is active, GTP binds to it. In G-proteins, GTP is converted to GDP by an intrinsic GTPase activity.

The G-protein becomes inactive once GTP is hydrolyzed. G-proteins are cyclical: Hormones bind to receptors. Hormone binding receptors bind to G-proteins, thereby causing GTP to replace GDP. Adenylate cyclase interacts with the GTP-bound G-protein.

Upon hydrolysis of GTP, the G-protein returns to the ground state. Various G-proteins can increase or decrease cyclic AMP production by either stimulating or inhibiting adenylate cyclase.