What molecule provides immediate energy

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ATP hydrolysis provides the energy needed for many essential processes in organisms and cells. These include intracellular signaling, DNA and RNA synthesis, Purinergic signaling, synaptic signaling, active transport, and muscle contraction. These topics are not an exhaustive list but include some of the vital roles ATP performs.

DNA and RNA synthesis requires ATP. ATP is one of four nucleotide-triphosphate monomers that is necessary during RNA synthesis. DNA synthesis uses a similar mechanism, except in DNA synthesis, the ATP first becomes transformed by removing an oxygen atom from the sugar to yield deoxyribonucleotide, dATP.[8]

Many processes are capable of producing ATP in the body, depending on the current metabolic conditions. ATP production can occur in the presence of oxygen from cellular respiration, beta-oxidation, ketosis, lipid, and protein catabolism, as well as under anaerobic conditions.

Beta-oxidation is another mechanism for ATP synthesis in organisms. During beta-oxidation, fatty acid chains are permanently shortened, yielding Acetyl-CoA molecules. Throughout each cycle of beta-oxidation, the fatty acid is reduced by two carbon lengths, producing one molecule of acetyl-CoA, which can be oxidized in the citric acid cycle, and one molecule each of NADH and FADH2, which transfer their high energy electron to the transport chain.[18]

Ketosis is a reaction that yields ATP through the catabolism of ketone bodies. During ketosis, ketone bodies undergo catabolism to produce energy, generating twenty-two ATP molecules and two GTP molecules per acetoacetate molecule that becomes oxidized in the mitochondria.

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