Advanced Certificate in Nutritional Anthropometry

Energy Metabolism

Adenosine Triphosphate (ATP): A high-energy molecule that stores and transports energy within cells for various metabolic processes, such as muscle contraction and protein synthesis. ATP is produced through cellular respiration and is continuously recycled in the body.

Anaerobic Metabolism: A metabolic process that occurs in the absence of oxygen, primarily in the form of anaerobic glycolysis. This process rapidly converts glucose into ATP, lactate, and carbon dioxide, providing energy for short, intense bursts of activity, such as sprinting.

Aerobic Metabolism: A metabolic process that requires oxygen to convert nutrients, such as carbohydrates, fats, and proteins, into ATP. Aerobic metabolism is more efficient than anaerobic metabolism, providing a steady supply of energy for longer periods of activity, such as endurance running.

Cellular Respiration: A series of metabolic reactions that convert biochemical energy from nutrients into ATP. Cellular respiration consists of three stages: glycolysis, the citric acid cycle (Krebs cycle), and the electron transport chain.

Glycolysis: The first stage of cellular respiration, occurring in the cytoplasm, where glucose is broken down into two pyruvate molecules, generating a small amount of ATP and NADH.

Citric Acid Cycle (Krebs Cycle): The second stage of cellular respiration, occurring in the mitochondria, where pyruvate is further broken down, releasing carbon dioxide and transferring high-energy electrons to carrier molecules, NAD+ and FAD, forming NADH and FADH2.

Electron Transport Chain: The third stage of cellular respiration, occurring in the inner mitochondrial membrane, where high-energy electrons from NADH and FADH2 are transferred to oxygen, creating a proton gradient that drives ATP synthase, producing ATP.

Beta-Oxidation: A metabolic process that occurs in the mitochondria, where fatty acids are broken down into acetyl-CoA molecules, which enter the citric acid cycle to produce ATP, NADH, and FADH2.

Glycogenolysis: The breakdown of glycogen, a stored form of glucose, into glucose-1-phosphate and then glucose-6-phosphate, which can enter glycolysis to produce ATP.

Glycogenesis: The conversion of glucose into glycogen for storage in the liver and muscles.

Lipolysis: The breakdown of triglycerides into glycerol and free fatty acids, which can be used for energy production through beta-oxidation.

Lactic Acidosis: A condition characterized by an excessive buildup of lactate in the blood due to insufficient oxygen supply or impaired aerobic metabolism, leading to muscle fatigue, cramping, and

potential organ damage.

Metabolic Rate: The amount of energy expended by an organism in a given period, typically measured in calories or kilojoules per day. Basal metabolic rate (BMR) refers to the energy required for basic bodily functions at rest, while total energy expenditure (TEE) includes BMR, physical activity, and the thermic effect of food.

Mitochondria: Membrane-bound organelles found in eukaryotic cells, responsible for producing ATP through cellular respiration. Mitochondria contain their own DNA and are thought to have originated from ancient bacteria that formed a symbiotic relationship with early eukaryotic cells.

Nutrient Partitioning: The process by which nutrients, such as carbohydrates, fats, and proteins, are allocated to various tissues and metabolic pathways in the body, affecting body composition, energy balance, and overall health.

Oxidative Phosphorylation: The process of ATP production that occurs in the electron transport chain during cellular respiration, where high-energy electrons are transferred to oxygen, creating a proton gradient that drives ATP synthase.

Substrate-Level Phosphorylation: The direct transfer of a phosphate group from a high-energy donor molecule, such as phosphoenolpyruvate, to ADP, forming ATP, bypassing the need for oxidative phosphorylation.

Thermic Effect of Food: The increase in energy expenditure that occurs after eating, due to the energy required for digestion, absorption, and metabolism of nutrients.

Triglycerides: The primary form of fat storage in the body, composed of a glycerol molecule bound to three fatty acid molecules. Triglycerides can be broken down through lipolysis to provide energy during periods of fasting or exercise.

This glossary provides a comprehensive overview of essential terms related to energy metabolism. Understanding these concepts is crucial for interpreting nutritional anthropometry data and developing evidence-based recommendations for promoting health and preventing disease. By familiarizing yourself with these terms, you can enhance your ability to communicate complex metabolic processes to clients, colleagues, and other stakeholders.