

# **CELLULAR METABOLISM**

Each time you fuel your body with food, your digestive system breaks down the proteins, ready to be absorbed by cells, and then change them into even smaller pieces to become energy in a process known as metabolism. During metabolism, chemical bonds are broken and energy from electrons are produced.

The cell uses every piece of energy from food to create a chemical battery (a molecule called ATP). During almost every stage of metabolism, the body is turning ADP, a spent bio-battery, into ATP. These steps in energy production have been broken down into 3 distinct cycles:

- Glucose and its movements from glycolysis
- The mitochondria in which the Citric Acid (or Krebs) Cycle occurs
- ETS -the Electron Transport System (where real energy is generated).

#### STEP 1

**Glycolysis** is the enzymatic and biochemical breakdown of Glucose (a 6-carbon sugar molecule) that occurs within the cytoplasm of the cell, releasing energy and pyruvic acid.



NADH- Nicotinamide Adenine Dinucleotide

- Glycolysis breaks down large sugars to even smaller units, in this case a glucose molecule becomes a
  pyruvate molecule along with ATP Adenosine Triphosphate (energy) molecules doubling.
  - 2 ATP molecules begin the process and 4 new ATP molecules are released.
- The body uses the pyruvate molecule to gain more energy in the next process, the Citric Acid (Krebs) Cycle.

Think of ATP as a rechargeable battery. When a cell needs energy, it uses stored energy within the charged battery and turns it into ADP (a dead battery). ATP & ADP cells can recharge through metabolism to reform ATP!



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- Glycolysis produces a net gain of 2 ATP molecules, 2 molecules of pyruvate from the splitting of glucose, and 2 high energy NADH molecules (nicotinamide [B3] adenine dinucleotide).

### **STEP 2**

The **Citric Acid (or Krebs) Cycle** begins when the newly formed pyruvate molecules enter into the mitochondria.

- The mitochondria (a small organelle) is referred to as the cell's *"powerhouse*", because it produces energy.

Within the mitochondria, different enzymes and co-enzymes including pantothenic acid, acetyl-coenzyme A, supplemental ATP, and NADH (another by roduct) are produced and passed along to the next cycle (ETS) to extract even more energy.







NADH's energy is advanced in a process called the Electron Transport System. At this end-point, the maximum ATP (energy) is produced from what used to be a single Glucose (sugar) molecule.

#### **STEP 3**

The **Electron Transport System (ETS)**, found on the inner membrane of the mitochondria consists of multiple complexes.

- The complexes include proteins, co-enzymes, vitamins, and peptides which accept electrons from NADH molecules and pass them along through the ETS.
- The objective of these complexes is to extract high energy electrons from NADH high energy molecules and pass the extracted energy onto regenerating ATP molecules.



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## ATP PRODUCTION PATHWAYS

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The Rejuvenator Series is formulated with key metabolic compounds Pantothenic acid (component of CoA) and niacinamide (component in NADH).

#### **SIMPLY AMAZING!**

From glycolysis, two ATP molecules were netted. The ETS system will effectively produce 34 ATP molecules. With an investment of ONLY two ATP molecules and one Glucose molecule, a cell can generate 36 ATP molecules!

