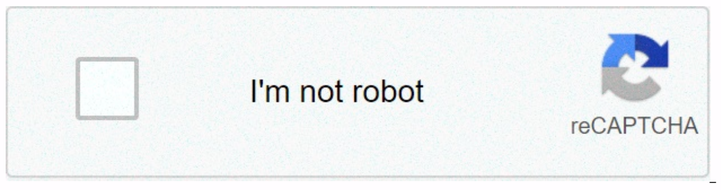

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Citric acid cycle steps simplified pdf

The Krebs Cycle (also known as the Citroic Acid or Tricarboxylic Acid (TCA) cycle) is the process by which aerobic cellular metabolism occurs. Hans Krebs was awarded the 1953 Nobel Prize in Medicine for his discovery of the citric acid cycle. This cycle involves a series of reactions involving a (1) a substrate, Oxaloacetate, which is altering in each response, (2) Acetyl-CoA, from which energy extracts, (3) energy transport reactors, which collect the extracted energy, and (4) the controlling enzymes, which regulate the steps of the cycle. This cycle is ubiquitous in living organisms, single and multi-cells, both plants and animals — including humans. Organizationally, the process is often divided into 8 steps, one for each controlling enzyme, usually starting with the combination of the Oxaloacetate substrate to the Acetone CoA, which is produced from either glycolysis or pyruvate oxidation. But because of the cyclical nature of the process, different methods of categorizing the reactions and their reactants, as well as ongoing scientific examination, there is some variation in terminology, organization, and detail. Also, while the Krebs cycle is a topic in elementary science and biology, it has also been studied in detail in advanced collegiate biology and biochemistry courses that can lead to over or under simplification, respectively. Because of these issues, tutors and students need to exercise care when using this summary and diagram to ensure that the language uses their answers correspond to the assigned class of materials and their instructor's expectations. Nevertheless, this summary tries to provide a simplified description balanced with sufficient detail to enable understanding of the process, while being able to use it as a basis on which to add supplementary information. Energy extraction via the Krebs Cycle Theoretical Yield: 24 Molecules of ATP/Molecule of Glucose Practical Yield: 20 Molecules of ATP/Molecule of Glucose The Krebs cycle is the primary metabolic pathway through which aerobic energy is released from carbohydrates, proteins, and fats in a useable form. When measured by the energy production of the Krebs cycle, the output measured in molecules of ATP (Adenosine triphosphate) per molecule of glucose. In total, the theoretical (and typical textbook) yield of cellular breathing (including the Krebs cycle) of one molecule glucose is 38 molecules ATP, but in practice the actual yield is closer to 30-32 ATP. Since one molecule glucose produces two molecules of Acetic CoA, the Krebs cycle's energy output is usually expressed as the product of the two cycles needed to break down both Asetyl-CoAs. Two Krebs cycles create two GTP, Guanosine triphosphate, which can readily be converted into 2 ATP. The other energy-producing products of the Krebs cycle (NADH, and QH2) generate an additional 22 ATP, but in practice produces closer to 18 ATP via the mitochondrial electron transport chain. electron transport chain. practical difference results from energy loss of the active transport of various reactors as well as the leakage of electrons within the electron transport chain. Steps in the Krebs Cycle The Krebs Cycle release energy from Acetyl-CoA, but the cellular challenge is to release the energy gradually and in usable forms. So the road (1) connects the Atelile CoA's aetyl group (2-carbon) to the substrate (4-carbon) to make a 6-carbon molecule; (2) rearrange the 6-carbon molecule to a more reactive form; (3) remove one of the substrate's carbon molecules to form a 5-carbon molecular and release energy; (4) remove another of the

substrate's carbon atoms, to form a 4-carbon molecule and release energy; and (5) rearrange the 4-carbon molectage several times to create first substrate, correcting energy in the process. The main observation is that the substrate is first manipulated and its carbon atoms are released in the form of CO2, and only then are the atoms rearranged in the acetone (of the Acetone CoA) to re-create the substrate. Step 1: Citrate synthhase The first step is to put energy into the system. The Citrate synthesis links to the Oxaloacetate substrate that can then bind to the Acetyl-CoA's acetyl group, which then releases the Associate Enzyme A. It produces the very well-known and common citry acid, that is, a citrate. It is this six-carbon molested that will be broken down, and sold back into Oxaloacetate. Step 2: Aconitase Unfortunately, citrate is too stable for the reactions that follow. Thus, the Acontiase links to the Citrate to move one of its oxygen atoms to create a more unstable citrate isomer. It does this by extracting a water molecule harvest that produces cis–Aconitate, and then taking back the water to produce D–Isokitrate. Step 3: Isokitrate dehydrogenase With the citrate rearranges, the process begins in earn severe; the Isokitrate dehydrogenase links to the D-Isocitrate, which transmits an electron to the NAD+, Nicotineamide adenine dinucleotide, producing its energetic shape NADH. With the electron removed, the enzyme then dissolves a carbon atom to form a molecule of carbon dioxide. That changes the substrate from a 6-carbon molecule to a 5-carbon molecule author. Step 4: α-Ketoglutarate dehydrogenase This step involves a highly developed complex of 24 enzymes. Marked here α-Ketoglutarate dehydrogenase, these complex transfers also electrons to NAD+ manufacturing NADH, remove another carbon atom as carbon dioxide (transforming the substrate from a 5-carbon to a 4-carbon molecule), and relinking the Coenzyme A to the substrate. Step 5: Succinyl-CoA synthesiserosis This step produces ATP directly because the substrate's link to Coenzyme A is sufficiently energetic to power the response. In mitochondria, the enzyme links to the Succinyl-CoA and uses the energy of releasing the coenzyme, to phosphate (P) to add GDPR to produce GTP. In the cytoplasm, a variation on this enzyme can produce ATP directly. It also begins the manipulation of the substrate to its original form. Step 6: Succinate dehydrogenase With the carbon removed, the rearrangement process begins to manipulate the hydrogen. When the Succinate dehydrogenase links to the substrate, it introduces two hydrogen atoms attaching them to a carrier, ubiquinone (Q), or FAD Flavin adenine dinucleotide. With the additional 2 electrons ubiquinone form ubiquinol (QH2 or FADH2) which are then transferred to power the electron transport chain. Step 7: Fumarase Fumarase continues the rearrangement process by adding hydrogen and oxygen back into the substrate previously removed. Step 8: Malate dehydrogenase Finally, the Malate dehydrogenase recreates the Oxaloacetate substrate and moves electrons from the NAD+ TO FORM NADH, the last energy provided by the Krebs cycle. Interestingly, this Malate-Oxaloacetate response is also used to move anaerobic energy from the cytoplasma to the mitochondria. While anaerobic reactions produce NADH, it cannot move from the cytoplasma to the mitochondria to be processed into the electron transport chain, but the Malate can be transported over the mitochondria's membrane, allowing the anaerobic NADH Oxaloacetate to be converted into Malate, which is then switched back into Oxaloacetate to produce NADH for the production of ATP. Process as a whole Review of the whole process, the Krebs cycle mainly converts the acetic group and water, into carbon dioxide and energetic forms of the other reactors. In addition, many of the enzymes and substrates are also intermediaries in other biochemical reactions of both amino acids and fatty acids. As Krebs (1953) himself noted in his Nobel Price read, the citric acid cycle is also part of the energy emissions process of the metabolic oxidation of proteins and fatty acids. As a result, the Krebs cycle is the primary method of cellular energy production. Conclusions The Krebs cycle is both the central hub of cellular metabolism and one of Biology's prototypical biochemical processes. Since the Krebs cycle regulates and enables the cellular oxidation of glucose and plays a role in the metabolism of proteins and fats, it is the fuel source for cellular activity and therefore fundamental to oxygen-based life. But the Krebs cycle also illustrates the role of biochemistry in biology as a field. This illustrates evolutionary biology in that many organisms from single cell to humans share the same biochemistry. And it illustrates enzymatic responses and biological conservation of resources and efficiency. As a result, the Krebs cycle is a critical part of science education to both illustrate how cellular biology works, and how biology works as a field to explore that biology. Reference Cellular breathing. (2013, February 28). 1996 - Wikiwand. Retrieved 5:58pm, March 1, 2013, from (2013). The Nobel Prize in Physiology or Medicine 1953. 1953. 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