Krebs Cycle

by Sophia

WHAT'S COVERED

In this lesson, you will be learning about the processes that occur in the Krebs cycle to help produce ATP for the cell. Specifically, this lesson will cover:

1. Overview

The **Krebs cycle** is the second stage in cellular respiration, following glycolysis, and it produces two ATP molecules for the cell. ATP stands for adenosine triphosphate and is an energy storage molecule used by cells.

You may sometimes hear the Krebs cycle referred to as the citric acid cycle, but they're both the same thing. The Krebs cycle occurs within the mitochondria of the cell and is an aerobic process, meaning it requires oxygen to occur. Pyruvate from glycolysis will move into the mitochondria and begin the preparatory steps of the Krebs cycle.

TERM TO KNOW

Krebs Cycle

The second stage of cellular respiration in which pyruvate from glucose is used to produce ATP, NADH, and $FADH_2$.

2. Preparatory Steps

Remember that pyruvate is a three-carbon molecule that came from glycolysis, the stage of cellular respiration before the Krebs cycle. Carbon dioxide will be released, leaving you with a two-carbon fragment of pyruvate, which will then combine with something called coenzyme A. When that two-carbon fragment of pyruvate combines with **coenzyme A**, it produces something called **acetyl CoA**.

TERMS TO KNOW

Coenzyme A

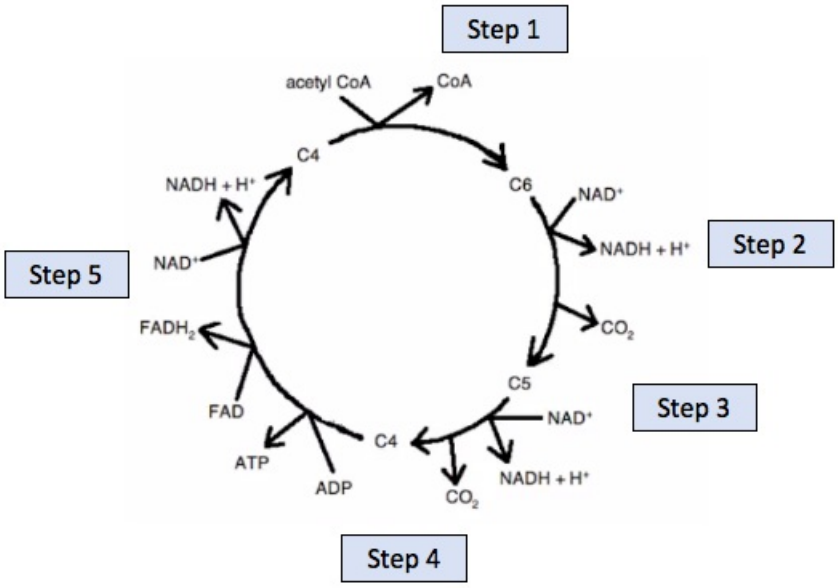
A coenzyme used to change pyruvate into acetyl CoA which enters the Krebs cycle.

Acetyl CoA

A molecule produced from pyruvate which enters the Krebs cycle to produce ATP.

3. The Krebs Cycle

Once you have acetyl CoA, you're ready to begin the actual Krebs cycle. Reference the diagram below as you learn about each step.



STEP BY STEP

Step 1: We started with pyruvate that was turned into acetyl COA, which is a two-carbon molecule. Then we have a four-carbon molecule that's going to combine with that two-carbon molecule to produce a six-carbon molecule.

Step 2: Then carbon dioxide will be released. A hydrogen will be removed from **NAD^+** and transferred to **NADH**. NADH is an electron carrier that will carry electrons into the electron transport chain to make more ATP later.

Step 3: We had a six-carbon molecule, which had a carbon removed to leave us with a five-carbon molecule. The steps then repeat and CO_2 is released again. NAD^+ will donate a hydrogen, leaving us with NADH, an electron carrier molecule.

DID YOU KNOW

This carbon dioxide that's being released is actually being breathed out. Each time you exhale, you're exhaling carbon dioxide, which is being released from the Krebs cycle within the mitochondria of your cells.

Step 4: When the five-carbon molecule releases a carbon, we're left with a four-carbon molecule. ADP is now going to join with a phosphate group, transforming it into ATP, our energy storage molecule. We haven't changed any of the carbons, so we're still at a four-carbon molecule.

Step 5: NAD^+ will become NADH and **FAD** will become **$FADH_2$**. A hydrogen will be removed and transferred, giving us $FADH_2$—another type of an electron carrier molecule. We still have the four-carbon molecule that we started with.

BIG IDEA

You start with a four-carbon molecule, which then combines with a two-carbon molecule to produce a six-carbon molecule. Then as you go through the cycle, you end back up where you started, with the four-carbon molecule. Each turn of the cycle will work on one pyruvate molecule. Remember, you have two pyruvate molecules that you get out of glycolysis. It takes two turns of the cycle for each glucose to be broken down because one glucose yields two pyruvate molecules.

TERMS TO KNOW

NAD^+ and NADH

NAD^+ is a molecule that picks up hydrogen atoms and becomes NADH, which is then transferred to the electron transport chain to produce more ATP from the energy in electrons.

FAD and $FADH_2$

FAD is a molecule that picks up hydrogen atoms and becomes $FADH_2$, which is then transferred to the electron transport chain to produce more ATP from the energy in electrons.

SUMMARY

This lesson has been an **overview** of the **preparatory steps** that lead to the **Krebs cycle** and the **processes** that occur within the Krebs cycle.

Keep up the learning and have a great day!

Source: THIS WORK IS ADAPTED FROM SOPHIA AUTHOR AMANDA SODERLIND AND KELSEY Perreault

TERMS TO KNOW

Acetyl CoA

A molecule produced from pyruvate which enters the Krebs cycle to produce ATP.

Coenzyme A

A coenzyme used to change pyruvate into acetyl CoA which enters the Krebs cycle.

FAD and $FADH_2$

FAD is a molecule that picks up hydrogen atoms and becomes $FADH_2$ which is then transferred to the electron transport chain to produce more ATP from the energy in electrons.

Krebs Cycle

The second stage of cellular respiration in which pyruvate from glucose is used to produce ATP, NADH, and FADH2.

NAD^+ and NADH

NAD^+ is a molecule that picks up hydrogen atoms and becomes NADH which is then transferred to the electron transport chain to produce more ATP from the energy in electrons.