Demonstration of Energy Production During Cellular Respiration Using Yeast

Course instructor: Jibril H. Yusuf PhD.
E-mail: jibril.habib@tiu.edu.iq
Assistant: Ms. Lava Ali
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Outline

- Concept of Energy and Metabolism
- Cellular Respiration
- Why Yeast is Used in This Experiment.
- Principle of the Experiment
- Materials
- Procedure
- Expected Results

❖ Concept of Energy and Metabolism:

- **Energy:** The capacity to do work that bring about change living organism.

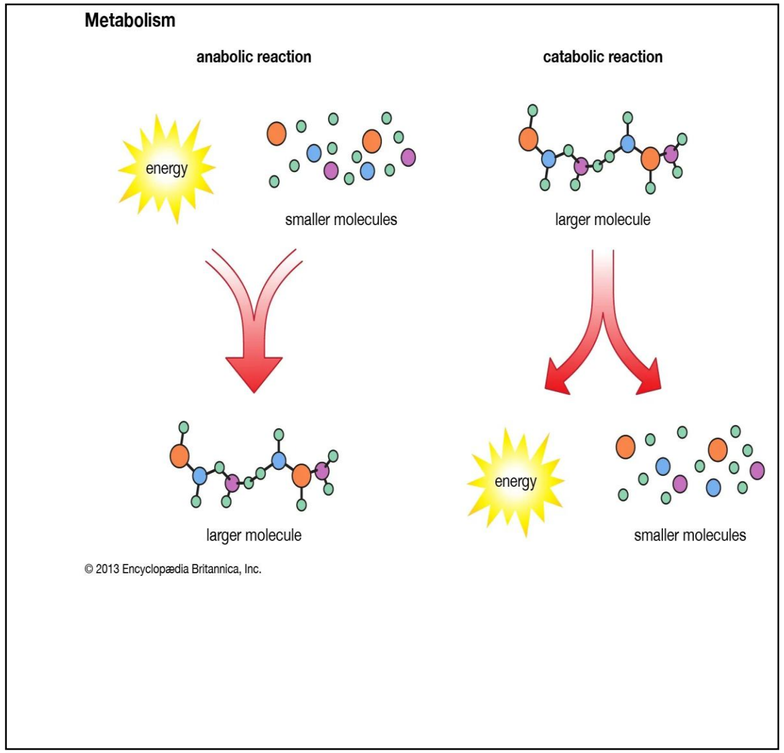
- **Metabolism:** The sum of all chemical reactions in a cell or organism.

✓ **Catabolism:** Breakdown of molecules to release energy

✓ **Anabolism:** Synthesis of molecules using energy

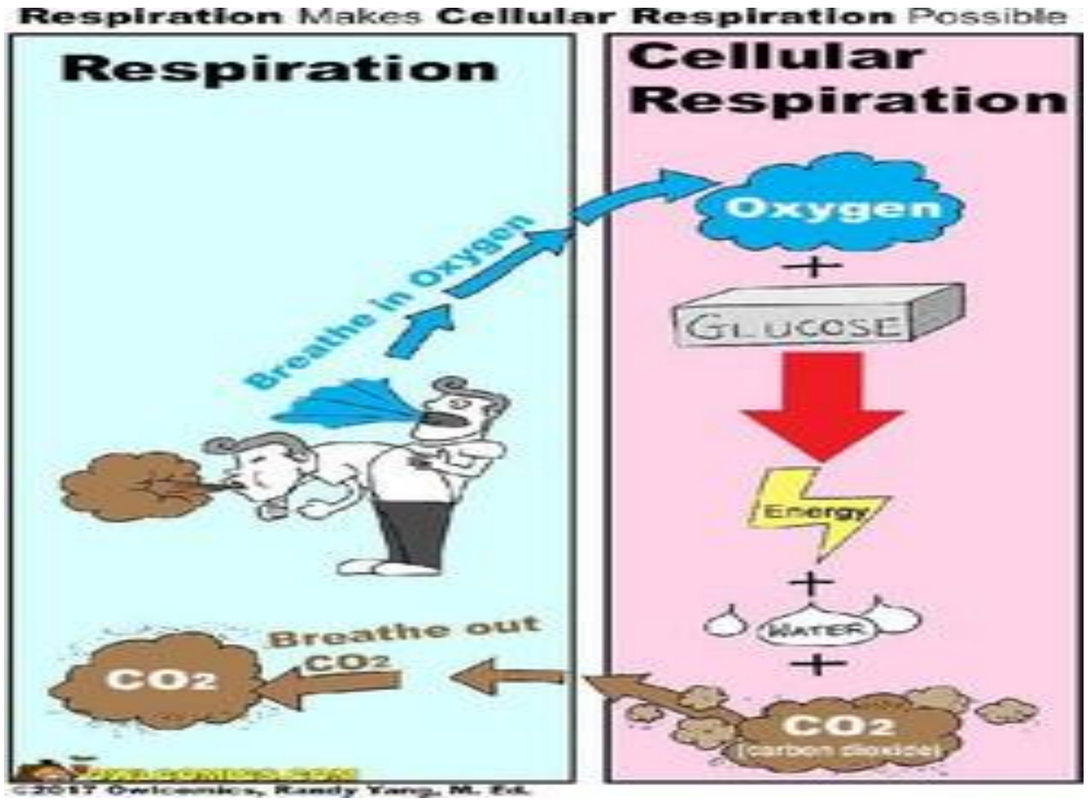
❖ Concept of Energy and Metabolism:

Feature	Catabolism	Anabolism
Meaning	Breaking down	Building up
Energy	Releases	Consumes
Molecules	Big → Small	Small → Big
Example	Respiration	Protein synthesis



❖ Concept of Energy and Metabolism:

➢Cellular respiration is a catabolic process that releases energy stored in glucose.



❖ Cellular Respiration:

- Cellular respiration is the process by which cells convert glucose into ATP.

➢ General equation:

- **Glucose + Oxygen → Carbon dioxide + Water + Energy (ATP)**

➢ In yeast, respiration can occur:

- Aerobically (with oxygen)
- Anaerobically (fermentation)

❖ Why Yeast is Used in This Experiment:

1. Yeast is a living organism with active metabolism.
2. Easy to handle and safe for teaching laboratories.
3. Rapidly metabolizes glucose.
4. Produces carbon dioxide, which can be easily observed

❖ Laboratory Experiment: Energy and Metabolism

➢ Demonstration of Energy Production During Cellular Respiration Using Yeast.

- **Aim**: To demonstrate energy production during metabolism by observing carbon dioxide (CO_2) release during cellular respiration in yeast.

➢ **Principle:** All living cells require energy for metabolic activities. This energy is produced mainly in the form of ATP through cellular respiration.

➢ Yeast cells metabolize glucose using enzymatic reactions.

✓ During respiration:

- Glucose is broken down
- Energy is released
- Carbon dioxide (CO_2) is produced as a by-product

➢ The production of CO_2 indicates active metabolism and energy release.

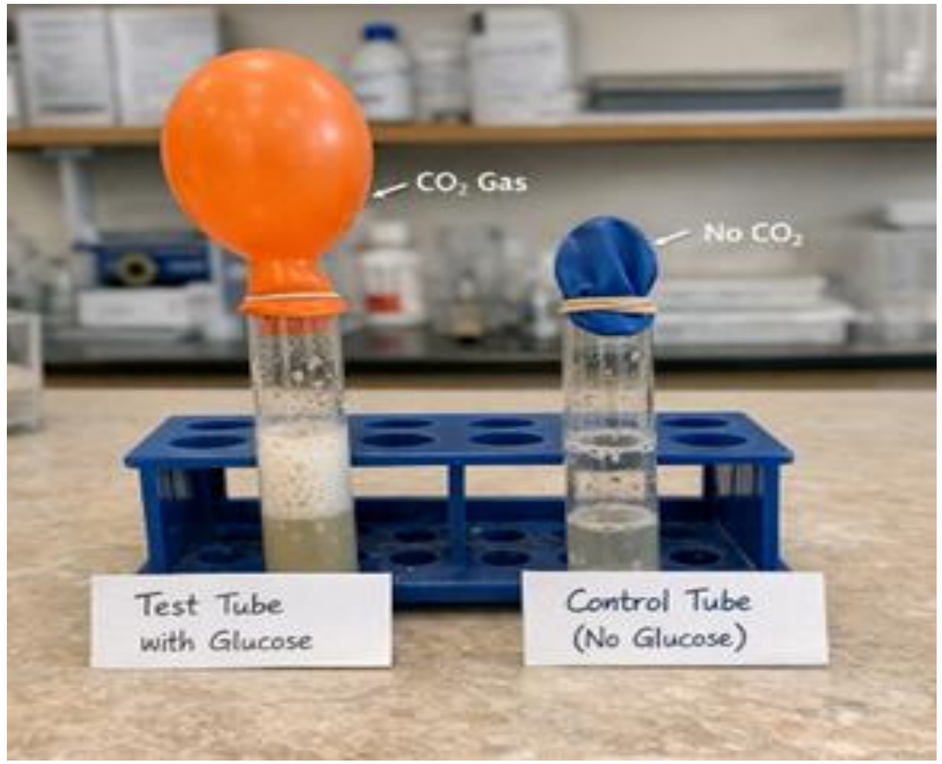
❖ Materials Required:

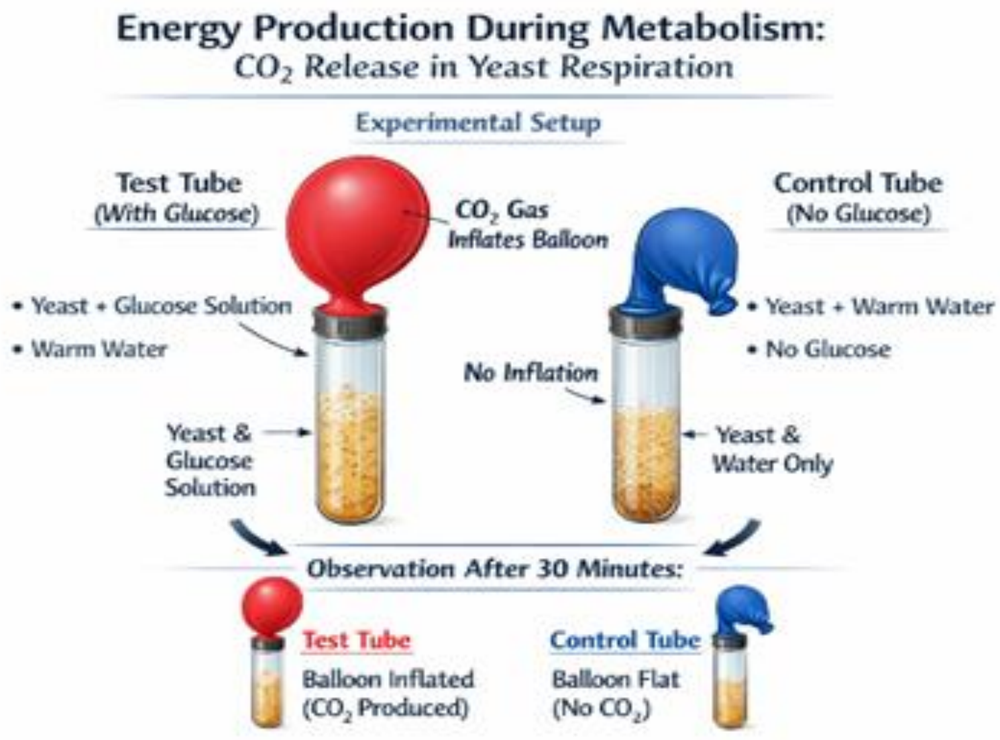
- Dry yeast
- Glucose solution (5–10%)
- Warm water (35–40°C)
- Test tubes
- Balloon or delivery tube
- Measuring cylinder
- Rubber band
- Test tube rack
- Stopwatch

❖ Procedure:

1. Label two test tubes as **Test** and **Control**.
2. Add **10 ml of warm water** to each test tube.
3. Add **1 teaspoon of yeast** to both tubes.
4. Add **5 ml glucose solution** to the **Test** tube only.
5. Do not add glucose to the **Control** tube.
6. Fix a balloon tightly over the mouth of each test tube using a rubber band.
7. Place the tubes in a warm area.
8. Observe the setup for **20–30 minutes**.

❖ Expected Result





- The balloon on the Test tube <u>inflates due to CO_2 production</u>.
- The balloon on the Control tube shows <u>little or no inflation.</u>

❖ Significance of the Experiment:

- Demonstrates that living cells produce energy.
- Shows the relationship between metabolism and energy.
- Helps understand basic biochemical processes relevant to:

➢ Human physiology.

➢ Medical laboratory analysis.

References

- Reece, J. B., et al. (2014). Campbell Biology, 10th Ed. Pearson.

- Alberts, B. et al. (2015). Molecular Biology of the Cell, 6th Ed. Garland Science.

- Svitil, K. (2006). "Crenation and Osmosis in Cheek Cells". The American Biology Teacher, 68(6), 364–367.

- Oparka, K. J. (1994). Plasmolysis: New insights into an old process. New Phytologist, 126(4), 571–591. https://doi.org/10.1111/j.1469-8137.1994.tb02958.x

Thanks