Effect of Creatine on Fermentation Rates in Yeast

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Abstract

As we observed the fermentation rate with the different percentages (10%, 20%, 30%, 40%) of creatine, the amount of creatine did not affect the fermentation rate. Our hypothesis was, if the amount of creatine is increased, the fermentation rate will also increase. Our hypothesis proved to be wrong. Creatine is used in the phosphocreatine system, which generates ATP from ADP. Since the fermentation process also generates ATP, using creatine may act as we thought “a booster” and help speed up the rate of fermentation in the yeast; which in turn would influence white blood cells seeing if it would help with fighting bacteria in the immune system.

Introduction

Creatine is a well-known compound for its role in energy metabolism and has gained attention for its use in workouts and, more recently, its potential for supporting immune function. Traditionally recognized for its involvement in the phosphocreatine system, creatine helps regenerate ATP from ADP during periods of high energy demand, such as during exercise. In the fitness community, it's common to hear discussions about how creatine use can give you "a few extra reps." Recent research has led to the development of creatine supplements specifically aimed at enhancing immune response (Nutraingredients-usa.com, 2023).

Given that fermentation, a process utilized by yeast, also generates ATP, we hypothesized that creatine could serve as an ATP "booster," potentially accelerating the fermentation rate. To test this hypothesis, we conducted an experiment examining the fermentation rate in yeast with varying concentrations of creatine (10%, 20%, 30%, 40%). Contrary to our expectations, our findings revealed that creatine did not significantly affect the fermentation rate. This result suggests that while creatine is vital for ATP regeneration in specific systems, it may not directly influence fermentation as anticipated.

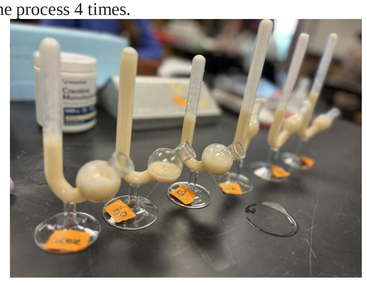
Methods

Materials & Location

Materials included essentials creatine monohydrate, champagne yeast, sucrose, fermentation tubes, testing tubes, incubator, gram scale, weigh boats, 250 mL beakers, glass stir rod, Sharpie, tape
Data was collected from July 29- August 5 in Biology lab!

Procedure

Using a gram scale, we weighed creatine in four different weighing boats (10%, 20%, 30%, and 40%). Then we transferred the creatine into 4 different 250 ml beakers, added 200 mL water ro each solution and mixed them with a stirring tool. We then mixed a 5-gram packet of champagne yeast with 60 mL of water to create our yeast solution., Meanwhile, we got 6 different tubes and labeled them (10%, 20%, 30%, 40%, water, and sucrose). In the 10% we added 10mL of yeast, 5mL 20% sucrose solution, and 5mL 20% creatine. In the 20% we added 10mL yeast, 5mL 20% sucrose solution, and 5mL 20% creatine. In the 30% we added 10 mL of yeast, 5 mL 20% sucrose solution, and 5 mL 30% creatine. In the 40% we added 10 mL of yeast, 5 mL 20% sucrose solution, and 5 mL 40% creatine.
In the water we added 10 mL of yeast and 10 mL of water (-control). In the sucrose we added 10 mL of yeast, 10 mL of 20% sucrose solution (+control). From there the solutions were transferred into fermentation tubes and stuck into the incubator until one of the solutions was halfway filled. We recorded the time and repeated the process 4 times.



Figures 1 & 2. The image on the left shows each solution in their respective fermentation tubes after being removed from the incubator. The image on the right shows each creatine solution we used.

Descriptive Title for your Table

Tube	Average Fermentation Rate (mL CO2/min)
10% creatine	0.54
20% creatine	0.71
30% creatine	0.66
40% creatine	0.62
sucrose	0.64
H2O	0.00

Table 1.This table shows the average fermentation rates for each solution across all four trials.

Fermentation Rates In Solutions Through All Trials

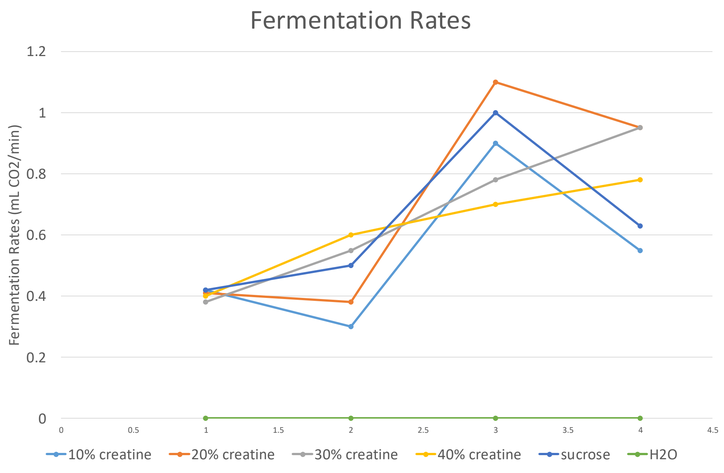


Figure 4. This graph shows the fermentation rates of each solution, including our positive control (sucrose) and negative (H2O). In this chart, you can see how no clear correlation was found between creatine and fermentation rates.

Discussion

In this experiment, we hypothesized that a higher percentage of creatine would equal a faster fermentation rate. However, across the four trials we conducted, we saw several varying results with no clear correlation. This refutes our original hypothesis; creatine has no effect on the rate of fermentation.

Since creatine is known to increase the synthesis of protein and deposit of energy in the human body, we initially believed that it would also increase the rate of fermentation when added to solutions of water, yeast and sucrose. We were able to watch as the yeast naturally fermented by watching the carbon dioxide levels increase in the fermentation tubes. As shown in Table 1 and Figure 4, there are no clear results to prove our hypothesis correct. Although we did find an answer to our original question, there were some areas of error in our research. The main one arose when we were creating our creatine solutions. We realized that the creatine powder could not be dissolved into the water and sunk to the bottom. To counter for this, we made sure to mix each solution thoroughly before drawing the solution with a pipette. This may have caused some discrepancies in our results.

The implications of our findings can be used for future research projects with a similar focus on ATP boosters' effect on fermentation. In future studies, we would recommend testing on a substances that occur in the same natural body; as creatine is organically produced in the human liver, pancreas and kidneys, while the champagne yeast we used in our experiment does not naturally occur in the same body.

Acknowledgements

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