Investigating the effect of sodium fluoride on respiration in yeast essay sample

Graph Showing the effect different volumes of Sodium Fluoride has on the average rate of production of H+ ions as measured by the colour change of resazurine

Comment on Graph:

The graph depicts a positive trend, as the amount of Sodium Fluoride increases the average rate of H+ ions as measured by the colour change of resazurine also increases. This increase is consistent with each 5 mL increase of Sodium Fluoride resulting in an increase of one assigned numerical colour. This steady increase plateaus at 15mL with no further colour change.

Conclusion and Evaluation

Conclusion

In our experiment we tested whether changing the amount of Sodium Fluoride effects the rate of respiration as measured by the colour change of resazurine. Our experiment indicates that there is a relationship between sodium fluoride and the rate of respiration. In our experiment the more sodium fluoride that was added the less colour change, indicating that less respiration was taking place. This is shown when we used 20mL of sodium fluoride and it got a four, a dark pink on our colour gradient while when we added no sodium fluoride it was a one, a very light pink. This indicates that sodium fluoride is an inhibitor of respiration, the scientific theory behind by results is explained below.

During respiration glucose is oxidised and hydrogen released at various stages, controlled by a dehydrogenase enzyme. In our experiment we used yeast, a microscopic, unicellular organism as a respiratory substrate as it contains stored food. To measure the rate of respiration we used resazurine as changes colour when it is reduced (gains H2), which occurs during respiration. The lighter the final colour the larger the amount of respiration, or according to our colour gradient the small number equates to a higher rate of respiration. In the yeast an enzyme enolase catalyzes the conversion of phosphoglycerate into phosphoenol pyruvate. Yet this conversion can be inhibited by the introduction of sodium fluoride as it is an inhibitor of the enzyme “ enolase” an enzyme necessary for glycolysis(2). Therefore as we increased the volume of sodium fluoride added to the yeast less colour change will occur as the sodium fluoride is precenting glycolysis and the subsequent production of H2 ions which react with the resazurine causing it to change colour.

This is congruent with our results as the lightest colour (1) indicating the most respiration occurred when we added 0mL of sodium fluoride. Our two results with the darkest colour (4 on our colour gradient) occurred when we added the two largest volumes of sodium fluoride, 15 and 20mL.

There was some discrepancy between my repeat values, particularly when I added 10mL which resulted in a 2, 3, 4, 3. As my other trials showed less discrepancy there must have been some systematic errors with the 10mL trials. The biggest abnormality was when we added 20mL of sodium fluoride, as this was the biggest volume of sodium fluoride we used I expected it to

result in a larger colour value as less colour change/respiration would occur, yet it averaged to a 4 which was the same as our 15mL test.

Evaluation:

Limitation of the method

How significantly could this have impacted on your results and why

Improvement

The test tubes had different volumes.

In the test tubes with the smaller volumes respiration would have occurred more quickly as there is less distance for the particles to move.

Added distilled water to make all the test tubes have the same volume.

There was light in the room, despite doing it in a cupboard there was some sunlight.

Because the reaction is effected by light there would have differing light levels between trials causing there to be different respiration rates effecting the validity and reliability of our results.

Conduct the experiment in pitch black with one lamp 30cm away for the test tube and have an automated device which measures the amount of light let through the test tube.

Temperature of the water bath was difficult to maintain.

As respiration is enzyme controlled and enzymes are effected by temperature it is important to keep the temperature consistent. Otherwise decreases in temperature will cause the enzymes kinetic energy to decrease and less collisions will be made and the rate of respiration will decrease. Which will significantly decrease the validity of our results.

We could use an electronic thermostatic water bath. Which would keep the temperature consistent.

Low concentration of sodium Fluoride

Because we were using a low concentration we were not getting differences between our results. Therefore the conclusion was difficult as out results were clustered together.

Use a 0. 5 mol/dm3 of sodium fluoride.

References:

http://www. courseworkbank. info/courseworkbank. info. php? f= R0NFIEEgLSBMZXZlbC9DaGVtaXN0cnkvUmF0ZSBvZiByZXNhenVyaW4gZWNwZXJpbWVudC5wZGY=

http://www. faculty. fairfield. edu/genbio/lab171/LabManual1_201201. pdf