

Example of phylum mollusca lab report

[Environment](#), [Animals](#)



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Abstract

The internal temperature of the cold-blooded organisms is dependent on the temperature of the surrounding in order to maintain their own temperature. An increase in temperature leads to an increase in metabolism processes, which also lead to increased heart activity. In this experiment, the effect of temperature of the rate of metabolism was studied. This was done using cold-blooded animals, *Mytilus* species, to determine the effect of temperature on metabolism. The increase in temperature led to an increased heart rate. It was thus concluded that temperature affects the rate of metabolism.

Introduction

A poikilotherm or cold-blooded organisms are those organisms that experience varying internal temperature depending with the environment in which they live. The opposite of this is the homeothermic, organisms that can regulate their internal temperature irrespective of the temperature

surrounding them. The variation of temperature in the poikilotherms results from the variations in the ambient temperature of the environment. Some of the poikilothermic organisms include vertebrates such as fish, amphibians and the reptiles as well as most of the invertebrate animals (Gray, 2005). Since the metabolism of these animals varies and is generally below the metabolism rate in homoeothermic animals, these animals cannot sustain activities that require high-energy. Such activity like powered flight that occurs in large animals is generally beyond the capability of the poikilotherm animals. Therefore, the metabolism processes in a poikilotherm favors them to use strategies like sit-and-wait hunting rather than using the methods of chasing prey that is used by large animals. Since they do not require the metabolism processes to heat or cool their body, the total energy that is required is generally small. For animals with the same body weight, it requires from half to a tenth of the total energy used by a homoeothermic to sustain a poikilotherm (Gray, 2005).

Enzymes that are located in the cells drive the metabolic reactions. In addition, temperature is a crucial factor in determining the level of enzyme activity. Increase in temperature up to 40°C increases the velocity of a reaction that is catalyzed by an enzyme. This is due to the increased collision of the substrate with the active sites of the enzyme as the movement of molecules happens in a rapid manner due to thermal agitation. Since the enzyme catalyzes the metabolic reactions, the rate of metabolism is also proportional to level of temperature until the enzyme is denatured. Increase in the rate of metabolism causes the heart rate to speed up the beating process in order to deliver oxygen to different cells (Callahan, 2011).

The *Mytilus* species are typical mussel shells that contain two equally sized shells that open when the organism is covered with water. *Mytilus* is known to be cosmopolitan genus with mussels ranging from medium to large-sized. Most of the mussels in this genus are edible.

This experiment was conducted with an aim of studying the relationship of metabolic activity and the temperature of the surrounding. The study hypothesized that an increase in ambient temperature increased the rate of metabolic processes and hence the heart beat. The hypothesis was tested by measuring the rate of heart contraction of a cold-blooded animal at varying temperatures. Increase in contraction of the heart with an increase in temperature was considered to be because of the rise in temperature.

Method

In order to study the soft internal parts of mussels, one shell of fresh specimens of *Mytilus* sp. were removed by pry opening the shell slightly with a thin screwdriver. A sharp scalpel was inserted between the shells, severed the adductor muscles, both the front (anterior), and back (posterior). One valve was removed leaving the animal in the other valve. The animal was placed on its side in a culture dish and submerged with seawater out of the aquarium. A thermometer was inserted in the culture dish where it stayed all through the experiment.

The pericardial cavity near the top edge of the mussel behind the hinge is where the heart is located. This area was observed using a dissecting microscope, and the pericardium was gently touched ensuring that the contracting of the heart is being felt. The temperature of the seawater bath that surrounded the mussel was checked and recorded on the worksheet.

The heart was observed and the rate of contraction for two minutes determined and recorded on the worksheet. The temperature was allowed to warm by 5OC, and the heartbeat recorded again. The temperature was allowed to warm again by 5OC, and the heart rate recorded. The whole experiment was repeated using 6 mussels of approximately the same size.

Results

The rate of heart contraction at the different temperatures was recorded in the table 1 below. At 12OC, the average rate of the heart contraction was 8.25 beats per minute. At 16OC, the rate of heart contraction increased to 10.125beats/minute. In addition, at 20OC, the rate had risen to 12.5beats/minute. The data for the specimen number 2 was not considered while determining the average since the some of the data were at the extremes and thus considered outliers.

The average of the heart rate was used to plot a graph of heart rate against temperature. The graph showed a steady increase in the contraction of the heart (Figure 1).

Figure 1: The trend of the average rate of heart contraction following a progressive increase in temperature. The temperature was an increase at an interval of 4 minutes from 12OC to 20OC. the heartbeat was monitored using a dissecting microscope.

The analysis of s a significance difference among the three groups showed a significant difference with the p value being less than 0. 05.

Discussion and conclusion

All animals other than the birds and the mammals belong to the poikilothermic class. Cold-blooded animals change their activity depending on the temperature in their surroundings. When the temperatures are high, these animals are very active, but when the temperatures are low, their activity is reduced. The animals are not able to use the metabolic processes taking place in their body to keep themselves warm. Since the metabolism of these animals varies and is generally below the metabolism rate in homeothermic animals, these animals are not in a position to sustain activities that require high-energy (Gray, 2005).

In the experiment, the temperature of the seawater in the water bath was initially at 12°C. the rate of heart contraction at this temperature was 8.25beats/ minute. This is the rate of heart contraction at the normal temperature of the seawater. When this temperature is an increase by 4°C, the rate of the heart contraction increases from the 8.25beats/ minute to around, 10.125beats/minute. The increase in heart contraction is due to the increased temperature. Finally, when the temperature was increased to 20°C, the rate of heart contraction increased to 12.5beats/minute. The increased rate of contraction was due to the increased temperature.

Temperature is among the many factors that determine the rate of enzyme activity. When temperature is increased, the rate of enzyme activity increases. The enzymes are actively involved in catalyzing reactions involved with the metabolic processes. When the temperatures are increased, the interaction between the enzyme and the substrate is enhanced as, therefore, increased activity. In oxidative respiration, oxygen is one of the main

substrates and is needed for oxidative respiration to take place. This oxygen is delivered to the respiring cells through the circulation system, which is subsequently powered by the pumping of the heart (Callahan, 2011).

Therefore, the effect of temperature on the rate of metabolism can be established by monitoring the rate of heartbeat. In poikilotherms, the increased levels of heart contraction continue as the temperature rises until a temperature is reached where the enzymes are denatured by the high temperatures. Other than the use of heartbeat, the other parameter that may be useful as an indicator of metabolic activity is oxygen consumption (Gray, 2005).

The endothermic, also known as warm-blooded, have most of their processes that take place in the body being regulated internally. The body is thus kept with a task of making sure that the body produces enough energy to keep the body warm. This enables the body of the warm-blooded organisms to continue with their normal processes without being interfered with by the changing environments. The change in metabolic activity is not easily noted even when the temperature ranges are high. The fact that the body of a warm-blooded animal is capable of maintaining the internal temperature helps the heart rate to remain in a steady state without much interference (Callahan, 2011).

Although the warm-blooded animals are capable of maintaining the body functions over a wide range of the ambient temperature, under extreme cold temperatures, may lead to the lowering of the heart activity. This mainly occurs when the body is exposed to the reduced temperatures for a long time. A drop in temperatures below 95°F may lead to a reduced activity of

the nervous system as the body begins to suffer hypothermia. Before the hypothermia begins, exposure to cold temperature starts by reducing the heart rate as well as in the reduction of metabolism (Callahan, 2011).

When a warm-blooded animal is kept in extreme heat, the body responds by increasing the activities of the heart. Both the medulla and the aorta respond to the increased temperatures by influencing the rate of heart beating. As the heart beats faster, the flow of blood in the body is increased enabling oxygen delivery to the respiring cells. However, unlike the cold-blooded animals, at high but bearable temperatures, the body is able to adjust to the environment and thus reducing the activity of the heart and thus to normal (Callahan, 2011). Therefore, similar effects are expected from the warm-blooded animals although it is just for a given time before the body can adopt. This will occur immediately after the body has determined the right mechanisms to retain the internal body temperature.

Reference List

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