

Oxygen Consumption in Molluscs

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Experiment Overview

Most living organisms are aerobic meaning they require the consumption of oxygen for survival. Oxygen consumption is one physiological parameter which can be readily assessed under laboratory conditions, it can be used as a measure of metabolic rate of the organism and used as a relative indicator of stress levels of an organism.

This experiment is designed to determine the influence of environmental temperature on the oxygen consumption of the Australian dog whelk, *Dicathais orbita*. *Dicathais orbita* is an intertidal mollusc found along most of the Australian coastline. Recently, it has been discovered that the ink released as a defence mechanism by this species contains a protein which functions as an anticancer agent, causing apoptosis of cancerous cells. This finding has increased the medical and commercial interest of the species, and thus a desire to identify optimal conditions to facilitate the aquaculture of the species. Molluscs are ectothermic and conform to the environment in which they live, therefore knowledge of the optimal temperature for growth and reproduction will be essential for successful commercial production of this species.

The overall aim of the experiment is to determine the temperature at which the rate of oxygen consumption is highest for *Dicathais orbita*, to ultimately apply this value to further development of aquaculture conditions for the species, T

Section 1 of your paper will be based on the responses to the headings below. However, it may be appropriate in the paper for you to re-arrange or omit some of this information.

Learning Experience

Understanding of how the environment affects the physiology of an organism is important for understanding of both the natural and artificial situations. Oxygen consumption is a parameter that is straightforward to measure in these simple conditions and it allows students to appreciate several basic physiological premises such as effects of mass on some physiological measures and use of surrogate measures to represent other physiological processes (oxygen consumption as a relative measure of metabolic rate).

Aims and Objectives

The aim is to interpret the effects of temperature on oxygen consumption in the Australian dogwhelk, *Dicathais orbita*.

The objectives are to:

- Calculate the total oxygen consumed and the rate of oxygen consumption of dogwhelks incubated at each of 5 temperature treatments, 18, 20, 22, 24 and 26 by using the change in dissolved oxygen in their incubation chambers.
- Calculate the oxygen consumed per g of body mass for each individual
- Determine at which temperature the highest rate of oxygen per gram of body mass occurred by collating the class data and analysing the trend graphically.

Level of Experiment

This practical is aimed at 2nd and 3rd year Physiology students.

Keyword Descriptions of the Experiment

Domain

Physiological Systems

Specific Descriptors

oxygen consumption, optimal temperature, metabolic rate, mass specific oxygen consumption

Time Required to Complete

Prior to Lab: 30 minutes

In Laboratory: 2 hours

After Laboratory: 1 hour if written only as a summary of overall results, 3-5 hours if written their formal practical report.

Experiment History

The experiment was originally developed by Dr. James Harris at FLindersUniversity using the greenlip abalone, *Haliotis laevigata*.

References

James O. Harris , Greg B. Maguire , Stephen Edwards, and Stephen M. Hindrum 1998 Effect of ammonia on the growth rate and oxygen consumption of juvenile greenlip abalone, *Haliotis laevigata* Donovan Aquaculture 160 _1998. 259–272