

RISK ASSESSING FOR ADVANCED HIGHER BIOLOGY LEARNERS

sserc

Work through this example for
inhibition of dopa oxidase



Background:

Prior to carrying out experiments in the laboratory, a risk assessment must be carried out. This is not just a piece of paper – it is a process that involves thinking carefully about the experiment, considering the hazards and the risk associated with it. **Hazards** might include toxic or corrosive chemicals, heat or flammable substances, pathogenic organisms, and mechanical equipment. The **risk** is the likelihood of harm arising from exposure to a hazard and this might be different for a school lab technician (often involved in preparing standard solutions from stock chemicals) compared to a teacher or learner. The **risk assessment** must identify suitable and sufficient **control measures** that will be implemented to minimise the risk. These might include using appropriate handling techniques, protective clothing and equipment, and aseptic technique. With these measures in place, can the experiment be carried out safely, taking into consideration the health and safety of yourself, your technician and anyone else sharing the laboratory space?

Aim: To carry out a risk assessment for a lab experiment.

Method: In your Advanced Higher Biology class, you find a protocol online to investigate inhibition of dopa oxidase. Dopa oxidase is an enzyme that can easily be extracted from bananas and catalyses the conversion of L-dopa (substrate) to dopachrome (product). You think it would be a good topic for your class project. A copy of the method is included below.

In this experiment, you will investigate the effect of an inhibitor on dopa oxidase activity. 1. Extract the enzyme: Dopa oxidase will be extracted from a banana. This will involve mashing a banana in a small plastic food bag with a small volume of distilled water. The slurry will be transferred to two microfuge tubes and centrifuged at 6000 rpm for 2 minutes. The supernatant will be transferred to a clean beaker, labelled "dopa oxidase enzyme".

2. The enzyme (dopa oxidase) will be incubated with 5% lead nitrate for 2 minutes at room temperature. The substrate (10 mM L-dopa) will be added, and the reaction incubated at room temperature for 10 minutes. Then, a wireless colorimeter will be used to measure the absorbance of the reaction.

TASK

The first step is to carry out a risk assessment. Complete the table on the next page to identify the hazards, who could be harmed, and control measures to minimise the risk. Do you think this experiment can be carried out safely?



USEFUL SOURCES OF INFORMATION

The SSERC website has a Hazardous Chemical Database listing most (if not all) the chemicals used in Scottish Schools. This will state the hazards of each and their concentration-dependent risk. To access this database, you require a SSERC account (email enquiries@sserc.scot to set this up).

Depending on the experiment, the SSERC Codes of Practice might also be useful.

- [Safety in Microbiology: Code of Practice](#) – useful for all microbiology investigations.
- [Materials of Living Origin: Code of Practice](#) – useful for any investigations involving living things, e.g. dissections, using saliva as a source of amylase, use humans as subjects of experiments.

Video tutorial: This [video](#) will show you how to navigate the SSERC website to find this information.



| | |
|--------------------------|--|
| Activity assessed | |
| Date of assessment | |
| School / Department | |
| Description of activity: | |

| Step 1 | Step 2 | Step 3 |
|--------------------------------|------------------------------|--|
| List Significant hazards here: | Who might be harmed and how? | Control measures: What are you already doing? What further action is needed? |
| | | |
| | | |

Conclusion: Do you think this experiment can be carried out safely? What control measures or adaptations to the protocol might you consider?

SUPPLEMENTARY RESOURCES



Risk Assessment Process

CfE Advanced Higher, Cells and Proteins: Key area 1 – Laboratory techniques for biologists (a) Health and Safety.

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[Printable copy of learner task](#)



Risk Assessment Process – Teacher Guide

Aim: To carry out a risk assessment for a lab experiment.

Method: Read this brief method outline.

In this experiment, you will investigate the effect of an inhibitor on dopa oxidase activity.
1. Extract the enzyme: Dopa oxidase will be extracted from a banana. This will involve mashing a banana in a small plastic food bag with a small volume of distilled water. The slurry will be transferred to two microfuge tubes and centrifuged at 6000 rpm for 2 minutes. The supernatant will be transferred to a clean bijoux, labelled "dopa oxidase enzyme".

[Teacher Support Notes](#)



[Video tutorial for task](#)



[Carry out the experiment detailed in this task](#)