**Eutrophication –**

**Investigating the effect of fertilisers on the growth of an algal population.**

**Teacher / Technical Guide**

**Curriculum links**

**National 4, Unit 3 Life on Earth**

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| **Key areas** | **Suggested learning activities** | **Exemplification of key areas** |
| 4 Fertiliser design and environmental impact of fertilisers. | Investigate the effects of fertilisers eg algal blooms. | Nitrogen in fresh water increases algal growth, blocking out the light. This causes death of organisms, decrease of oxygen and means less life can be supported. |

**National 5, Unit 3 Life on Earth**

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| **Mandatory Course key areas** | **Suggested learning activities** | **Exemplification of key areas** |
| **5 Human impact on the environment**  b. Fertilisers can leach into fresh water, causing algal blooms. This leads to a reduction in oxygen levels. | Investigate the importance of minerals such as nitrates and magnesium for plant growth. | There are opportunities throughout this topic for learners to investigate and debate ethical issues. |

This practical activity is based on an investigation in *Algae: a practical resource for secondary schools,* Society for General Microbiology, 2012.

Algae are considered to be level 1 microorganisms (see *Safety in Microbiology: A Code of Practice for Scottish Schools and Colleges*, SSERC, 2012), having little, if any, known risk. However, hands should be washed prior to and on completion of the activities involved in this practical work. Similarly, benches should be swabbed with 1% bleach prior to and on completion of the work

Discard jars containing the appropriate concentration of VirkonTM should be made available for sterilising used pipettes and microscope slides.

Used algal samples should be sterilised by autoclaving before they are discarded.

The **purpose** of this practical activity is to demonstrate the effect of fertilisers on the growth of an algal population. Here *Euglena gracilis* is used. This is a common algal species which will bloom due to the effects of eutrophication.

*Euglena gracilis* can be obtained from Sciento. [www.sciento.co.uk](http://www.sciento.co.uk)

Follow the suppliers instructions for cultivating the algae.

**Notes on the method**

* The use of conical flasks will reduce evaporation since the investigation is to proceed for several weeks.
* The amount of fertiliser used should be as recommended by the manufacturer.
* The liquid in the cuvettes used for the ‘blank’ colorimeter measurements should be retained and frozen in between weekly measurements. This is to reduce bacterial contamination which might cloud the liquids.
* The colorimeter is set at 665 nm.
* Flasks should be left close to a light source. The lamp can be turned off at night, or left on constantly.

**Materials for setting up the cultures**

***For each group of pupils***

* Measuring cylinder
* 2 x conical flasks
* Distilled water
* Baby BioTM (or other suitable liquid plant fertiliser)
* Access to a colorimeter
* 2 x cuvette
* 3 x plastic pipette
* Access to a discard jar containing VirkonTM
* Culture of *Euglena gracilis* (pre-dispensed 25 cm3)
* Control cuvette 1 – containing distilled water. Control cuvette 2 containing fertiliser solution. (These should be retained and frozen after each colorimeter reading).

**Materials for preparing the hanging drop**

Using the hanging drop method for observing the algae under the microscope avoids the use of fragile coverslips and avoids the expense of cavity slides.

See the Preparing a Hanging Drop help card.

***For each group of pupils***

* Microscope
* Two glass
* Lens tissue
* Pipette
* Blu-takTM
* Paper towels