# Mud & blood

**This short bulletin article will look at health and safety guidance relating to the culturing of soil microorganisms, and the use of human blood samples for microscopy.**

## A muddy issue

SSERC's Safety in Microbiology: A Code of Practice (CoP) for Scottish schools and colleges [1] outlines the methodology for carrying out a microbiological swab of an environmental sample (see 3.16 on page 10 of the CoP). Samples unsuitable for swabbing are stipulated, including mud, e.g. from a pond or field. Mud presents anaerobic conditions for microorganisms, potentially resulting in the growth of pathogenic organisms.

Recently, we had an enquiry about whether a practical, which involved culturing soil microbes, could be performed in secondary schools. The aim of the practical was to explore the effect of soil microbes on the degradation of different kinds of paper [2]. In the experiment, a soil sample was mixed with nutrient broth in a conical flask, to form a suspension. A small volume of this suspension was then added to a test tube with a piece of paper; the test tube was plugged with cotton wool and left at room temperature for at least a week (Figure 1).

Learners make observations about the appearance of the paper over the experimental duration, determining whether the microbial enzymes have degraded the cellulose in the paper. The hazard in this experiment is the potential to culture human pathogens and this risk is minimised by careful consideration of the soil sample. "Mud", with its high-water content and compact structure, offers anaerobic conditions and would be unacceptable to use for this experiment. Soil has a lower water content and loose structure, permitting adequate air movement to offer aerobic conditions. Soil must be obtained from a source that is free from animal grazing and thus free from contamination with animal waste. The test tubes must remain plugged with cotton wool to facilitate gas exchange and preclude contamination of the cultures by air-borne spores. The incubation must take place in a location inaccessible to students and visual observation of cultures during the incubation period must be supervised and carried out without removal of the cotton wool plug (see 3.17 CoP). At the end of the experiment, the cultures must be disposed by autoclaving to sterilise the contents (see 3.8 CoP).

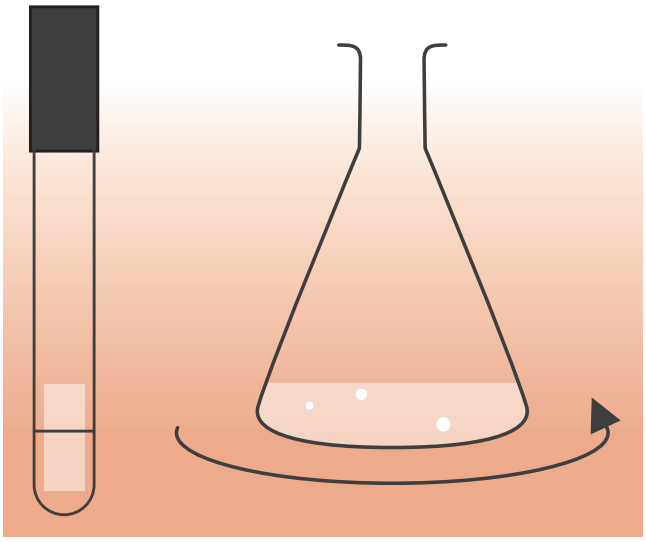

**Figure 1** - Image of the experiment, Society for General Microbiology [2].

## Bloody microscopy

The National 5 Biology course specification outlines the requirement for learners to understand osmotic effects on animal and plant cells. To support this curricular area, SSERC produced a microscopy activity to observe reversible plasmolysis of onion cells [3]. We recently received an enquiry about whether human blood could be used to observe osmotic effects on animal cells.

Taking human blood samples in schools and colleges is not banned by legislation; it is, however, possible your local authority has a local ban in place and, thus, the first step is to ascertain whether they will grant approval for blood sampling in your school. Although there is no legal requirement to obtain parental permission, it would be prudent to do so and an example permission letter has been provided by SSERC [4]. SSERC's Code of Practice, "Materials of Living Origin" [5] provides a detailed methodology on sampling blood and this must be followed. The risk with handling human blood is that microbes may be transmitted, the most significant of which include HIV and Hepatitis viruses B and C. Providing the correct sterile procedure is used (as outlined on page 20 of the CoP [5]), there is no significant risk of transmission of blood borne viruses.

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**Figure 2** - Location to insert the lancet [5].

To minimise the risks associated with blood sampling, the maturity and behaviour of learners must be carefully considered such that they can follow the sampling procedures to the letter. Learners must only handle their own blood and equipment and use the correct sterile procedures with single use disposable lancets, which reduces the risk of "needle-stick" injuries. Blood should only be taken from the side of the finger, 5-10 mm from the lower corner of the nail (Figure 2). Lancets from finger pricking devices must be disposed of in a medical sharps container, so accessibility to this and its subsequent disposal must be considered during the planning stage. Other waste is not regarded as clinical waste and can be disposed of through the normal refuse system. Used glassware etc. must be placed in a disinfectant discard jar, soaked for at least 24 hours, prior to autoclaving for reuse or disposal.

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**References**


[1] SSERC (2018), Safety in Microbiology: A Code of Practice for Scottish schools and colleges, available at https://www.sserc.org.uk/wp-content/uploads/2018/06/SSERC-Safety_in_Microbiology_Code_of_Practice.pdf.

[2] Nuffield foundation (2008), Microbes ate my homework, available from Practical Biology. Available at https://practicalbiology.org/environment/carbon-cycle/microbes-ate-my-homework?highlight=WyJzYW1wbGUiXQ==#:~:text=Microbes%20ate%20my%20homework%20Class%20practical%20Investigate%20the,waste%20and%20their%20place%20in%20the%20carbon%20cycle.

[3] SSERC (NA), Observing plasmolysis using the VehoTM VMS-001 USB Microscope, available at https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2F2g1hrx40gw3t1oo1bvqfy70u-wpengine.netdna-ssl.com%2Fwp-content%2Fuploads%2F2013%2F07%2FPlasmolysis-protocol.docx&wdOrigin=BROWSELINK.

[4] SSERC (2022), Example Parental Permission Form, available at https://sserccltd-my.sharepoint.com/:w:/g/personal/enquiries_sserc_scot/EVq0addLdfFJv_XBFJSRXocB9VCr7o53YjRrmZProLv_9g?e=8EoQZs.

[5] SSERC (2018), Materials of Living Origin – Education Uses: A Code of Practice for Scottish schools and colleges, available at https://www.sserc.org.uk/wp-content/uploads/2018/06/SSERC-Materials_of_Living_Origin_Code_of_Practice.pdf.