Society of Biology Teacher Network (Scotland)

The Society of Biology, the leading professional body for biologists in the United Kingdom, has recently launched its Teacher Network in Scotland.

The stated mission for the network is:

Building on, and supported by SYNAPSE, our mission as the Society of Biology Teacher Network in Scotland is to support the professional development of Biology teaching community colleagues by providing more opportunities for links and experiences with Higher Education and life sciences research and to act as a voice for the Biology teaching community in Scotland.

Four coordinators who will start working from February 1st 2015 have been appointed:

- Andrew Johnston
- Marjorie Smith
- Claire McCartney
- Gillian Davis

The key role of the four co-ordinators will be to help the Society sustain the Network and ensure that it is responsive to the needs of teachers. The coordinators will also support the management, and further development of, the SYNAPSE mailing list. Each co-ordinator would also take on responsibility, with the assistance of the Society, for organising one regional event/meeting per term covering an aspect of current interest to the membership in their region.

Initial enquiries can be directed to: the Director of Education and Training, Rachel Lambert-Forsyth, rachellambertforsyth@societyofbiology.org

Working

Changes to the legislation that controls the way work with DNA is regulated, and the increasing availability of DNA practical work for schools makes a review of the guidance for experimental work with DNA in schools appropriate at this time.

The relevant pieces of legislation are: *Genetically Modified Organisms (Contained Use) Regulations (2014)* [1], *Human Tissue (Scotland) Act (2006)* [2], and the *Data Protection Act (1998)* [3]. This legislation governs the release of genetically modified organisms, consent for the use of human tissue (in this case learners' own DNA) and the use of personal information. Although the prime purpose of this legislation is not to regulate practical laboratory work in schools, such work still falls under the legislation and schools must comply with it. Nor does this legislation regulate safe working with DNA in school laboratories, that is governed by the *Health and Safety etc. Act (1974)* [4] and its associated regulations. The good news in all of this is that by following the guidance for *DNA Technology* in the SSERC Code of Practice *Materials of Living Origin - Educational Use (2012)* [5], schools will be able to comply with all of the legislation mentioned above.

The genetically modified organisms regulations do not regulate the techniques of genetic modification; they regulate the use of the genetically modified organisms produced. Work with genetically modified organisms can only be carried out in premises registered with the relevant authority (typically the Health and Safety Executive) and may require a Genetic Modification Safety Committee to be set up to oversee and control the work. This would appear to put such work beyond the scope of most schools. However, genetic modification is officially defined as 'the alteration of genetic material (DNA or RNA) of an organism by means that could not occur naturally through mating and/or recombination' [1]. This allows some work with microorganisms (typically bacteria) to be exempt from these requirements. For example, the 'transformation' of *E. coli* strain K-12 with pGLO plasmid DNA may be carried out in schools. 'Self cloning' experiments where antibiotic containing plasmids are transferred between strains of *E. coli* K-12 may also be carried out in schools. In both these instances the 'transformed' or 'self cloned' bacteria must be destroyed by autoclaving after completion of the practical work. Such protocols usually

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involve the incubation of *E. coli* K-12 at 37°C, a permitted exception to the general guidance on incubation temperatures in the SSERC Code of Practice *Safety in Microbiology* [6]. When looking for kits or protocols for microbial transformation experiments it is best to avoid sources from the USA or the web which may not comply with European, UK and Scottish legislation. SSERC is happy to provide advice on such protocols.

Human DNA can be extracted from cheek cells using the sampling procedures in the SSERC Code of Practice *Materials of Living Origin - Educational Use (2012)* [5]. Human DNA, suitable for use in schools, may also be available from molecular biology and school suppliers. The Human Tissue (Scotland) Act requires that informed consent is obtained from learners where they analyse samples of their own DNA. Although DNA sequencing in schools may be some way off, the amplification of DNA fragments by PCR may well be possible. Informed consent requires that learners should understand the purpose for which the DNA is being sampled and the implications for any issues that may arise from the analysis. Such consent must be voluntary and, as with any activity that involves learners as the subject of an experiment or investigation, they must not feel under any pressure to participate. Care must be exercised that the results of any such analysis do not reveal information about family relationships or other sensitive information such as disease susceptibility or sex chromosomes. In principle this is no different from the care and sensitivity that teachers exercise in the observation of inherited traits during genetics lessons. It is a case of avoiding inadvertently carrying out genetic or phenotypic testing which may reveal such sensitive information. In practice, teachers are often expert at surrounding such work with sufficient cautionary caveats such as experimental error and unknown genetic effects to alleviate such concerns.

Image courtesy of Ponsulak at FreeDigitalPhotos.net.

Practical work with learners' own DNA may also raise data protection concerns. Activities should ensure that any personal genetic information can be kept private to the individual concerned. Where class results are collated they should be done so anonymously in a way that is not reversible. Learners should be advised of the risks of revealing personal information through, for example, social media where a third party may make use of it. Again this is an area where teachers are often skilled at avoiding the inappropriate disclosure of personal information by learners.

Good laboratory practice should be observed when working with DNA and care must be taken to ensure that hazards from electrical equipment, buffers, stains for DNA etc., are understood and the risk of harm is adequately controlled. DNA itself can generally be regarded as not constituting a hazard. However, full length viral DNA that may be infectious in its own right or DNA extracted from calf thymus (which may harbour the infectious agent for transmissible spongiform encephalopathies) must not be used. Kiwi fruit (often used as a source for extracting DNA) is a potential allergen and should be avoided where known allergies exist; onion can be a suitable alternative source of DNA.

Further more detailed advice on the health and safety of working with DNA can be found in the revised (2014) Chapter 16 of *Topics in Safety* published by ASE [7]. ◀

References

[1] Genetically Modified Organisms (Contained Use) Regulations (2014), http://www.legislation.gov.uk/uksi/2014/1663/contents/made (accessed September 2014).
[2] Human Tissue (Scotland) Act (2006), http://www.legislation.gov.uk/asp/2006/4/contents (accessed September 2014).
[3] Data Protection Act (1998), http://www.legislation.gov.uk/ukpga/1998/29/contents (accessed September 2014).
[4] Health and Safety etc. Act (1974), http://www.legislation.gov.uk/ukpga/1974/37/contents (accessed September 2014).
[5] Materials of Living Origin - Educational Use, SSERC (2012), http://www.sserc.org.uk/images/Publications/Biology/SSERC-Materials_of_Living_Origin_Code_of_Practice.pdf.
[6] Safety in Microbiology, SSERC (2012), http://www.sserc.org.uk/images/Publications/Biology/SSERC-Safety_in_Microbiology_Code_of_Practice.pdf.
[7] Topic 16: Working with DNA, Topics in Safety, ASE (2014), http://www.ncbe.reading.ac.uk/NCBE/materials/microbiology/PDF/DNASafety.pdf.