

# Title of HWBGM Guidance Note: **Safe Use of Electrophoresis Equipment**

Cross Ref. to University of Oxford Guidance Note: **S11/07**

## **Introduction**

This document, together University Guidance Note S11/07, outlines the risks associated with Electrophoresis equipment currently used within the Centre. It will then produce guidelines that must be followed by all operators to ensure safety & health of all individuals involve and compliance to this document.

## **Responsibilities**

All **Users** must ensure they are fully aware of the risks associated with working with Electrophoresis equipment & understand the appropriate actions to be taken before they start using the equipment.

**Group Heads** must ensure that appropriate supervisors are appointed to provide suitable & sufficient training.

**Electrical Safety Supervisor (Lab Support)** must ensure all electrical equipment is tested in compliance to S11/07.

**NOTE:** This guideline should be read in conjunction with the equipment's 'User Guide'.

## **Hazards & Risk Assessment**

The significant risks are from:

- Electric shock –  The effect produced on the body and particularly on the nervous system by an electrical current passing through it. The effect depends on the current strength which itself depends on the voltage and body resistance *i.e.* path length and surface resistance of skin (which is much reduced when wet). Death can be the result of the normal voltage of 230-240 V causing currents of greater than 30 mA to flow through the body for more than 40 ms. Even minor shocks can cause injury following involuntary muscle contraction.
- Burns caused by the passage of heavy currents through the body or by direct contact with an electrically heated surface.
- Explosion and fire caused by electrical sparks, short circuits or overload heating, old wiring in the presence of flammable material.
- Hazardous substances used within Gel Electrophoresis, particularly Ethidium Bromide, Acrylamide



The most likely incidents to occur are from exposure to the user of hazardous substances from spills & leakages. By following the guidelines set out below, this can be controlled so that the associate risk to the user is minimal.

In exceptional circumstances though, the most serious incident that could occur, would be electric shock. This could occur, but is only likely following incorrect usage, as safety interlocks are an absolute requirement of the University. However correct usage is paramount and strict training is required in the following procedures. Therefore once again as long as the following rules are applied then the likelihood of this happening is low and so the associate risk is minimal.

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***Do's & Don'ts***

**Oxford University Policy Requirements - Information from University Guidance Note S11/07**

**Power Packs**

- All power packs should be clearly labeled with their maximum output voltage.
- Power packs capable of operating **above** 1000 volts must incorporate a safety device, which disables the high voltage supply to the equipment when the cover of the gel apparatus is opened or removed. Such a device should, if possible, operate on the input side of the power pack.
- Power packs with a maximum output up to 1000 volts, need not be fitted with interlocks provided the apparatus to which they are connected:
  - Cannot be used without a cover in place, preventing exposure to the electrodes and buffer chambers when the supply is on.
  - Have deep insulated sockets, which engage with contact pins in the tanks and be so arranged so that the current is cut immediately the cover is removed.
- Multioutlet power packs, with an output capability of above 1000 volts, should have only one pair of active outlet sockets and any others should be blanked off. Any power packs with multiple outlets should be subject to a written risk assessment by the research supervisor concerned and passed to the Safety Officer for review.
- Power packs capable of operating above 1000 volts, should utilise 2mm shrouded type connectors on the high voltage outlets so that they cannot be connected to apparatus not designed for this range. However a given suppliers power packs, used exclusively, with the same suppliers dual molded 4mm plug connectors are regarded as satisfactory, but must be clearly labeled accordingly.

**Gel Equipment**

- Gel equipment must be used with a cover in place such that both the electrodes or buffer chambers are inaccessible and the apparatus is not useable unless the cover is in place.
- For gel equipment operating up to 1000 volts, interlocks are not required but removable covers must be fitted with deep insulated sockets which engage with contact pins in the tanks and be so arranged so that the current is cut immediately the cover is removed. The live parts of the sockets must not be inadvertently accessible. The cover must be inspected before use to ensure that there are no cracks in it.
- For gel equipment operating at 1000 volts or above, the lid should also operate an electrical safety device that disconnects the supply from the power pack when the lid is opened.
- Apparatus that is not designed for use above 1000 volts must not be fitted with leads that can be plugged into a power pack capable of delivering more than 1000 volts.
- Home-made equipment must not be used unless adapted to comply with the requirements of the university guidance note.

**High Voltage Cables**

- All connecting cables between power packs and gel equipment must be fitted with shrouded connectors so that live parts are inaccessible.
- Both the cable & connectors must be correctly rated for the maximum voltage, which the power pack can deliver.
- Cable assemblies must be regularly inspected to ensure that there is no damage to insulation and that all parts of the conductor are covered.

**In General**

Is the apparatus in good working order? If you identify any problems, then the item must either be replaced or the Electrical Safety Supervisor must be consulted.

- Check all the electrodes & electrode terminals are properly sheathed & look for signs of damage, loose connections, discolouring etc.
- Check the gel tank & lid for signs of cracks.
- If the Gel is being cast in the apparatus can the apparatus tolerate the temperature of the medium being used? In some cases this may lead to the tank splitting.

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- Ensure the connection leads are secured to the apparatus lid, such that it is not possible to operate the apparatus without the lid being in place and any part of any electrode or terminal being exposed.
- Check that all safety interlocks are in order before use.
- Check that the powerpack has been electrically tested within the last 12 months. If a label has not been affixed on the equipment stating this, then contact the Electrical Safety Supervisor before using it.

Are all the equipment & cables compatible?

- Check that all the equipment including the Powerpack, tank, lid, connection leads and connectors are all capable of withstanding the voltage and current to be used. Do you know what the equipment is rated at – If not consult the manufacturer user guides or contact the Electrical Safety Supervisor? If there is any doubt, you must not use the equipment.

Set up the equipment in a safe & stable manner:

- Position the Powerpack away from any hazard likely to affect its performance or physical well being or present a hazard to fellow lab users. Ensure that the fans of the powerpack are not blocked and that there is at least a 6cm gap around the unit.
- Ensure there is no flammable material in the near-by vicinity while the equipment is in use.
- Ensure that the On/Off switch is easily accessible & the power indicator lights are clearly seen.
- Handle the electrodes by their sheathed support – Do not pull at the cables as this is likely to damage the connections.
- Operate the apparatus in a plastic tray, which in the event of a leakage could safely contain the **entire volume** of the gel running buffer. Operate the apparatus positioned so that it presents no hazard to colleagues or anyone entering the lab.
- If High Voltage is to be used, ensure clear signs are affixed stating 'Danger-High Voltage' on both the Powerpack & the Tank.
- If High Voltage Multioutlet powerpacks are used, then ensure all unused outlets are blanked off before operating.

When operating the Electrophoresis Equipment:

- Ensure the equipment is running at the required voltage before leaving it unattended. If it is to run unattended and specifically overnight, ensure that information stating the user, time of starting/finishing, contact details, required voltage are attached and clearly visible.
- If the power output from the power supply is not running at the expected level, disconnect the supply & investigate. Do not ignore the situation.
- Make sure that any apparatus used to assist cooling, (e.g. fan or water), is fitted with a safety device to the apparatus that is capable of disconnecting the power supply output in the event of overheating due to cooling failure or apparatus malfunction.

Afterwards:

- Wash out any tanks & wipe down lids, specifically if they have been used to run solutions containing Ethidium Bromide or Polyacrylamide (unpolymerised Acrylamide is always a possibility).
- Check again that all connections & equipment are still satisfactory.
- If you need to remove the Electrophoresis Equipment from a cold room, leave it for at least 3 hours at room temperature before using it again. This will prevent any condensation build up, which could damage the components. **NOTE: Overall the use of any electrical equipment in a cold room is discouraged.**

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***Emergency Procedures***

In the event that an incident or accident related to Electrophoresis occurs:

- Turn off the electrophoresis equipment and disconnect it from the power source.
- Notify others in laboratory and evacuate accordingly.
- Notify your supervisor, H&S Officer or [lab-support@well.ox.ac.uk](mailto:lab-support@well.ox.ac.uk)
- Refer to relevant COSHH assessment for any hazardous material used.
- Refer to local Radiation Rules for any radiochemical used.

***Further Information***

If you have any difficulties while using any of the Electrophoresis within the HWBGM, then please contact [lab-support@well.ox.ac.uk](mailto:lab-support@well.ox.ac.uk) for further advice.