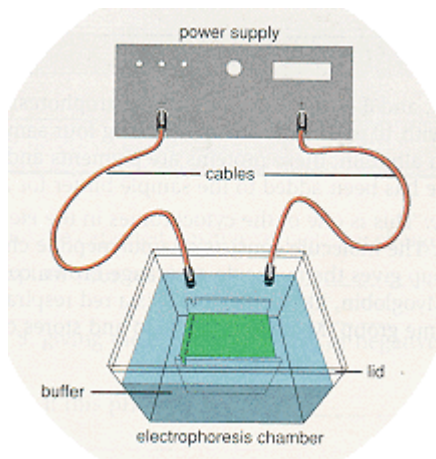


# ELECTROPHORESIS SAFETY

Electrophoresis is a commonly used laboratory technique which uses electrical energy to separate molecules such as proteins or nucleic acids by their size, structure, and electrical charge. Electrophoresis work poses potential electrical, chemical and physical safety hazards.



## ELECTRICAL SAFETY



Danger  
Electrical  
Hazard

Electrophoresis equipment can pose significant electrical hazards in the laboratory. Typical electrophoresis units operating at 100 volts can provide a lethal shock of 25 milliamps. Take the following precautions when working with electrophoresis equipment:

### Power Supplies:

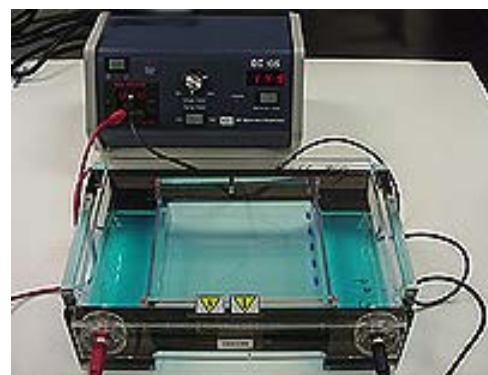
- Ensure all switches and indicators are in proper working condition and that power cords and leads are undamaged and properly insulated.
- Label equipment with the warning: "Danger Electrical Hazard."
- Connect equipment to outlets with ground fault circuit interrupters (GFCIs)
- Use 3-prong plugs.
- Use power supplies with safety features that detect issues with the electrical circuit (e.g., no-load, overload, sudden load changes, short circuits, etc.)

### Connecting Leads:

- Turn off main power supply before connecting or disconnecting electrical leads.
- With dry gloved hands, connect one lead at a time using one hand only.
- Be sure that leads/banana plugs are fully seated.

### Using Equipment:

- Don't run equipment unattended.
- Keep equipment clear of unintentional grounding points and conductors (e.g., sinks or other water sources, metal plates, jewelry, aluminum foil, pipes or other electrical/metal equipment).
- Gel chamber must have a lid or cover with safety interlocks to prevent accidental contact with energized electrodes or buffer solutions.
- Gel chamber exterior must be dry with no spilled solutions. Check the chamber for leaks.
- Switch off all power supplies and unplug the leads before opening the gel chamber lid or reaching inside the gel chamber. Do not rely on safety interlocks.



## CHEMICAL & PHYSICAL HAZARDS

**Hazardous chemicals** commonly used in conjunction with electrophoresis work include:



- Ethidium bromide – mutagen, irritant
- Acrylamide – carcinogen, neurotoxin, irritant
- Phenol – corrosive, toxic
- Chloroform – suspect carcinogen, toxic

- See SU's [Laboratory Chemical Safety Toolkit](#) for more information on working with hazardous chemicals.
- Always review the Material Safety Data Sheet prior to working with any hazardous material.

Laboratory personnel may be exposed to **thermal hazards** when heating agarose solutions.

**Ultraviolet** (UV) light boxes and handheld lamps are often used in visualizing ethidium bromide gels and pose potential exposures to UV radiation.

### CONTROLS

#### Engineering Controls/Work Practices

- Read and follow manufacturer's instructions for electrophoresis equipment.
- Prepare a Standard Operating Procedure (SOP). For guidance, see SU's Laboratory Chemical Safety Toolkit at: <http://chemtoolkit.stanford.edu/TemplateSOP>.
- Consult with PI prior to initial use of electrophoresis equipment. Discussion should include special hazards and safety precautions.
- Measure, mix, and handle all hazardous powdered chemicals or gel prep mixtures with hazardous components (e.g., acrylamide monomer, ethidium bromide, phenol, ammonium persulfate, and formaldehyde) in the fume hood.
- Purchase pre-made gels or pre-mixed acrylamide and ethidium bromide solutions instead of making your own.
- Consider using ethidium bromide substitutes (see EH&S website for more information, <http://ehs.stanford.edu>).
- Exercise caution when using a microwave to melt agarose solutions – don't use sealed containers, and beware of superheated liquids that may suddenly and unexpectedly boil. Let hot agarose solutions cool to 50°-60°C before adding ethidium bromide or pouring into trays. Wear insulated gloves and point the flask opening away from you.

#### Personal Protective Equipment

- Wear a long-sleeved lab coat, safety goggles, nitrile gloves (latex is not effective), long pants, and closed-toe shoes.
- Wear appropriate skin and eye protection when working with UV radiation.

### EMERGENCY PROCEDURES AND WASTE MANAGEMENT

- See SU's Chemical Safety Toolkit (<http://chemtoolkit.stanford.edu>) for guidance on cleaning chemical spills or responding to chemical exposures.
- Hazardous Waste Management: Dispose of chemicals and gels as hazardous waste. Collect in a non-leaking container labeled with a hazardous waste tag. Create waste tags using the online system at <http://wastetag.stanford.edu>
- Non Hazardous Waste Management: Some gels may be considered non-hazardous and may be treated as such. For example, ethidium bromide <0.4 wt% in non-polyacrylamide gel is considered non-hazardous waste and can be placed into a closed bag, then into trash. For more information, consult the SU Non-hazardous Waste List: (<http://www.stanford.edu/dept/EHS/prod/enviro/waste/nohaz.html>)



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