

# ELECTROPHORESIS SAFETY

Electrophoresis, a technique which uses electrical energy to separate molecules such as proteins or nucleic acids by their size, structure and electrical charge, is frequently used in laboratories.

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 millamps. Take the following precautions:

### Power Supplies:

- Inspect to ensure all switches and indicators are in proper working condition and that power cords and leads are undamaged and properly insulated.
- Label equipment with warning: "Danger Electrical Hazard."
- Connect to ground fault circuit interrupters (GFCIs)
- Use 3-prong plugs.
- Use power supplies with safety features that detect no-load, overload, sudden load change, short circuit, arc or ground leak, etc.

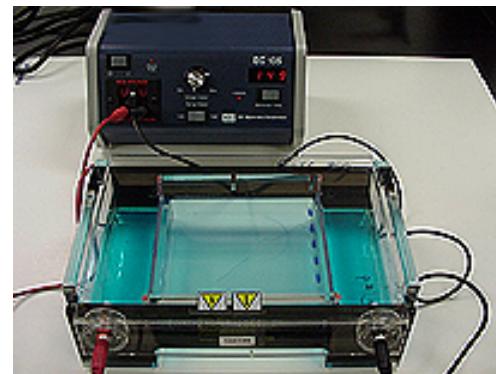
### Connecting Leads:

- 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 for leaks.

- Switch off all power and unplug the leads before opening the gel chamber lid or reaching inside the gel chamber. Don't 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 at (<http://chemtoolkit.stanford.edu/lcss/lcss.html>) for more information on signs/symptoms/health effects for specific chemicals.
- Always review the Material Safety Data Sheet prior to working with any hazardous material.

Laboratory personnel may be exposed to **thermal hazards** posed by liquefied gels.

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

## CONTROLS

## EMERGENCY PROCEDURES AND WASTE MANAGEMENT

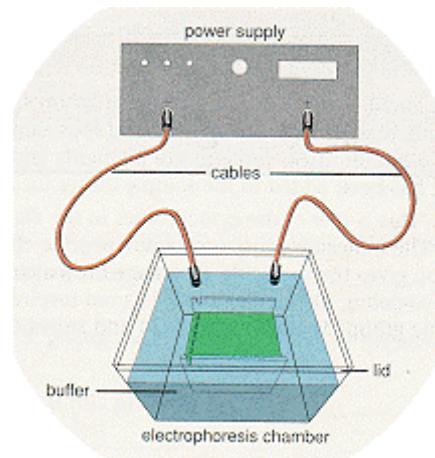
Engineering Controls/Work Practices

- Read and follow manufacturer's instructions for electrophoresis equipment.
- Prepare Standard Operating Procedure relevant to health and safety. 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://www.stanford.edu/dept/EHS/prod/index.html>).
- Exercise caution when using microwave to liquefy gels – don't use sealed containers, beware of superheated liquids that may froth up unexpectedly. Let hot gel preps 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 lab coat with fully extended sleeves, splash goggles, nitrile gloves (latex is not effective), pants, and closed-toe shoes.
- Wear appropriate skin and eye protection for UV radiation work.

- See SU's Chemical Safety Toolkit (<http://chemtoolkit.stanford.edu>) for guidance on emergency spills or exposures.
- Hazardous Waste Management: Dispose of chemicals and gels as hazardous waste. Collect in non-leaking container with a hazardous waste tag.
- 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. Consult the Nonhazardous Waste List: (<http://www.stanford.edu/dept/EHS/prod/enviro/waste/nohaz.html>)



Environmental Health and Safety  
480 Oak Road  
Stanford, CA 94305-8007  
Phone (650) 723-0448  
Fax (650) 725-3468