

Electrophoresis Standard Operating Procedure

Revision: September 12, 2022

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This standard operating procedure (SOP) outlines the process of electrophoresis, including the use of equipment and chemicals necessary for the process. Review this document and supply the information required in order to make it specific to your laboratory. In accordance with this document, laboratories should use appropriate controls, personal protective equipment, and disposal techniques when performing electrophoresis. All laboratory workers must read and understand the [Laboratory Emergencies SOP](#) prior to commencing any work in a laboratory.

Description [Provide additional information as it pertains to your research protocol]

Electrophoresis uses electrical energy to separate molecules based on their size, structure, and electrical charge.

Process [Write the steps for using the chemical in your research protocol]

Potential Hazards [Provide additional information as it pertains to your research protocol]

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:

- **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 (GFCI).
 - 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 the 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 chambers 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.
- 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

Always review the 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.

Engineering and Work Practice Controls [Provide additional information as it pertains to your research protocol]

- Read and follow manufacturer's instructions for electrophoresis equipment.
- Prepare Standard Operating Procedure relevant to health and safety.
- Consult with the Lab Director 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 a fume hood.
- Purchase pre-made gels or pre-mixed acrylamide and ethidium bromide solutions instead of making your own.
- Due to the potential health risks of working with ethidium bromide, EHS strongly encourages researchers to consider alternative nucleic acid stains whenever possible. Products such as SYBR Safe, GelRed, GelGreen, and EZ-Vision are examples of safer, less-toxic alternatives to EtBr. These alternatives may still be hazardous, but with less toxic consequences. Always refer to Safety Data Sheets and SOPs for best work practices.
- Exercise caution when using a 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 stain or pouring into trays. Wear insulated gloves and point the flask opening away from you.

Personal Protective Equipment [Provide additional information as it pertains to your research protocol]

- Wear lab coat with fully extended sleeves, safety glasses or splash goggles if appropriate, nitrile gloves (latex is not effective), pants, and closed-toe shoes.
- Wear appropriate skin and eye protection for UV radiation work.



Waste Disposal [Provide additional information as it pertains to your research protocol]

- **Hazardous Waste Management**— Handle and store hazardous waste following the guidelines above for work practice controls, transportation and storage. Contact Environment, Health & Safety (EHS) Hazardous Materials Management (HMM) at 734-763-4568 with questions and to schedule a pickup of hazardous waste. Also, refer to the EHS [Hazardous Waste Web page](#) for more information.
- **Non-Hazardous Waste Management**— Some gels may be considered non-hazardous but still present a health hazard if untreated or discarded into the normal trash. Contact HMM for proper collection and disposal.

Training of Personnel

All personnel shall read and fully adhere to this SOP when performing electrophoresis.



Certification

I have read and understand the above SOP. I have received approval from my Lab Director to perform this procedure. I agree to contact my Lab Director if I plan to modify this procedure.

Name	Signature	UMID #	Date

Laboratory Director

Revision Date



Revision History (Do not print as part of SOP)

09/08/2022	Partial Revision	Reviewed and updated. Removed emergency spill procedure, emergency reporting, and exposure/unintended contact, updated broken hyperlinks, added EtBr alternative information (SW/BR)
03/04/2019	Annual Revision	
09/14/2018	Annual Revision	EHS name and logo were added, updated the formatting, and revised the content under Exposure/Unintended Content (AKJ).