

ELECTROPHORESIS SAFETY

Introduction

Electrophoresis apparatus are commonly found in many laboratories, but it is important to use them safely as they are a potential electrical shock hazard. These apparatus do not need to be operating at the high voltages required for DNA sequencing gels to present an electrical shock hazard. Even protein gel electrophoresis operating at 100 volts or less can cause a lethal shock at a current of 25 milliamps. Precautions for safely operating electrophoresis apparatus to prevent electrical shock during use are described below.

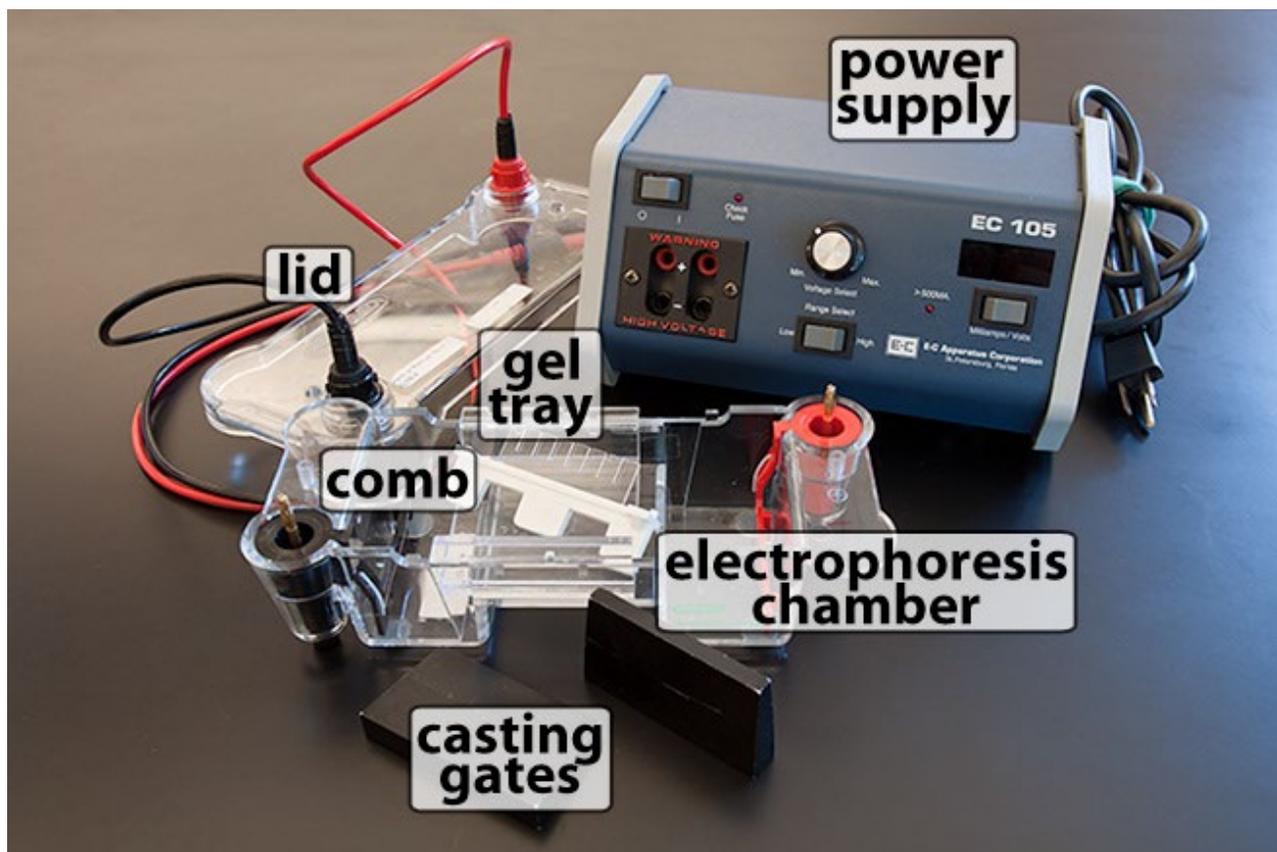


Figure 1 Components of the electrophoresis apparatus¹

¹ Photo from <https://brianmccauley.net/bio-6b/6b-lab/electrophoresis/dna-electrophoresis>



General Precautions

- When locating, or working around or near an electrophoresis system, avoid unintentional grounding points and conductors (e.g., sinks and other water sources, metal plates, aluminum foil, jewelry, pipes, or other metal equipment). If a darkened box is needed for light sensitive work, a black photographer's cloth will work as long as it does not come in contact with the buffer. Non-conducting benches (wood or plastic) and floors (and/or rubber mats) are recommended.
- Always think and look before touching any part of the apparatus. A thin film of moisture can act as a good conductor of electricity.
- Some power supplies produce high voltage surges when they are first turned on, even if the voltage is set to zero. Do not ignore safety rules just because the voltage is low. Changes in load, equipment failure, or power surges could raise the voltage at any time.
- Do not touch any cooling apparatus connected to a gel. The current can be conducted through the tubing.
- Do not run electrophoresis equipment unattended.
- If electrophoresis buffer is spilled or leaks from the chamber, stop the run and clean up the bench top immediately..
- Do not underestimate the hazards of any chemicals/gels used with the electrophoresis chamber. Read all applicable Safety Data Sheets.

Equipment Placement

- Locate the equipment where it will not be easy to knock over or trip on.
- Place the electrophoresis chamber and its power supply so that the on/off switch is easy to reach and the power-indicator light is easily seen.
- Always maintain adequate clearance around the chamber and power supply. Do not permit leads to dangle below the lab bench. At the lab bench, position the power supply so that it is not necessary to reach across the chamber to make connections to turn the power on or off. Whenever possible, set the power supply on a shelf above the chamber. Good housekeeping is essential.

Pre-Operation

- Test the power supply to ensure that all switches, lights, and the floating output circuit is functioning properly. Record the inspection date and test for open circuit and GFI protection, if the power supply has this feature.
- Inspect insulation on the voltage leads for signs of deterioration (e.g., exposed wires, cracks or breaks, etc.) and ensure that these items are not hanging over the benchtop.
- Check all safety interlock features, including alarms, for proper functioning. Don't override safety devices.
- Inspect the electrophoresis chamber for cracks or leaks, exposed connectors, or missing covers, and correct deficiencies prior to use.
- Connect both supply leads to the chamber before turning on the power supply



- Ensure that your gloved hands are dry while connecting the leads or touching any electrical apparatus.

Post-Operation

- Turn off the power supply before opening the lid of the chamber. Do not rely on safety interlocks, as they can fail.
- The user should always turn off the main power supply switch and wait 15 seconds (the voltage may not be completely discharged from internal capacitors) before making any disconnection or connections. After use, turn the power supply off before disconnecting both leads from the power supply.

Training and Personal Protective Equipment

- Principal Investigators or Lab Managers are responsible for providing instruction and demonstrating safe use of electrophoresis units to laboratory workers. Instruction should cover operating procedures written by the manufacturer and/or laboratory, as well as the associated hazards, the correct personal protective equipment, and applicable emergency procedures.
- Special personal protective equipment beyond standard lab attire (lab coat, gloves, and eye protection) is not required to operate an electrophoresis apparatus.

References: Information contained in this SOP was gathered from the following sources: University of California-Berkeley, University of Vermont, and the University of California-Santa Cruz.