Ethidium Bromide

Standard Operating Procedure

Revision Date: 12/20/23

This standard operating procedure (SOP) outlines the handling and use of Ethidium Bromide (EtBr). 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 handling EtBr. All laboratory workers must read and understand the [*Laboratory Emergencies SOP*](https://ehs.umich.edu/wp-content/uploads/2022/05/LaboratoryEmergencyProceduresSOP.docx) prior to commencing any work in a laboratory.

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

Ethidium bromide (EtBr) intercalates double-stranded DNA and RNA and acts as a frameshift mutagen. It is also used as a fluorescent label for DNA and as a nucleic acid stain. It can also be used in conjunction with acridine orange to differentiate between viable, apoptotic and necrotic cells.

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

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

* EtBr is an odorless solid that is irritating to the eyes, skin, mucous membranes and upper respiratory tract.
* EtBr is a potent mutagen and should be treated as a possible reproductive hazard and carcinogen.
* Consult the SDS and [Laboratory Chemical Safety Summary for Ethidium Bromide](http://www.nap.edu/openbook.php?record_id=4911&page=310) in *Prudent Practices in the Laboratory* (National Academies Press).

# Engineering Controls [Provide additional information as it pertains to your research protocol]

Due to the potential health risks of working with EtBr, EHS strongly encourages researchers to consider alternative nucleic acid stains whenever possible. Products such as SYBR Safe, GelRed, GelGreen, EZ-Vision and EvaGreen 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.

Stock solutions of EtBr should be prepared in a chemical fume hood. If aerosols may be produced (dust or liquid mist), EtBr must be handled in a chemical fume hood, exhausted biological safety cabinet with negative pressure ductwork, or other exhausted enclosure. Aerosols may be produced during any open handling of dry powder, and during open or pressurized manipulations of solutions.

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

* Set up a designated area for work with Ethidium Bromide, and label it with the following wording: “Ethidium Bromide in use. Mutagen and Irritant.”
* Line the work area with a disposable plastic-backed absorbent pad.
* Keep containers closed as much as possible.
* If weighing dry powders and the balance cannot be located in a fume hood or BSC, tare a container then add the material to the container in a hood and seal the container before returning to the balance to weigh the powder.
* Change gloves regularly (at least every two hours) and wash hands at the time of the glove change. No skin contact is permitted.

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

* Standard nitrile laboratory gloves and a fully buttoned lab coat with sleeves extending to the wrists should be worn when handling EtBr (powder and solutions).
* If splashes may occur, wear goggles and a face shield. Otherwise, wear standard laboratory safety glasses.
* When using a UV light to visualize EtBr contamination, wear UV-blocking eyewear or work behind a UV shielding glass. (Most standard safety glasses will block UV, but employees should check the approval of their safety glasses.)
* In cases where the arms or torso may be exposed to liquid suspensions or dry particles, wear Tyvek sleeves and/or gowns (or other air-tight non-woven textile).

# Transportation and Storage [Provide additional information as it pertains to your research protocol]

* EtBr powder and solutions should be in tightly closed, shatter-resistant containers during transportation and storage. Secondary containment is advised.
* It should be stored away from strong oxidizing agents in a cool, dry place.

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

EtBr (or an alternative) waste in concentrated or solid form is collected as chemical waste and must not be flushed down the drain or disposed of in the trash. Waste must be properly labeled and handled.

Contact EHS Hazardous Materials Management (EHS-HMM) at (734) 763-4568 for waste containers, labels, manifests, waste collection and for any questions regarding proper waste disposal. Also refer to the EHS [Hazardous Waste](http://ehs.umich.edu/haz-waste/) Web page for more information.

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| type of Etbr Waste | Instructions for disposal |
| Liquids | Non-aqueous solutions and solutions containing EtBr concentration will be picked up by EHS-HMM.  EHS-HMM provides the following supplies:   * 1-gallon or 5-gallon pails for solid waste and gels * 1-gallon glass jugs for liquid waste * Smaller waste containers. |
| Contaminated sharps (needles, syringes, slides, broken glass, etc.) | 1. Discard in an infectious waste sharps container. Affix a properly completed chemical waste label. 2. Contact EHS-HMM for pickup of the sharps container as infectious waste when it is 2/3 to 3/4 full. |
| Solids (contaminated gloves, centrifuge tubes, towels, etc.) | Store in a properly labeled 1-gallon or 5-gallon pail for disposal as chemical waste.  Do not use glass containers. |
| Gels | Gels should be disposed of as contaminated solids described above. |

# Training of Personnel

All personnel are required to complete the ***General Laboratory Safety Training*** session (**BLS025w** *or equivalent*) via the [EHS My LINC](https://ehs.umich.edu/safety-training/) Web page.

Furthermore, all personnel shall read and fully adhere to this SOP.

# Certification

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

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| Laboratory Director | Revision Date |

### Major Revisions (Tracking purposes only -- Do not print as part of SOP)

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| Date | Revision |
| 9-21-18 | Updated EHS name and logo and format and revised the Exposure/unintended contact section (AKJ) |
| 03-04-19 | Reviewed and updated. |
| 05-18-20 | Updated editing rights to headings (RSH) |
| 05-25-22 | Updated waste disposal instructions. Removed generic “Exposures/Unintended Contact” and “Emergency Reporting” sections. Refer to lab specific emergency response procedures SOP. (LGS) |
| 12-20-23 | Added another EtBr alternative and updated links. (BR) |

**References**

National Academies of Sciences, Engineering, and Medicine. 1995. Prudent Practices in the Laboratory: Handling and Disposal of Chemicals. Washington, DC: The National Academies Press. https://doi.org/10.17226/4911.