****Ethidium bromide ****

# Introduction

Ethidium Bromide (EtBr) is an odorless chemical with dark red color and is available to purchase in the form of a solid (powder) or a solution. This chemical has the ability to intercalate with double stranded nucleic acids and to fluoresces a red-orange color under ultraviolet (UV) light. The fluorescence of EtBr under the UV light intensifies upon binding to the nucleic acids. Thus EtBr is commonly used as a stain for the visualization of nucleic acids in agarose gels. It is widely used by scientists due to its high sensitivity, rapid staining and very inexpensive price. Although it is an effective tool, its hazardous properties require safe handling and disposal procedures.

Note: *This fact sheet is not intended to replace the Safety Data Sheet provided by the manufacturer.*

# Hazards

* + EtBr is an acute toxin (Inhalation and oral) and strong mutagen requiring special precautions to protect against exposure.
	+ EtBr is not easily decontaminated from surfaces. Areas where EtBr is used should be treated as hazardous, even when not actively in use.1
	+ UV visualization of EtBr stained gels requires added caution. Work without proper skin and eye protection may result in exposure to UV radiation, which causes damage to the skin and to the cornea of the eyes with exposures as brief as three seconds in duration.

# Best practices

* Locations where EtBr is used must be demarcated and identified as EtBr work area.
* Always wear a lab coat, closed toed shoes, eye protection, and gloves when handling EtBr or anything with EtBr on it.
* When visualizing gels stained with EtBr using an UV light source, keep the UV box protective cover in place and wear an UV protective face shield.
* To minimize inhalation exposure with EtBr solids, purchase ready-made liquid stock solutions.
* Perform procedures using EtBr powder or those with the potential to generate aerosols inside a chemical fume hood.
* Allow agarose gel preparations to cool to just before solidification before adding EtBr to minimize aerosols.
* DO NOT heat anything containing EtBr in the microwave.
* DO NOT autoclave any material contaminated with EtBr.
* Transport solutions of EtBr in secondary containers to prevent accidental spill.

# Disposal1

* EtBr liquid waste (including running buffers) must be collected as hazardous waste and cannot be treated in any way in an attempt to make it non-hazardous. Contact [OEHS](https://research.wayne.edu/oehs/hazardous/chemical-waste) for disposal.
* EtBr solid waste and contaminated debris, (gels, gloves, bench paper and other non-labware items) must be collected as hazardous waste in lined pails to be disposed of by [OEHS](https://research.wayne.edu/oehs/hazardous/chemical-waste).
* DO NOT use hypochlorite (bleach) to treat ethidium bromide. Bleach treatment can produce mutagenic products and leave behind up to 20% of the original ethidium bromide.

# Alternatives2,3

* Alternative nucleic acid stains are available, such as SYBR Green I and Nancy-520. These are less hazardous than EtBr. However, due to their high affinity binding to nucleic acids and the associated hazardous chemical properties (e.g. mutagenic, carcinogenic and acute toxicity), alternative nucleic acid stains should still be handled as hazardous chemicals.
* In addition, alternatives are typically supplied in dimethyl sulfoxide (DMSO), a chemical which easily absorbs through the skin, pulling along any toxic substances (from the stains) mixed with it. Refer to DMSO SDS to understand safety concerns.
* Disposal of alternatives may still require collection by OEHS.

# Exposure Response & Contacts

* **Contact with eyes:** immediately flush with copious amount of cold water for at least 15 minutes
* **Skin contact:** immediately wash the affected area with copious amounts of cool water.
* **Principal Investigator (PI):** *(Add relevant phone number)*
* **WSU Public Safety:** 313-577-2222, emergency transportation
* **Henry Ford Occupational Health – Harbortown**

3300 East Jefferson, Suite 100

Detroit MI 48207

(313) 656-1618

Monday – Friday 8:00 AM to 6:30 PM

* **Detroit Receiving Hospital - Emergency Room:** 313-745-3355

**Henry Ford Hospital – Emergency Room**: 313-916-8742

Available outside of occupational health clinic hours

* **Office of Environmental Health and Safety:** 313-577-1200, spills or clean-up

# References

1. Lunn, G., & Sansone, E. (1987, May). Ethidium bromide: destruction and decontamination of solutions. Analytical Biochemistry, 162(1), 453-8.
2. CCRIS 8512 - SYBR Green I. (2018). [from PubChem](https://pubchem.ncbi.nlm.nih.gov/compound/56841760)
3. nucleic acid gel stains. (2019). [from Millipore Sigma](https://www.sigmaaldrich.com/catalog/search?term=nucleic+acid+stains&interface=All&N=0&mode=match%20partialmax&lang=en&region=US&focus=product)