

### SAFETY PRECAUTIONS

The following control measures MUST be adhered to:

- Ensure that staff/students using EtBr are trained in its safe use by an experienced person.
- Ensure that each procedure that involves the use of EtBr has its own Safe Operating Procedure incorporating information from this sheet.

### MSDS INFORMATION

1. EtBr is a hazardous substance & dangerous goods (6.1 toxic) by NOHSC and ADG criteria/code
2. Risk Phrase Very Toxic by Inhalation: i.e. LC50, inhalation, rat <0.25 mg/L hr
3. Risk Phrase: Harmful if swallowed: i.e. LD50, oral, rat 200 <LD50 <2,000 mg/kg
4. Risk Phrase: May cause heritable genetic damage i.e. it is a category 1 or 2 mutagen
5. Risk Phrase: Cumulative effects may result following exposure (limited evidence)
6. Risk Phrase: Limited Evidence of a Carcinogenic Effect : i.e. it is a Category 3 carcinogen
7. Risk Phrase: May be harmful to the foetus/embryo (limited evidence)
8. Risk Phrase: Toxic to aquatic organisms: important in disposal.

This information, interpreted as the worst possible case, shows: EtBr is very toxic if inhaled; mildly toxic if swallowed; is a powerful mutagen; is a category 3 carcinogen; it may be absorbed through the skin; may be a cumulative toxin; may be teratogenic. Sound safety practice assumes the worst; you must assume the carcinogenic, teratogenic & skin contact hazards are as proven as the toxic and mutogenic properties. Without safety controls the risk levels are:

- Ethidium Bromide Powder: Very High
- Ethidium Bromide solution >1% (w/w): High
- Ethidium Bromide Solution > 0.1% < 1% (w/w): Medium
- Ethidium Bromide Solution < 0.1% (w/w): Medium (For environmental i.e. disposal reasons)

### CONTROL INFORMATION

The safety control strategy is: to deal with the powder situations and avoid body contact with the liquid; ingestion of the liquid can be discounted.

1. **Elimination:** Some DNA stain must be used. But by buying the ethidium bromide in solution part of the powder problem can be eliminated
2. **Substitution:** Gel red and EzVision are claimed to be a safer alternatives and if it is appropriate to your work use it (Note: Gel red and EzVision are a new substances and their safety characteristics are yet to be fully explained)
3. **Isolation:** Need to manipulate the gel eliminates this control
4. **Mechanical:** A fume hood must be used to weigh out the powder
5. **Management:** Experience shows that spillage of EtBr solution and cross contamination, from PPE (mostly gloves) while handling the gel is a major problem. The solution dries out leaving contamination with EtBr powder. Every effort must be made to design the DNA staining and documentation processes to avoid possibility of this happening.
6. **Personal Protective Equipment:** When handling EtBr gloves, lab coat and eye cover will be worn. (This is not a licence to contaminate equipment and work surfaces because you are protected) Any spill must be cleaned immediately

### DISPOSAL

Ethidium Bromide is harmful to the aquatic environment so it is best to remove it from solutions. Any solution of <0.1% w/w can be washed down the sink with sufficient rinsing.

Use the School's Chemical Waste Disposal system to dispose of any Ethidium Bromide Waste.

**Note: EtBr solid solution or waste is never autoclaved.**

Gels, gloves, pipette tips and other solids contaminated with EtBr should be securely wrapped and sent for incineration i.e. in a "yellow" bin.

### **ETHIDIUM BROMIDE SOLUTIONS**

The easiest method of decontamination is to absorb the EtBr onto activated charcoal. This can be done in a couple of ways:

1. Add 3 grams of powdered activated charcoal to 1 litre of EtBr liquid waste (Concentration should be no greater than 10 mg/L).  
Leave to stir overnight then filter the solution. The activated charcoal and filter are then sent to be incinerated, and the liquid is safe to be poured down the sink.
2. Alternately, Bio-101 produces 'tea-bags' of activated charcoal, called the Ethidium Bromide 'Green Bag' Disposal Kit (supplied by Integrated Sciences, catalogue number 2350-200). The kit contains 50 bags, each one filters 10 mg of EtBr, and will be enough to satisfy the requirements of most laboratories for a year.

Each of these methods can be checked for satisfactory decontamination of the solution by adding some DNA, waiting 15 minutes then checking for fluorescence under a UV light. If fluorescence occurs the solution requires further decontamination.

### **SPILLS**

To clean up a spill of EtBr follow these steps:

#### **Solution:**

1. Absorb the majority of the liquid with paper towel.
2. Wet the surface with ethanol (ethanol dissolves EtBr), after ensuring no ignition sources are present.
3. Sprinkle activated charcoal on the wet surface.
4. Wipe up the paste with paper towel, place in a plastic bag and dispose of to incineration.

#### **Solid:**

1. Wear a dust-mask
2. Carefully pickup all visible chemical using a dampened cloth
3. Wipe all surfaces with an ethanol dampened cloth
4. Check that all EtBr has been removed using a UV lamp
5. Place contaminated clothes in a plastic bag and put in a yellow bin for incineration

### **USE OF BLEACH**

It has been practice to inactivate EtBr solutions by treatment with bleach. This method is not recommended as it can result in incomplete destruction of the mutagenic properties of the EtBr, and potentially produces more mutagenic compounds. There has also been one report of an explosion occurring after inactivation with bleach was carried out in a Winchester bottle containing acid residue. The lid was closed on the bottle overnight and chlorine gas built up pressure, which caused the bottle to explode. For these reasons, inactivation using bleach is not considered to be an acceptable procedure.

### **PREGNANCY**

As with all teratogenic or suspect teratogenic substances: use by pregnant persons warrants careful consideration.