

# LESSONS LEARNED: CHEMICAL INCOMPATIBILITY

## LESSON 1: BLEACH INCOMPATIBILITY

Bleach can be incompatible with reagent kits and certain buffers. See OESO's [bleach guideline](#) for incompatibility information.

A recent lab injury at Duke involved a plasmid prep lysis buffer reagent. The buffer was accidentally added to bleach. The buffer contained guanidine hydrochloride, which is incompatible with bleach. The lab worker inhaled an irritating gas containing chlorine.



Image from [www.biomall.in](http://www.biomall.in)

## LESSON 2: NITRIC ACID INCOMPATIBILITY

Nitric acid is an oxidizer as referenced in this [guideline](#). It reacts violently with organic solvents. The incidents described here could have been avoided by reviewing the SDSs of the two chemicals, clearly labeling waste, and keeping these wastes separate from nitric acid.

At Boise State University, nitric acid waste and isopropyl alcohol were poured into a single bottle. The bottle was capped and the container pressurized and exploded. Three students were splashed and had to be decontaminated in the emergency showers. Thirteen more students were exposed to the vapor that filled the room.

### Nitric Acid, 70%



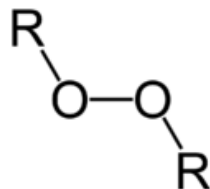
**Danger**

At the University of Utah, a laboratory employee mistook a bottle of nitric acid for a waste collection vessel and poured in ~24 ml ether, then replaced the lid. The vessel exploded, causing burn injuries to two students in the laboratory.

## LESSON 3: PEROXIDE FORMATION

Many chemicals can form explosive organic peroxides as referenced in [this guideline](#). Organic peroxide crystals are explosive and sensitive to shock, friction, heat and/or light. Test for peroxides or submit a chemical waste pickup request for organic peroxide formers within a year.

At the University of Nebraska, a graduate student tried to recycle tetrahydrofuran. It was unclear whether any stabilizer remained in the solvent. Distillation took place under air, which favors peroxide formation. The use of peroxidized tetrahydrofuran in the distillation process caused an explosion. The graduate student sustained severe lacerations.



Organic peroxide structure from Wikipedia

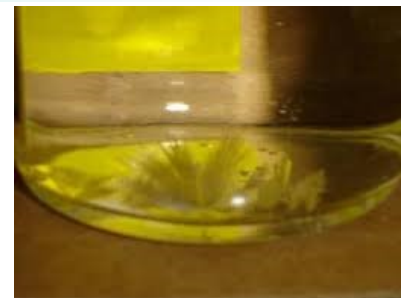


Image: UCSC Lab Safety Manual

## BEFORE DECONTAMINATING WITH BLEACH

- Review any compounds in buffers that are incompatible with bleach. See [Bleach Incompatibility Information and Safety Guidelines](#).
- Chemical decontamination with bleach is also a treatment option for liquid biological waste. Refer to the [Biohazard Waste Management](#) section of the Laboratory Safety Manual.
- **Do not mix bleach with ethanol or other incompatible cleaners.** These combinations could produce chloroform, chloramines, or other toxic chlorine-containing compounds.

## BEFORE A PLANNED CHEMICAL REACTION



- Research the chemicals to be used in your reaction for any incompatibilities:
  - Section 10.5 of a safety data sheet contains known incompatible materials for the chemical.
  - Review the Lab Chemical Safety Summary in [PubChem](#).
- Review any lab-specific and generic SOPs for chemicals you are using.
- Search the reaction to know what to expect:
  - What is the heat for the intended reaction?
  - How does the rate of the reaction increase with temperature?
  - What are the intended products?
  - Might there be unintended byproducts?
- Evaluate risk, both low and high probability.
- Eliminate/Minimize hazards:
  - Substitute less dangerous chemicals where possible.
  - Minimize the quantity of hazardous materials used.
- Plan your waste disposal strategy. See the lab-specific chemical hygiene plan, Lab Chemical Waste Management Practice, Drain Disposal Practice, and SDSs. **DO NOT MIX** incompatible chemicals in a waste container (e.g., nitric acid with organics)!!!
- Take your required safety training online.
- Store chemicals properly so they are in good condition for your experiment.

## DURING YOUR REACTION

- Don't work alone.
- Wear all recommended Personal Protective Equipment.
- Focus on your reaction and stay in the vicinity.

## FOR INCIDENTS OR EXPOSURES

- Never try to cap a runaway reaction. This could pressurize the vessel and cause an explosion.
- If the experiment is out of control, evacuate and follow the instructions on the Emergency Response Flip Chart or on the [emergency response & incident reporting website](#).
- If you have been exposed to a hazardous chemical, report it even if you don't have any symptoms. Some symptoms may be delayed.

Laboratory Emergency Response & Incident Reporting Guide	
Occupational & Environmental Safety Office State University Health System www.safety.stateu.edu	
Quick Reference	
Biohazard Flare (red)	915
Chemical spill (red)	919-654-6115
Fire (red)	915
Gas leak (red)	915
Medical Emergency (red)	911
Personnel Injury (red)	919-654-2444
Personnel Safety (red)	919-654-2130
Personnel Training (red)	919-654-2130
Personnel Management (red)	919-654-2130
Personnel Compensation (red)	919-654-2130
Personnel Health (red)	919-654-2130
Personnel Safety (red)	919-654-2130
Personnel Security (red)	919-654-2130
Personnel Utilities (red)	919-654-2130

**EMERGENCY 911**

**BIOLOGICAL**  
**CHEMICAL**  
**FIRE - CODE RED**  
**PERSONAL INJURY**  
**RADIOLOGICAL**  
**SAFETY / SECURITY**  
**UTILITIES**