UC Irvine
Environmental Health & Safety

Lessons Learned:
Decontamination with Bleach
December 2025

What Happened?

A graduate student researcher prepared a 10× buffer stock solution for use as a nutritional supplement in 2xYT and agar plates when growing E.coli. The 10× buffer is concentrated and contains various salts including ammonium chloride, calcium chloride, ferric citrate, and uracil, as primary ingredients. About a week after preparing the stock solution, the researcher observed what they thought was microbial contamination and decontaminated it. They added 10% bleach v/v to the flask and observed rapid bubbling and foaming within the mixture. They recognized that this was an unexpected reaction and immediately moved the flask into a nearby fume hood. The flask was left in the fume hood overnight to ensure that the reaction was completed. The following day, the researcher ensured that all bubbling had ceased, diluted further with water, then disposed of the mixture as hazardous waste. No injuries occurred and the area was cleaned and decontaminated. The direct cause was bleach reacting with the high concentration of ammonium chloride and other salts present in the buffer solution to produce toxic chloramine and chlorine gas.

Root Cause:

The chemical composition and reactivity of the stock solution were not fully evaluated prior to adding bleach, and no solution-specific standard operating procedure or documented training was in place to guide this decision.

This underscores the importance of reviewing the core chemistry of buffers before introducing oxidizing agents, like bleach.

Primary factors that contributed to the incident:

The stock solution was prepared at a 10× concentration intended solely for later dilution prior to use. At this concentration, the solution does not represent optimal growth conditions, making microbial contamination unlikely, while salt precipitation is commonly expected. Contamination was presumed and a routine chemical disinfection approach was applied without confirming contamination.

What steps can be taken to prevent this type of incident from occurring again?

- Fully understand the chemical properties of prepared solutions; in this case, recognizing that concentrated stock solutions can precipitate and appear cloudy may have prevented unnecessary disinfection.
- Verify contamination using appropriate scientific methods (e.g., microscopy) prior to decontamination.
- Ensure hazards are identified and mitigated by performing a risk assessment for all materials and procedures, including effects of heating, handling, and potential byproduct formation.
- Discuss concerns and procedural changes with your PI and Lab Manager before experiments are started.
- Consult with EHS Biosafety (biosafety@uci.edu) when developing/adjusting procedures that involve mixing chemicals with biological materials and the need for decontamination.

For more information or assistance, please contact EHS at (949) 824-6200 or at safety@uci.edu.