



Formalin Recovery in Health Care Labs

Minnesota Technical Assistance Program ■ FACT SHEET

Formalin; a mixture of formaldehyde, methanol and water; is used as a fixative to preserve tissue samples in health care laboratories. It is typically diluted with water to 10 percent.

Recovering formalin by either distilling or filtering helps histology laboratories:

- Reduce costs by decreasing the volume of formalin purchased
- Improve employee safety by reducing the volume of hazardous materials inventory and the risk of exposure and spills
- Reduce regulatory compliance burden

Minimizing formalin waste helps facilities meet the Hospitals for a Healthy Environment (H2E) goal of reducing the volume of waste at health care facilities 50 percent by 2010. H2E is a joint project of the American Hospital Association, the U.S. Environmental Protection Agency, Health Care Without Harm and the American Nurses Association.

Health Issues

Low to moderate exposure to formaldehyde can irritate the eyes, nose, mouth, throat and skin, and cause headaches. Formaldehyde may be carcinogenic, and toxic or fatal to humans at high concentrations.

For occupational exposure to airborne concentrations of formaldehyde, the U.S. Occupational Safety and Health Administration (OSHA) regulates the permissible exposure limit—0.75 ppm as an 8-hour time weighted average (TWA).

Formalin Waste

Formalin waste is toxic due to the presence of formaldehyde and methanol. When poured down the drain, it kills some of the biological organisms used for sewage treatment.

Although formalin waste can generally be disposed into the sanitary sewer once tissue samples have been removed (check with your sewer authority), some municipalities have talked about banning the practice.

Formalin Recovery

Formalin recovery is becoming more common in health care facilities. Many hospitals are already recycling ethyl alcohol and xylene, also used to prepare tissues for viewing under a microscope. Although formalin is less expensive to purchase, recycling it is economical when using about 5 gallons a week, factoring in neutralizer and waste disposal costs.

Non-technical staff can safely operate distillation and filtration equipment, which require little operator time. Transfers or chemistry adjustments should take place under a hood with carbon filters to prevent vapors from dispersing.

Recycling requires updating operating procedures and the lab emergency plan. Train employees to understand all new procedures. Containers of recovered formalin should be dated and labeled as recovered or distilled formalin.

Waste

Still bottoms, the contaminants remaining after formalin is distilled, and filtration waste contain blood, formalin, reagents, stains, tissue particles and water. This material might be considered hazardous due to the presence of formaldehyde or heavy metals from stains. Check with your local regulatory authority and evaluate your waste. Emptying the waste into the sewer may not be allowed.

Distilling

Distillation recovers 80 to 90 percent of the formalin, depending on the contamination level of the waste. The efficiency of the still will determine the purity of the recovered formalin, which can be 100 percent pure.

Depending on the formalin solution needed, after distilling, buffer salts are added to adjust pH or zinc tablets are added for zinc formalin. Test the reclaimed product to see if formalin needs to be added to compensate for evaporation.

With technology advances fractional distillation units are now practical and safer. Precaution: Never distill any formalin waste that may contain either picric acid (trinitrophenol; used in Bouin's Fixative) or colloidin (nitrocellulose)—both are explosive when heated.

Ridgeview Medical Center

Ridgeview Medical Center, a 129-bed hospital in Waconia, purchased a fractional distillation unit that allowed them to distill formalin, as well as alcohol and xylene, from its histopathology lab. The equipment reclaimed 90 percent of the formalin.

Because the reclaimed formalin was at 9 to 10 percent, staff no longer needed to dilute 37 percent formalin, making working conditions safer for employees.

Ridgeview's lab used to purchase 128 gallons of bulk formalin per year. The year after buying the distillation unit, the lab did not need to purchase any formalin. Because this saved \$3,600 a year, the unit would pay for itself in 4.5 years.

Ridgeview piloted a few equipment models before selecting the one it found easiest to operate and the most compact. The equipment was on a cart so it could be stored in a housekeeping closet when not in use.

Lab staff ran the equipment and handled routine cleaning and maintenance, which took about one to two hours a week. The unit generated about 1.5 gallons of waste a week, which had to be managed as hazardous waste.

Filtering

Filtering recovers 99 percent of the formalin. Filtration is less complex than distillation. Gravity or a pump pulls the used formalin through a series of filters. Waste is collected in a filter cartridge for disposal.

The recovered formalin does not need to be buffered because salts are not removed during filtering. The pH may need to be adjusted by adding water or formalin.

Because heat is not used in the filtering process, equipment cleaning is simpler than it is for distillation.

Methodist Hospital

The laboratory at Methodist Hospital, a 350-bed hospital in St. Louis Park, purchased two formalin filtering units, one for neutral buffered formalin (NBF) and another for alcoholic formalin. The equipment recovered 100 percent of the formalin.

In 2002, the lab bought about 352 gallons of concentrated NBF. In the first four months of using the filter equipment, the lab decreased the amount of concentrated NBF it ordered by 50 percent. The histology lab projects that filtering will save approximately \$5,000 a year.

Methodist used a large volume of formalin and did not have the space for distillation equipment. Lab staff also preferred the less complicated process. All histology technicians ran the equipment.

Selecting Equipment

The purity of the recovered formalin, volume of waste produced and the amount of space needed will help determine the type of formalin recovery unit to purchase. The unit should minimize the number of times waste and reclaimed formalin are handled. Waste should accumulate in a container ready for disposal. Equipment may be available for a free trial period.

When looking for fractional distillation units that recycle solvent as well as formalin, be sure that the units are made of formaldehyde-resistant materials.

Before purchasing new equipment to recycle formalin, evaluate its payback. Equipment vendors can assist with this calculation.

Alternatives

Formaldehyde-free products may be appropriate for use in your lab. The Sustainable Hospitals Web site provides a list of formaldehyde-free products at <www.sustainablehospitals.org/cgi-bin/DB_Report.cgi?px=W&rpt=Subcat&id=18!18>.

Suppliers of Formalin Recovery Equipment

MnTAP maintains the following list of formalin recovery equipment suppliers solely as a service to Minnesota companies. This is not a complete list of available suppliers and does not represent an endorsement by MnTAP. MnTAP, by providing the list, does not guarantee that the products do or do not ensure compliance with environmental and safety laws in any specific application.

Suppliers	Notes
B/R Instrument Corporation Easton, MD 800/922-9206 brinstrument.com	Fractional distillation. 2 to 10 gallon capacity; manual, semi- and fully automatic units available. Floor and tabletop models. Units available that distill multiple solvents (acetone, alcohol, xylene, xylene substitutes) as well as formalin.
CBG Biotech Columbus, OH 800/941-9484 cbgbiochem.com	Fractional distillation. 2 to 10 gallon capacity; manual, semi- and fully automatic units available. Floor and tabletop models, carts available. Units available that distill multiple solvents (acetone, alcohol, xylene, xylene substitutes) as well as formalin.
Creative Waste Solutions, Inc. 888/795-8300 West Linn, OR cwsincorp.com	Gravity filtration. 3 and 10 gallon capacity; three phase: micro- and ultrafiltration, carbon absorption; uses filter cartridges. Floor model on cart. Removes fats, particles, proteins and stains. Can recycle alcoholic formalin.
Triangle Biomedical Sciences Durham, NC Midwest representative 800/395-6204 trianglebiomedical.com	Filtration using a pump system. 5 gallon capacity; three phase: micro- and ultrafiltration, carbon absorption. Floor model. Removes fats, particles, proteins and stains.

For More Information

MnTAP has a variety of technical assistance services available to help Minnesota businesses implement industry-tailored solutions that prevent pollution at the source, maximize efficient use of resources, and reduce energy use and cost. Our information resources are available online at <mntap.umn.edu>. Or, call MnTAP at 612/624-1300 or 800/247-0015 from greater Minnesota for personal assistance.