Journal of Criminal Law and Criminology

Volume 44 | Issue 6 Article 12

1954

Storage, Preservation, and Handling of Toxicological Samples

James W. Jr. Brackett

Lowell W. Bradford

STORAGE, PRESERVATION, AND HANDLING OF TOXICOLOGICAL SAMPLES

James W. Brackett, Jr., and Lowell W. Bradford

The authors are both associated with the Laboratory of Criminalistics, Office of the District Attorney at San Jose, California, and are undoubtedly known to our readers through earlier contributions to this Journal—the last of which dealt with the "Comparison of Writing Ink by Paper Chromatography."

James W. Brackett, Jr., has been an Assistant Criminalist at this laboratory since 1948 and is a graduate of the College of Chemistry, University of California, Berkeley.

Lowell W. Bradford is the Laboratory Director. A graduate of the University of California, he also serves as a part time instructor in the San Jose State College Police School Program.—EDITOR.

The use of glass jars as containers for organ samples submitted for toxicological analysis is the recommendation of nearly every text on toxicology or criminalistics (3-13). Glass jars, while they are readily available, re-usable, easy to clean, sterilize, and inspect, have many disadvantages such as:

1. The requirement that the jar be wide-mouthed in order to admit large objects often limits the size of the sample that can be stored regardless of the capacity of the jar.
2. When empty or partially full the glass jar requires as much storage space as when completely full.
3. Jars are bulky and heavy in relation to capacity.
4. Jars are relatively expensive.
5. All jars are not adaptable to freezing techniques due to expansion cracking, icing, and slower thawing properties.
6. Jars are difficult to seal effectively.
7. Jars are relatively easy to break and may shatter into dangerous pieces.
8. Jars usually have screw-type metal tops which are disadvantageous for toxicological work, because of possible metal contamination.
9. Jars are usually of cylindrical shape which limits their storage efficiency.
10. Jars are difficult to label.
11. Long term storage of samples at temperatures above 0° C permits decomposition and requires that the jars be vented lest the internal pressure created may cause them to burst.
12. Jars have little resistance to thermal shock.

It was proposed to evaluate "frozen food" techniques using polyethylene bags and waxed cardboard cartons as containers with storage well below 0° C. in comparison to the widely used glass jar containers stored at refrigerator temperatures just above 0° C. It is noted that Adelson and Gerber (1) have used polyethylene bags for ordinary refrigerator storage, and that Gentzkow, Tobie, and Goldbaum have recommended freezing for transport preservation (9).

PROCEDURE AT AUTOPSY ROOM

The samples are procured, each organ or body fluid enclosed sep-

arately in a labelled, polyethylene bag, and the bag sealed. All of the bags, each containing organ samples of a case, are stored together in a waxed cardboard carton, and the carton is sealed by use of plastic tape seals. The carton is then labelled and frozen as soon as possible for storage and transportation. The samples may be stored or transported without freezing for short periods if necessary, but care must be taken to prevent decomposition.

Procedure At Laboratory

The carton containing the organs is received from the freezer and opened by means of slitting the cardboard, preserving the seals and label.

The bag containing the frozen organ sample desired to be analyzed is removed from the box and is thawed prior to analysis by immersion of the sealed bag in hot water. When thawing is sufficient to allow the selection of a representative sample of material, the bag is removed from the hot water, and the exterior dried with a towel. Thawing may also be accomplished by allowing bag and contents to remain at room temperature for a few hours. The bag is slit, and the sample desired for analysis is taken in the customary manner. The remnants are placed in another bag, sealed, and refrozen for retainment if necessary.

Discussion

The polyethylene bags are easily sealed by heat, using a special iron, or by means of a rubber band; are furnished in a clean and sanitary condition; require little storage space when empty; are easily adapted to any size needed; are not limited in storage capacity by the size of the mouth of the container; are easily labelled with a laboratory wax pencil; may be rapidly thawed by immersion in hot water; and, being inflammable, can be quickly disposed of in a sanitary manner.

The waxed cardboard cartons may be labelled with ball point pen or wax pencil on all sides and are adaptable to compact and efficient storage; when empty they require little storage space; they may be easily sealed with cellulose scotch tape, which may not be tampered with nor removed without leaving telltale signs on the surface of the paper. These scotch tape seals may be preserved if the toxicologist opens the cartons by slitting or cutting the cardboard box to remove the contents, preserving the seal for demonstration in court.

The polyethylene bags and the cardboard cartons are available at local frozen food lockers; the most practical sizes are the two-quart

size available for smaller organ samples, and the one-gallon size for storage of larger organs such as an entire brain.

The polyethylene bag is obtainable in a variety of sizes at a cost of about 3¢ per bag with waxed cardboard, rectangular cartons of corresponding size priced at approximately 2¢ each. This cost advantage of the bag and box is offset by the re-usability of jars.

Equipment

The frozen sample method of storage requires that an insulated chest of sufficient refrigeration capacity such as a "home freezer" be available to the laboratory. These units are available at any home appliance dealer's at a cost of $350 up depending upon size, etc.

Storage of these samples in the frozen condition has the following advantages:

a. Samples are easy to handle with little fear of breakage.
b. Offensive odor is minimized.
c. Spoilage and interference due to putrefaction products caused by storage is eliminated.
d. There is little loss of volatile material even on prolonged storage.
e. Sample and container are easily disposed of in a sanitary manner by burning.
f. Samples may be retained for periods of up to one year without noticeable change in condition.
g. Samples easier to transport from place to place.
h. More samples may be stored in a given space.

Transportation of Sample

The frozen samples may be transported from one place to another without refrigeration for a period of up to four hours if the carton is wrapped in several layers of newspaper immediately after removal from freezer. For longer periods of time or shipment over long distances, solid CO_2 (dry ice) may be purchased in thin, flat cakes and wrapped with the samples. The carbon dioxide is superior to ice as it requires no drainage and keeps objects at a lower temperature. Care must be taken when shipments are made using solid CO_2 that the refrigerated material will be solidly fastened in the exterior package and not become loose and rattle around inside due to evaporation of the CO_2.

The effect of freezing on the microscopic cell structure is not known. Frozen blood samples are extensively hemolyzed. Samples known to contain no poisonous material consistently give negative tests for poisonous material after storage in the polyethylene bags for long periods of time.

This method of preserving toxicological samples has been used in this laboratory for the past two years with results that have been completely satisfactory.

SUMMARY

A method is described of packaging, storing, and shipping toxicological samples at subzero temperatures using commercially available polyethylene bags and waxed, rectangular cardboard cartons as containers. The procedure has many practical advantages over the customary glass container, and storage at temperatures above 0° C.

BIBLIOGRAPHY

1. L. Adelson and S. R. Gerber, Am. Jour. Cl. Pathol., *22*:866 (1952).
2. F. Bamford, Poisons, Their Isolation and Identification. The Blakiston Co., Philadelphia.
3. F.B.I. Law Enforcement Bulletin, *21*:8 (Sept. 1952).
4. J. Glaister, Medical Jurisprudence & Toxicology, E & S Livingstone, Ltd., Edinburgh (1945).
5. T. A. Gonzales, M. Vance, and M. Helpern, Legal Medicine & Toxicology. D. Appleton Century Co., New York (1951).
6. P. L. Kirk, Crime Investigation, Interscience Publishers, New York (1953) p. 412.
7. E. Leschke, Clinical Toxicology, Wm. Wood & Co., Baltimore (1934) p. 333.
8. A. Lucas, Forensic Chemistry & Scientific Criminal Investigation, Edward Arnolds & Co., London (1945) p. 257.
9. J. S. Simmons and C. J. Gentzkow, Laboratory Methods of the United States Army, 5th Ed. Lea & Febiger, Philadelphia, p. 320.
10. S. Smith & F. S. Fiddes, Forensic Medicine, J. A. Churchill, Ltd., London (1949) p. 55.
11. L. M. Snyder, Homicide Investigation. Chas. C. Thomas, Springfield, Ill. (1944) p. 204.
12. C. H. Thienes & T. J. Haley, Chemical Toxicology, Lea & Febiger, Philadelphia (1948) p. 251.
13. R. W. Webster, Legal Medicine & Toxicology. W. B. Saunders Co., Philadelphia (1930) p. 332.