



Designation: E1566 – 00 (Reapproved 2019)

Standard Guide for Handling Hazardous Biological Materials in Liquid Nitrogen¹

This standard is issued under the fixed designation E1566; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

Hazardous biological materials maintained at liquid nitrogen temperatures require special handling and storage procedures. The penetration of vials by liquid nitrogen during storage can result in contamination of the nitrogen itself² or contamination of personnel resulting from improperly sealed vials exploding.^{3,4} Ensuring safe storage conditions and taking precautions during the retrieval of cultures from liquid nitrogen can help reduce the potential hazards. To avoid the penetration of vials by liquid nitrogen and resulting hazards, they should be filled to a point that minimizes the air space in the vial, and they shall be sealed completely. Vials may be examined for leaks by immersing them in an aqueous methylene blue (0.05 %) solution at 4°C.

1. Scope

1.1 This guide covers recommended procedures for maintaining and handling hazardous biological materials at liquid nitrogen temperatures.

1.2 This guide covers the safety precautions recommended when handling material stored in liquid nitrogen.

1.3 This guide does not cover the maintenance and handling of hazardous biological materials maintained at cryogenic temperatures in systems other than liquid nitrogen.

1.4 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the*

Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

2. Referenced Documents

2.1 *ASTM Standards:*⁵

E1342 Practice for Preservation by Freezing, Freeze-Drying, and Low Temperature Maintenance of Bacteria, Fungi, Protista, Viruses, Genetic Elements, and Animal and Plant Tissues (Withdrawn 2011)⁶

3. Terminology

3.1 *Definitions:*

3.1.1 *cryogenic temperatures, n*—temperatures below or equal to -100°C .

3.1.2 *hazardous biological materials, n*—living biological materials, and products derived therefrom, that pose a potential threat to human health.

3.1.3 *liquid nitrogen storage, n*—storage directly in liquid nitrogen or in the vapor phase above liquid nitrogen.

4. Significance and Use

4.1 This guide is intended for use by individuals maintaining and handling hazardous biological material in liquid nitrogen freezers.

¹ This guide is under the jurisdiction of ASTM Committee E55 on Manufacture of Pharmaceutical and Biopharmaceutical Products and is the direct responsibility of Subcommittee E55.13 on Process Evaluation and Control.

Current edition approved Feb. 1, 2019. Published March 2019. Originally approved in 1993. Last previous edition approved in 2014 as E1566 – 00 (2014). DOI: 10.1520/E1566-00R19.

² Shafer, T. W., Everett, J., Silver, G. H., and Came, P. E., “Biohazard: Virus-Contaminated Liquid Nitrogen,” *Science*, Vol 191, 1976, pp. 24–26.

³ Simone, F. P., Jr., Daggett, P.-M., McGrath, M. S., and Alexander, M. T., “The Use of Plastic Ampoules for Freeze Preservation of Microorganisms,” *Cryobiology*, Vol 14, 1977, pp. 500–502.

⁴ Grieff, D., Melton, H., and Rowe, T. W., “On the Sealing of Gas-Filled Glass Ampoules,” *Cryobiology*, Vol 12, 1975, pp. 1–14.

⁵ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

⁶ The last approved version of this historical standard is referenced on www.astm.org.