

# Gaseous Ethylene Oxide Sterilization

Practical equipment with automatic cycle control which uses gaseous ethylene oxide for sterilization of heat-sensitive apparatus and materials in hospitals and laboratories has been developed for commercial production. The method of sterilization employs a nonflammable, nonexplosive mixture of ethylene oxide (11 percent) and halogenated hydrocarbons (89 percent) with low-pressure characteristics.

During the field testing of this sterilization method, conducted over a period of 18 months, mechanical performance of the equipment, reliability, and safety were studied. Temperature of selected points within the sterilizer chamber was measured with thermocouples connected to a multipoint recorder. Using gas chromatographic apparatus, the study developed a rapid and fairly accurate method of determining ethylene oxide concentration of small samples of gas withdrawn from the chamber. Relative humidity was determined simultaneously by use of an electric hydrometer. A variety of materials and apparatus together with representative test organisms were exposed to a range of conditions to determine the effect of the gas on micro-organisms and exposed materials.

The sterilization method used in this study was found to be safe and reliable when used in an adequately ventilated room.

The ethylene oxide-halogenated hydrocarbon

mixture used in this study was found to be a satisfactory sterilizing agent when used with a pre-vacuum of approximately 26 inches of mercury and in a manner that insured adequate exposure of contaminated surfaces to the gaseous mixture. A minimum exposure period of 2 hours sterilized all surfaces readily accessible to the ethylene oxide gas in a concentration of approximately 1,000 milligrams per liter at chamber pressure of approximately 15 pounds per square inch gauge, temperatures 120° F. to 140° F., and relative humidity between 30 percent and 50 percent. A 4-hour exposure period was also found to be satisfactory for the conditions above with an ethylene oxide concentration of approximately 500 milligrams per liter and corresponding chamber pressure of approximately 2 pounds per square inch gauge.

Preliminary tests should be performed to obtain correct exposure conditions for sterilizing items with surfaces not readily accessible to the ethylene oxide gas, if sterilization data for such materials are not available. All exposed materials, especially leather and rubber goods, should be allowed an 8- to 12-hour aeration period in a well-ventilated area before use in contact with body tissues. Packaging or wrapping materials should allow free penetration of ethylene oxide throughout the package and should also prevent contamination after sterilization.

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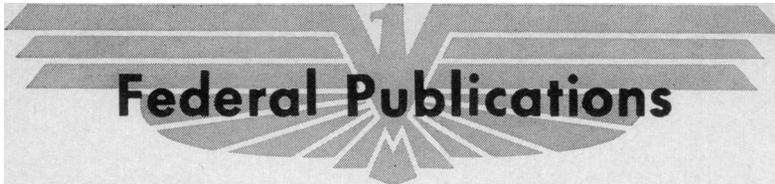
## Public Health Monograph No. 68

**Evaluation of Sterilization by Gaseous Ethylene Oxide.** By Harry Stierli, Lawrence L. Reed, and Irwin H. Billick. Public Health Monograph No. 68 (PHS Pub. No. 903), 15 pages, illustrated. U.S. Government Printing Office, Washington, D.C., 1962, 20 cents.

The accompanying summary covers the principal contents of Public Health Monograph No. 68, published concurrently with this issue of *Public Health Reports*. Mr. Stierli is a sanitary engineer in the Water Quality Section, Basic Data Branch, Division

of Water Supply and Pollution Control, Public Health Service, Cincinnati, Ohio. Dr. Reed is a bacteriologist with the American Sterilizer Co., Erie, Pa., and Dr. Billick is a physical chemist with the Esso Research Center, Linden, N.J.

For readers wishing the data in full, copies are on sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Official agencies and others directly concerned may obtain single sample copies without charge from the Public Inquiries Branch, Office of Information, Public Health Service. Copies will be found also in the libraries of professional schools and the major universities and in selected public libraries.



imprint date, frequency, and notes relating to the serial for period covered. Cross references are also included.

**Waste Stabilization Lagoons.** *PHS Publication No. 872; 1961; 170 pages; \$1.25.*

Edited proceedings of the Symposium on Waste Stabilization Lagoons, held in Kansas City, Mo., August 1-5, 1960, constitute a review of the research and experience in the design, construction, operation, and maintenance of the lagoon method of treating raw sewage. The book details the history of lagoon development in midwestern and southwestern United States and in Australia. Photographs, diagrams, and charts illustrate the design and chronological development of lagoons.

**Strictly for Teenagers.** *PHS Publication No. 913; 8 pages; 1962; 5 cents, \$3.25 per 100.*

Adapted from an Ohio Department of Health leaflet of the same name, this leaflet deals frankly with venereal diseases—what they are, how they spread, and the possibilities for cure. Besides answering many questions modern teenagers ask about this important topic, it corrects several misconceptions about these diseases. It also challenges teenagers to develop standards and attitudes that will guide their control and contribute to the prevention of venereal diseases.

**Dental Care for the Chronically Ill and Aged.** A community experiment. *PHS Publication No. 899; by Jack R. Vermillion and Mary N. Gailbreath; 1961; 54 pages; 45 cents.*

This booklet provides a detailed account of a 4-year Public Health Service study in Kansas City of a prototype community dental program for the institutionalized and homebound chronically ill and aged. It is divided into four major sections; the site, the survey, and the question of resources; treating the patients; the logistics of clinic and home care; and the study in retrospect. Illustrated with photographs taken at the scene of the study, the booklet also serves as a comprehensive guide for developing similar programs in other communities.

**Proceedings, 1961 Annual Conference of the Surgeon General, Public Health Service, and the Chief, Children's Bureau, with State and Territorial Health Officers.** *PHS Publication No. 927; 1962; 60 pages.*

The official recording of the annual meeting held November 1961, Washington, D.C., presents addresses given at a session on metropolitan health problems, as well as a general review of current activities in the two agencies. Enacted recommendations are shown under the various standing and special committees. Eight resolutions adopted at the meeting are presented in the concluding section.

**How To Determine Nursing Expenditures in Small Health Agencies.** *PHS Publication No. 902; 1962; 30 pages.*

To guide agencies contracting for services, this pamphlet outlines principles and provides a valid but simple procedure to arrive at a basis for determining a rate of expenditure for nursing service.

The method has been developed

for small agencies that need to calculate expenditures on more of their direct service work units than home visiting, but are limited in the amount or type of financial and statistical data available for this purpose. It provides that calculation of the expense for each direct service work unit include its proportionate share of travel and supporting service.

**New Horizons for Hospital Research.** *PHS Publication No. 904; by Jack C. Haldeman; 1961; 9 pages.*

Two articles, reprinted from *Hospitals*, the Journal of the American Hospital Association, December 16, 1961, emphasize the need to intensify hospital research. The title article discusses the hospital as a research setting, areas of current research, the need for a more systematic approach and the tools for effecting this approach, present and future support, and goals for hospital research. The second article, "Guidelines for Federally Supported Health Facilities Research," describes the various types of research and demonstration projects eligible for Federal aid under the Hill-Burton program and application procedures for research grants.

**Biomedical Serials, 1950-1960.** A selective list of serials in the National Library of Medicine. *PHS Publication No. 910; By Lela M. Spanier; 1962; 503 pages; \$3.*

From a file of about 18,500 biomedical serials, the National Library of Medicine lists 8,939 titles represented by at least one issue for the period 1950-60. Primarily a guide to the substantive biomedical serials in the library's collection, the list includes titles from all over the world and in all languages. Entries are arranged alphabetically by title. Bibliographic information for each entry gives title, publisher, place of publication, descriptive holdings or

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This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D.C.

The Public Health Service does not supply publications other than its own.

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## PUBLICATION ANNOUNCEMENTS

*Address inquiries to the publisher or sponsoring agency.*

*Scientific and Technical Personnel in Industry, 1960.* NSF 71-75. National Science Foundation. Prepared by the U.S. Department of Labor, Bureau of Labor Statistics. 1961; 57 pages; 45 cents. Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

*Research Conference on Workmen's Compensation and Vocational Rehabilitation, 1960.* Edited by A. J. Jaffe. March 1961; 148 pages. Bureau of Applied Social Research, Columbia University. Order from Office of Vocational Rehabilitation, Department of Health, Education, and Welfare, Washington 25, D.C.

*Source Book of Health Insurance Data, 1961.* 79 pages. Health Insurance Institute, 488 Madison Ave., New York 22.

*Food and Science, Today and Tomorrow.* Public Affairs Pamphlet No. 320. By William J. Darby, M.D., and Gwen Lam. November 1961; 20 pages; 25 cents. Public Affairs Pamphlets, 22 East 38th St., New York 16.

*Quiet Guardians of the People's Health.* Public Affairs Pamphlet No. 322. By Nettie Kline. January 1962; 20 pages; 25 cents. Public Affairs Pamphlets, 22 East 38th St., New York 16.

*Preventive Procedures for Combating Cross-Infection.* By H. P. Curley. Revised November 1961; 32 pages. Research Department, Hospital Bureau, Inc., 60 West 55th St., New York 19.

*Statistical Survey of the Aid to Needy Children Program in Imperial County, California.* By Jerome L. Schwartz; July 1961; 68 pages. Imperial County Family Health and Welfare Project, El Centro, Calif.

*Therapeutic Recreation Curriculum Development Conference.* February 16-18, 1961. 44 pages. Comeback, Inc., 16 West 46th St., New York 36.

*Principles of Dental Public Health.* By James Morse Dunning, D.D.S., M.P.H. 1962; 543 pages; \$11. Harvard University Press, Cambridge, Mass.

*Water pollution. Economic aspects and research needs.* By Allen V. Kneese. Resources for the Future, Inc. 1962; 107 pages; \$1.75. Johns Hopkins Press, Baltimore 18, Md.

*Medical Education and Research Needs in Maryland.* Publication No. 117. Report of the Subcommittee on Medical Education and Research. January 1962; 167 pages; \$1.50. Committee on Medical Care, Maryland State Planning Commission, State Planning Department, 1103 State Office Building, Baltimore 1, Md.

*Patient Care Facilities: Construction Needs and Hill-Burton Accomplishments.* Hospital Monograph Series No. 10. By Alan E. Treloar, Ph.D., and Don Chill. 1961; 231 pages; \$1.25. American Hospital Association, 840 North Lake Shore Drive, Chicago 11.

*Man and His Environment. Proceedings of the National Congress on Environmental Health.* Continued Education Series No. 95. 1961; 124 pages; \$3. Continued Education Service, University of Michigan School of Public Health, Ann Arbor.

*Asylum to Community. The development of the Mental Hygiene Service in Victoria, Australia.* By E. Cunningham Dax. 1961; 230 pages; 30 s. (\$3.36). F. W. Cheshire Pty. Ltd., 338 Little Collins St., Melbourne CI.

*Children and TV.* Public Affairs Pamphlet No. 323. By Josette Frank. January 1962; 28 pages; 25 cents. Public Affairs Pamphlets, 22 East 38th St., New York 16.

*Federal Funds for Science X. Fiscal years 1960, 1961, and 1962.* NSF 61-82. Survey of Science Resources Series, National Science Foundation. 1962; 145 pages; 75 cents. Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

*Factors in Farmers' Subscription to Health Insurance.* Department of Rural Sociology Mimeograph Bulletin No. 60. By Bert L. Ellenbogen, Charles E. Ramsey, and Robert A. Danley. December 1961; 24 pages. Cornell University Agricultural Experiment Station, Ithaca, N.Y.

*Changes in the Availability and Use of Health Resources in Two Central New York Counties, 1949 and 1957.* Department of Rural Sociology Bulletin No. 54. By Bert L. Ellenbogen, Donald G. Hay, and Olaf F. Larson. June 1959; 56 pages. New York State College of Agriculture, Ithaca, N.Y.

*A Mental Health Survey of Older People.* Mental Health Research Unit, New York State Department of Mental Hygiene. 1961; 138 pages; \$2.25. State Hospitals Press, Utica, N.Y.

*Community Mental Health and Social Psychiatry. A reference guide.* Harvard Medical School and Psychiatric Service, Massachusetts General Hospital. 1962; 161 pages; \$3.50. Harvard University Press, Cambridge, Mass.

*Medical Service Corporations in the State of Washington. A study of the administration of physician-sponsored prepaid medical care.* By George A. Shipman, Robert J. Lampman, and S. Frank Miyamoto. 1962; 215 pages; \$6.50. Harvard University Press, Cambridge, Mass.

### SEC Technical Reports

*A limited number of the following reports are available from the Robert A. Taft Sanitary Engineering Center, Public Health Service, Cincinnati, Ohio. Order by number.*

*Bacteriological Studies of Commercial Shellfish Operations on the Gulf Coast.* F61-9. By M. W. Presnell and C. B. Kelly. 1961; 52 pages.

*Controlled Environment Facilities. A survey.* W61-6. By John M. Henderson. 1961; 52 pages.

*Stabilization Ponds for Treatment of Industrial Wastes. Inventory and reference material.* W61-29. By Ralph Porges, G. L. Harlow, E. J. Struzeski, and Grover L. Morris. 1961; 35 pages.