AD NUMBER

ADB189664

NEW LIMITATION CHANGE

TO

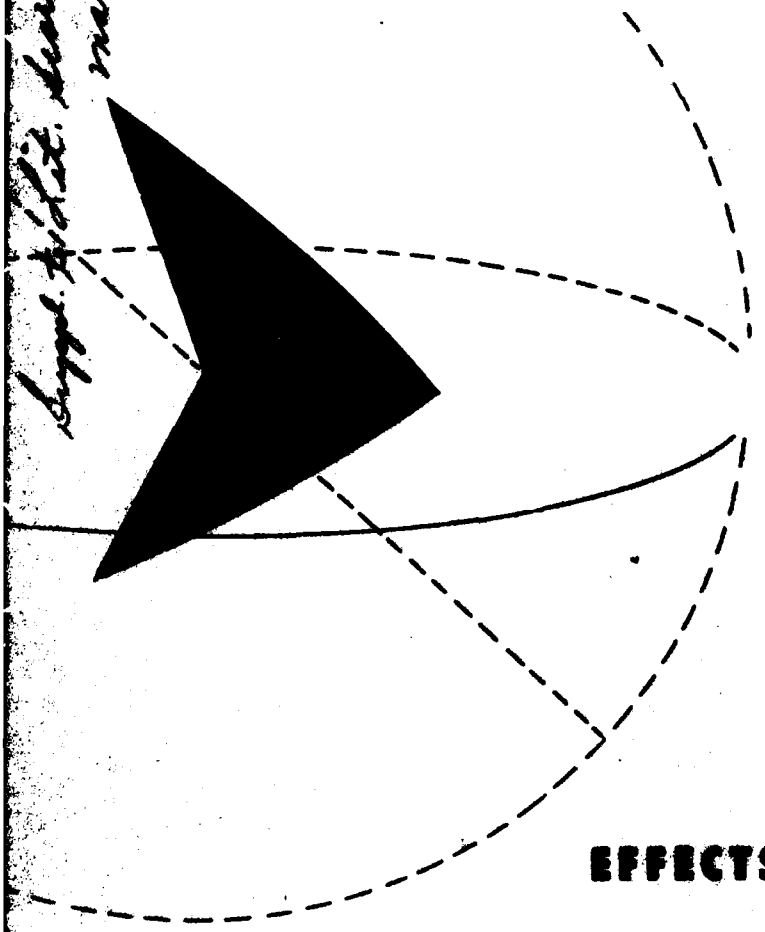
Approved for public release, distribution unlimited

FROM

Distribution authorized to U.S. Gov't. agencies and their contractors; Administrative/Operational Use; 01 MAR 1963. Other requests shall be referred to National Aeronautics and Space Administration, Washington, DC 20546.

AUTHORITY

NASA TR Server Website



EFFECTS OF STERILIZING AGENTS ON MICROORGANISMS

SUPPLEMENT TO LITERATURE SEARCH NO. 280

MARCH 1963

[redacted]

JET PROPULSION LABORATORY

CALIFORNIA INSTITUTE OF TECHNOLOGY, PASADENA, CALIFORNIA

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
CONTRACT NO. NAS 7-100

ASTRONAUTICS INFORMATION

EFFECTS OF STERILIZING AGENTS ON MICROORGANISMS

SUPPLEMENT TO LITERATURE SEARCH NO. 260

COMPILED BY
JANET SWIFT

JET PROPULSION LABORATORY
CALIFORNIA INSTITUTE OF TECHNOLOGY
PASADENA, CALIFORNIA

MARCH 1963

FOREWORD

Since the publication of Astronautics Information Literature Search No. 260 (August 1961), interest in sterilization of microorganisms has continued. At the request of personnel of the Jet Propulsion Laboratory (JPL), a supplementary compilation has been prepared. The subject matter in the original literature search has been updated with special emphasis on chemical sterilizing agents. The chemical agents of particular interest are ethylene oxide, β-propiolactone, propylene oxide, and ozone. Since the field has broadened, additional subject matter from sources used in the original search has been incorporated in this supplement. This literature search is published for distribution to other interested organizations working in the field of astronautics.

The following sources were covered:

Armed Services Technical Information Agency, Technical Abstract Bulletins (ASTIA), August 1961 through December 1962

JPL Subject File, January 1953 through December 1962

Unpublished JPL Literature Searches

List of Current Medical Literature, January 1954 through December 1960

Index Medicus, cumulated through 1961

Biological Abstracts (*BA*), January 1957 through December 15, 1962

Biochemical Journal, January 1955 through December 1962

Journal of Biological Chemistry, January 1955 through December 1962

Engineering Index (*EI*), January 1955 through December 1962

Bibliography of Agriculture, 1962, and *Chemical Abstracts,* January 1955 through December 1962, were also consulted.

The material is divided as follows:

Physical Agents. These agents are grouped under General Physical Agents, General Radiation, Gamma Radiation, X-radiation, Ultraviolet Radiation, Acoustics, and Temperature Variation.

Chemical Agents. Subject headings included are General Chemical Agents, Ethylene Oxide, β-propiolactone, Ozone, Propylene Oxide, Pesticides, and Antibiotics.

Miscellaneous Agents. General Agents and Physical-Chemical Combinations are the subject divisions. The latter includes references involving sterilization where both agents are used simultaneously.

All references are arranged alphabetically by author within each section. An author index is included.

CONTENTS

PHYSICAL AGENTS

GENERAL PHYSICAL AGENTS

1. **BIOLUMINESCENCE AS A PHYSIOLOGICAL INDEX**
Berliner, M. D., Laughlin, L. L., Jr.
1962
Avco Corp., Research and Advanced Development Div., Wilmington, Mass.
Report, NAS w-389

Certain organisms, particularly wood-decaying fungi, emit a portion of the waste energy of oxidation as light rather than heat. Thus, the cell respiration is intimately connected to the production of light. Changes in the intensity of luminescence serve as an indicator of physiological changes both within the organism and the environment. Several species have proven themselves ideal test organisms and are being studied intensively from all aspects of normal and variable environments. Luminescence is continuous for 30 days or longer, and accurate photometric techniques make monitoring routine. Preliminary work on the effects of temperature, light, X-ray, and ultraviolet irradiation is reported herein. Effects of other physiological parameters are under continuing study.

2. **DEHYDRATED STERILIZER CONTROLS CONTAINING BACTERIAL SPORES AND CULTURE MEDIA**
Brewer, J. H., McLaughlin, C. B.
***Journal of Pharmaceutical Sciences*, v. 50, pp. 171–172, February 1961**

3. **EFFECT OF HIGH PRESSURE ON INTENSITY OF GLUCOSE CONSUMPTION BY PRESSURE-TOLERANT BACTERIA**
Chumak, M. D.
***Doklady Akademii Nauk SSSR—Biological Sciences Section* (English translation), v. 126, no. 1–6, pp. 524–526, 1960**

The marine and soil bacteria were not identified. (*BA*, v. 35, 1960, #70,795)

4. **THE FLASH FLAME STERILIZER, A NEW APPROACH TO SOIL DISINFECTION BY HEAT**
Hunter, J. A., De Linden, A. J. O.
***New Zealand Plants and Gardens*, v. 4, no. 5, pp. 219–223, December 1961**

5. **COMPLEMENTARY EFFECTS OF HEAT AND RADIATION ON FOOD MICROORGANISMS**
Kempe, L. L.
***Nucleonics*, v. 18, no. 4, pp. 108–113, 1960**

Heat and radiation used together may be more effective for food preservation than either one alone. Each of these agents can be somewhat damaging. Overcooking food sometimes reduces its nutritive value; radiation can produce off-odors, off-flavors, and degraded textures. Experiments show, however, that a radiation dose that is about one-third of the sterilization dose reduces the heat treatment required to sterilize to about one-fourth of what it is without radiation.

6. **INTERACTION OF ATMOSPHERIC IONS WITH BIOLOGICAL MATERIAL**
Kingdon, K. H.
***Physics in Medicine and Biology*, v. 5, no. 1, pp. 1–10, 1960 (in English with French and German summaries)**

Some of the possible physical and chemical bases for the alleged physiological effects of inhaled ionization on humans were investigated. Evidence is adduced from glow discharge electrolysis to show that ordinary small ions of atmospheric electricity carry appreciable quantities of chemical and electrostatic energy. About 5×10^{-4} coulomb/cm^2 of such ions incident on *Escherichia coli* kill them to 1/e. This amounts to 3×10^8 erg/gm and is about eight times the amount of ultraviolet energy or 700 times the amount of X-ray energy required to kill *E. coli*. Natural atmospheric ionization inhaled by humans can supply in one day at most 10^{-10} coulomb/cm^2 to a small part of the upper respiratory tract; thus, the amount of natural ionization inhaled is too small to kill bacteria or viruses in the upper respiratory tract. However, mucus may collect and transmit the ion energy in the form of chemically reactive molecules which finally reach more sensitive biological material, such as the receptor centers through which viruses gain access to epithelial cells, and thus the ion energy may have some effect on airborne respiratory infections. This transmission of the ion energy is analogous to the indirect effect of radiation chemistry. (*BA*, v. 37, 1962, #8256)

7. VLIYANIE ELEKTRICHESKOI STERILIZATSII NA MIKROFLORU POCHVY PARNIKOV (EFFECT OF ELECTRIC STERILIZATION ON THE MICROFLORA OF THE SOIL OF HOTBEDS)
Kozlov, K. A.
***Agrobiologiia*, v. 5, pp. 703–706, 1960**

Hotbeds were subjected to electrification for 43–74 hr. The soil was heated to an average of 50°C. Before sterilization the bacterial content in the soil was 42–68%; fungi and actinomycetes were, respectively, 21–31 and 11–33%. After sterilization, the total amount of microorganisms decreased eight- to ten-fold. The bacterial count decreased to 34–60%; fungi, including some phytopathogens, decreased to 13–28%. The number of actinomycetes increased to 14 – 50%. The eggs and larvae of the spider mite were completely destroyed. (*BA*, v. 38, 1962, #7424)

8. EFFECTS OF UNIPOLAR AIR IONS ON MICROORGANISMS AND ON EVAPORATION
Kreuger, A. P., Hicks, W. W., Beckett, J. C.
***Journal of the Franklin Institute*, v. 266, pp. 9–19, July 1958**

9. THE EFFECT OF ULTRASHORT WAVES ON THE CONTAGIOUSNESS AND ANTIGENIC PROPERTIES OF THE SPRING–SUMMER TICK AND JAPANESE ENCEPHALITIC VIRUSES
Levkovich, E. N., Goldfeld, A. Ya., Rzhakova, O. E.
***Biulleten Eksperimentalnoi Biologii i Meditsiny*, v. 44, no. 7, pp. 77–81, 1957**

Exposure of a 1–10% suspension of mouse brain, containing the virus of the spring-summer tick (strain Sofyin) or Japanese encephalitis, to ultrashort ultraviolet rays (259 Å) completely inactivated the viruses in 5–15 min. A 10% brain suspension of chick embryos infected with the Sofyin strain, became inactivated in 20–30 min, and undiluted allanotic fluid in 20–40 min. A similar exposure of suspensions to ultralong UV rays (2970–3020 Å) did not inactivate them in 30 min. In antigens, prepared from a completely inactivated suspension of viruses of tick encephalitis, complement-fixation test titers were two times lower (1:40) in comparison to similar native antigens. Increase of UV-ray dosage led to a more pronounced decrease in antigenic properties. (*BA*, v. 35, 1960, #27,194)

10. STUDIES ON X-AGENT. IX. EFFECT OF LEAD SHIELD UPON X-AGENT WITH SPECIAL REFERENCE TO ITS ACTION ON THE GROWTH OF BACTERIA AND ON THE TURBIDITY OF PROTEIN SOLUTIONS
Moriyama, H., Ueno, H.
***Japanese Journal of Experimental Medicine*, v. 31, pp. 99–110, April 1961**

11. EFFECT OF ULTRAHIGH VACUUM ON VIABILITY OF MICROORGANISMS
Portner, D. M., Spiner, D. R., Hoffman, R. K., Phillips, C. R.
***Science*, v. 134, no. 3495, p. 2047, 1961**

Three species of resistant microorganisms were exposed for five days to an ultrahigh vacuum approaching that of interplanetary space. Since no lethal effect was observed, there is no indication that the vacuum of outer space would prevent transport of viable microorganisms on unsterilized space vehicles. (*BA*, v. 39, 1962, #13,048)

12. HIGH-ENERGY ELECTRONS—LETHAL AGENT AND CATALYST
Ranftl, J. W.
***General Electric Review*, v. 58, no. 3, pp. 35–38, May 1955**

Electrons accelerated in a vacuum tube and emerging into air through a thin metal window in the tube constitute a high-energy electron beam. As a lethal agent, it destroys bacteria, molds, and yeasts, thus effectively pasteurizing and sterilizing food and drug products. Electrons can participate in chemical reactions to produce new materials and beneficial changes in already existing materials. (*EI*, 1955)

13. STERILIZATION OF FRANK'S NEEDLE IN THE PREVENTION OF VIRAL HEPATITIS
Stepanov, G. P.
***Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii*, v. 31, pp. 153–156, November 1960 (in Russian)**

14. APPARATUS AND METHOD FOR THE STEAM STERILIZATION OF FOOD FOR GERMFREE LABORATORY ANIMALS. AN INVESTIGATION OF THE PRACTICAL APPLICATION OF GNOTOBIOTIC TECHNOLOGY TO THE IMPROVEMENT OF BREEDING COLONIES
Wescott, R. B., Gardner, J. A.
June 1962

Biological Laboratories, Frederick, Md.
Technical Manuscript 7
AD-276,619
(Also available through U.S. Dept. of Commerce, Office of Technical Services, Washington, D. C.)

The design and preliminary use of an apparatus and method for the steam sterilization of food for germ-free animals are described. The need for such a system is shown by an examination of other existing methods. In addition, the general gnotobiotic techniques and equipment used in this colony are described and the purpose of maintaining such a colony is discussed. (ASTIA)

15. VPLYV IONIZATSIYI POVITRYA NA SUSPENDOVANI V NOMU MIKROORHANIZYMY (THE INFLUENCE OF AIR IONIZATION ON MICROORGANISMS SUSPENDED IN THE AIR)
Yaroshenko, V. A.
***Mikrobiologichnii Zhurnal, Akademiya Nauk Ukrainskoi, RSR*, v. 23, no. 2, pp. 53–58, 1961**
(in Ukrainian with Russian summary)

Experiments were carried out with the drop or dust phase of a bacterial *Staphylococcus albus* aerosol. As a result of air ionization, the microorganisms suspended in the air coagulated noticeably more rapidly and sedimentation proceeded rapidly. Ozone accumulation was recorded during the ionization process, but no bactericidal effect was observed under the conditions of the experiment. The air was purified of microorganisms more rapidly as a result of ionization. The experimental procedure is described in detail. (*BA*, v. 39, 1962, #7234)

16. THE BECTON, DICKINSON LECTURES ON STERILIZATION
1957–1959
Seton Hall University, College of Medicine and Dentistry, South Orange, N. J.
Lectures

Because the trend toward sterile, disposable medical equipment has transferred more and more responsibility for sterilization from the user to the producer, it becomes important for physicians and hospital personnel to be familiar with the latest techniques in order to evaluate the various methods applied by manufacturers. It is hoped that these lectures will assist in this task as well as supply a basis for review of all sterilization procedures so that the latest scientific developments may be utilized.

17. NEGATIVE IONS RETARD CHEESE MOLD GROWTH
***Milk Products Journal*, v. 52, no. 11, p. 24, 1961**

The installation of a pair of negative ion generators in Hulbregtse's River Road Cheese plant at Fredonia, Wis. stopped mold growth in the storage room for Parmesan cheese. Negative ions are electronically charged particles of O_2. No maintenance except cleaning of generators is required. (*BA*, v. 40, 1962, #20,064)

GENERAL RADIATION

18. THE EFFECT OF IRRADIATION ON THE ACTIVITY OF CERTAIN ENZYMES LOCALIZED IN THE STRUCTURES OF PACINIAN CORPUSCLES OF CAT MESENTERY
Afrikanova, L. A.
***Doklady Akademii Nauk SSSR—Biological Sciences Sections* (English translation), v. 121, no. 1–6, pp. 535–537, 1958**

19. SOME EFFECTS OF RADIATION ON BACTERIOPHAGE
Alper, T.
In "Proceedings of the Sixth International Congress for Microbiology, Rome, 1953," v. 3, pp. 431–436
Foundazione Emanuele Paterno, Rome, Italy, 1955

20. RADIATION SENSITIVITY OF *ESCHERICHIA COLI* TO β-RAYS IN DRY AND WET CONDITION
Bhattacharjee, S. B., Das Gupta, N. N.
***Nature*, London, v. 191, pp. 1015–1017, September 2, 1961**

21. RADIATION RESISTANCE OF THE NATURAL BACTERIAL FLORA OF CURED HAM
Brown, W. L., Vinton, C., Gross, C. E.
***Food Technology*, v. 14, no. 12, pp. 622–625, 1960**

Three separate experiments were conducted to study the radiation resistance of the natural bacterial flora of canned ham. Most strains were extremely sensitive to

irradiation and were destroyed at low levels. Two strains of cocci were able to survive high levels of radiation but were not studied extensively since in commercial processing they would be destroyed with low levels of heat. Small numbers of spores of the S-2 strain of PA 3679 were able to survive high levels of radiation in cans of cured ham. If curing salts (salt, sugar, nitrate, and nitrite) were present in normal amounts the ground ham did not spoil in the cans given at least 0.5 Mrad irradiation when incubated at 26°C and 30°C for two months. The spores were able to grow and produce spoilage through a radiation level of 1 Mrad, provided no curing salts were present in the meat. Counts after incubation indicated that the cells were increasing in numbers in cans of meat containing no curing salts. No marked differences were found in destruction of bacteria between a gamma source and electron beam source of irradiation. (*BA*, v. 36, 1961, #28,118)

22. THE MODIFICATION OF RADIATION EFFECTS IN BACTERIA BY NITRIC OXIDE

Dale, W. M., Davies, J. V., Russell, C.
***Biochemical Journal*, v. 82, no. 1, pp. 9P–10P, 1962**

The following paper was presented at the 410th Biochemical Society Meeting, held at the Manchester College of Science and Technology, England on November 11, 1961. The effect of external agents on the extent of radiation injury has been widely studied with a variety of materials (e.g., cells, tissues, protein solutions, etc.). Probably the best-known example is the increased radiation sensitivity found in oxygen compared with that found in nitrogen. Recent research has shown that nitric oxide can both increase and decrease radiation damage relative to anoxic radiation in certain systems. In earlier experiments, evidence was presented that the enhancement of radiation damage in aqueous suspensions of bacteria by nitric oxide was exactly similar to that produced by oxygen and the suggestion was made that the close similarity in electronic structure of the two gases was the cause of the molecule for molecule equivalence.

The basic premise behind the experiments presented here was that the similarity between nitric oxide and oxygen as radiation sensitizers may be illusory especially as nitric oxide is known to be reactive with many cell constituents, e.g., porphyrins. It was surmised that nitric oxide would probably modify the bacterial cell so as to change its radiation sensitivity. Accordingly, aqueous suspensions of *Shigella flexneri* were subjected to treatment with various concentrations of nitric oxide for different periods of time. The nitric oxide was then removed and the bacterial suspension irradiated with X-rays in the presence of nitrogen. Such cells (termed pre-treated cells) had a different radiation sensitivity from untreated cells irradiated in nitrogen or cells irradiated in the presence of nitric oxide. This pre-treatment effect has been shown to be dependent on the concentration of nitric oxide used and also the time of contact between nitric oxide and cell.

A surprising feature of the radiation sensitivity in the presence of nitric oxide was that a maximum was found at 10% nitric oxide, followed by a fall in sensitivity to a level approximately constant, at and above 40% nitric oxide. Evidence was presented that these results cannot be explained on the basis of residual free nitric oxide.

23. EFFECT OF SPACE RADIATIONS ON BACTERIAL SPORES [ABSTRACT]

Davis, I., Roberts, T. L.
***Bacteriological Proceedings*, v. 61, p. 56, 1961**

24. SYMPOSIUM ON AEROSPACE RADIOBIOLOGY. BIOLOGICAL EFFECTS OF ACCELERATED HEAVY IONS

Deering, R. A., Hutchinson, F., Schambra, P. E.
***Aerospace Medicine*, v. 32, pp. 915–924, 1961**

Use of heavy ions at 10 Mev from the heavy ion linear accelerator to irradiate Artemia eggs, bacteria, dioxiribonucleic acid, enzymes, HeLa cells, and virus proved more effective than X- or γ-rays, particularly in situations where little or no inactivation is achieved by X-rays.

25. PHYSIOLOGICAL STUDIES ON RADIATION RESISTANT BACTERIA OCCURRING IN FOOD

Duggan, D. E. (Oregon State University, Corvallis, 1961, Thesis)
***Dissertation Abstracts*, v. 22, no. 4, pp. 973–974, 1961**

26. AN EXAMPLE OF NON-INHERITED RADIATION RESISTANCE

Durham, N. N., Wyss, O.
***Journal of Bacteriology*, v. 72, no. 1, pp. 95–100, 1956**

Variation in ultraviolet resistance of several bacterial cultures can be correlated with the concentration of salt in the c medium. This is not due to selection of resistant variants but rather a physiological variation in all or most of the cell population. It appears to be associated with the ability of the cell to restrain leakage of nucleotides following radiation damage. A number of biochemical characteristics of the resistant *Escherichia coli* cells differ

from those of the radiation resistant mutant. (*BA*, v. 31, 1957, #531)

27. STUDIES ON THE IRRADIATION OF MICROORGANISMS IN RELATION TO FOOD PRESERVATION. I. THE COMPARATIVE SENSITIVITIES OF SPECIFIC BACTERIA OF PUBLIC HEALTH SIGNIFICANCE
Erdman, I. E., Thatcher, F. S., Macqueen, K. F.
***Canadian Journal of Microbiology*, v. 7, pp. 199–205, April 1961**

28. STUDIES ON THE IRRADIATION OF MICROORGANISMS IN RELATION TO FOOD PRESERVATION. II. IRRADIATION RESISTANT MUTANTS
Erdman, I. E., Thatcher, F. S., Macqueen, K. F.
***Canadian Journal of Microbiology*, v. 7, no. 2, pp. 207–215, 1961**

Using a Co^{60} source, repeated irradiation of survivors of bacterial cultures at a level initially destroying a high proportion of cells, cells gave rise to strains which were more resistant to irradiation than the original cultures. Development of resistance was shown in single strains of *Escherichia coli*, *Streptococcus faecalis*, and *Clostridium botulinum* Type A, and in one of three strains of *Staphylococcus aureus*, but not in two strains of *C. botulinum* Type E nor in *Salmonella gallinarum*. Changes were noted in phage patterns of the staphylococci, biochemical characteristics of *E. coli*, and toxin production of *C. botulinum* in response to repeated irradiation. Irradiation of parent and resistant cultures at −78°C did not change their comparative resistance, though each was afforded some protection at this temperature. These findings suggest that the induced resistance is an expression of resistance to the primary effect of irradiation and not to possible toxic substances formed by free-radical interaction. (*BA*, v. 36, 1961, #49,835)

29. THE RADIATION SENSITIVITY OF PHYCOMYCES. INTERACTION OF VISIBLE LIGHT AND IONIZING RADIATION
Forssberg, A. G., Novak, R., Dreyfus, G., Pehap, A.
***Radiation Research*, v. 13, pp. 661–668, November 1960**

30. EFFECT OF IRRADIATION ON MICROORGANISMS
Geyer-Duszalska, J., Janota-Bassalik, L.
***Postepy Biochemii*, v. 3, pp. 289–307, 1957**

Different kinds of radiation and their effects are discussed, especially their action on microorganisms. (*BA*, v. 35, 1960, #17,907)

31. BIOLOGICAL ACTION OF RADIOACTIVE RAYS: REVIEW
Gierschik, H.
***Praktische Tierarzt*, pp. 463–465, 1961**

32. HOW PROCESSING CONDITIONS AFFECT MICROORGANISM RADIORESISTANCE
Goldblith, S. A., Proctor, B. E., Davison, S., Oberle, E. M., Bates, C. J., Kan, B., Hammerle, O. A., Kusmierek, B.
***Nucleonics*, v. 13, no. 1, pp. 42–45, January 1955**

Studies are presented relating to sterilization of foods with ionizing radiation. Particular reference is made to the effect of different gases in food containers, temperature of irradiation, and composition of food material; inert or vacuum atmosphere, frozen suspension medium, or more complex organic medium decrease radiosensitivity of *Escherichia coli* when exposed to irradiation. (*EI*, 1955)

33. DIRECT AND INDIRECT BIOLOGICAL EFFECTS OF RADIATION
Hobitz, H.
***Archiv fuer Hygiene and Bakteriologie*, v. 145, pp. 561–570, 1961**

A discussion is presented of how radiation induced on biological material affects physical processes, ionization, and excitation.

34. RADIATION BIOLOGY—VOLUME II
Hollaender, A., Daniels, F., Loofborrow, J. R., Pollister, A. W., Stadler, L. J., Editors
McGraw-Hill Book Co., Inc., New York, N. Y., 1955

Among the chapters included in this book are the following:

"Photochemistry," by R. Livingstone, pp. 1–40

"Practical Applications and Sources of Ultraviolet Energy," by L. J. Nuttolph, pp. 41–93

"Sunlight as a Source of Radiation," by J. A. Sanderson, E. O. Hulburt, pp. 95–118

"Technique of Study of Biologic Effects of Ultraviolet Radiation," by J. F. Scott, R. L. Sinsheimer, pp. 119–163

"Critique of Cytochemical Methods," by A. W. Pollister, pp. 203–248

"Effects of Radiation on Protozoa and Eggs of Invertebrates Other Than Insects," by R. F. Kimball, pp. 285–331

"Radiation and Viruses," by S. E. Luria, pp. 333–364

"Effects of Radiation on Bacteria," by M. R. Zelle, A. Hollaender, pp. 365–430

"Radiation Studies on Fungi," by S. Pomper, K. C. Atwood, pp. 431–453

"Photoreactivation," by R. Dulbecco, pp. 455–486

"Sunburn," by H. F. Blum, pp. 487–528

"Ultraviolet Radiation and Cancer," by H. F. Blum, pp. 529–559.

35. RADIATION EFFECTS ON CELLS AND BACTERIA
Kelner, A., Bellamy, W. D., Stapleton, G. E., Zelle, M. R.
***Bacteriological Reviews*, v. 19, pp. 22–44, 1955**

A review is presented of radiation effects on cells and bacteria. 77 references.

36. NONGENETIC EFFECTS OF RADIATION ON MICROORGANISMS
Kimball, R. F.
***Annual Review of Microbiology*, v. 11, pp. 199–220, 1957**

37. ON THE PROBLEM OF THE FATAL EFFECT OF SUN'S RAYS AND WIND ON THE CAUSATIVE AGENTS OF BRUCELLOSIS *BRUCELLA BOVIS*
Kravchenko, T. M.
***Trudy Kubanskogo Selskokhozyaistvennogo Instituta*, no. 3, pp. 182–187, 1957**

38. COMPREHENSIVE REVIEWS. FOOD PRESERVATION BY IONIZING β- AND γ-RAYS
Kuprianoff, J.
***Zeitschrift fuer Lebensmittel-Untersuchung und-Forschung*, v. 100, pp. 275–303, 1955**

Among the subjects reviewed are the following: irradiation effects, irradiation energy, irradiation dosage, temperture, atmosphere, and packaging, apparatus construction, tests with individual foods, ultraviolet light, X-rays, ray sources, and irradiation of foods.

39. VERBESSERUNG DER HALTBARKEIT VON KALTGELAGERTEN LEBENSMITTELN DURCH ANWENDUNG IONISIERENDER STRAHLEN (IMPROVED CONSERVATION OF COLD STORAGE FOOD PRODUCTS BY IONIZING RADIATION)
Kuprianoff, J.
***Kaeltetechnik*, v. 9, no. 4, pp. 90–94, April 1957**

Because of its microbicidal effect radiation can be used for preservation of foods in their original state. Pasteurization by irradiation combined with cold storage seems to be especially promising. No deleterious effects on organoleptical properties were observed. (*EI*, 1957)

40. BIOLOGICAL REACTIONS INDUCED BY HIGH-ENERGY RADIATION
Langendorff, H.
***Arzneimittel-Forschung*, v. 5, pp. 265–267, 1955**

A review is presented of biological reactions induced by high -energy radiation. 36 references.

41. IRRADIATION OF BACTERIAL SPORES
Laser, H.
In "Congres International de Biochemie, 3e Congres, Brussels, 1955, Résumés des Communications," p. 130 Societe Belge de Biochemie, Liege, Belgium, 1955

In a non-nutrient medium of freeze-dried spores of *Bacillus subtilis*, which are resuspended and irradiated, no 0-effect is evident. Metabolic pathways appear to be blocked by freezing, as do various chemical compounds.

42. BIOLOGICAL EFFECTS OF IONIZING RADIATIONS
Lorenz, E., Congdon, C. C.
***Annual Review of Medicine*, v. 5, pp. 323–338, 1954**

A review of the biological effects of ionizing radiations is presented. 67 references.

43. THE EFFECT OF RADIATION ON FOODS. III. EFFECT ON MICROORGANISMS
Lück, H.
***Deutsche Lebensmittel Rundschau*, v. 55, pp. 135–144, 1959**

The sterilization of preserved foods by irradiation is reviewed.

44. EFFECT OF RADIATION ON ANTIBODY FORMATION
Makinodan, T., Gengozian, N.
In "Radiation Protection and Recovery," pp. 316–351
Pergamon Press, New York, N. Y., 1960

45. BIOLOGICAL AND BIOCHEMICAL EFFECTS OF IONIZING RADIATION. IV. URIC ACID SECRETION IN RATS AFTER WHOLE-BODY RÖNTGEN IRRADIATION IN COMPARISON WITH EFFECTS OF DEOXYCORTICOSTERONE ACETATE (DOCA) AND ADENOSINETRIPHOSPHORIC ACID (ATP)
Maurer, H. J., Schwarzmann, P.
Strahlentherapie, v. 100, pp. 463–476, 1956

With total röntgen irradiation of 625 r and DOCA, the uric acid excretion of rats shows a wavelike course. With DOCA, however, the normalization seems to occur after a shorter period. Uric acid excretion, before and after the irradiation could be observed, increased with the administration of doses of ATP.

46. BIOLOGICAL EFFECTS OF IONIZING RADIATION
Minder, W.
Mitteilungen aus dem Gebiete der Lebensmitteluntersuchung und Hygiene, v. 46, pp. 76–90, 1955

Physical, chemical, and biological effects of radiation are discussed.

47. EFFECTS OF IRRADIATION *IN VIVO* ON BACTERIAL DEOXYRIBONUCLEIC ACID
Norman, A., Rowen, J. W.
Biochemica et Biophysica Acta, v. 22, no. 1, pp. 203–204, 1956

48. VARIABILITY OF MICROORGANISMS UNDER THE INFLUENCE OF IONIZING RADIATIONS
Pasichnik, A. M.
Mikrobiologichnii Zhurnal, Akademiya Nauk Ukrainskoi RSR, v. 22, no. 3, pp. 69–74, 1960 (in Ukranian)

49. THE ACTION OF IONIZING RADIATION ON VIRUSES
Pollard, E. C.
In "Advances in Virus Research," v. 2, pp. 109–151
Academic Press, Inc., New York, N. Y., 1954

50. ACTION OF IONIZING RADIATION ON ENZYMES AND VIRUSES
Pollard, E. C.
In "Proceedings of the Radiobiology Symposium, Liege, Belgium, August–September 1954," pp. 70–74 (in English)
Academic Press, Inc., New York, N. Y., 1955

Deutrons and electrons were administered to *Bacillus subtilis*. Molecular weight, length, and thickness of the enzymes were determined.

51. RADIATION ACTION ON SOME METABOLIC PROCESSES IN *ESCHERICHIA COLI*
Pollard, E. C., Vogler, C.
Radiation Research, v. 15, pp. 109–119, 1961

The effect of Co^{60} radiation on the time course of uptake of $P^{32}O^4$, $S^{35}O^4$, the formation of DNA, the induction of β-galactosidase, the formation of β-galactosidase, and the formation of lipid in cells of *E. coli* has been measured. Except in the case of DNA formation, there is no immediate postirradiation effect unless doses in excess of 60,000 r are used. At later times a depressed linear increase is observed, the time of beginning linearity being shorter for higher doses. At late times, irradiated cells leak β-galactosidase to the medium. The results indicate that there is initial damage to the nucleus followed by the sequence:

DNA→ RNA→ Ribosome→ Protein→ Lipid

The time course of damage appearance after radiation shows lipid to be affected latest, protein next, and P^{32} uptake toward the early times, in agreement with the above.

52. RADIATION RESPONSE OF *ESCHERICHIA COLI* AND *BACILLUS CEREUS*
Romig, W. R. (University of Texas, Austin, 1957, Thesis)
Dissertation Abstracts, v. 18, pp. 364–365, 1958
(Also obtainable as Publication 25177, University Microfilms, Ann Arbor, Mich.)

53. RESEARCH ON THE RADIATION RESISTANCE OF SOME PSYCHROPHILIC BACTERIA AND YEASTS FROM SALT-WATER FISH
Schmidt-Lorenz, W., Farkas, J.
Archiv fuer Mikrobiologie, v. 39, pp. 1–12, 1961 (in German)

54. A COMPARISON OF THE EFFECTS OF α- AND β-RAYS ON MICROORGANISMS
Sokurova, E.
***Biophysics* (English translation of *Biofizika*), v. 3, no. 4, pp. 453–457, 1958**

The results of comparisons made show that α-particles depressed the development of bacteria much more than did β-particles; this agrees with published data. When Po^{210} was used at concentrations such as to give doses equivalent to those producing stimulation with β-rays, it greatly depressed the development of root-nodule bacteria and Azotobacter. A mixed α- and β-emitter (Ra), used in the medium at concentrations such as to give doses equivalent to those above, gave an intermediate effect; it can stimulate somewhat after depressing development more or less strongly. Energy production and N fixation were more sensitive to α-rays than to β-rays. (*BA*, v. 36, 1961, #11,773)

55. EFFECT OF IONIZING RADIATION ON SOIL MICROORGANISMS
Stanovick, R., Giddens, J., McGreery, R. A.
***Soil Science*, v. 92, pp. 183–187, 1961**

The effects were studied of neutron and gamma radiation on soil bacteria, actinomycetes, and fungi, and on nitrifying bacteria, nitrogen fixation, and CO_2 evolution. Soil samples from alfalfa and ammonia-treated soils at two moisture levels were exposed at a dosage of 4.13×10^{12} neutrons/cm^2 and a mean gamma dosage of 3.4×10^{12} erg/g. Similar studies were made on soil samples taken at varying distances from the reactor after a run of 735 Mw hours of operation, which gave a cumulative mixed neutron and gamma dosage ranging from over 100,000 r at 100 ft to 9000 r at 700 ft.

56. ON THE EFFECT OF PERFUSATE FROM IRRADIATED TISSUE ON THE BACTERICIDAL PROPERTIES OF THE SKIN AND PHAGOCYTE ACTIVITY OF THE LEUKOCYTES
Sverdlov, A. G.
***Meditsinskaya Radiologiya*, v. 5, pp. 73–74, December 1960 (in Russian with English summary)**

57. THE EFFECTS OF MICROWAVE IRRADIATION ON SPERMATOGENESIS AND ON ACCESSORY SEX ORGANS IN THE MALE ALBINO RAT
Thomas, J. A. (State University of Iowa, Iowa City, 1961, Thesis)
***Dissertation Abstracts*, v. 22, no. 5, p. 1696, 1961**

58. THE EFFECT OF IONIZING RADIATION ON THE MICROFLORA AND COURSE OF EXPERIMENTAL INFECTED WOUNDS
Vodyannikova, A. A.
***Biulleten Eksperimentalnoi Biologii i Meditsiny*, v. 48, no. 7, pp. 824–828, 1959**

Experiments conducted on 96 white rats and 138 white mice demonstrated that X-irradiation of animals with local suppurative focus causes an acute depression of phagocytosis and a pronounced increase in the number of microbes in the wound with corresponding increase of their pathogenic properties. This promotes the generalization of the process (bacteriemia) and causes the death of the animals. (*BA*, v. 35, 1960, #40,203)

59. RADIATION INACTIVATION OF VACCINIA VIRUS
Wilson, D. E.
***Radiation Research*, v. 14, no. 6, pp. 796–802, 1961**

Radiation inactivation of P^{32}-labeled vaccinia virus indicates that the virus possesses one or two sites responsible for attachment to the host cell. The sensitive volume of the attachment site corresponds to a molecular weight of about 3 million. The sensitive volume of the unit controlling pock formation by vaccinia was equal to 4% of the nucleic acid volume of the virus. The implications of the ratio of the nucleic acid volume to radiosensitive volume are discussed. (*BA*, v. 36, 1961, #83,263)

60. VERÄNDERUNGEN IN LEBENSMITTELN UNTER DEM EINFLUSS DER IONISIERENDEN STRAHLUNG (CHANGES IN MICROFLORA CAUSED BY IONIZING RADIATION)
Wolf, A., Hlavacova, M., Prskavcova, V., Maresova, P.
***Journal of Hygiene, Epidemiology, Microbiology, and Immunology*, v. 1957, no. 1–2, pp. 156–162, 1957**

The influence of X-rays on the changes in the microflora, vitamin C, pepsin and diastasis in some foods has been studied. It has been found that relatively small doses cause significant inhibition in the microflora, a decrease of vitamin content, and a lowering of the activity of some enzymes. (*BA*, v. 32, 1958, #34,799)

61. RADIOSENSITIVITY OF BACTERIAL SPORES
Wynn, J. H., Jr. (Syracuse University, N. Y., 1958, Thesis)
***Dissertation Abstracts*, v. 20, pp. 460–461, 1959**
(Microfilm obtainable as MIC 59-1209, University Microfilm, Ann Arbor, Mich.)

62. RADIATION STERILIZATION—XI
***Nucleonics*, v. 13, no. 1, pp. 36–39, January 1955**

The present status of the food and drug industry is examined in relation to radiation processing research. Results of an editorial survey based on questionnaires were sent to government laboratories, educational institutions, and industrial organizations. Data gathered on research, staff size, annual expenditures, radiation sources used, and future possibilities of radiation processing is presented. (*EI*, 1955)

63. NEW USE FOR RADIATION—WASTE TREATMENT BY FISSION PRODUCTS
***Engineering News-Record*, v. 155, no. 7, pp. 39–40, August 18, 1955**

A review is presented of research work carried on by Engineer Research and Development Laboratories of Corps of Engineers, U. S. Army, in conjunction with Oak Ridge National Laboratory, Tennessee, and Department of Chemistry at Columbia University, New York, in order to develop uses for waste fission products. Sterilization of water-borne sewage by gamma radiation without activating or leaving residual radiation in treated liquids is discussed. (*EI*, 1955)

64. SYMPOSIUM ON THE BIOLOGICAL EFFECTS OF RADIATION [UNIVERSITY OF TORONTO, 1959]
***Canadian Journal of Biochemistry and Physiology*, v. 38, pp. 311–336, 1960**

Among the papers presented at the Symposium are the following: "Introduction," by E. A. Sellers, p. 311; "Radiation, Its Primary Interactions," by G. F. Whitmore, pp. 312–320; "Radiation, the Cellular Approach," by G. M. Clark, D. G. Baker, pp. 320–325; "Somatic Effects of Ionizing Radiation," by E. A. Sellers, pp. 326–330; "Genetic Effects of Ionizing Radiation," by H. B. Newcombe, pp. 330–336.

GAMMA RADIATION

65. INFLUENCE OF GAMMA RADIATION ON THE MICROFLORA OF CUCUMBER FRUIT AND BLOSSOMS
Etchells, J. L., Costilow, R. N., Bell, T. A., Rutherford, H. A.
***Applied Microbiology*, v. 9, no. 2, pp. 145–149, 1961**

Results are presented of a study on gamma radiation of several microbial groups in the heterogeneous population occurring naturally on cucumber fruit and blossoms. The initial populations of the different microbial groups were markedly higher on blossoms as compared to fruit, but the corresponding microbial survival curves indicated that the destruction rates were comparable for irradiation of both types of material. The asporogenous bacteria, as represented by the coliform and acid-forming bacteria, were the most sensitive to radiation; the aerobic and anaerobic sporeformers were the most resistant. The yeasts and molds were second only to bacterial spores in radiation resistance; however, the resistance of yeasts as a group and molds as a group was considered to be the same. Increasingly higher doses of gamma radiation resulted in correspondingly lower cucumber firmness values as compared to non-irradiated controls. (*BA*, v. 36, 1961, #45,772)

66. GAMMA RAY STERILIZATION AND RESIDUAL TOXICITY STUDIES OF GROUND BEEF INOCULATED WITH *CLOSTRIDIUM BOTULINUM* SPORES [ABSTRACT]
Kempe, L. L., Graikoski, J. T.
***Bacteriological Proceedings*, v. 61, p. 57, 1961**

67. GAMMA IRRADIATION OF MISO AND SOY SAUCE. II. RADIATION EFFECTS ON MICROORGANISMS
Okazawa, Y., Namiki, M., Matsuyama, A.
***Agricultural Society of Japan, Journal of the*, v. 35, no. 6, pp. 533–540, 1961**

68. THE EFFECT OF GAMMA RADIATION ON THE MICROBIAL POPULATION OF THE SOIL

Popenoe, H., Eno, C. F.
***Soil Science Society of America Proceedings*, v. 26, no. 2, pp. 164–167, 1962**

Arredondo fine sand was exposed to gamma radiation from a Co^{60} source at doses of 1, 4, 16, 32, 64, 256, 512, 1024, and 2048 kr. Survival of fungi and bacteria progressively decreased to <4% at 1024 kr; algae were slightly more resistant. No nematodes were recoverable after 14 days from soils receiving 256 kr or more. Initially, CO_2 evolution was inversely related to radiation dose except for the 64 kr treatment. Later, all soils except those which received doses higher than 256 kr essentially equaled or exceeded the control in CO_2 production. Nitrate and sulfate production were progressively reduced with increasing doses of radiation. Production of nitrate after 28 days was <3% of the controls for the 1024 kr level. Greatest reductions in organisms and biological processes occurred above a radiation dose of 256 kr. (*BA*, v. 39, 1962, #8031)

69. THE EFFECT OF GAMMA RADIATION ON THE MICROORGANISMS CONCERNED WITH JAPANESE FOOD AND ITS APPLICATION TO STERILIZATION

Teramoto, S., Taguchi, H., Hashida, W., Ueda, R., Misaki, A., Yoshii, S.
***Hakko Kogaku Zasshi (Journal of Fermentation Technology)*, v. 36, no. 5, pp. 169–172, 1958 (in Japanese with English summary)**

Hiochikin, B. natto, Z. salsus, Aspergillus niger, and *Aspergillus Oryzae* as well as saké and soya were exposed to gamma rays produced by 9 curie and 100 curie sources of Co^{60}. Straight survival lines were obtained against radiation dose. The D_0 values for the microorganisms were found to lie within the range of 3.3×10^4 to 1.25×10^5 repeatedly. In this dose level, undesirable flavor appeared in irradiated saké and soya. (*BA*, v. 35, 1960, #10,944)

70. EFFECT OF GAMMA-RAY UPON FOOD MICROORGANISMS. VI. STUDIES ON THE EFFECT OF GAMMA-RAY UPON *E. COLI* IN COMPONENTS OF VARIED MEATS

Watanabe, W.
***Bulletin of the Agricultural Chemical Society of Japan*, v. 24, no. 7, pp. 673–681, 1960**

A series of studies has been carried out on the effects of various conditions on the survival of *Escherichia coli* irradiated with Co^{60} gamma-ray. This report deals with the survival of the strain irradiated in the medium containing each of the components of various types of fish-meats and meats. (*BA*, v. 36, 1961, #38,376)

71. EFFECT OF GAMMA-RAY UPON FOOD MICROORGANISMS. IX. STUDIES ON THE THE ADDITION OF SOME PRESERVATIVES OR ANTIBIOTICS

Watanabe, W.
***Agricultural and Biological Chemistry*, v. 25, no. 4, pp. 313–318, 1961**

The possibility of enhancement in the lethal effect of gamma-ray by the aid of various substances was investigated. The survival-ratios are reported of four strains of bacteria in the nutrient or the non-nutritious pure agar medium, to which various kinds of preservatives or antibiotics were added. (*BA*, v. 36, 1961, #61,430)

72. EFFECT OF GAMMA-RAY UPON FOOD MICROORGANISMS. IX. STUDIES ON THE INFLUENCE OF SOME PHYSICAL CONDITIONS UPON SURVIVALS OF BACTERIA IRRADIATED

Watanabe, W.
***Agricultural and Biological Chemistry*, v. 25, no. 6, pp. 448–452, 1961**

The effect of the secondary rays from metallic foil and the influence of irradiation in the frozen state on survival of bacteria are examined. *Escherichia coli, Aerobacter aerogenes, Proteus vulgaris,* and *Pseudomonas aeruginosa* at concentrations ranging from 4.0 to 9.9×10^2 cells/ml were suspended in nutrient agar and placed in petri dishes. The surface of the medium was covered with a sterile sheet of 0.01 mm thick tin or aluminum foil. Irradiation was with 50 curie Co^{60}. Only *E. coli* was used for the frozen state experiment. Metallic foil enhanced the lethal effect of the gamma-rays; the effect was greater with tin foil. Double sheets were slightly more effective than single. Freezing did not influence survival rate. (*BA*, v. 37, 1962, #23,830)

X-RADIATION

73. THE EFFECT OF TOTAL IRRADIATION WITH X-RAYS ON PHAGOCYTIC FUNCTION OF GRANULOCYTES
Demidas, V. V.
1959
U. S. Atomic Energy Commission, Technical Information Service Extension, Rockville, Md.
AEC-tr-3661, pp. 334–337

74. EFECTO DE LOS RAYOS-X SOBRE EL VIRUS DE LA POLIOMIELITIS (THE EFFECT OF X-RAYS ON POLIOMYELITIS VIRUS)
Ercoli, N.
***Acta Cientifica Venezolana*, v. 12, no. 1, pp. 15–17, 1961**

A suspension diluted to 10^{-4} of the Lansing strain (Type II) in the cerebrum and spinal medulla of the rat loses its virulence only with a dose of 200,000 r, and at a concentration of 10^{-6} with a dose of 100,000 r. Compared with rabbit papilloma virus (3000 r) and fibroma virus (10,000 r) as well as with their susceptibility to ultraviolet rays, the polio virus shows a marked resistance to X-rays, which is probably due as much to the small size of the virus as to the presence of extraneous proteins. (*BA*, v. 38, 1962, #15,102)

75. ON THE EFFECT OF X-RAYS AND VARIOUS RADIOPROTECTIVE SUBSTANCES ON THE FUNGUS PHYCOMYCES
Huber, R., Harhash, A. W., Brucker, W.
***Acta Biologica et Medica Germanica*, v. 5, pp. 146–152, 1960 (in German with English and Russian summaries)**

76. EFFECT OF X-RAYS ON PHOTOSYNTHETIC PURPLE SULFUR BACTERIA
Lambina, V. A.
***Microbiology*, v. 30, no. 4, pp. 506–510, 1962**
(See also *Mikrobiologiya*, v. 30, no. 4, pp. 601–606, 1961)

At 2–10 kr, X-irradiation stimulates cell division, increases the biomass and the rate of photosynthesis within the first day of development of the culture. On the fifth day these processes are inhibited as compared with the control. Doses exceeding 10 kr inhibit the development of purple sulfur bacteria, but doses up to 30 kr do not cause any regular change in the ratio: carbon consumed/biomass. Irradiation of these bacteria with X-rays at doses of 0.5 to 30 kr does not favor bacterial development in the absence of light. (*BA*, v. 38, 1962, #8589)

77. IRRADIATION EFFECTS IN YEAST
Laser, H.
***Radiation Research*, v. 16, pp. 471–482, 1962**

The effect of X-irradiation on the viability of two strains of yeast is described with special regard to its dependence on variations in substrate and water content of the cells prior to and during irradiation and on nitrogen starvation before or after irradiation. The results strongly support the view of the importance of indirect effects and the large part they play in intracellular reactions to radiation.

78. X-RAY DIFFRACTION STUDIES OF BACTERIAL VIRUSES
North, A. C. T., Rich, A.
***Nature*, v. 191, pp. 1242–1245, 1961**

These experiments suggest that some of the DNA inside the bacteriophage T_2 virus head is oriented parallel to the tail. Furthermore, the evidence suggests that the DNA may be organized into crystalline domains about 140 Å across in T_2 and 120 Å in T_7. The T_7 virus can be crystallized, which should prove to be very useful in furthering the study of the internal organization of the bacteriophage.

79. THE ROLE OF FREE RADICALS IN THE LETHAL EFFECTS OF X-RAYS IN DRY BACTERIAL SPORES
Powers, E. L., Ehret, C. F., Smaller, B.
In "Free Radicals in Biological Systems," pp. 351–366
Academic Press, Inc., New York, N.Y., 1961

80. EFFECTS OF X-IRRADIATION ON THE DEVELOPMENT OF MALARIAL PARASITES IN MOSQUITOES [ABSTRACT]
Ward, R. A.
***Anatomical Record*, v. 137, no. 3, p. 400, 1960**

81. SURVIVAL AND REPRODUCTIVE ABILITY AFTER X-IRRADIATION IN 4 SPECIES OF PARAMECIUM [ABSTRACT]
Wichterman, R.
***Anatomical Record*, v. 138, no. 3, p. 389, 1960**

ULTRAVIOLET RADIATION

82. LETHAL AND MUTAGENIC EFFECT OF ULTRAVIOLET LIGHT ON MICROORGANISMS

Alikhanyan, S. I., Mindlin, S. Z.
***Zhurnal Obshchei Biologii*, v. 17, pp. 413–435, 1956**

The lethal effect of ultraviolet light increases with the incubation of *Escherichia coli* at 15, but the rate of induction of mutations decreases. In the presence of iodoacetate, the lethal effect of ultraviolet light on Streptomyces T_{12} decreases, but the rate of mutations is not affected. Degree of photoactivation in different organisms is different.

83. EFFECT OF ULTRAVIOLET IRRADIATION ON 5-FLUOROURACIL-PRETREATED BACTERIA

Ben-Ishai, R., Goldin, H., Oppenheim, B.
***Biochemica et Biophysica Acta*, v. 55, pp. 748–754, 1961 (in English)**

High concentrations of 5-fluorouracil reduced resistance to ultraviolet irradiation, while lower concentrations enhanced it. The post-irradiation metabolism of 5-fluorouracil pretreated bacteria, the composition of the cells at the time of irradiation, and the effect of reversing agents on survival were examined in studies of the mechanism of 5-fluorouracil induced resistance to irradiation. A correlation was found between the deoxyribonucleic acid content of a cell and its response to irradiation: 5-fluorouracil treated cells became resistant to the action of irradiation on DNA synthesis. Pretreatment of cells with 5-fluorouracil induced delayed division and macromolecular synthesis.

84. ESTUDIO DE LOS EFECTOS QUE PRODUCE LA LUZ ULTRAVIOLETA SOBRE LAS BACTERIAS. I. ALTERACIONES DEL COMPORTAMIENTO FISIOLÓGICO DE LA *ESCHERICHIA COLI* (A STUDY OF THE EFFECTS OF ULTRAVIOLET LIGHT UPON BACTERIA. I. ALTERATIONS OF THE PHYSIOLOGICAL BEHAVIOR OF *E. COLI*

Cabezas de Herrera, E.
***Microbiologia Espanola*, v. 14, no. 1, pp. 7–16, 1961**

Prior to irradiation, 37 physiological characteristics of a synchronized culture of *Escherichia coli* K_{12} were determined and growth curves were plotted. Samples of a diluted culture in the logarithmic phase were agitated during exposure for varying lengths of time to ultraviolet. Irradiated cells were then employed in the series of 37 physiological tests to determine growth curves. The procedure revealed physiological changes undetectable by the common methods of detecting only survivors by plate counts. (*BA*, v. 36, 1961, #66,852)

85. ESTUDIO DE LOS EFECTOS QUE PRODUCE LA LUZ ULTRAVIOLETA SOBRE LAS BACTERIAS. II. ALTERACIONES DEL COMPORTAMIENTO FISIOLÓGICO DEL *BACILLUS CEREUS* (A STUDY OF THE EFFECTS OF ULTRAVIOLET LIGHT UPON BACTERIA II: CHANGES IN PHYSIOLOGICAL BEHAVIOR OF *BACILLUS CEREUS*)

Cabezas de Herrera, E.
***Microbiologia Espanola*, v. 14, no. 1, pp. 53–58, 1961**

Prior to irradiation, 37 physiological characteristics of a synchronized culture of *Bacillus cereus* were determined and growth curves were plotted. Samples of a diluted culture in the logarithmic phase were agitated during exposure for varying lengths of time to ultraviolet. Irradiated cells were then employed in the series of 37 physiological tests to determine growth curves. The procedure revealed physiological changes undetectable by methods devised to count only surviving cells. (*BA*, v. 36, 1961, #66,853)

86. ESTUDIO DE LOS EFECTOS QUE PRODUCE LA LUZ ULTRAVIOLETA SOBRE LAS BACTERIAS. III. ALTERACIONES DEL COMPORTAMIENTO FISIOLÓGICO DEL *MYCOBACTERIUM PHLEI* (STUDY OF THE EFFECTS OF ULTRAVIOLET LIGHT ON BACTERIA. III. ALTERATIONS IN THE PHYSIOLOGICAL BEHAVIOR OF *MYCOBACTERIUM PHLEI*)

Cabezas de Herrera, E.
***Microbiologia Espanola*, v. 14, no. 2, pp. 107–112, 1961**

The influence of ultraviolet radiation on the physiological activities of *M. phlei* in different culture media and on its growth curve is studied. (*BA*, v. 37, 1962, #4703)

87. ESTUDIO DE LOS EFECTOS QUE PRODUCE LA LUZ ULTRAVIOLETA SOBRE LAS BACTERIAS. IV. ALTERACIONES DEL COMPORTAMIENTO FISIOLÓGICO DEL

STAPHYLOCOCCUS AUREUS (STUDY OF THE EFFECTS OF ULTRAVIOLET LIGHT ON BACTERIA. IV. ALTERATIONS IN THE PHYSIOLOGICAL BEHAVIOR OF _STAPHYLOCOCCUS AUREUS_)
Cabezas de Herrera, E.
***Microbiologia Espanola*, v. 14, no. 2, pp. 113–117, 1961**

The influence of ultraviolet radiation on the physiological activities of S. *aureus* in different culture media and on its growth is studied. (*BA*, v. 37, 1962, #4704)

88. ESTUDIO DE LOS EFECTOS QUE PRODUCE LA LAZ ULTRAVIOLETA SOBRE LAS BACTERIAS. V. ALTERACION DEL METABOLISMO DE LOS ACIDOS NUCLEICOS DEL _MYCOBACTERIUM PHLEI_ (STUDY OF THE EFFECTS OF ULTRAVIOLET LIGHT ON BACTERIA. V. ALTERATION OF THE NUCLEIC ACID METABOLISM OF _MYCOBACTERIUM PHLEI_)
Cabezas de Herrera, E., Aznar, P.
***Microbiologia Espanola*, v. 14, no. 2, pp. 119–127, 1961**

The synthesis of deoxiribonucleic acid in the irradiated strain was inhibited in a study of the metabolism of nucleic acids of normal and ultraviolet irradiated *M. phlei* strains. (*BA*, v. 37, 1962, #4705)

89. EFFECT OF ULTRAVIOLET IRRADIATION OF BACTERIOPHAGE T_2 ON ENZYME SYNTHESIS IN HOST CELLS
Dirksen, M.-L., Wiberg, J. S., Koerner, J. F., Buchanan, J. M.
***National Academy of Sciences of the United States of America, Proceedings of the*, v. 46, no. 11, pp. 1425–1430, 1960**

The kinetics of formation of deoxycytidylate hydroxymethylase, an enzyme induced in *Escherichia coli* by infection with phage T_2, have been studied. Under the usual conditions of infection, enzyme formation takes place during the time interval of 3–12 min after infection, after which time the enzyme level remains approximately constant. If the cells are infected with phage which has been irradiated with ultraviolet light at an appropriate dose, the kinetics of enzyme formation during the first 10 min are similar to those observed upon infection with non-irradiated phage. However, enzyme formation continues for a longer period of time after infection with the irradiated phage. This effect has also been noted with two other phage-induced enzymes, deoxycytidine triphosphatase and thymidylate kinase. Possible implications of this finding are discussed. (*BA*, v. 36, 1961, #76,686)

90. INCORPORATION OF THYMIDINE INTO DEOXYRIBONUCLEIC ACID BY EXTRACTS FROM BACTERIA EXPOSED TO ULTRAVIOLET LIGHT
Doudney, C. O., Billen, D.
***Nature*, v. 190, no. 4775, pp. 545–546, 1961**

91. THE CHEMICAL REVERSAL OF ULTRAVIOLET EFFECTS ON BACTERIA
Ellison, S. A., Erlanger, B. F., Allen, P.
***Journal of Bacteriology*, v. 69, pp. 536–540, 1955**

The reversal of lethal and mutagenic effects was carried out by plating the irradiated bacteria in nutrient agar to which NaOAc had been added. One strain of bacteria was not reactivated by acetate despite its ability to be photoreactivated.

92. STUDIES ON DISEASES OF FORAGE CROPS. I. THE REACTION OF CASUAL ORGANISM OF TARGET SPOT OF RED CLOVER TO SOME FUNGICIDES AND ULTRAVIOLET-RAY
Fujioka, Y.
***Hiroshima Nagyotanki Deigaku, Bulletin*, v.1, no. 4, pp. 1–3, 1961 (in Japanese and English)**

Target spot (*Stemphylium sarcinaeforme*) is one of the serious diseases of red clover found in Hiroshima Prefecture. In laboratory experiments, Melan (mercury phenylacetate) proved best for controlling both mycelial growth and spore formations. Exposure of spores to ultraviolet rays for 1–10 min increased germination; 30 min or more decreased it. Germination of spores placed in culture medium was checked by irradiation for 1 hr or more. (*BA*, v. 40, 1962, #8239)

93. INTERFERENCE BETWEEN INACTIVATED AND ACTIVE INFLUENZA VIRUSES IN THE CHICK EMBRYO. I. A REEVALUATION OF FACTORS OF DOSAGE AND TIMING USING INFECTIVITY TITRATIONS FOR ASSAY
Henle, W., Paucker, K.
***Virology*, v. 6, no. 1, pp. 181–197, 1958**

Interference by ultraviolet-inactivated influence virus with propagation of the active homotypic or heterotypic agents in the endoderm of the chick embryo allantoic has been re-evaluated with respect to dosage and timing

of the two injections, using infectivity titrations for assay. By varying (1) the interfering dose in terms of hemagglutinin units, (2) the intervals between its injection and challenge with serial decimal dilutions of active virus, and (3) the period of incubation after challenge, the following results were obtained. The time required to establish solid interference decreases with the size of the interfering dose; i.e., when increasingly more inactivated virus particles are provided per cell. With 850 HA units no evidence of viral multiplication was obtained upon challenge at 9 hr, whereas with 20 to 100 HA units, interference was extensive yet not complete in 24 hr. If the interfering and challenge inocula were given simultaneously or at a 2-hr interval, the first and part of the second infectious cycles were found to proceed before further spread of the infectious process was arrested, unless the dose of inactive virus was large. In that case the homotypic preparations affected the yields of the initial infectious cycles to significant extent. In all instances where interference was not as yet fully established, using 20 or more HA units of the interfering agent, the yields of infectious virus were directly proportional to the challenge dose. With a smaller dose of inactivated virus (<20 HA units), a proportion of the cells remained fully susceptible and the yields were no longer proportional to the challenge inoculum, but reached a plateau, presumably in proportion to the number of remaining susceptible cells. The implications and quantitative aspects of these experiments have been discussed. (*BA*, v. 33, 1959, #42,237)

94. INFLUENCE OF ULTRAVIOLET IRRADIATION ON GENERAL TRANSDUCTION IN *PSEUDOMONAS AERUGINOSA*
Holloway, B. W., Monk, M.
In "Radiobiology," pp. 231–237
Butterworth and Co., Ltd., London, England, 1961

This paper was presented at the 3rd Australasian Conference held in Sydney, Australia in 1960.

The frequency of successful transductions was increased by ultraviolet irradiation. Other changes in the deoxyribonucleic molecule were noted.

95. SYNTHESIS OF NUCLEIC ACIDS IN ULTRAVIOLET-TREATED *ESCHERICHIA COLI*
Iverson, R. M., Giese, A. C.
***Biochemica et Biophysica Acta*, v. 25, no. 1, pp. 62–68, 1957**

The effect of various wavelengths of ultraviolet radiation upon the synthesis of nucleic acids in cultures of *E. coli* B in logarithmic (log) and out-of-log phases of the growth cycles was studied. Treatment of cultures of log phase *E. coli* B with ultraviolet radiation of 254 mμ stops DNA synthesis immediately, whereas RNA synthesis continues for about one division cycle (30 min) afterwards. Treatment of out-of-log phase cultures of *E. coli* B with these radiations stops DNA and RNA synthesis immediately, as does treatment with ultraviolet of 265 mμ. After irradiation with ultraviolet of λ 226 mμ the synthesis of RNA and DNA is not delayed as compared to the controls. Synthesis of RNA and DNA stopped by ultraviolet, is resumed first in the cultures subsequently illuminated with white light, indicating photoreversal of ultraviolet injury by white light, and then in the ultraviolet-treated cultures. In both cases, synthesis of nucleic acid is resumed at about the time that the bacteria begin to divide. Since RNA synthesis is inhibited by ultraviolet (254 mμ or 265 mμ) in *E. coli* cultures in the out-of-log phases of the growth cycle but not in the log phase cultures, two loci of action of ultraviolet radiations RNA synthesis are suggested. The decline in viability of *E. coli* B after irradiation with very short ultraviolet (226 mμ) without a corresponding decrease in RNA and DNA synthesis suggests a locus of action of these radiations different from the part of the cell involved in nucleic acid synthesis. (*BA*, v. 31, 1957, #38,642)

96. THE INHIBITION OF THE PHAGOCYTIC ACTIVITY OF LEUCOCYTES BY COXSACKIE VIRUSES. III. VIRUSES INACTIVATED BY ULTRAVIOLET RAYS
Kantoch, M., Szalaty, H.
***Archiwum Immunologii i Terapii Doswiadczalnej*, v. 8, pp. 399–405, 1960**

97. EFFECTS OF NEAR-ULTRAVIOLET IRRADIATION ON GROWTH AND OXIDATIVE METABOLISM OF BACTERIA
Kashket, E. R., Brodie, A. F.
***Journal of Bacteriology*, v. 83, no. 5, pp. 1094–1100, 1962**

The effects of irradiation with near-ultraviolet light (360 mμ) have been studied with *Escherichia coli* W and a strain of *Pseudomonas aeruginosa*. The growth of the aerobe *P. aeruginosa* was inhibited by light on minimal salts media containing succinate, glutamate or glucose as sole carbon sources. The facultative anaerobe *E. coli* was capable of growth under irradiation on a fermentable carbon source such as glucose but with a smaller yield of cells on limiting substrate as compared to unirradiated

control cultures. The rate of growth of aerobic irradiated cells on glucose was equal to that of anaerobic growth on that carbon source, and there was a greater accumulation of end products of glucose catabolism aerobically in the light as compared to dark controls. When irradiated in media containing carbon sources from which energy was obtainable only by oxidative phosphorylation (such as succinate or malate), *E. coli* cells were still capable of oxidizing these substrates but could not grow on them. This bacteriostatic effect of 360-mμ light could be reversed by the addition of glucose which resulted in the growth of irradiated cells. Visible (400 to 600 mμ) light was found to have no effect. Irradiated *E. coli* cells in succinate were found to contain no naphtho- or benzoquinones (compounds which are more sensitive to 360-mμ irradiation than other components of the respiratory chain). It is suggested that the effect of 360 mμ light on whole cells is the destruction of light-sensitive components, (such as the benzoquinone Q_8 and naphthoquinone K_2C_{45}) of *E. coli* W which are essential for obtaining energy from oxidative metabolism. (*BA*, v. 39, 1962, #19,520)

98. ON REACTIVATION OF *ESCHERICHIA COLI* AFTER TREATMENT BY ULTRAVIOLET RAYS. II. PHOTOREACTIVATION OF AQUEOUS SUSPENSIONS OF IRRADIATED BACTERIA
Linz, R., Lecocq, E.
***Annales de l'Institut Pasteur*, v. 100, pp. 180–189, February 1961 (in French)**

99. LETHAL EFFECTS ON SEVERAL COMMON DERMATOPHYTIC FUNGI BY ULTRAVIOLET LIGHT AFTER EXPOSURE TO COMPOUNDS OF THE FUROCOUMARIN GROUP
Mikkelson, V. E., Fowlks, E. W., Griffith, D. G.
***Archives of Physical Medicine and Rehabilitation*, v. 42, pp. 609–613, August 1961**

100. UNBALANCED GROWTH AND BACTERIAL DEATH IN THYMINE-DEFICIENT AND ULTRAVIOLET IRRADIATED *ESCHERICHIA COLI*
Okagaki, H., Tsubota, Y., Sibatani, A.
***Journal of Bacteriology*, v. 80, pp. 762–771, December 1960**

101. EFFECT OF SMALL DOSES OF ULTRAVIOLET RAYS ON THE VARIABILITY OF FLEXNER'S BACILLI
Pershina, Z. G., Vasileva, I. G.
***Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii*, v. 31, pp. 99–103, November 1960 (in Russian)**

102. USE OF ULTRAVIOLET RADIATION IN MICROBIOLOGICAL LABORATORIES
Phillips, G. B., Hanel, E., Jr.
February 6, 1961
Army Chemical Corps Biological Laboratories, Fort Detrick, Md.
Technical Report BL 28
AD-250,124

The results are summarized of a six-year research program which was established because it was desirable first to survey the literature concerning the action and use of ultraviolet radiation, and second, to determine experimentally the susceptibility of various types of microorganisms when exposed to radiation under conditions that might be found in the infectious disease laboratory. Finally it was planned to use the assembled data as a guide in developing, designing, and testing suitable ultraviolet installations for use in the infectious disease laboratory. Germicidal ultraviolet radiation is used in industry for protection of personnel and protection of the product. Its uses in this report have been directed primarily toward protection of personnel and test animals. 328 references. (ASTIA)

103. MAPLE SIRUP. XIV. ULTRAVIOLET IRRADIATION EFFECTS ON THE GROWTH OF SOME BACTERIA AND YEASTS
Schneider, I. S., Frank, H. A., Willits, C. O.
***Food Research*, v. 25, no. 5, pp. 654–662, 1960**

A statistically designed study was made of the effects of ultraviolet radiation of different intensities and exposures. Two bacterial strains were found to be equally sensitive to destruction and were more sensitive than yeasts. As time of exposure increased there was corresponding increase in reduction of all living cells. Discontinuous exposure of the bacterial strains was less effective than the continuous radiation. Conclusions were based on a statistical analysis of the data. (*BA*, v. 36, 1961, #18,322)

104. THE ULTRAVIOLET LIGHT INACTIVATION OF PHI-X174 BACTERIOPHAGE AT DIFFERENT WAVE LENGTHS AND pH'S
Setlow, R., Boyce, R.
***Biophysical Journal*, v. 1, pp. 29–41, September 1960**

105. USTOICHIVOST EPIFITNYKH MIKRO-ORGANIZMOV K ULTRAFIOLETOVYM LUCHAM (THE RESISTANCE OF EPIPHYTIC MICROORGANISMS TO ULTRAVIOLET RAYS)
Shirokov, O. G.
***Biulleten Nauchnich Tekhnologricheskuch Informatzii po Selskoklozaystvehhoi Mikrobiologii*, v. 6, no. 1, pp. 3–7, 1959 (in Russian)**

It was found that cultures of epiphytic microorganisms isolated from spikes were more resistant to the effect of ultraviolet rays (a plating by means of a smear on cabbage agar was irradiated with quartz mercury vapor lamp PRK-2 from a distance of 1 m than were cultures of epiphytic microorganisms isolated from roots and soil. The pigmented cultures were more resistant than the nonpigmented cultures (maintenance of the capability to multiply is implied). Of 14 cultures of various genera and species studied, pigmented and nonpigmented mycobacteria and mycococci were more resistant to ultraviolet rays than were Chromobacterium and representatives of the genus Pseudomonas. (*BA*, v. 37, 1962, #12,614)

106. INACTIVATION OF THE FOOT AND MOUTH DISEASE BY MONOCHROMATIC ULTRAVIOLET LIGHT
Strohmaier, K., Geiss, E.
***Zentralblatt für Bakteriologie, Parasitenkunde, Insektionskrankheiten und Hygiene, Erste Abteilung: Originale*, v. 180, pp. 166–175, October 1960 (in German)**

107. INACTIVATION OF MICROORGANISMS BY MEANS OF ULTRAVIOLET RADIATION
Stuy, J. H.
***Medica Mundi*, v. 6, pp. 122–126, 1960**

108. SOME EFFECTS OF ULTRAVIOLET IRRADIATION ON YEAST CELLS (*CANDIDA UTILIS*)
Svihla, G., Schlenk, F., Dainko, J. L.
***Radiation Research*, v. 13, pp. 879–891, December 1960**

109. EFFECT OF ULTRAVIOLET RADIATION ON THE PERMEABILITY AND PROTEIN SYNTHESIS OF *MYCOBACTERIUM*
Tsukamura, M.
***Japanese Journal of Tuberculosis*, v. 9, no. 3–4, pp. 106–114, 1961**

A study was made of the action of ultraviolet radiation on the biochemical property of *Mycobacterium "Jucho"* (an avirulent strain of *Mycobacterium avium*). Under the conditions tested, ultraviolet radiation increased P^{32} and S^{35} uptake. Incorporation of P^{32}-phosphate was accelerated into different cellular factions of the irradiated cells. On the other hand, incorporation of S^{35}-sulfate was increased only in the acid-soluble fraction and incorporation of S^{35} into the protein fraction was inhibit synthesis. Thus there is an inhibition of protein synthesis or an abnormal protein synthesis in the irradiated cells, without accompanying the inhibition of nucleic acids. Ultraviolet radiation caused a marked leakage (liberation) of P^{32} from P^{32}-labelled cells during irradiation. After irradiation leakage of P^{32} occurred at similar rates in both non-irradiated and irradiated cells. Leakage of glutamic acid also occurred during irradiation, while no marked difference in leakage of pentose was found between both kinds of cells. (*BA*, v. 39, 1962, #17,450)

110. STUDIES IN THE SYNTHESIS OF VIRUSES. III. EFFECTS OF ULTRAVIOLET IRRADIATION ON INTRACELLULAR BACTERIOPHAGE PRODUCTION. ON THE DISPERSIBILITY OF ULTRAVIOLET LETHALS AMONG PROGENY PARTICLES
Uchida, H.
***Japanese Journal of Experimental Medicine*, v. 28, no. 2, pp. 73–83, 1958**

The effects of ultraviolet irradiation on phage formation were examined by irradiating T_2 infected *Escherichia coli* B, 15 min after infection started, with various doses of the ultraviolet. It was found that the maturation steps in the phage synthesizing process did not discriminate between normal deoxyribonucleic acid (DNA) and DNA possessing lethal. The intracellular pool DNA had approximately the same sensitivity to the action of ultraviolet light as the free phages. The number of the inactive mature particles which incorporated lethals had been estimated radiochemically, and it was concluded that lethals themselves were not reproduced as such, and they behaved as clusters within intracellular pool. The number of the clusters incorporated per mature phage particle was estimated as very few, probably one or two. The result was not compatible with any dispersive models postulated for DNA replication. (*BA*, v. 35, 1960, #4866)

111. ULTRAVIOLET RADIATION
August 16, 1961
Joint Publications Research Service, New York, N. Y.
JPRS: 8751

ACOUSTICS

112. BIOLOGICAL EFFECTS OF HIGH INTENSITY SOUND WAVES
Ackerman, E., Reid, J. J., Kinsloe, H., Frings, H. W.
January 1953
Pennsylvania State College, State College, Penn.
Report for March 1949–October 1952 on Sonic and Mechanical Vibration Action on Air Force Personnel, WADC TR 53–82, AF 33 (038)786
AD-26,848

The effects of vibratory energy on microorganisms were studied by the Department of Bacteriology. Death curves obtained for *Escherichia coli, Serratia marcescens,* and *Pseudomonas aeruginosa* showed a logarithmic order. Exposures were conducted at maximum plate voltage at 15, 25 and 45°C with suspensions buffered at pH 4.0, 5.0, and 7.0; a Raytheon magnetostriction bar was used as the sound source. At pH 7.0 a little effect was noted on the rate of destruction of *E. coli* or *S. marcescens.* Although each rise of 10°C increased the destruction of *P. aeruginosa,* the increase in the rate was not of sufficient magnitude to suggest that the chemical reactions were of major importance to the destruction. Only the two higher temperatures, 35 and 45°C, gave an increase in the destruction rate of micrococcus varians over that obtained at 15°C. The pH destruction of the other three microorganisms occurred with a pH of 4.0 at 45°C.

Studies were made by the Department of Zoology and Entomology of the effects of high intensity sonic radiation on (1) audiogenic seizures in mice; (2) protozoa; (3) embryos; (4) gene mutation in Drosophila; and (5) such physiological effects of mice as skin growth, hearing impairment, and fertility.

Research conducted by the Department of Physics was concerned with (1) high intensity sound sources such as sirens, whistles, loud speakers, and magnetostriction vibrators; (2) the apparatus and methods for measuring sound intensities and frequencies; (3) procedures for irradiating specimens; (4) studies on LF cavitation; (5) construction of barium titanate probe microphones and electrokinetic probe hydrophones; and (6) an industrial hearing survey.

113. SONIC RESONANCES OF MAMMALIAN RED BLOOD CELLS
Ackerman, E.
***Acoustical Society of America, Journal of the*, v. 28, no. 1, p. 778, 1956**

Studies of the breakdown rate of mammalian red blood cells in cavitating fields generated by 50 kc to 1 Mc vibrations show three types of frequency effects. The focused sonic fields used are monitored by a pressure sensitive probe as well as by the transducer current readings. At certain frequencies the breakdown rate increases many-fold for fixed acoustic pressures in the exposure chamber. Also at these frequencies the apparent threshold for cellular disruption is lowered. This type of frequency effect is associated purely with the nature of the sonic field employed. A second type of effect occurs at other frequencies where the relative breakdown rates of erythrocytes of different species varies appreciably from their normal values. Since all the cells are exposed to the same sonic field, this variation appears to be caused by the particular cell type. A third effect is the variation of the relative threshold for cellular disruption of erythrocytes of different species. The relation of the two species dependent phenomena to surface resonance modes of the cells is discussed.

114. ACOUSTIC ABSORPTION COEFFICIENTS OF THE SURFACE OF LABORATORY ANIMALS
Ackerman E., Farwell, E., Oda, F., Anthony, A.
***Acoustical Society of America, Journal of the*, v. 30, pp. 1105–1111, 1958**

115. EFFECTS OF ULTRASONIC RADIATION ON GROWTH AND FERMENTATION IN THE YEAST, *SACCHAROMYCES CEREVISIAE*
Anderson, J. M.
***Biochimica et Biophysica Acta*, v. 11, pp. 122–137, 1953**

116. PHOTOGRAPHIC STUDIES OF ERYTHROCYTES IN ULTRASONIC FIELDS
Benstock, L., Ackerman, E.
***Acoustical Society of America, Journal of the*, v. 31, p. 1583, 1959**

117. ABSORPTION OF SOUND ARISING FROM THE PRESENCE OF INTACT CELLS IN BLOOD
Carstensen, E. L., Schwan, H. P.
***Acoustical Society of America, Journal of the*, v. 31, p. 185, 1959**

118. EXPOSURE OF MICROORGANISMS TO FOCUSSED AND UNFOCUSSED SOUND FIELDS

Dalzell, R. C., Kinsloe, H., Reid, J. J., Ackerman, E.
***Journal of Bacteriology*, v. 73, no. 4, pp. 499–503, 1957**

A hemolytic strain of *Micrococcus pyogenes* var. *aureus* and strains of B,B/r and C-30 of *Escherichia coli* were exposed to the sound fields of a 10-kc Raytheon magnetostriction oscillator and an 800-kc barium titanate ceramic bowl transducer. *M. pyogenes* var. *aureus* was more resistant to the lethal effects of the sound field than were the *E. coli* strains. Increase in power output resulted in an increase in lethal effect. Ultraviolet-resistant strains were as susceptible to the sound field as the ultraviolet-susceptible strain, suggesting oxidative effects are of little significance in the lethal mechanism of vibratory energy. Breaks in death curves obtained with the 800-kc transducer suggest that critical intensities were reached. At RF current of 4.5 to 5.0 amp, some effect on pigmentation of *M. pyogenes* var. *aureus* was noted. (*BA*, v. 31, 1957, #31,956)

119. USE OF ULTRASOUND WAVES FOR THE DISRUPTION OF MICROORGANISMS

Davies, R.
***Biochimica et Biophysica Acta*, v. 33, pp. 481–493, 1959 (in English)**

Apparatus is described for the disruption of microorganisms by ultrasonic radiation. It is based on a magnetostriction transducer operating at 26 kc/sec and a power of 500 w.

The length of the stainless steel cup containing the material under irradiation is a critical variable. Maximum breakage of baker's yeast occurs with tube lengths of 10.5 and 18.5 cm and minimum breakage with tube lengths of 12.5 and 20.5 cm.

The degree of cell breakage is an inverse function of the volume of the suspension irradiated, a negative exponential function of the time of irradiation and relatively independent of the cell concentration.

Making certain assumptions, a relationship is deduced between the fraction of cells remaining intact R, the volume of the suspension V and the time of irradiation t which fits reasonably well with the experimental findings. This relationship has the form $\log R = -\text{constant } z\ t/V$.

120. ULTRASONIC INFLUENCES IN SOME ACTINOPHAGES AND BACTERIOPHAGES

Fadeeva, N. P., Rautenschtein, Ya. I., Elpiner, I. E.
***Mikrobiologiya*, v. 28, pp. 391–395, 1959 (in Russian with English summary)**

A direct relationship has been established between the exposure time to ultrasonic waves and the degree of inactivation of Type I, II, and III actinophages of *A. streptomycini* and of *A. olivaceus* No. 8238 as well as of the phage of the *B. magatherium* culture. All actinophages so far tested proved to be more resistant to ultrasonics than the bacteriophage of *B. megatherium*. No significant differences have been found in the degree of inactivation of *B. megatherium* phage exposed to ultrasonics in air, argon or hydrogen medium. Ultrasonic inactivation of the actinophages and bacteriophages tested proved irreversible. Further storage in a refrigerator of the treated phages in the irradiation on medium did not reduce the titer provided the phage lystate had been prepared on the meat-peptone or fish broth. A decrease in the titer was only observed in phages exposed to ultrasonics in physiological saline and kept in the same solution.

121. PHOSPHORYLATION OF SHIKIMIC ACID BY ULTRASONIC EXTRACTS OF MICROORGANISMS

Fewster, J. A.
***Biochemical Journal*, v. 85, p. 388, 1962**

A method for determining the capability of ultrasonic extracts of microorganisms of catalysing transphosphorylation from adenosine triphosphate to shikimic acid is described.

The responsible enzyme, to which the name shikimic acid kinase is given, is present in mutants and wild-type *Escherichia coli*. It is soluble, has an optimum pH of 7.0, exhibits a requirement for Mg^{2+} or Mn^{2+} ions, is not inhibited by 0.2-mM phenylmercuric acetate, and is 55% inhibited by 3-mM iodoacetate. Formation of the enzyme is not suppressed and its activity is not inhibited by the ultimate products of the aromatic biosynthetic pathway.

Enzyme activity is measured by determination of the rate of disappearance of shikimic acid and of adenosine triphosphate from the incubation mixture. The product of the reaction is shown to be chromatographically identical with shikimic acid 5-phosphate accumulated in the growth medium of *Aerobacter aerogenes* A170–40 when grown in the presence of limiting amounts of the full aromatic supplement. Fivefold purification of the enzyme is described.

The presence of shikimic acid kinase in extracts of a number of microorganisms capable of synthesizing aro-

matic amino acids is reported. The enzyme is shown to be absent from extracts of some microorganisms recognized as being incapable of synthesizing these acids. 22 references.

122. BIOLOGICAL AND MEDICAL ACOUSTICS
Fry, W. J.
***Acoustical Society of America, Journal of the*, v. 30, pp. 387–393, May 1958**

This paper was presented at a meeting of the Acoustical Society of America held in October 1957 on unsolved problems in acoustics. Recent developments were discussed on the use of (1) low intensity sound waves in the study and identification of macro- and microstructures; and (2) high intensity waves to weaken bonds in macromolecules in cells and thus affecting the subsequent behavior of the latter. Applications to the possible control of cancer and malignant tumors and to neurosurgery are reviewed. (*PA*, 1958, #6565)

123. ACTION DES ULTRASONS SUR LES PROPRIÉTÉS BIOLOGIQUES DU VIRUS DE LA GRIPPE (ACTION OF ULTRASONIC WAVES ON THE BIOLOGICAL PROPERTIES OF INFLUENZA VIRUS)
Hannoun, C. I., Prudhomme, R. O., Giuntini, J.
***Annales de l'Institut Pasteur de Lille*, v. 99, no. 2, pp. 188–201, 1960 (in French with English summary)**

The treatment of influenza virus by ultrasonic waves in the presence of hydrogen increases the hemagglutination titer; the infectivity, after a short activation, is then inactivated. The increase of the hemagglutination capacity is greater and more rapid when the virus has been purified by ultracentrifugation, then suspended in isotonic medium. If the treatment is carried out in the presence of air, the hemagglutination titer slowly decreases, whereas the infectivity is very rapidly destroyed. The antigenic properties of the virus are preserved after treatment by ultrasonic waves. The immunizing power for mice varies according to the hemagglutination capacity: it is also activated by the treatment. The alteration of the viral particles was followed by electron microscopic studies: The filamentous forms are first dissociated, then the imperfect spheres, then the particles of active virus. (*BA*, v. 40, 1962, #7329)

124. EFFECT OF ULTRASONIC VIBRATION ON THE HAEMAGGLUTINATING ACTIVITY OF SOME *PARA*-INFLUENZA VIRUSES
Hermodsson, S.
***Nature*, London, v. 188, p. 1214, December 31, 1961**

125. VIBRATING BUBBLE ADJACENT TO BIOLOGICAL CELL
Jackson, F. J., Nyborg, W. L.
***Acoustical Society of America, Journal of the*, v. 30, p. 618, 1958**

126. THE EFFECT OF ULTRASOUND UPON DYSENTERY BACILLI. ABSTRACT
Khvoles, A. G.
***Journal of Microbiology, Epidemiology, and Immunobiology*, v. 31, no. 5, pp. 920–921, 1960 (Translated from *Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii*, v. 31, no. 5, pp. 113–114, 1960)**

127. THE ROLE OF CHEMICAL SUBSTANCE FORMED IN ULTRASONIC TREATED WATER IN THE SURPRISING ACTION OF ULTRASOUND ON YEAST CELLS
Komolova, G. S., Levinson, M. S.
***Izvestiya Sibirskogo Otdeleniya Akademii Nauk SSSR*, no. 5, pp. 80–85, 1961**

Yeast cells were destroyed by H_2O_2 which formed in the treated water. No effect is evident by the addition of HNO_2.

128. THE EFFECT OF AIR-GENERATED SOUND WAVES ON SUSPENSIONS OF MICROORGANISMS
Konsloe, H. L., Ackerman, E., Reid, J. J.
May 1952
Wright Air Development Center, Wright-Patterson AFB, Ohio
WADC TR 52-176, AF 33(038)786
AD-1122

Two high intensity airborne sound generators, a siren and a JER T-type whistle were used to study the effects of sound on liquid suspensions of bacteria. Special techniques and exposure chambers were developed. Lethal effects and cellular disruptions were most obvious with certain strains of *Micrococcus pyogenes* var. *aureus*, but they were irreproducible over a period of months. The experiments failed to elucidate the mode of action of the acoustic field in producing a sharp threshold for the lethal effects. The data showed that bacteria can be

killed in standing wave fields with maximum pressure amplitudes of a few tenths of an atmosphere and maximum particle velocities of a few centimeters. The sound sources indicated a relative scale of bacterial sensitivity to low-intensity sound fields.

129. STUDIES ON THE SOLUBLE ANTIGEN OF INFLUENZA VIRUS. II. A COMPARISON OF THE EFFECTS OF SONIC VIBRATION AND ETHER TREATMENT OF ELEMENTARY BODIES

Lief, F. S., Henle, W.
***Virology*, v. 2, no. 6, pp. 772–781, 1956**

A comparison was made of the effects of sonic vibration and of exposure to ether on the release of S antigen from influenza virus. Elementary body suspensions (EB) obtained by high-speed centrifugation or by one cycle of adsorption onto and elution from red cells frequently reacted directly with anti-S sera. The presence of such external S depended upon the length of *in ovo* incubation and upon the strain of virus employed. Following sonic vibration the S titers increased in the EB preparations which initially revealed some S activity, and antigen became detectable in those originally free of measurable quantities. After sonic vibration or even only after second adsorption–elution cycles, the EB suspensions, as a rule, failed to react with anti-S. Although the data indicate that sonic vibration liberated some internal S, its release was not immediately accompanied by detectable losses in infectivity nor was a change noted in the degree of sedimentation of the virus particles by high-speed centrifugation. In any event, exposure to ether proved to be a more potent means of releasing internal S than sonic vibration since no additional S was liberated from ether-treated virus by the latter technique; whereas, in contrast, sonically vibrated EB suspensions on treatment with ether yielded apparently as much S as untreated virus particles. The implications of these results have been discussed. (*BA*, v. 31, 1957, #14,610)

130. THE ACTION OF ULTRASONIC WAVES ON BACTERIA

Marchal, J. G., Bernanose, A.
***Travaux du Laboratoire de Microbiologie de la Faculte de Pharmacie de Nancy*, v. 17, pp. 195–221, 1953**

The mechanisms of action are reviewed as well as biological, chemical and physical effects of the action.

131. DEISTVIE ULTRAZVUKOVYKH VOLN NA DROZHZHEVYE KLETKI (THE ACTION OF ULTRASONIC WAVES ON YEAST CELLS)

Medvedeva, G. A.
***Zhurnal Obshchei Biologii*, v. 16, no. 4, pp. 315–320, 1955**

A study was made of the effect of ultrasonic waves on a sterile 1% suspension of day-old yeast cells which had been washed free of nutrient medium and which were members of one of three groups differing not only in shape and size but also in structural organization (*Endomyces magnusii*, three species of saccharomyces, and *Saccharomycodes ludwigii*). Treatment of the cells with ultrasound was carried out by the use of a quartz piezoelectric ultrasound generator. As an ultrasound transducer, use was made of a concave quartz piezoelectric plate 55 mm in diameter with a focal length of 8 cm, supplied with 250 w of power; the frequency of the ultrasonic waves reached 1.2×16^6 cps. For irradiating test tubes or volumetric flasks containing the yeast suspension, the vessels were immersed in the so-called ultrasonic fountain. Most sensitive to the ultrasonic vibrations proved to be the endomycetes, while the most resistant were the saccharomycetes. Even when irradiated for only 30 sec to 1 min, noticeable changes took place in the *E. magnusii* cells which were caused, probably, by the action of ultrasound on the intracellular structures as a result of the penetration of the ultrasonic energy into the cell. Five-minute exposure caused abrupt mechanical tearing of the cell membranes, caused, evidently, by the action of the shock wave which is related in origin to the formation and jarring action of cavitation in the surrounding medium. Checking showed that the cells which were strongly changed were not viable. In a 30-min exposure of saccaromycetes to ultrasound, the cells increased considerably in size, and their protoplasm became less dense. In some cell membranes, straight, canal-shaped tears were observed. In *S. ludwigii* visible changes also began with comparatively protracted exposure. There were no tears in the cells, and disturbances of the cell protoplasts were associated with strong contractions of the protoplasm. Thus the nature of the changes caused by ultrasound was different for all three groups investigated. (*BA*, v. 32, 1958, #24,778)

132. ÉTUDE DE L'EFFET DES ULTRASONS SUR UN INFUSOIRE CILIE *PARAMECIUM CAUDATUM* (STUDY OF ULTRASONIC EFFECTS ON THE CILIATE INFUSORIA *PARAMECIUM CAUDATUM*)

Mugard, H., Renaud, P.

Archives de Biologie, v. 71, no. 1, pp. 73–91, 1960
(in French with English summary)

Several temperature factors play a role in the destruction of paramecia by ultrasounds: the lower the temperature, the greater the resistance of paramecia. At constant temperature (1) the time of survival is a decreasing function of the power applied, and (2) a certain amount of ultrasonic work is necessary to annihilate the entire colony. The time of survival of a colony is an increasing function of its population. Ultrasonic waves seem to damage the macromolecular membrane first, the cytoplasm then becomes vacuolar, the micronucleus bursts, and finally the cytoplasmic membrane breaks at the level of the posterior contractile vacuole, the infraciliature remaining intact except at the bursting point. (*BA*, v. 40, 1962, #8479)

133. DIVERSE EFFECTS OF ULTRASONIC VIBRATIONS IN BIOLOGY

Obolensky, G.
Année Biologique, v. 33, pp. 465–521, 1957

Physical effects are discussed principally. Biological and chemical aspects of the action on living and dead organisms and on chemical compounds are covered also. 267 references.

134. BACTERICIDAL EFFECTS OF ULTRASOUND-INSTRUMENTATION AND TECHNIQUES FOR QUANTITATIVE STUDIES

Russel, L. A., Buswell, A. M., Fry, F. J., Whitney, R. M.
Industrial and Engineering Chemistry, v. 46, pp. 1751–1756, 1954

Bactericidal effects of ultrasound have been conclusively demonstrated by other workers in the field; however, in the equipment employed, quantitative control of the ultrasonic variables could not be obtained. A body of quantitative data based on the measurement and control of the physical variables of the ultrasonic field and sufficient to define the conditions most favorable to bacterial destruction would be of considerable advantage in evaluating this tool for commercial use and in outlining specifications for equipment to be used for municipal sterilization of water and commercial sterilization of milk. The research described in this paper was initiated to supply this quantitative data. In the earlier studies a commercially available generator with quartz transducer was used on a pure culture of a single strain of *Escherichia coli*. More recent studies are being made on the same organism but with the use of equipment designed for research purposes. This first section of the study is primarily concerned with describing instrumentation and techniques that are suitable for initial quantitative studies of the bactericidal effects of ultrasound.

135. THE ACTION OF ULTRASONIC WAVES ON SEVERAL BACTERIAL AND VIRAL ORGANISMS

Schulze, W.
Archiv fuer Experimentelle Veterinaermedizin, v. 11, pp. 253–309, 1957

Mortality effects of ultrasonic waves on several organisms are compared and reviewed. 56 references.

136. EFFECT OF ULTRASOUND ON TICK-BORNE ENCEPHALITIS VIRUS

Stetkevich, A. A.
Problems of Virology (USSR), v. 6, no. 1, pp. 20–24, 1961
(Translated from *Voprosy Virusologii*, v. 7, no. 1, pp. 20–23, 1961)

Treatment of tick-borne encephalitis virus with ultrasound alone for periods of less than 10 min and divided irradiation up to 64 min did not lead to its complete inactivation. On irradiation of an uncentrifuged virus-containing brain tissue suspension the virus titer rose on an average by one log unit; with identical treatment of a suspension sedimented by centrifugation the virus titer did not change. On combined ultrasound and heat treatment the virus was inactivated after 30 min of irradiation at a temperature of 30 . On combined ultrasound and formalin treatment tick-borne encephalitis virus was reliably inactivated after 10 min of irradiation of a suspension to which 0.01% formalin had been added. With the combined effect of ultrasound and ethyl alcohol, tick-borne encephalitis virus was inactivated after 10 min of irradiation with addition of 1% spirit. The centrifuged and alcohol-precipitated suspensions of virus were inactivated on combined application of ultrasound and formalin more rapidly and more reliably than an uncentrifuged suspension. Low doses of ultrasound (5–15 min) may be used for the more complete isolation of tick-borne encephalitis virus and for raising its titer in virus-containing tissue suspensions. The combined effect of ultrasound and formalin yields a tick-borne encephalitis virus antigen containing a much smaller amount of formalin (0.01 instead of the 0.1–2.5% usually used). (*BA*, v. 38, 1962, #10,646)

137. INTRACARDIAC ACOUSTICS
Wallace, J. S., Brown, J. R., Jr., Lewis, D. H., Deitz, G. W., III, Ertugrul, A.
***Acoustical Society of America, Journal of the*, v. 31, p. 712, 1959**

138. HOW FOOD ULTRASONICS ARE SHAPING UP
Whitney, R. M.
***Food Engineering*, v. 27, no. 5, pp. 80–82, 159–160, May 1955**

Results are presented of investigations conducted at the University of Illinois concerning the application of ultrasound to destruction of bacteria. Techniques for dairy products, sugars, starches, hops, and grain are covered. (*EI*, 1955)

139. THE BACTERIAL CELL WALL. VII. RESISTANCE OF THE BACTERIAL CELL WALL TO OSMOTIC SHOCK. THE DESTRUCTIVE EFFECT OF THE ULTRASONIC VIBRATION UPON THE BACTERIAL CELL WALL
Yoshida, N., Tanaka, S., Fukuya, I., Takaishi, K., Nishino, K., Kakutani, I.
***Nippon Saikingaku Zasshi*, v. 10, pp. 561–567, 1955 (in Japanese)**

Experimental results concerning the degrees of destruction to the cell walls of several bacteria by the osmotic shock of 6M NaCl, $CaCl_2$, K_2CO_3 and sucrose are presented. The destruction rate as compared to time is also discussed.

140. INTERNATIONAL CONFERENCE OF ULTRASONICS IN MEDICINE
The William and Wilkin Co., Baltimore, Md., 1958 (See also *American Journal of Physical Medicine*, v. 37, pp. 107–236, 1958)

The International Conference of the American Institute of Ultrasonics in Medicine was held in Los Angeles, California in September 1957.

Of immediate value to practicing physicians will be the evaluation reports on results of applying ultrasonic therapy. Case histories are described and statistics given on various categories of patient reactions. Of special significance are statistics comparing results of ultrasonic therapy with those obtained by other accepted methods, such as diathermy.

Also described are ultrasonic-medical techniques which are being used on an exploratory basis, or which show promise of future use. For example, reports are given on applications of focused ultrasonics, especially to the brain, and on methods for clinical diagnosis by ultrasonics. Two papers on side effects of dental drilling with ultrasonics present results which clearly indicate a need for better understanding of the physical agent.

TEMPERATURE VARIATION

141. TIME-TEMPERATURE EFFECTS ON SALMONELLAE AND STAPHYLOCOCCI IN FOODS. I. BEHAVIOR IN REFRIGERATED FOODS. II. BEHAVIOR AT WARM HOLDING TEMPERATURES
Angelotti, R., Foter, M. J., Lewis, K. H.
***American Journal of Public Health and The Nation's Health*, v. 51, no. 1, pp. 76–88, 1961**

Mixed cultures of *Salmonella senftenberg* 775W, *Salmonella enteritidis*, *Salmonella manhattan*, and mixed cultures of *Staphylococcus aureus* 196E, MF159, and Ms149 were cultured in custard, chicken à la king, and ham salad for five days at 2°F intervals from 40 to 50°F and 95 F and for 24 hr at 2 F intervals from 112 to 120 F and 95 F. In custard, the staphylococci grew at temperatures of 44 to 50 F. The salmonellae underwent a gradual decrease in numbers at all temperatures from 40 to 50 F. Both groups of organisms grew at 114 F, but decreased in numbers at 116 through 120°F. In chicken à la king, growth of both salmonellae and staphylococci occurred at temperatures of 44 through 50°F. At 112°F, the staphylococci grew, but were killed at all higher temperatures. The salmonellae grew at 114°F, but were killed at 116 F and above. In ham salad, no growth of either group of organisms occurred at 40 through 50 F, and a decrease in numbers of both groups was noted at 112 through 120°F. Good growth of both groups of organisms was observed in all three foods incubated at 95 F. The results indicate that (1) the temperature growth range for salmonellae and staphylococci in foods of the type studied is 44 to 114°F; and (2) that holding perishable foods in the mid-portion of this range for periods that permit growth of salmonellae and staphylococci may result in dangerous increases of these organisms and is a practice to be avoided during food preparation services. (*BA*, v. 36, 1961, #34,825)

142. THE EFFECTS OF TEMPERATURE ON SALIENTIAN BREEDING CALLS
Bellis, E. D.
***Copeia*, v. 2, pp. 85–89, 1957**

Four species of Oklahoma salientians were timed with a stop watch under natural conditions to determine the effects of temperature on the frequency and length of call. A highly significant positive correlation between frequency and water temperature was found in *Pseudacris nigrita triseriata* and *Pseudomonas clarki*. No significant correlation between frequency and air temperature was found in *Pseudomonas streckeri*, probably due to discrepancies between thermometer readings and frog temperatures. A highly significant negative correlation between call length and temperature was found in *P. n. triseriata* and *Bufo terrestris charlesmithi*. The total call time per 10 sec for *P. n. triseriata* was essentially constant between 13 and 23°C. Among other variables which might influence the frequency and length of call are humidity, wind, hormone level, and social factors. (*BA*, v. 32, 1958, #3479)

143. THE EFFECT OF HEAT-TREATMENT ON THE FUNGUS RESISTANCE OF PINE AND BEECH
Buro, A.
***Holz als Roh- und Werkstoff*, v. 12, pp. 297–304, 1954**

The pine (sap) and beech blocks decreased in volume of moisture regain after heat-treatment. The decrease in volume was proportional to the loss in weight. For beech, the effect was greater. Also tested was the resistance to biological attack which is defined by $R = (G_r - G_b)/G_r \times 10^2$ where G_r and G_b are the weight losses (after biobiological attack) by control and heated specimen, respectively.

144. PROVE PRELIMINARI CIRCA L'EFFETTO DELLA TEMPERATURA SULLA SPORULAZIONE DELLA *PERONOSPORA TABACINA* (PRELIMINARY TESTS ON THE EFFECT OF TEMPERATURE ON SPORULATION OF *PERONOSPORA TABACINA*)
Ciferri, R. e D. Z.
***Revista di Patologia Vegetale, Series 3*, v. 2, no. 1, pp. 13–19, 1962**

Burley tobacco leaves from plants infected by *P. tabacina* were incubated at three temperatures, cool (15 C), temperate (22.5 C), and warm (30 C); in some cases the conditions were maintained constant throughout, and in others various combinations of day (12 hours) and night (12 hours) temperatures were tested. The most favorable combination was 22.5 C day and night and next was 22.5 C day and 15 C night. Sporulation under other conditions occurred only rarely. Under the most favorable temperature conditions maximum sporulation occurred between the fifth and ninth day after beginning of treatment. (*BA*, v. 40, 1962, #8147)

145. SURVIVAL OF SPORES AT SEVERAL TEMPERATURES IN ULTRAHIGH VACUUM [ABSTRACT]
Davis, N. S., Silverman, G. J., Goldblith, S. A., Keller, W. H.
***Bacteriological Proceedings*, v. 62, p. 31, 1962**

This paper was presented at the 62nd Annual Meeting of the American Society for Microbiology, held in Kansas City, Missouri in May 1962.

146. THE EFFECT OF HEAT AND IRRADIATION ON THE MIROFLORA OF CANNED HAMS
Drake, S. D., Evans, J. B., Niven, C. F., Jr.
***Food Research*, v. 25, no. 2, pp. 270–278, 1960**

The bacterial flora of canned hams before heat processing consisted largely of a variety of lactic acid bacteria. Either the normal commercial heat processing or irradiation with approximately 1 Mrad of gamma irradiation destroyed most of the flora but permitted survival of spores of bacilli and clostridia and occasionally nonsporeforming lactic acid bacteria. The most troublesome of these latter organisms would appear to be *Streptococcus faecium*, some strains of which were unusually resistant to both heat and irradiation. The combination of moderate levels of heat and irradiation did not appear to have any particular advantage over present methods of heat processing followed by refrigerated storage. (*BA*, v. 35, 1960, #39,009)

147. DISINTEGRATION BY FREEZE-PRESSING. I. EFFECTS ON BACTERIA
Edebo, L.
***Acta Pathologica et Microbiologica Scandinavica*, v. 52, pp. 300–320, 1961 (in English)**

148. EFFECTS OF MEDIA, TEMPERATURE, AND HUMIDITY ON DEVELOPMENT OF COLIFORM ORGANISMS ON MOLECULAR FILTER MEMBRANES
Eye, J. D., Gardner, J. G., Neel, J. F.
***American Water Works Association, Journal of the*, v. 48, no. 9, pp. 1182–1188, September 1956**

Membrane filter procedure for bacteriological examination of water is discussed. The comparative effect of

type of media, temperature, and humidity on development of coliform organisms on MF membranes is covered. If these factors are less critical than originally believed, MF procedure will be more widely acceptable than it is at present. (*EI*, 1956)

149. EEN EENVOUDIGE METHODE TER BEPALING VAN HET BACTERIOLOGISCH EFFECT VAN STERILISATIEPROEVEN VOOR MELK, TOEGEPAST OP HET STERILISEREN VAN MELK IN DOORSTROOM —EN FLESSENSTERILISATOREN (A SIMPLE METHOD OF ESTIMATING THE BACTERIOLOGICAL EFFECT OF STERILIZING PROCESSES FOR MILK, APPLIED TO THE STERILISEREN VAN MELK IN DOORSTROOM TEMPERATURE—SHORT TIME (U.H.T.S.T.) AND "IN BOTTLE" STERILIZERS
Galesloot, T. E.
***Nederlands Melk en Zuiveltijdschrift*, v. 10, no. 2, pp. 79–100, 1956 (in Dutch with English summary)**

The method is based on the fact that a linear relation exists between the time of heating of a spore-suspension on a certain temperature and the logarithm of the number of surviving spores. (*BA*, v. 31, 1957, #8628)

150. EFFECT OF TEMPERATURE AND pH ON HETEROGENETIC BACTERIAL ANTIGEN: ABSTRACT
Gorzynski, E. A., Neter, E.
***Bacteriological Proceedings*, v. 61, p. 139, 1961**

151. THE SIMULTANEOUS LETHAL EFFECT OF TEMPERATURE AND GAMMA RADIATION ON BACTERIAL SPORES [ABSTRACT]
Graikoski, J. T. (University of Michigan, Ann Arbor, 1961, Thesis)
***Dissertation Abstracts*, v. 22, no. 2, p. 394, 1961**

152. THE EFFECT OF PASTEURIZATION ON THE INFECTIVITY OF TICK-BORNE ENCEPHALITIS VIRUS
Gresikova, M., Havranek, I., Gorner, F.
***Acta Virologica*, v. 5, no. 1, pp. 31–36, 1961 (in English)**

The effect of heat on tick-borne encephalitis was studied at temperatures ranging from 55 to 85 C. It was experimentally established that the virus was inactivated in milk during pasteurization at both 72 and 85 C for 10 sec. (*BA*, v. 40, 1962, #11,748)

153. TEMPERATURA LETAL A LOS PROTOZOOS DEL TERMITE *CALOTERMES CHILENSIS* (LETHAL TEMPERATURE FOR PROTOZOA OF THE TERMITE *CALOTERMES CHILENSIS*)
Guaman, S. R.
***Investigaciones Zoologicas Chilenas*, v. 6, pp. 73–77, 1960 (in Spanish with English summary)**

The lethal temperature for flagellate protozoa from *C. chilensis* has been established to be 39 C, when the living insects are kept at that temperature in humid atmosphere for 24 hr. This is the highest defaunation temperature for termites known up to now. These data are practical for the following reasons: (1) for obtaining totally defaunated termites for biological experiments; and (2) because it affords a minimum experimental basis as a contribution to a method of attacking *C. chilensis* plagues in commercial woods by applying either dry or wet warmth according to the conservation of proper wood quality. The totally defaunated termites at 39 C live about two weeks, during which time biological experiments upon them are feasible. (*BA*, v. 37, 1962, #12,101)

154. STUDIES ON THE EFFECT OF TEMPERATURE ON VIRUS MULTIPLICATION IN INOCULATED LEAVES
Harrison, B. D.
***Annals of Applied Biology*, v. 44, no. 2, pp. 215–226, 1956**

The rate at which Rothamsted tobacco necrosis virus accumulates in inoculated french bean leaves increases with temperature rising to 22 C and then decreases. Three days after inoculation, leaves at 22 C contain 4×10 times as much virus as at 10 C, and 1×10 times as much as at 30 C. At all temperatures the rate of accumulation seems to depend on the balance between synthesis and inactivation of virus, but inactivation becomes increasingly important with rise of temperature above 22 C and as the virus content of the leaves increases. Virus is both synthesized and inactivated in leaves at 30 C. Raising the temperature also decreases the number of lesions produced by the virus, possibly by increasing the chances that the introduced virus particles will become inactivated. At, and below 30 C, tomato aucuba mosaic virus produces necrotic local lesions in tobacco or *Nicotiana glutinosa* leaves; above 30 C the lesions are chlorotic. In both hosts this virus multiplies more rapidly when the infected cells are killed. (*BA*, v. 31, 1957, #2652)

155. LIFE AT HIGH TEMPERATURES
Imshenetskiy, A. A.
December 29, 1960
Joint Publications Research Service, Washington, D.C.
JPRS 7349
(Also obtainable as OTS PB: 61-11973, U.S. Dept. of Commerce, Office of Technical Services, Washington, D.C.)

This paper discusses the high temperature boundaries of life, thermophilic bacteria, the unexplained riddle of thermophilic bacteria reproduction at high temperatures, and how microbes become accustomed to high temperatures. It concludes with a few comments on the practical uses of such bacteria in certain problems such as the decomposition of wastes.

156. STUDIES ON PHYTOALEXINS. II. INFLUENCE OF TEMPERATURE ON RESISTANCE OF *PHASEOLUS VULGARIS* TOWARDS *SCLEROTINIA FRUCTIOCOLA* WITH REFERENCE TO PHYTOALEXIN OUTPUT
Jerome, S. M. R., Muller, K. O.
***Australian Journal of Biological Sciences*, v. 11, no. 3, pp. 301–314, 1958**

The resistance of *Phaseolus vulgaris* pods toward the parasites *Sclerotinia fructicola* and *Botrytis cinerea* is affected by the temperature environment before inoculation. At the critical temperature of 44°C for two hours, loss of resistance is seen to be a reversible process. Recovery takes place within three days, when stored at 20°C. The storage temperature after heat-conditioning is important for the recovery process. Output of the post-infectionally produced defensive substance—phytoalexin—is likewise affected by pre-inoculation conditioning at various temperatures. Under all conditions there is a close correlation between the clinical behavior of the pods and phytoalexin production. Respiration rate shown by or uptake in air is affected by the preconditioning treatment with high non-lethal temperatures. There appears to be no direct correlation between the O_2 uptake and the clinical behavior or phytoalexin output, although there is an obvious connection. Practical applications of these results are considered: the effect of climate on the state of resistance of hosts to particular parasites; optimal conditions for storage of fruit and vegetables. (*BA*, v. 33, 1959, #27,467)

157. EFFECT OF TEMPERATURE AND NUTRIENTS ON THE DEVELOPMENT OF MARINE MICROORGANISMS [ABSTRACT]
Jones, G. E.
***Bacteriological Proceedings*, v. 60, pp. 36–37, 1960**

158. STUDIES OF THE INACTIVATION OF BACTERIAL VIRUSES BY NORMAL HUMAN SERUM. 4. DECAY OF THE COLI T_2 PHAGE INACTIVATING CAPACITY AT VARIOUS TEMPERATURES
Kallings, L. O.
***Acta Pathologica et Microbiologica Scandinavica*, v. 52, pp. 98–112, 1961**

159. CARBOHYDRATE METABOLISM OF THE COLI GROUP OF BACTERIA. PART I. DISTRIBUTION OF α-GLUCOSIDASE AND β-GLUCOSIDASE. PART II. EFFECT OF TEMPERATURE ON β-GALACTOSIDASE
Morooka, N., Ono, N.
***Eiyogaku Zasshi (Japanese Journal of Nutrition)*, v. 10, pp. 114–123, 1952–1953 (in Japanese with English summary)**

Part I. Alpha-glucosidase acts upon phenyl-α-glucoside and β-galactosidase acts upon *p*-nitrophenyl-β-glactoside. Most of the coli groups examined contained β-galactosidase: most strains belonging to acetobacter I and II types and intermediate I and II types contained α-glucosidase. *Escherichia coli* I and II types contained no α-glucosidase.

Part II. The optimal temperature for β-galactosidase is 43°C. As far as the hydrolysis was concerned, β-galactosidase was inactivated at 56°C.

160. THERMAL RESISTANCE OF MICROORGANISMS TO DRY HEAT: DESIGN OF APPARATUS, OPERATIONAL PROBLEMS, AND PRELIMINARY RESULTS
Pflug, I. J.
***Food Technology*, v. 14, no. 10, pp. 483–487, 1960**

An apparatus was designed and constructed for determining the resistance of bacterial spores to dry heat conditions at temperatures in the range 149 to 193°C. Four samples are tested at a time; they are moved into and out of the apparatus by a pneumatic-mechanical action. Electric strip heaters are used to maintain the temperature of the machine, while the gas, used as the testing medium, is heated in an electric gas heater. Temperature control is effected by varying gas flow through the sys-

tem while the energy input is held constant. The heating and cooling lag correction factors were evaluated and range from 0.12 to 0.31 min depending on the gas used, the flow rate and the z of the thermal destruction rate curve. The heat resistance of a strain of *Bacillus subtilis* in superheated stream was determined and found to have a D_{350} of 0.57 min and a z of 42°F. The same suspension of the organism had a wet heat resistance D_{250} of 0.35 min and a z of 14.8°F. (*BA*, v. 36, 1961, #11,754)

161. EFFECT OF MOISTURE AND LOW TEMPERATURE ON NUMBER OF BACTERIA IN SOIL

Rahno, P. H.

***Microbiology*, v. 29, no. 2, pp. 171–173, 1960 (Translated from *Mikrobiologiia*, v. 29, no. 2, pp. 229–233, 1960)**

Certain soil bacteria (putrefying and oligonitrophil) may reach a maximal number in frozen soil in winter, under the climatic conditions in the northern temperate zone. Many groups of soil bacteria, under laboratory conditions as well, can multiply vigorously in frozen soil at −1.5 to −5.0°C when nutrients are added to the soil. (*BA*, v. 36, 1961, #18,365)

162. THE EFFECT OF TEMPERATURE ON STEROL METABOLISM IN YEAST

Starr, P. R., Parks, L. W.

***Journal of Cellular and Comparative Physiology*, v. 59, no. 2, pp. 107–110, 1962**

Sterol synthesis from glucose in resting cultures of *Saccharomyces cerevisiae* proceeds at a maximal rate of 30°C. At temperatures above this, increasing inhibition occurs until a critical point is reached at 40°C. Formation of sterol at 40°C proceeds at a very slow rate and the final yield is low. At higher temperatures no sustained sterol synthesis is permitted. Death of yeast cells growing in defined media at 40°C can be averted by the addition of oleic acid. For cell growth, however, both oelic acid and ergosterol must be provided in the synthetic medium. (*BA*, v. 40, 1962, #7967)

163. HEAT-INACTIVATION STUDIES ON ANIMAL VIRUSES. I. THE INACTIVATION OF VIRUS HEMAGGLUTININ

Woese, C. R.

***Archives of Biochemistry and Biophysics*, v. 63, pp. 212–220, 1956**

By the conditions of ionic strength and pH, which was used in the heat inactivation of virus hemagglutinin, the reaction is pseudo first order. The first-order rate constants were analyzed by reaction-rate theory. A correlation was found to exist between the value of the heat of activation and the virus type.

164. HEAT ACTIVATION OF PLANT VIRUS INFECTIONS

Yarwood, C. E.

***Virology*, v. 14, no. 3, pp. 312–315, 1961**

When bean leaves were heated at 0.5–4 sec at 45–65°C within 8 sec of mechanical inoculation, the number of lesions produced was up to 14 times as many as on unheated leaves. At 1 min to 3 hr after inoculation similar dosages of heat reduced infection. At more than 24 hr after inoculation similar dosages of heat had no clear effect on infection. Similar responses to heat were noted with tobacco necrosis virus, peach yellow bud mosaic virus, alfalfa mosaic virus, and apple mosaic virus, and the greatest response observed was with the sweet potato strain of tobacco mosaic virus. (*BA*, v. 36, 1961, #78,109)

165. ADVANCES IN BIOLOGICAL AND MEDICAL PHYSICS [VOLUME IV]

Academic Press, Inc., New York, N.Y., 1956

The following reviews with many references are presented:

"X-Ray Diffraction Applied to Crystalline Proteins," by D. Harker, pp. 1–22

"Problem of Information Transfer From Nucleic Acids to Proteins," by G. Gamow, A. Rich, M. Yeas, pp. 23–68

"Materials for the Biophysical and Biochemical Study of Cell Division," by D. Mazia, pp. 69–118

"Lethal Effects of High and Low Temperatures on Unicellular Organisms," by T. H. Wood, pp. 119–165

"Infrared Spectrometry," by N. K. Freeman, pp. 167–221

"Kinetics of Iron Metabolism," by R. L. Huff, O. J. Judd, pp. 223–237

"Gross Composition of the Body," by W. E. Siri, pp. 239–280

"Consideration of the Aging Process, Disease, and Life Expectancy," by H. B. Jones, pp. 281–337

166. OPERATING ROOM TEMPERATURE CONTROL AND DEATH TO BACTERIA; HOSPITAL-MASTER AND STERILAMP

***Electrical Engineering*, v. 76, pp. 1122–1123, December 1957**

CHEMICAL AGENTS

GENERAL CHEMICAL AGENTS

167. THE CHEMICAL INACTIVATION OF ENCEPHALOMYOCARDITIS (EMC) AND HERPES VIRUSES

Albrecht, H.

***Zentralblatt fuer Bakteriologie, Parasiten Kunde, Infektionskrankheiten und Hygiene, Abteilung I, Originale*, v. 175, pp. 333–343, 1959 (in German)**

Of the 18 chemical compounds tested for their ability to diminish the number of active particles in crude EMC or herpes virus suspensions, phenylmercuric salts, β-propiolactone, compounds of I and Cl, and HCHO were the substances proved to be active. Several dilutions were used and the incubation time was 30 min.

168. EFFECT OF FURACIN ON THE DISSIMILATION OF PYRUVATE AND FORMATE BY CELL-FREE EXTRACTS OF BACTERIA

Asnis, R. E., Glick, M. C., Fritz, M.

***Journal of Biological Chemistry*, v. 227, pp. 863–869, 1957**

The effects of Furacin on pyruvate and formate dissimilation by bacterial cell-free extracts have been studied. Furacin inhibited pyruvate dissimilation to varying degrees, depending upon the cell-free enzyme system studied. Pyruvate dismutation by extracts of *Escherichia coli* was the most sensitive reaction and was completely inhibited by 1×10^{-4} *M* Furacin. The phosphoroclastic system of *E. coli* was 100% inhibited by 2.5×10^{-4} *M* Furacin, and the acetylmethylcarbinol (AMC)-forming system of *Streptococcus faecalis* was 80% inhibted by 5×10^{-4} *M* Furacin. The aerobic oxidation of pyruvate by extracts of *Proteus vulgaris* and of *E. coli* and the phosphoroclastic dissimilation of pyruvate by *Clostridium butyricum* were not measurably inhibited by maximal attainable (5×10^{-4} *M*) concentrations of Furacin. Anaerobic dissimilation of formate by the hydrogenlyase system of *E. coli* was completely inhibited by 5×10^{-4} *M* Furacin, but the aerobic oxidation of formate by extracts of *E. coli* was not at all inhibited by this concentration of Furacin.

It was also observed that inhibition of the AMC-forming system in extracts of *S. faecalis* was antagonized by oxygen, although there was no measurable utilization of oxygen or reduction of Furacin by this system. 15 references.

169. EFFECT OF VITAMIN B_{12} AND ANALOGS ON THE RESPIRATION OF A MARINE BACTERIUM

Ayers, W. A.

***Archives of Biochemistry and Biophysics*, v. 96, no. 2, pp. 210–215, 1962**

Resting cells of a B_{12}-deficient marine bacterium oxidized propionate only in the presence of cobamides. Cyanocobalamin, 2-methyladenyl cobamide cyanide, adenyl cobamide cyanide, and cobamide cyanide were equally effective in promoting the oxidation. Cobinamide was inactive. The evidence suggested that B_{12}-active compounds function as cofactors in the isomerization of methylmalonyl CoA to succinyl CoA. The rate of oxidation of *n*-valerate, *n*-heptanoate, isovalerate, 3-methylvalerate, isoleucine, norleucine, and valine was markedly stimulated by cobamides, presumably as a result of the production of propionyl CoA or methylmalonyl CoA as intermediate products during the degradation of these substrates. (*BA*, v. 39, 1962, #3159)

170. THE EFFECT OF VARIOUS NITROGEN COMPOUNDS ON GROWTH OF ROOT MICROFLORA OF FIELD PEAS AND OATS

Balicka, N.

***Zeszyty Naukowe Wyzszej Szkoly Rolniczej we Wroclawiu, Rolnictwo*, no. 14, pp. 97–107, 1961**

Peptone and glutamic acid are compared to alanine for constituting better N sources for the root microflora of the field pea. Microflora of oats developed better with a medium of alanine.

171. ANTIFUNGAL AGENT FROM OSAGE ORANGE WOOD

Barnes, R. A., Gerber, N. N.

***American Chemical Society, Journal of the*, v. 77, no. 12, pp. 3259–3262, June 20, 1955**

Wood of Osage orange, Toxylon pomiferum, has been found to contain approximately 1% of 2, 3′, 4, 5′-tetrahydroxystilbene; this substance was toxic to five of thirteen microorganisms which were tested. Its presence is believed to be the main reason for remarkable resistance of Osage orange wood to decay. (*EI*, 1955)

172. 6-(M-AMIDINOPHENYLDIAZOAMINO)-4-AMINO-1, 2 DIMETHYLQUINAZOLINIUM CHLORIDE HYDROCHLORIDE: A NEW DRUG ACTIVE AGAINST *BABESIA CANIS*
Berg, S. S., Lucas, J. M.
***Nature*, London, v. 189, p. 64, January 7, 1961**

173. BEHAVIOR OF BACTERIAL CELLS IN THE PRESENCE OF DETERGENTS, PARTICULARLY SODIUM DODECYL SULFATE
Bolle, A., Kellenberger, E.
***Pharmaceutica Acta Helvetiae*, v. 33, pp. 379–390, 1958**

Gram-positive and Gram-negative cells are killed by Na dodecyl sulfate only in the presence of a respiratory poison. On other bacterial cell walls Gram-positive and Gram-negative organisms remained unaffected under the same conditions. 40 references.

174. THE EFFECTS OF 6-MERCAPTOPURINE ON BIOSYNTHESIS IN *ESCHERICHIA COLI*
Bolton, E. T., Mandel, H. G.
***Journal of Biological Chemistry*, v. 227, pp. 833–844, 1957**

6-Mercaptopurine (6-MP) inhibits the growth of *Escherichia coli* B. Growth inhibition is reversed by adding purines to cultures of the bacteria. It may also be reversed by subculture of the cells in 6-mercaptopurine-free media or by prolonged incubation of the bacteria in low concentrations of the drug. The capacity of the microorganisms to form the inducible enzyme, β-galactosidase, is unimpaired. Protein synthesis as measured by the incorporation of S^{35} from labeled sulfate is identical in inhibited and control cultures for the same extent of growth. The utilization of acetate for protein and lipide syntheses is strongly suppressed. Nucleic acid synthesis, as measured spectrophotometrically or by the incorporation of radioactivity from labeled glucose, formate, uracil, or phosphate in cultures treated with 10 γ /ml of 6-MP, is almost half that found in control cultures for the same amount of growth. At low levels of 6-MP a decrease in growth rate is produced, although no effect on acetate utilization, formate uptake, or nucleic acid content is observed. It is suggested that 6-MP exerts its effects by interfering with the function and synthesis of purine-containing cofactors. 25 references.

175. EFFECT OF D-1 ETHIONINE ON SOME FACTORS OF NONSPECIFIC RESISTANCE TO MYXOVIRUSES
Borecky, L., Rathova, V., Kociskova, D., Hana, L.
***Journal of Hygiene, Epidemiology, Microbiology, and Immunology*, v. 6, no. 1, pp. 65–70, 1962**

After systematic intraperitoneal administration of smaller doses of ethionine to laboratory animals a significant decrease of complement level as well as that of virus inhibitors and properdin was found. In experiments on animals it was found that a decrease of the titer of antihemagglutinating as well as of virus neutralizing inhibitors of the virus NDV and of one primary A strain was taking place. No decrease of inhibitors against the avid strain A_2 was observed. Experiments on hamsters have shown that virus from the group A_1 multiplied sooner and to a higher titer in the lungs of ethioninized hamsters than in the control ones. The neutralization ability of hamster sera mixtures has significantly decreased during ethioninization whereas in the control groups a slight vacillation only was observed. (*BA*, v. 39, 1962, #19,626)

176. SOME NEW SOIL DISINFECTANTS
Bravenboer, L., Pet, G.
***Naaldwijk*, Netherlands. *Proefstation voor Groenten-en Fruitteelt onder Glas, Jaarverslag*, pp. 141–142, 1960 (in Dutch with English summary) (Obtainable as 86N112J, U.S. Dept. of Agriculture, Washington, D.C.)**

177. EFFECT OF SYNTHETIC POLYLYSINE ON FUNGI
Buchanan-Davidson, D. J., Deese, D. C., Uritani, I., Stahmann, M. A.
***Science*, v. 132, pp. 1664–1666, December 2, 1960**

178. INACTIVATION OF VIRUS HAEMAGGLUTININS BY *PARA*-CHLOROMERCURIBENZOIC ACID
Buckland, F. E.
***Nature*, London, v. 188, p. 768, November 26, 1960**

179. THE ACTION OF INHIBITORS ON DERMATOPHYTES
Chattaway, F. W., Thompson, C. C.
***Biochemical Journal*, v. 63, pp. 648–656, 1956**

The endogenous respiration of strains of *Microsporum audouini, Microsporum canis, Trichophyton schoenleini, Trichophyton rubrum* and *Epidermophyton floccosum* is inhibited by arsenite, fluoride, iodoacetate, fluoroacetate and malonate, Azide and 2:4-dinitrophenal also inhibit respiration at higher concentrations, but show a stimulatory effect at lower levels.

Saturated straight-chain fatty acids strongly inhibit endogenous respiration, the effect increasing with carbon-chain length up to C_{14} and being greatest at acid pH values. In the presence of optimum levels of fatty acid the inhibition is complete in 2 min, and partially reversible by washing the mycelium up to 30 min, but irreversible after this time. Representative cationic, anionic and neutral detergents are also inhibitory and also show their highest activity in the presence of the undissociated form.

The release of amino acids, pentose, inorganic phosphate and material absorbing at 260 mμ from mycelium exposed to fatty acids and detergents has been followed under varying conditions of time, concentration of inhibitor and pH.

Release of these materials from mycelium treated with fatty acid was greatest at acid pH values, but change of pH had no significant effect upon the release by detergents.

Incubation of mycelial pads of these fungi in the presence of arsenite leads to the accumulation of pyruvate and α-oxoglutarate together with traces of an unidentified α-keto acid. The yield of α-keto acids is increased by the presence of glucose in the medium. 31 references.

180. EFFECT OF ORANGE ACRIDINE ON TUBERCULAR BACTERIA

Chizhik, G. Ya., Sidorova, S. F.
***Leningrad Gosudarstvennyĭ Universitet. Uchenye Zapiska*, no. 216, *Seriîa Biologichiskaîa*, no. 41, pp. 211–217, 1956**

The fluorescent dye, orange acridine (I) in concentrations of 1:1000–1:20,000 causes destruction of a considerable percentage of tubercular bacteria. A portion of fluorochromated cells illuminated green are incapable of further multiplication. Different strains of tubercular bacteria are distinguished by variable resistance to I. In utilizing I for determination of live and dead cells, the dye should be used in concentrations not higher than 1:30,000. (*BA*, v. 35, 1960, #19,266)

181. DEVELOPMENT OF MICROBIOLOGICAL SLUDGE INHIBITORS

Churchill, A. V., Leathen, W. W.
June 1961
Gulf Research and Development Co., Pittsburgh, Pa.
Report for April 1960–April 1961, ASD TR61-193, AF 33(616)-6989
AD-263,009

A research investigation was carried out to develop information and materials for control of microbiological sludge formation in jet fuel bulk storage tanks. Approximately 178 water-soluble materials were evaluated as potential microbiological sludge inhibitors. Three compounds are recommended for trial in bulk storage tanks to control microbial growth. These are alkyl quaternary ammonium acetate, ethylidene diacetate and tri-*n*-butyl borate. Several others satisfactorily controlled microbial growth but contained elements that are potenially deleterious to fuel properties and fuel system materials.

182. SOME EFFECTS OF SPRAY DISPOSAL OF SPENT SULFITE LIQUOR ON SOIL MOLD POPULATIONS

Cooke, W. B.
***Purdue University, Engineering Bulletin, Extension Series*, no. 106, pp. 34–48, 1960**

The spray disposal has added to the soil a quantity of nutrients which have (1) a favorable effect on the natural fungi, (2) a neutral effect on the natural bacteria, and (3) an unfavorable effect on the natural actinomycetes populations.

183. EFFECTS OF DEUTERIUM OXIDE ON CERTAIN MICROORGANISMS

De Giovanni, R.
***Annals of the New York Academy of Sciences*, v. 84, pp. 644–647, 1960**

The extent of the effects is dependent upon the strain of microorganisms. Those cells grown in the presence of D_2O were more sensitive to ultraviolet when irradiated and washed in H_2O.

184. THE EFFECT OF INHIBITORS ON THE HEMAGGLUTINATING ACTIVITY OF POLYOMA VIRUS

Deinhardt, F., Henle, G., Marks, M.
***Journal of Immunology*, v. 84, no. 6, pp. 599–607, 1960**

In efforts to obtain reproducible results in hemagglutination tests with polyoma virus, it was found that the presence of inhibitors accounted for the extreme variations in titers observed from test to test with individual virus preparations. The inhibitors combine with the virus at 4°C but readily dissociate at 37°C. They were found in all animal sera and cultured cells tested as well as in guinea pig red cell suspensions. Attempts to remove the inhibitors from virus preparations by differential centrifugation or treatment with fluorocarbon, trypsin or receptor destroying enzyme (RDE) did not meet with full success. Slight degrees of inhibitory activity always re-

mained in the treated materials, indicating that at least two inhibitory substances are involved. Because of the rapid dissociation of inhibitor from the virus particles at 37°C reproducible hemagglutinin titers were obtained merely by incubation of the test at 37°C for a few minutes prior to settling of the red cells at 4°C. In the competition for the virus on cooling of the mixtures the red cells apparently outrace the inhibitors. (*BA*, v. 35, 1960, #67,392)

185. MODIFICATION OF LETHAL EFFECT OF BACTERIAL ENDOTOXIN BY SUBSTANCES ALTERING THE METABOLISM OF 5-HYDROXYTRYPTAMINE
Des Prez, R. M., Fallon, N., Hook, E. W.
***Society for Experimental Biology and Medicine, Proceedings of the*, v. 107, pp. 529–532, July 1961**

186. THE BACTERIOSTATIC AND BACTERICIDAL EFFECTS OF TWO TETRAHYDROPYRIMIDINES
Eastburg, P. H., Hochede, R. J., Whitney, E. I., Harvey, P. A.
***Antibiotics & Chemotherapy*, v. 6, no. 9 pp. 561–563, 1956**

The 15 and 17 carbon side-chain 2-alkyl-4,4,6-trimethyltetrahydropyrimidine derivatives have bactericidal effects *in vitro* against 13 bacteria tested. (*BA*, v. 31, 1957, #5098)

187. THE EFFECT OF SODIUM AZIDE ON THE MULTIPLICATION OF VACCINIA VIRUS. IN: AUSTRALIAN SOCIETY FOR MICROBIOLOGY, BRISBANE, MAY 1961 [ABSTRACT]
Easterbrook, K. B.
***Australian Journal of Science*, v. 24, no. 6, pp. 295–296, 1961**

188. STERILIZATION OF GUM SOLUTIONS
Eberl, J. J., Stonehill, A. A., Masci, H. N.
March 15, 1960
U.S. Department of Commerce, Washington, D.C.
U.S. Patent 2,928,717 (assigned to Johnson & Johnson)

An epoxide results from adding liquid ethylene or propylene oxide to gum solutions at pH 4–8 and storing them for four to fourteen days in an airtight container. This epoxide provides a non-irritating and viscous solution used in cosmetic and pharmaceutical preparations.

189. EFFECT OF DDT, BHC, AND TOXAPHENE ON NODULATION OF LEGUMES AND SOIL MICROORGANISMS
Elfadl M., M. A., Fahmy, M.
***Agricultural Research Review*, Cairo, v. 36, pp. 339–350, 1958**

190. THE EFFECT OF MONOFLUOROACETATE ON THE METABOLISM OF *RHODOSPIRILLUM RUBRUM*
Elsden, S. R., Ormerod, J. G.
***Biochemical Journal*, v. 63, pp. 691–701, 1956**

Rhodospirillum rubrum S1 metabolizes acetate, propionate, butyrate, pyruvate, oxaloacetate, succinate, fumarate and L-malate anaerobically in the light or aerobically in the dark.

Monofluoroacetate ($8.3 \times 10^{-4} M$) strongly inhibits (70–80%) the photometabolism of acetate, butyrate, pyruvate and oxaloacetate. The effect of the inhibition on the photometabolism of the remaining substrates is much smaller (20–30%).

A material which behaved like citrate accumulated when acetate, pyruvate and oxaloacetate were metabolized anaerobically in the light in the presence of fluoroacetate. No significant amounts of citrate accumulated, over and above that formed in the control without substrate in the presence of fluoroacetate, when propionate, butyrate, succinate, fumarate and L-malate were metabolized under these conditions.

Anaerobically in the dark the oxidation of all substrates was strongly inhibited by 8.3×10^{-4} *M* fluoroacetate. Under these conditions citrate was produced from succinate, L-malate, fumarate and oxaloacetate; the amount of citrate produced from propionate and pyruvate was small; the amount accumulating in the presence of acetate and butyrate was no greater than that formed by the cell alone.

Succinate, fumarate and L-malate catalysed the photometabolism of acetate. Carbon dioxide stimulated the photometabolism of succinate. Aerobically in the dark carbon dioxide increased the endogenous citrate formed by suspensions of *R. rubrum* in the presence of fluoroacetate. Carbon dioxide had little effect on the amount of citrate formed aerobically in the dark from acetate and pyruvate in the presence of fluoroacetate.

It is concluded (1) that the tricarboxylic acid cycle plays an essential part in the light-metabolism of acetate, butyrate, pyruvate and oxaloacetate by washed suspensions of *R. rubrum*, but not of propionate, L-malate, fuma-

rate and succinate; and (2) that aerobically in the dark the oxidation of all substrates involves the tricarboxylic acid cycle. 34 references.

191. EVALUATION OF WAREXIN AS A POTENTIAL COLD STERILIZING AGENT. I. BACTERIOLOGIC STUDIES
Engelhard, W. E., Wiedman, J. G., Jolliff, C. R.
***Surgery*, v. 49, pp. 651–656, May 1961**

192. EFFECT OF OXIDATION-REDUCTION CONDITIONS OF THE MEDIUM ON THE INTENSITY OF NITRATE REDUCTION BY DENITRIFYING BACTERIA
Fedorov, M. V., Sergeeva, R. V.
***Mikrobiologiia*, v. 26, no. 2, pp. 137–147, 1957**

Nitrate reduction by cultures of *Pseudomonas fluorescens* and *Pseudomonas pyocyanea* under various conditions of O_2 supply and on different substrates was investigated. Under aerobic conditions *P. fluorescens* and *P. pyocyanea* utilize O_2 and nitrates simultaneously. The better the aeration the less is the role of nitrates as H_2 acceptor, and vice versa. But even at a partial O_2 pressure, 600 mm of nitrate oxygen is utilized, even though it covers only ¼ of the total consumption of H_2 acceptor in the oxidation process. The Eh in denitryfing cultures in the presence of nitrates does not fall below + 70–80 mv. (*BA*, v. 35, 1960, #19,033)

193. CHEMICAL CONTROL OF INACTIVATED POLIOMYELITIS VACCINE
Feldman, M. Ia.
***Problems of Virology (USSR)* (English translation of *Voprosy Virusologii*), v. 4, no. 6, pp. 54–58, 1959**

194. A COMPARISON OF THE BACTERICIDAL ACTIVITY OF OZONE AND CHLORINE AGAINST *ESCHERICHIA COLI* AT 1°
Fetner, R. H., Ingols, R. S.
***Journal of General Microbiology*, v. 15, no. 2, pp. 381-385, 1956**

The lethal concentration was found to be that quantity of ozone necessary to produce a detectable residue in the suspension; under the conditions of the experiments this was 0.4–0.5 mg/l. A comparison of the bactericidal activity of chlorine under similar conditions emphasized the different modes of action of the two agents. (*BA*, v. 31, 1957, #14,536)

195. SOME EFFECTS OF 2-THIOURACIL ON THE MULTIPLICATION OF TURNIP YELLOW MOSAIC VIRUS
Francki, R. I. B., Matthews, R. E. F.
***Virology*, v. 17, no. 3, pp. 367–380, 1962**

Treatment of leaves of chinese cabbage plants with 2-thiouracil suppresses the production of infective TYMV nucleoprotein. The analog is not incorporated into the virus RNA in detectable amounts and has no effect on the infectivity of the virus that is formed in its presence. If treatments are commenced about five days after inoculation, or later, the analog induces a very marked increase in the production of virus protein shells containing no RNA. The total amount of virus protein per leaf (empty protein shell plus protein in nucleoprotein) may exceed that in control leaves. There appears to be no accumulation of free virus RNA equivalent in amount to the excess of virus protein shells. (*BA*, v. 40, 1962, #8194)

196. THE ACTION OF DISINFECTANTS ON BACTERIAL CELLS
Futschik, J.
***Oesterreichische Milchwirtschaft*, v. 12, pp. 50–52, 1957 (in German)**

The disinfectants discussed are steam and alkaline Cl-containing oxidizing agents.

197. STERILIZATION OF COLLAGENOUS SUTURES WITH EPOXIDES
George, W. L., Eberl, J. J.
December 24, 1957
U.S. Department of Commerce, Washington, D.C.
U.S. Patent 2,817,437 (assigned to Johnson & Johnson)

With sterilization, tensile strength and resistance to papain digestion are produced. Ethylene or propylene oxide are involved in the processes.

198. POVIDONE-IODINE AS A SPORICIDE
Gershenfeld, L.
***American Journal of Pharmacy and the Sciences Supporting Public Health*, v. 134, pp. 78–81, 1962**

Several skin antiseptics were tested for sporicidal efficiency at 20 and 37 C. They were tested on *Bacillus subtilis*, *Clostridium tetani*, and *Clostridium perfringens*.

Of the antiseptics, povidone-iodine and iodine tincture (U.S.P.) possess sporicidal efficiency. Even month-old cultures of the most resistant strains were killed in a short period of time.

199. EFFECT DU CO_2 SUR LA NUMÉRATION DES BACTÉRIES NITRIFICATRICES DES SOLS (EFFECT OF CO_2 ON THE COUNT OF NITRIFYING SOIL BACTERIA)
Giambiagi, N.
***Annales de l'Institut Pasteur*, v. 102, no. 3, pp. 367–369, 1962 (in French with English summary)**

Counts were carried out of nitrifying soil bacteria on silica-gel plates seeded with suspension-dilutions in the presence of various atmospheric CO_2 and ammonium sulfate concentrations in the medium. Any increase of CO_2 induced a decrease in the number. The optimal $(NH_4)_2SO_4$ concentration was 0.5 *M*. There is no optimal-relationship between the CO_2 tension and this concentration. (*BA*, v. 40, 1962, #7711)

200. THE INFLUENCE OF OXYGEN ON THE RESPONSE OF CELLS AND TISSUES TO IONIZING RADIATION
Gray, L. H.
***Lectures on the Scientific Basis of Medicine*, v. 7, pp. 314-347, 1957–1958**

A review is presented. 65 references.

201. DRUG RESISTANCE OF ENTERIC BACTERIA. XIII. INTERFERENCE OF R FACTORS IN THE R⁻ BACTERIAL CELL WHEN INFECTED WITH ANOTHER R FACTOR
Harada, K., Kameda, M., Suzuki, M., Kakinuma, Y., Mitsuhashi, S.
***Gunma Journal of Medical Sciences*, v. 10, pp. 201–205, 1961 (in English)**

Escherichia coli and *Shigella flexneri* are rendered resistant to compounds such as chloramphenicol, tetracycline, streptomycin, and sulfanilamide by eight types of transmissible factors. After treatment with acriflavine, these factors sometimes spontaneously disappear. The methods and resulting effects of shifting the factors between three different strains of *E. coli* are given.

202. THE EFFECT OF THE CELLULOSE SUBSTRATE ON THE CELLULOSE-DECOMPOSING SOIL MICROFLORA.
Henis, Y., Keynan, A., Keller, P.
***Bulletin of the Research Council of Israel, Section E: Experimental Medicine*, v. 9, no. 2, pp. 56-57, 1961**

203. THE EFFECT OF CHLORAMPHENICOL ON THE MICROFLORA OF SOIL CRUMBS LAYED ON AGAR PLATES
Henis, Y.
***Bulletin of the Research Council of Israel, Section E: Experimental Medicine*, v. 9, no. 2, pp. 57–58, 1961**

204. STERILISATION BY CHEMICAL AGENTS. I
Heuzenroeder, M., Johnson, K. D.
***Australasian Journal of Pharmacy*, v. 39, no. 465, pp. 998–1001, 1958**

This is the first report of an investigation being made to find a method of sterilizing which is rapid and does not require the aid of heat. The test organisms were spores of *Clostridium tetani* NCTC 9567, *Bacillus cereus* NRRL B569, and *B. cereus* NCTC 8035. They were selected because of their relative resistance to acid: the first was resistant for 5 min and the last two for 30 min. In preparation for exposure to chemicals, sterile stainless steel cylinders were contaminated by immersion into a serum suspension containing 10^5 spores/ml. After drying, the cylinders were immersed in solutions of the chemicals being tested for intervals up to 24 hr, and were then placed in culture media and incubated for a week to detect any viable spores. Acidified 1% and 5% aqueous potassium permanganate solutions (pH 1) were the most sporicidal of all the chemicals used. *C. tetani* and *B. cereus* B569 spores were killed after 15 min, while *B. cereus* 8035 were destroyed after 2 min but not after 1 hr. In hydrogen peroxide, tetani spores were usually killed after 15 min in aqueous, 70% ethyl, and isopropyl alcohol solutions; those of the cereus strains usually required exposure for 2 or 3 hr in 10 vol, and for 1 or 2 hr in 30 vol peroxide for destruction. Formaldehyde, 10%, was approximately as sporicidal as hydrogen peroxide, and its aqueous and isopropyl alcohol solutions were somewhat more potent than ethyl alcohol. None of four phenols (hexachlorophene, benzyl cresol, octyl cresol, and dichlor-m-xylenol) used in 5% solutions were sporicidal, nor did they, with one exception, have a great or consistent effect in combination with 10% formaldehyde. Hexachlorophene was the exception; it increased the potency of 10% formaldehyde in 70% ethyl alcohol. The pH of the solutions, with the exception of the permanganates already mentioned, ranged from 3.0 to 4.5. Tests indicate that the

chemicals have a germicidal effect, and that not enough had been carried over into the culture media for them to have had a bacteriostatic effect. (*BA*, v. 33, 1959, #18,777)

205. INFLUENCE OF ANTI-VITAMINS ON MICRO-ORGANISMS. VI. CHEMICAL DETERMINATION OF INDOLE. THE TRYPTOPHANASE OF SURVIVING CELLS OF *ESCHERICHIA COLI*
Hiraoka, E.
***Bitamin*, v. 13, pp. 579–581, 1957 (in Japanese with English summary)**

Indole could be determined colorimetrically by the reaction of this extract with toluene and Ehrlich's reagent (*p*-dimethylaminobenzaldehyde solution in alcoholic HCl).

206. INFLUENCE OF ANTI-VITAMINS ON MICRO-ORGANISMS. VII. EFFECT OF ANTI-VITAMIN B_6 ON THE TRYPTOPHANASE OF *ESCHERICHIA COLI*
Hiraoka, E.
***Bitamin*, v. 13, pp. 582–585, 1957 (in Japanese with English summary)**

Isonicotinic acid hydrazide and 2-methyl-4-amino-5-hydroxymethylpyrimidine inhibited the action of tryptophanase of *E. coli*. Vitamin B_6 prevented the inhibitory effect of isonicotinic acid hydrazide on the enzyme, but it had no effect on 2-methyl-4-amino-5-hydroxymethylpyrimidine.

207. INFLUENCE OF CHEMICAL PRE- AND POST-TREATMENTS ON RADIO-SENSITIVITY OF BACTERIA, AND THEIR SIGNIFICANCE FOR HIGHER ORGANISMS
Hollaender, A., Stapleton, G. E.
In "Ciba Foundation Symposium, Ionizing Radiations and Cell Metabolism", pp. 120–135
Little Brown & Co., Boston, Mass., 1956

208. THE INFLUENCE OF PANTOTHENIC ACID AND PANTOTHENOL ON THE SENSITIVITY OF BACTERIA TO PENICILLIN AND OTHER THERAPEUTIC AGENTS
Holtermann, H.
***Zentralblatt fuer Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene, Abteilung I. Originale*, v. 161, pp. 457–464, 1954**

No improvement in the action was revealed. By the presence of Bepanthen, the effectiveness of badional was slightly increased.

209. EFFECT OF OXYGEN ON THE RADIOSENSITIVITY OF BACTERIOPHAGE IN THE PRESENCE OF SULPHYDRYL COMPOUNDS
Howard-Flanders, P.
***Nature*, London, v. 186, pp. 485–487, 1960**

When air or O mixtures were exposed to lyophilized preparations, *Escherichia coli* cells died.

210. ACTION OF DISINFECTANTS ON INFLUENZA VIRUSES
Hsu, C.–Mu
***Journal of the Taiwan Pharmaceutical Association*, v. 12, pp. 71–76, 1960**

Of the disinfectants used, 1% tincture of iodine, 0.1% Antiseptol, and 45% and 75% ETOH were effective in virus inactivation.

211. REMOVAL OF PATHOGENIC MICROORGANISMS BY SEWAGE TREATMENT PROCESSES
Kabler, P.
***Sewage and Industrial Wastes*, v. 31, no. 12, pp. 1373–1382, December 1959**

Test results of various investigations are discussed. The effect of treatment by trickling filters, activated sludge, anaerobic digestion, and stabilization ponds on pathogenic enteric bacteria, virus, tubercle bacilli, and other microorganisms usually present in new sewage is examined. The effect of chlorination is described. Chemical flocculation removes parasitic ova. Sludges should be heat treated or dried 12 to 15 months before use as fertilizers for vegetables. (*EI*, 1960)

212. THE EFFECT OF pH AND PHOSPHATE ON VIRUS INFECTION. IN: ANNUAL MEETING OF THE PACIFIC DIVISION OF THE AMERICAN PHYTOPATHOLOGICAL SOCIETY, CALIFORNIA, JUNE 1961 [ABSTRACT]
Kado, C. I.
***Phytopathology*, v. 52, no. 4, p. 362, 1962**

213. EFFECT OF PROPIONIC ACID AND CALCIUM PROPIONATE ON THE GROWTH OF MOLDS
Kamaletdinov, A. Z.
***Mikrobiologichnii Zhurnal, Akademiya Nauk Ukrainskoi RSR*, v. 23, no. 4, pp. 19–22, 1961**

Calcium propionate and propionic acid are superior as compared with HOAc (acetic acid). The growth-inhibiting

effect intensity is directly proportional to the amount of acid the molds adsorb.

214. STERILIZATION OF MEDIA FOR BIOCHEMICAL PROCESSES

Kempe, L. L.
***Advances in Applied Microbiology*, v. 2, pp. 313–319, 1960**

Summarizing developments occurring in industrial sterilization procedures during the past decade, the following can be stated: (1) Heat sterilization is still the method of choice wherever it can be used. (2) Continuous, high-temperature heat sterilization has been successfully adapted to fermentations from previous use in food processing. (3) The contradiction between Z value and activation energy calculations has not been resolved; in fact, it has not even been adequately recognized. Hence, improved flash processing schedules should be possible when data become available from spore destruction studies at higher temperatures. Such studies should also justify one or the other of the calculation methods, provided either is valid at high temperatures. (4) Radiation sterilization may become useful in the beverage alcohol and perhaps in some other fermentation; however, its adaptation to industrial use is contingent upon development of better and cheaper irradiating equipment. (*BA*, v. 36, 1961, #2340)

215. COMPARATIVE STUDIES OF MONOEPOXIDES AS INDUCERS OF REVERSE MUTATIONS IN NEUROSPORA

Kølmark, G., Giles, N. H.
***Genetics*, v. 40, pp. 890–902, 1955**

The most active of the six monoepoxides tested is epichlorohydrin. Other active ones are glycidol and propylene oxide. Stronger mutagens tend to be those epoxy rings carrying side chains with strong electronegative properties.

216. FUNGICIDE RESEARCH

Koopmans, M. J.
***Philips Technical Review*, v. 17, no. 7–8, pp. 222–229, January–February 1956**

Research in the field of fungus control is discussed, with particular reference to work of Boekesteyn Agrobiological Laboratory, of N. V. Philips-Roxane, 's-Gravenland, Netherlands. A review of existing fungicides is presented along with properties to be considered in fungicide research. Experiments involving one or two living oganisms are described. (*EI*, 1956)

217. SOIL FUNGICIDES [ABSTRACT]

Kreutzer, W. A.
In "International Botanical Congress, 9th, Montreal, Canada–1959", v. 2, pp. 207–208 University of Toronto Press, Canada, 1959

218. THE INFLUENCE OF RADIOACTIVE PHOSPHORUS UPON SOME MICROBIOLOGICAL PROCESSES IN THE SOIL

Kvasnikov, E. N., Petrushenko, O. P.
***Doklady Akademii Nauk Uzbekskoi SSR*, no. 1, pp. 55-58, 1957 (in Russian)**

The influence of P^{32} on microbiological processes depends upon each individual process, and on the size of the dose. The decomposition of cellulose in the soil is greatly affected.

219. EFFECT OF CHLORINE ON SPORES OF *BACILLUS COAGULANS*

La Bree, T. R., Fields, M. L., Desrosier, N. W.
***Food Technology*, v. 14, no. 12, pp. 632–634, 1960**

The sporicidal effect of chlorine on spores of *Bacillus coagulans* was influenced by pH, temperature, and chlorine concentration. Specific variables studied were as follows: pH 4.5, 6.8, and 7.8; temperatures 15, 20, 30, and 60°C. At 60°C the sporicidal effect was in the range of practical use in a cannery regardless of pH or chlorine concentration. When lower temperatures were used, a concentration of 20 ppm Cl was needed to achieve a 90% kill in a practical time. (*BA*, v. 36, 1961, #28,125)

220. BACTERIOSTATIC AND BACTERICIDAL ACTIVITY OF SOME COMPOUNDS AGAINST A PURE STRAIN OF SULFATE-REDUCING BACTERIA

Lagarde, E.
***Annales de l'Institut Pasteur*, v. 100, pp. 368–376, 1961**

Several compounds were tested and the very active bactericides were found to be alkylaminopropyleneamines, acetate of primary copramine, dimethylbenzylododecylammonium chloride (III), dimethyldicoprammonium chloride (IV), octadecyldipolyglycolbenzylammonium chloride, mixtures of III and IV, and complex of Cu alkylaminopropionate, complex of Cu dodecylamine acetate.

221. EFFECT OF ZINC BACITRACIN ON SILAGE MICROORGANISMS

Langston, C. W., Conner, R. M., Moore, L. A.
***Journal of Dairy Science*, v. 45, no. 4, pp. 544–547, 1962**

Zinc bacitracin at 5, 20 and 50 ppm was tested against typical silage bacteria: streptococci, leuconostocs, pediococci, lactobacilli, sporeforming aerobes, spore-forming anaerobes and Gram-negative bateria. With the exception of leuconostoc, all of the lactic acid-producing bacteria studied grew in the presence of the antibiotic at 5 and 20 ppm. The spore-forming anaerobes found in silage (*Clostridium sporogenes* and *Clostridium tyrobutyricum*) showed some variation but were generally able to tolerate higher concentrations of the antibiotic than the lactic acid bacteria. Since the supposed mode of action of zinc bacitracin in silage is that of differential suppression of clostridia, the data presented cast considerable doubt on its use as a preservative. (*BA*, v. 40, 1962, #12,102)

222. EFFECT OF FLUORINATED PYRIMIDINES ON HERPES SIMPLEX VIRUS

Lerman, S., Doyle, J., Doyle, R. F.
***Nature*, London, v. 194, pp. 986–988, 1962**

An inoculation with a virus suspension and 5-fluorodeoxyuridine (5-FDU) or 5 fluorouracil (5-FU) in 0.1 ml sterile water were introduced simultaneously to the chorioallantoic membrane of chick embryo. After 24 hr all membranes were removed and the number of pock-forming units were counted. The virus was collected and nucleic acids were extracted and measured. The 5-FDU was found to inhibit virus growth by 70–100%. No apparent effect showed up for 5-FU.

223. OBSERVATIONS ON THE INFLUENCE OF DEUTERIUM ON BACTERIAL GROWTH

Lester, W., Jr., Sun, S. H., Seber, A.
***Annals of the New York Academy of Sciences*, v. 84, pp. 667–677, November 25, 1960**

224. EFFECT OF *p*-FLUOROPHENYLALANINE AND PUROMYCIN ON THE REPLICATION OF POLIOVIRUS

Levintow, L., Thorén, M. M., Darnell, J. E., Jr., Hopper, J. L.
***Virology*, v. 16, no. 3, pp. 220–229, 1962**

The presence of an appropriate concentration of *p*-fluorophenylalanine in the medium of infected HeLa cells prevents the maturation of poliovirus, but permits the synthesis of infectious RNA. When the inhibition is released by the addition of phenylalanine, a second cycle of viral RNA is formed coordinately with viral protein, and only this latter RNA appears in the mature virus particles. Puromycin, added to an infected culture early in the latent period, prevents both maturation and RNA synthesis; addition of puromycin near the end of the latent period permits limited synthesis of RNA. The data suggest that protein synthesis is necessary to permit the replication of RNA and provide some evidence for the necessity for protein synthesis early in the infectious cycle. (*BA*, v. 39, 1962, #3011)

225. EFFECT OF OXYGEN ON FREEZE-DRIED *ESCHERICHIA COLI*

Lion, M. B., Bergmann, E. D.
***Journal of General Microbiology*, v. 24, pp. 191–200, 1961**

When *E. coli* organisms were suspended in distilled water and freeze-dried, the maximum loss of viability did not occur during the drying process proper but rather during the time of contact of the dried organisms with air between the primary and the secondary drying periods. By substituting other gases for air at this stage, it was proven that oxygen was the active agent involved. The dried organisms which were exposed to different pressures of air and oxygen at different temperatures proved to be extremely sensitive to traces of oxygen, even at very low temperatures. The implications of this oxygen effect in connection with existing freeze-drying procedures are discussed, as well as some preliminary kinetic experiments concerning the shape of the survival curve.

226. CHEMICAL AND COMBINED METHODS FOR PLASMA STERILIZATION

Lo Grippo, G. A., Hartmann, F. W.
***Bibliotheca Haematologica, Supplementa ad Acta Haematologica*, no. 7, pp. 225–230, 1958**

With the addition of 500 mg/l β-propiolactone and irradiation with ultraviolet light of 2 mw/cm^2 complete vericidal action against eastern equine encephalomyelitis virus was achieved.

227. THE EFFECT OF OXIDATION AND REDUCTION ON THE INFECTIVITY OF POLIOMYELITIS VIRUS
Lund, E., Lycke, E.
***Archiv fuer die Gesamte Virusforschung*, v. 11, no. 1, pp. 100–110, 1961**

Poliovirus Type 3 was suspended in solutions with different oxidation-reduction potentials at pH 7.0 and 37°C. The inactivation of virus cytopathogenicity for monkey kidney cells followed. Virus was found to be rapidly inactivated at potentials of +400 mv or higher. Atmospheric oxygen did not influence the inactivation under the experimental conditions applied. A relationship between inactivation rate and oxidation-reduction potential is suggested and the importance of oxidation as the rate determining factor for virus inactivation is discussed. (*BA*, v. 38, 1962, #15,145)

228. STUDI SU UN FARMACO (DERIVATO CHETO-ALDEIDICO DEL DIFENILE) ATTIVO NELLE INFEZIONI DA VIRUS EPATITICO DEL TOPO. FISIONOMIA DELLA DINAMICA DEL PROCESSO INFETTIVO DA VIRUS MHV$_3$-CEPPO CRAIG-NEL TOPO E DESTINO DEL VIRUS NEGLI ORGANISMI TRATTATI CON TALE FARMACO [STUDIES ON A DRUG (KETO-ALDEHYDE DERIVATIVE OF DIPHENYL) ACTIVE IN INFECTIONS OF MOUSE HEPATITIS VIRUS. NATURE OF THE ACTIVITY OF THE INFECTIVE PROCESS OF THE VIRUS MHV$_3$ —CRAIG STRAIN—IN THE MOUSE AND FATE OF THE VIRUS IN ORGANISMS TREATED WITH THE SAID DRUG]
Magrassi, F., Altucci, P., Buonanno, G. A., Lorenzutti, G., Sapio, U.
***Giornale di Microbiologia*, v. 8, no. 4, pp. 219-246, 1960 (in Italian with English and German summaries)**

229. ISOLATION FROM *GINKGO BILOBA* L OF AN INHIBITOR OF FUNGUS GROWTH
Major, R. T., Marchini, P., Sproston, T.
***Journal of Biological Chemistry*, v. 235, no. 11 pp. 3298-3299, November 1960**

Isolation of α-hexenal from the products obtained in the steam distillation of the leaves of *Ginkgo biloba* L. The presence of this aldehyde, which was obtained in the proportion of about 75 ppm of the leaves, may account for part of the resistance of *Ginkgo biloba* L leaves to fungi, inasmuch as α-hexenal has an ED_{100} 300 ppm against fungi. 14 references.

230. EFFECT OF DISINFECTANTS ON THE MORPHOLOGY AND BIOLOGY OF BACTERIAL CELLS
Malchenkov, A. M.
***Mikrobiologiia*, v. 30, pp. 466–472, May–June 1961 (in Russian with English Summary)**

231. THE EFFECT OF SOIL FUMIGANTS UPON THE FUNGUS *FUSARIUM VASINFECTUM*
Martinez, J. A., Andrade, A. C.
***Sao Paulo Instituto Biologico Arquivos*, v. 27, pp. 117–126, 1960 (in Portuguese with English summary)**

232. EFFECTS OF VAPORS OF AROMATIC CHEMICALS ON FUNGI
Maruzzella, J. C., Chiaramonte, J. S., Garofalo, M. M.
***Journal of Pharmaceutical Sciences*, v. 50, pp. 665–668, August 1961**

233. EFFECT OF STEROLS ON MICROORGANISMS
Matkovics, B.
***Naturwissenschaften*, v. 44, pp. 400–401, 1957**

With 0.05 to 0.1% cholesterol additions, the dry weights of shaken cultures of microorganisms were increased over the controls by 122 to 160%. Cholesterol concentrations from 0.01 to 0.33% decreased *Penicillium chrysogenum* Q 176-race.

234. VIRUCIDAL EFFECT OF SOME CHEMICAL AGENTS ON BLUETONGUE VIRUS
McCrory, B. R., Foster, N. M., Bay, R. C.
***American Journal of Veterinary Research*, v. 20, no. 77, pp. 665–669, 1959**

The effectiveness of five chemicals (Roccal, agent R; Wescodyne, agent W; sodium hydroxide; sodium carbonate; and ethyl alcohol) against bluetongue virus was evaluated in tests involving the use of embryonating chicken eggs and sheep. In each of the tests using embryonating eggs with four of the chemical agents in 4- to 6-min inactivation periods, agent W, at a final concentration of 750 ppm or greater, was the only one that completely inactivated the virus. No difference in the re-

sults was noticed when beef-heart infusion broth (Difco), at a pH of 7.2, was used in place of buffered saline solution as the diluent. In one test using sheep for the experimental animals, bluetongue virus in sheep serum was inactivated in a 5-min inactivation period by 750 ppm of agent W, 3% solium hydroxide, or 70% ethyl alcohol in final concentration. (*BA*, v. 39, 1962, #7422)

235. CONDITIONS WHICH AFFECT THE GERMICIDAL ACTIVITY OF CHLORINE COMPOUNDS

Mercer, W. A.
***Food in Canada*, v. 16, no. 6, pp. 40, 42–43, 1956**

Experiments showed no basis for the claim that the effect of pH change on the germicidal activity of chloramine compounds is not as great as that on other chlorine compounds. No significant difference was found in the pattern of survivor curves for spores of the same organism exposed to equal concentrations of gaseous chlorine, hypochlorite, or chloramine. The killing time for the chloramine tested was 12 to 15 times longer at all pH levels. There is no significant advantage in the use of one or the other of these chlorine compounds with respect to the effect of organic matter. Temperature and other factors affecting the germicidal activity of chlorine solutions are discussed. The speed at which bacteria are killed in chlorine solutions is directly proportional to the concentration of undissociated hypochlorous acid in the solution. (*BA*, v. 31, 1957, #28,837)

236. THE ACTION OF SUBTILIN ON HEATED BACTERIAL SPORES

Michener, H. D.
***Journal of Bacteriology*, v. 70, pp. 192–200, 1955**

Subtilin is adsorbed on ungerminated spores. The subtilin is effective only when placed in an environment which causes germination.

237. A COMPARATIVE STUDY ON THE EFFECT OF COTTON DUST AND 2,4-D ON THREE PATHOGENIC FUNGI

Mostafa, M. A., Gayed, S. K.
***Mycopathologia*, v. 13, pp. 198–214, October 31, 1960**

238. DIALKYLFLUOROPHOSPHATASES OF MICROORGANISMS

Mounter, L. A., Baxter, R. F., Chanutin, A.
***Journal of Biological Chemistry*, v. 215, pp. 699–704, 1955**

It has been found that enzymes (DFPases) which hydrolyze dialkyl fluorophosphates are present in every tissue of six species studied. Since these enzymes may play a role in the normal metabolism of tissues, it was decided to study their distribution in microorganisms. These studies demonstrate the presence of DFPases in microorganisms and describe some their characteristics.

Microorganisms are capable of hydrolyzing diisopropyl fluorophosphate, and this reaction may be potentiated or inhibited by Mn^{++}, Co^{++}, or Mg^{++}. Large differences in activity are observed with various types of microorganisms.

Kinetic studies show that DFP is hydrolyzed by enzymes which are similar in many respects to those present in tissues. 55 references.

239. THE PROBLEM OF REDUCING THE DANGER OF SERUM HEPATITIS FROM BLOOD AND BLOOD PRODUCTS

Murray, R., Diefenbach, W. C. L., Geller, H., Leone, N. C., Ratner, F.
***New York State Journal of Medicine*, v. 55, pp. 1145–1150, 1955**

The agent of serum hepatitis in plasma is inactivated by S mustard and β-propiolactone.

240. INDUCTION OF THE RESPIRATION-DEFICIENT MUTATION IN YEAST BY VARIOUS SYNTHETIC DYES

Nagai, S.
***Science*, v. 130, pp. 1188–1189, 1959**

Series of triphenylmethane and xanthene dyes were found to be effective as inducers of respiration-deficient mutation in yeast. The quantitative difference in the mutagenic effect appeared to be in close relationship to the chemical structure of the respective dyes. This survey may provide a useful clue for elucidation of the mechanism of mutagenic induction.

241. CHEMICAL PRESERVATIVES IN FOODSTUFFS. THE EFFECT ON MOLDS

Nikkilä, O. E., Linko, R. R.
***Maataloustieteellinen Aikakauskirja*, v. 30, no. 2, pp. 125–131, 1958**

Twelve species of molds (from aspergillus, cladosporium, penicillium and sporotrichum) have been isolated from spoiled fish preserves, from spices employed

in their preparation, and from various sites of contamination in a fish cannery. One drop of a spore suspension was added to each of three sterilized circles of filter paper placed aseptically on the surface of a buffered (McILVAINE) Czapek or wort agar medium in a Petri dish. After incubation at 25°C for four, eight and twelve days, colony size and extent of spore formation were used to evaluate the growth. The preservatives studied were dehydroacetic, sorbic and benzoic acids, ethyl *p*-hydroxybenzoate, hexamethylenetetramine and 2-methyl-2-amino-1-naphthol hydrochloride (vitamin K_5). The pH of the media were 4.55 and 7. At pH 4.55, concentrations of preservatives required to arrest mold growth were relatively low. The order of effectiveness of the preservatives is as follows: dehydroacetic acid > vitamin K_5 > hexamethylenetetramine > sorbic acid ≈ ethyl *p*-hydroxybenzoate > benzoic acid. The composition of the medium exerted an effect only with benzoic acid and hexamethylenetetramine, which required larger effective concentrations in wort than in Czapek's medium. At pH 7 considerably larger concentrations of the acid preservatives were required. The order of efficiency at pH 7 is: vitamin K_5 > ethyl *p*-hydroxybenzoate ≈ hexamethylenetetramine > dehydroacetic acid > sorbic acid > benzoic acid. The threshold concentrations are reported for the acid preservatives, ethyl *p*-hydroxybenzoate and vitamin K_5 together with the corresponding undissociated fractions required to inhibit the growth of *Aspergillus niger*, *Cladosporium herbarium* and *Penicillium expansum* at pH 4.55 and pH 7. For the acid preservatives the concentrations of undissociated, microbiostatically active fractions are lower in neutral than in acid medium. (*BA*, v. 36, 1961, #5384)

242. EFFECT OF ALLANTOLACTONES *IN VITRO* ON PATHOGENIC AND SAPROPHYTIC FUNGI: COMMUNICATION 2

Olechnowicz-Stepien, W., Skurska, H.
***Archiwum Immunologii i Terapii Doswiadczalnej*, v. 8, pp. 347–353, 1960 (in Polish with English and Russian summaries)**

243. EVALUATION OF LIQUID STERILANTS

Opfell, J. B., Miller, C. E., Hammons, P. N.
August 28, 1961
Dynamic Science Corporation, Pasadena, Calif.
Final Report, JPL NI-143452

The results are presented of a study to evaluate several chemicals which might serve as liquid sterilants. This study includes an evaluation of the compatibility of the chemicals with a wide variety of materials as well as an evaluation of their sterilizing effectiveness.

244. EVALUATION OF LIQUID STERILANTS, PHASES III, IV, V, VI, VII

Opfell, J. B., Miller, C. E., Louderback, A. L. English, E. G., Koretz, R. L.
September 7, 1962
Dynamic Science Corporation, Pasadena, Calif.
Final Report, JPL N2-150247

This final report includes the following general topics: stability of the formaldehyde-in-absolute-methanol liquid sterilant, a liquid sterilant based on ethylene oxide, stability of the grease sterilant, long term compatibility of liquid and grease sterilants with electrical components, identification of factors having a critical effect on efficacy of liquid sterilants, and corrections of errors in earlier reports.

245. STUDIES ON THE MECHANISM OF ACTION OF 6-AZATHYMINE II. AZATHYMINE DEOXYRIBOSIDE, A MICROBIAL INHIBITOR

Prusoff, W. H., Welch, A. D.
***Journal of Biological Chemistry*, v. 218, pp. 929–939, 1956**

Azathymidine, the deoxyriboside of 6-methyl-as-triazine-3, 5(2*H*, 4*H*)-dione, was markedly more active than the parent compound (azathymine) as an inhibitor of the growth of *Streptococcus faecalis* (8043), *Lactobacillus leichmannii* (7830), and *Thermobacterium acidophilus* R26. Azathymidine, like azathymine, competitively inhibited the growth of S. *faecalis* in media supplemented with either thymine or thymidine. However, the ratio of the molar concentration of the metabolite to that of azathymidine, for 50% inhibition, was the same with either thymine or its deoxyriboside, whereas azathymine was less effective against thymidine than thymine. The profound inhibition, produced by either azathymine or its deoxyriboside, when added during the logarithmic phase of growth of S. *faecalis*, could be reversed to only a very limited degree by the subsequent addition (after 2 hr) of even massive concentrations of thymine, thymidine, or folic acid. Of 10^7 cells/ml, about 1% remained viable 6 hr after the addition of azathymidine (0.3 mM) to a rapidly growing culture of S. *faecalis* (thymidine, 0.005 mM); however, an additional 40 hr were required to attain a lethal effect of all cells. The mechanism of action and complications concerning the possible applications of azathymidine have been discussed. 13 references.

246. **POSSIBILITIES OF CHEMICAL STERILIZATION**
Przyborowski, R.
***Pharmazie*, v. 17, no. 1, pp. 1–5, 1962 (in German)**

A review is presented. 25 references. (*BA*, v. 40, 1962, #13,543)

247. **MECHANISM OF THE DETOXIFICATION OF TOXINS BY FORMALDEHYDE. TWO NEW ATOXIC ANTIGENIC DERIVATIVES: 2,4-DINITROFLUOROBENZENE (DNFB) TOXOID AND β-PROPIOLACTONE TOXOID**
Raynaud, M., Blass, J., Turpin, A.
***Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences*, v. 245, pp. 862–863, 1957 (in French)**

Highly purified tetanus toxin was treated with DNFB causing destruction of its toxicity in 24 hr. A completely nontoxic product, which still flocculated antitetanus serum, occurred when tetanus toxin was treated with β-propiolactone.

248. **SOIL FUMIGATION**
Reed, J. P., Jenkins, W. R., Guest, R. T., Davis, R. A.
October 1961
U.S. Department of Agriculture, Washington, D. C.
275.29 N46

249. **NEW COMPOUNDS WITH BACTERICIDAL, FUNGICIDAL AND INHIBITORY EFFECTS ON THE GROWTH OF VIRUSES. II. THIOURETHANE**
Rieche, A., Hilgetag, G., Martini, A., Philippson, R.
***Archiv der Pharmazie und Berichte der Deutschen Pharmazeutischen Gesellschaft*, v. 294/66, pp. 201–209, April 1961 (in German)**

250. **A STUDY OF THE EFFECT OF N-PHENYLBENZAMIDINE, N-PHENYL-2-FURAMIDINE AND N-PHENYLAMIDE OF THIOPHENE-2-CARBOXYLIC ACID ON THE RADIORESISTANCE OF SUSPENSIONS OF *B. ANTHRACIS, B. CEREUS, CANDIDA ALBICANS* AND *STAPHYL. AUREUS* FOLLOWING THEIR IRRADIATION WITH GAMMA RAYS**
Robev, S., Todorov, S.
***Suvremenna Meditsina*, v. 11, no. 6, pp. 56–61, 1960 (in Bulgarian with Russian and English summaries)**

251. **THE MECHANISM OF DDT ACTION ON MICROORGANISMS AND ENZYMES**
Rohrlich, M., Flatow, R.
***Deutsche Lebensmittel-Rundschau*, v. 53, pp. 249–253, 1957 (in German)**

A review is presented. 22 references.

252. **COMBINED EFFECT OF LEVOMYCETIN AND BACTERIOPHAGE ON DYSENTERIC MICROORGANISMS**
Rydenko, L. S., Fedorova, L. G.
***Mikrobiologichnii Zhurnal, Akademiya Nauk Ukrainskoi RSR*, v. 23, no. 6, pp. 37–41, 1961**

The combined effect of levomycetin and bacteriophage was more active than the sum of the independent test results.

253. **EFFECT OF FERTILIZERS ON ROOT MICROFLORA OF WINTER WHEAT**
Samtsevich, S. A., Borisova, V. N.
***Microbiology*, v. 30, no. 6, pp. 842–848, 1962 (Translated from *Mikrobiologiya*, v. 30, no. 6, pp. 1033–1041, 1961)**

Fertilizers greatly affect the number of microflora in the root layer of soil, have less effect in the rhizosphere, and very slightly affect the soil outside of the rhizosphere. Nitrogenous mineral fertilizers have the greatest effect on the growth and yield of winter wheat. The effect of nitrogenous fertilizers on the microflora of the root layer of soil is mainly indirect, through the higher plant. Strong well-developed plants treated with nitrogenous fertilizers can fairly actively regulate the quantitative and qualitative composition of the microflora of the root layer of soil. Such plants reduce the number of microorganisms in the autumn-winter period and increase it in the spring-summer growing period. The effect of fertilizers on the soil microflora is determined mainly by the root excretions, the composition and amount of which depend largely on the degree of illumination of the plant and the availability of easily assimilable nitrogenous compounds. The active and favorable alteration of the quantitative and qualitative composition of the microflora of the root layer of soil by the plant is one of the main factors underlying the beneficial effect of fertilizers on plant growth and soil fertility. (*BA*, v. 40, 1962, #3585)

254. **THE EFFECT OF THREE INSECTICIDES ON THE NUMBERS OF SOIL MICROORGANISMS**
Saldarriaga Vélez, A.
***Acta Agronomica, Columbia*, v. 4, pp. 45–67, 1954**

The effect of the insecticides BHC, chlordan, and toxaphene on the number of bacteria in fertile tropical soil was tested. No significant effect was accomplished. Each insecticide gave a different result. 25 references.

255. PRODUCTION OF VIRUS VACCINES WITH HYDROXYLAMINE. PROCESS OF INACTIVATION AND EFFECT OF HYDROXYLAMINE ON VARIOUS BIOLOGICAL PROPERTIES OF SOME VIRUSES

Schaefer, W., Rott, R.
***Zeitschrift fuer Hygiene und Infektionskrankheiten*, v. 148, pp. 256–268, 1962**

As a result of a first-order reaction, the ME virus of the Columbia SL group and viruses of the influenza group were inactivated by hydroxylamine.

256. PARTIALLY INACTIVATED POLIOMYELITIS VIRUS: INITIATION OF INFECTION IN TISSUE CULTURE

Schultz, P., Rightsel, W. A., Timm, E. A., Taylor, A. R., McLean, I. W., Jr.
***Journal of Immunology*, v. 79, no. 6, pp. 497–507, 1957**

Detailed comparisons were made between formalin-treated suspensions of poliovirus, and the course of inactivation produced by ultraviolet irradiation, iodine, β-propiolactone, and heat. The studies show that formalin alone produces a unique delay in initiating infection of sensitive tissue culture cells as evidenced by the rate of appearance of plaque formation. Prolonging the time of treatment or increasing the concentration of formalin results in an increased delay in appearance of plaques. Other factors such as storage, pH, presence of inactive virus particles, or residual formalin do not account for the delayed infection observed. In addition, virus suspensions treated with formalin continue to show a delay in cellular degeneration whether formalin is neutralized or removed by dialysis. The possible mechanisms involved are considered and the importance of the phenomenon is discussed. (*BA*, v. 32, 1958, #20,307)

257. THE INFLUENCE OF ALIPHATIC NITRILES, DETERGENTS, CYTOSTATIC AGENTS WHICH HINDER CELL GROWTH, AND SH GROUP INHIBITORS ON BACTERIA. I. ACTION OF VARIOUS SUBSTANCES ON *ESCHERICHIA COLI* AND A FEW OTHER BACTERIA.

II. ACTION OF TWO DIFFERENT SUBSTANCES ON *E. COLI*

Schweisfurth, R., Schwarz, W.
***Acta Biologica et Medica Germanica*, v. 2, pp. 54–93, pp. 107–143, 1959**

Twenty-one poisons caused reproducible changes in cells and nucleoids of *E. coli* and other bacteria. In all, 41 different poisons were studied. 138 references.

258. THE EFFECT OF NITRIC OXIDE ON BACTERIA

Shank, J. L., Silliker, J. H., Harper, R. H.
***Applied Microbiology*, v. 10, pp. 185–189, 1962**

Nitric oxide, as well as several other oxides of nitrogen, were assayed for their antibacterial action. It is shown that nitric oxide has virtually no effect on bacteria, whereas both $NaNO_3$ and $NaNO_2$ appear to have either neutral or stimulatory effects. It is suggested that the formation of nitrous acid is mainly responsible for the quantitative as well as the qualitative changes that occur in the bacterial flora of cured meat. A pH-dependent "nitritic cycle" is presented to account for the production of nitrous acid in cured meat systems.

259. MODE OF ACTION OF DIALKYLDITHIOCARBAMATES ON MOLDS AND BACTERIA

Sijpesteijn, A. K., Janssen, M. J.
***Antonie van Leeuwenhoek, Journal of Microbiology and Serology*, v. 25, pp. 422–438, 1959 (in English)**

Copper complexes have higher toxicity than Na dimethyldithiocarbamate. The species of organism causes varied response. The activity of higher homologs is determined.

260. THE EFFECT OF CURING SALTS ON BACTERIAL SPORES

Silliker, J. H.
***Proceedings of the Research Conference Sponsored by the Research Advisory Council of the American Meat Institute Foundation at the University of Chicago*, v. 11, no. 50, pp. 51–60, 1959**

A review is presented. 21 references.

261. EFFECT OF RADIOACTIVE PHOSPHORUS P^{32} ON THE MULTIPLICATION OF ROOT BACTERIA

Smalii, V. T.
***Mikrobiologichnii Zhurnal, Akademiya Nauk Ukrainskoi RSR*, v. 23, pp. 28–34, 1961**
(in Ukrainain with Russian summary)

262. THE EFFECT OF PENICILLIN, STREPTOMYCIN AND SULFATHIAZOLE ON MICE INFECTED BY INFLUENZA VIRUS
Sobis, H., Szadowska, A.
***Medycyna Doswiadczalna i Mirkobiologia*, v. 10, no. 3, pp. 357–366, 1958 (in Polish with English and Bulgarian summaries)**

White mice infected with the influenza virus died earlier if treated with penicillin, steptomycin, or sulfathiazole. The earlier the treatment, the greater the mortality rate. (*BA*, v. 35, 1960, #63,992)

263. SPONTANEOUS AND CHEMICALLY INDUCED MUTATIONS GIVING RISE TO CANAVANINE RESISTANCE IN YEAST
Srb, A. M.
***Comptes Rendus des Travaux du Laboratoire Carlsberg, Série Physiologique*, v. 26, pp. 363–380, 1956 (in English)**

For canavanine-resistant mutants, the recovery was approximately quantitative out of populations of sensitive cells. With β-propiolactone, canavanine-resistant mutants were produced more effectively than with γ-butyrolactone or γ-valerolactone.

264. EFFECT OF SOME VOLATILE CHEMICALS ON THE MICROBIAL SPOILAGE OF MOIST KAFFIR UNDER AIRTIGHT STORAGE
Srinivasan, K. S., Majumder, S. K.
***Cereal Chemistry*, v. 38, pp. 529–535, 1961**

The microbial population was reduced to zero by MeBr and chloropicrin at 96 mg/l and $(CH_2)_2O$ at 64 mg/l. Changes in fat- and H_2O-solution acidity, reducing sugars, amino N, and wt./vol. were retarded.

265. THE EFFECT OF THE NEW DISINFECTANT LYSATON AGAINST FUNGI
Staib, F.
***Arzneimittel-Forschung*, v. 11, pp. 406–408, April 1961 (in German)**

266. STUDIES ON FUSARIUM WILT OF BANANAS. III. INFLUENCE OF SOIL FUNGITOXINS ON BEHAVIOR OF *F. OXYSPORUM F. CUBENSE* IN SOIL EXTRACTS AND DIFFUSATES
Stover, R. H.
***Canadian Journal of Botany*, v. 36, no. 4, pp. 439–453, 1958**

Aqueous extracts from soil obtained (1) by mixing equal volumes of soil and distilled water and filtering until clear, (2) by displacing the soil solution with ethyl alcohol, and (3) by soil perfusion were inhibitory to germination, hyphal growth, sporulation, and chlamydospore formation by *Fusarium oxysporum f. cubense*. In general, acid loam extracts were less fungitoxic than alkaline clay loam extracts and differences were not related to extract pH.

Fungitoxins were reduced by filtering extracts through charcoal, by evaporating or dialyzing the extracts, and by air-drying soil before extracting. Fungitoxins were greatly reduced by filtration through sintered-glass or Seitz filters. Heat sterilization or fumigation with ethylene oxide destroyed most of the fungitoxic effect. However, differences in growth and sporulation between heat-sterilized loam and clay loam extracts and diffusates were often apparent. Fusarium germination, hyphal growth, sporulation, and chlamydospore formation on agar films were inhibited by fungitoxins diffusing through cellulose membranes and by addition of non-sterile soil to 1.5% water agar. High concentrations of nutrients masked and low concentrations reduced effects of fungitoxins in soil extracts and diffusates. The addition of dextrose, glutamic acid, yeast extract, banana sap, or banana roots to extracts stimulated growth and sporulation. Yeast extract or glutamic acid stimulated sporulation at concentrations of 10 ppm, particularly where the bacterial population in the extract had been reduced by filtering through sintered glass. Fungitoxins and nutrients interacting, often appeared to act independently on hyphal growth, sporulation, and chlamydospore formation, stimulating or inhibiting one but not the others. Both sporulation and chlamydospore formation, in general, were more sensitive to fungitoxins and nutrients than was hyphal growth. In addition, morphogenic responses of the yellow and non-yellow fusarium clones to fungitoxins and nutrients were markedly different. Both germination and hyphal growth were greater with the yellow than the non-yellow clone in all extracts. In general, chlamydospores were produced more frequently and in greater numbers in agar films containing diffusates from acid loam than alkaline clay loam.

Chlamydospores were formed most rapidly and in greatest abundance on sterile soil-amended or plain agar after five to six days. In aqueous extracts chlamydospores, if produced, formed after three to five days. Conidia, if produced, formed within 18 to 42 hr regardless of substrates. The data indicated that fungitoxins in extracts and diffusates were associated with the bacterial soil flora since measures that reduced or altered this flora were reflected in a response by fusarium. (*BA*, v. 33, 1959, #2740)

267. GAS STERILIZATION
Stryker, W. H.
Hospital Management, v. 85, no. 3, p. 74, March 1958

268. GRAFT STERILIZATION; A BACTERIOLOGICAL AND HISTOLOGICAL STUDY OF THE RELATIVE MERITS OF ETHYLENE OXIDE AND β-PROPIOLACTONE AS TISSUE STERILIZING AGENTS, WITH SPECIAL REFERENCE TO ARTERIAL GRAFTS
Sutherland, T. W., Williamson, G. M., Zinnemann, K., Skucksmith, H. S.
British Medical Journal, no. 5073, pp. 734–736, March 29, 1958

269. THE EFFECT OF ANTI-INHIBITOR SERUM ON THE MULTIPLICATION OF INFLUENZA VIRUS
Szanto, J., Laucikova, O., Kociskova, D., Rathova, V.
Virology, v. 10, no. 1, p. 149, 1960

270. STUDIES ON THE MODE OF ACTION OF ANTI-BACTERIAL DRUGS
Tago, K.
September 30, 1961
Kitassto Institute, Japan
Final Report 2 for October 1, 1960–September 30, 1961, DA 92-557-FEC-31914
AD-268,966

Leucomycin, an antibiotic unrelated structurally to chloramphenicol, shows quite the same spectrum of organisms inhibited. The present investigation is to clarify the difference of the mode of action of those two antibiotics. Morphological changes of protoplast of *Bacillus megaterium* and *Escherichia coli* under the influence of the antibiotics were observed with a phase-contrast microscope and an electronmicroscope. Cytoplasmic membrane and cytoplasm of those affected cells were denatured and "ghosts" were observed after the exposure of those cells against gramicidin J. Chromatin bodies of several bacteria, stained with acid-giemsa solution, were aggregated in the presence of tetracyclin. Antibacterial activity of 42 oximes was estimated *in vitro*, and 5-acetyl-8 hydroxyquinoline showed highest antibacterial activity. Their activity against *Escherichia coli* was not decliesed by the addition of a chelating agent, disodium ethylendiamine tetraacetate dihydrate. (ASTIA)

271. METABOLIC ANTAGONISTS AND SELECTIVE VIRUS INHIBITION
Tamm, I.
Clinical Pharmacology and Therapeutics, v. 1, pp. 777–796, November–December 1960

272. EFFECT OF VARIOUS INACTIVANTS ON FOOT-AND-MOUTH DISEASE VIRUS AT 4°C [ABSTRACT]
Tessler, J., Fellowes, O. N.
Bacteriological Proceedings, v. 61, p. 164, 1961

273. RESISTANCE OF HUMAN GINGIVAL COLLAGEN TO HUMAN GINGIVAL BACTERIA
Thonard, J. C., Scherp, H. W.
Society for Experimental Biology and Medicine, Proceedings of the, v. 96, no. 1, pp. 165–170, 1957

In 44 tests, in which untreated human gingival tissue from cases of periodontitis simplex was incubated for ten days in broth with its indigenous microbiota, no breakdown of collagen could be detected either chemically or histologically. All other tissue elements, however, were stripped away. In concurrent controls, bovine Achilles' tendon, stored frozen and sterilized by ethylene oxide as in a previous investigation, was used as a substrate for the same microorganisms and underwent collagenolysis in 37 of 44 tests. Freezing, thawing, and sterilization of human gingival tissue with ethylene oxide rendered its collagen susceptible to degradation by its indigenous flora in 17 of 23 tests. This action of ethylene oxide was paralleled by a striking alteration of the reaction of the tissues to the Mallory-azan stain for connective tissue. The participation of true bacterial collagenases in periodontal disease has not yet been substantiated. Conclusions to the contrary have been based on the digestion of altered collagen by other proteases. (*BA*, v. 32, 1958, #9548)

274. STUDIES ON THE MECHANISM OF BACTERICIDAL ACTION OF 5-FLUOROURACIL IN *ESCHERICHIA COLI* K-12
Tomasz, A. (Columbia University, New York, N.Y., 1962, Thesis)
Dissertation Abstracts, v. 23, p. 421, 1962
(Also obtainable as 62-2876, University Microfilms, Ann Arbor, Mich.)

275. CHEMICAL STERILIZATION OF LIQUID MEDIA WITH β-PROPIOLACTONE AND ETHYLENE OXIDE
Toplin, I., Gaden, E. L.
***Journal of Biochemical and Microbiological Technology and Engineering*, v. 3, pp. 311–323, 1961**

Both compounds sterilized effectively at concentrations up to 0.5%. Methods and media make-up are given. Curves illustrate the behavior of the fermentations for both compounds. Other data are given.

276. INACTIVATION OF THE FOOT-AND-MOUTH DISEASE VIRUS AND THE NEWCASTLE VIRUS BY β-PROPIOLACTONE AND BY FORMALDEHYDE
Ubertini, B., Nardelli, L., Santero, G., Cessi, D.
***Schweizer Archiv fuer Tierheilkunde*, v. 99, pp. 309–328, 1957**

Both viruses are inactivated by β-propiolactone, which is proven to be quicker than HCHO and an excellent viricide. A chemical process occurs when using β-propiolactone whereas both a chemical and thermal process occurs with HCHO.

277. GLYOXAL AND RELATED COMPOUNDS AS POTENTIAL BLOOD-STERILIZING AGENTS
Underwood, G. E., Weed, S. D.
***Society for Experimental Biology and Medicine, Proceedings of the*, v. 93, pp. 421–424, 1956**

For the purpose of sterilizing human blood and plasma, glyoxal and β-ethoxy-α-ketobutyraldehyde were more potent than were equimolar amounts of HCHO, β-propiolactone, or β-diethylamino-lactaldehyde-HCl.

278. EFFECT OF FLUOROCARBON TREATMENT ON NEWCASTLE DISEASE VIRUS
Wilson, D. E.
***Journal of Bacteriology*, v. 83, no. 4, pp. 930–931, 1962**

279. THE EFFECT OF MELANOIDIN SUBSTANCES ON MALT MICROFLORA
Zabrodskii, A. G., Tikhomirova, E. I.
***Microbiology*, v. 27, no. 1, pp. 124–127, 1958**

The antiseptic action of melanoidin substances on microorganisms growing on malt has been established. A theoretical explanation is given of the reduced souring of mashes prepared by "strong" cooking, an effect well-known in practice in the alcohol industry. This method of combating infection, however, involves losses of fermentable carbohydrates due to melanoidin formation when the raw materials are cooked under pressure. (*BA*, v. 35, 1960, #2137)

ETHYLENE OXIDE

280. THE TOXIC EFFECTS ON BLOOD CLOTTING FACTORS OF ETHYLENE GLYCOL PRODUCED BY ETHYLENE OXIDE STERILIZATION. IN: 46th ANNUAL MEETING, ATLANTIC CITY, NEW JERSEY [ABSTRACT]
Allen, R. C., Meier, H., Hoag, W. G.
***Federation Proceedings*, v. 21, no. 2, 1962**

281. ON THE STERILIZING EFFECT OF ETHYLENE OXIDE ON VIRUS SUSPENDED IN PROTEIN SOLUTIONS
Auerswald, W., Doleschel, W.
***Medicina Experimentalis*, v. 6, no. 3, pp. 193–199, 1962**

Suspensions of poliomyelitis virus in human fibrinogen and albumin, respectively, were treated with ethylene oxide. The ethylene oxide concentrations during the inactivation were 0.1, 0.25, 0.5, 0.75 and 1.0%, the exposure time was 60 min and the temperature 20° C. The inactivation rate was found to be a function of the ethylene oxide concentration. The inactivation was not significantly inhibited by the presence of protein in various concentrations. Physico-chemical controls of the fibrinogen after the virus inactivation revealed no denaturation effects. (*BA*, v. 40, 1962, #11,800)

282. FUNGICIDAL AND BACTERICIDAL ACTIVITY OF ETHYLENE OXIDE
Betto, E.
***Notiziario sulle mallatie delle piante*, no. 52, pp. 104–118, 1960**

The sterilizing activity of ETOH on several microorganisms was examined at reduced pressure. A full effect was obtained on *Aspergillus niger, Penicillium digitatum, Mucor racemosus, Endothia parasitica,* and *Escherichia Coli* by supplying 140 g/m^3 for 3 hr at 24°C. Other tests using 600 g/m^3 for 2 hr at 12°C brought about different results depending upon the type of microorganism. 16 references.

283. STERILIZATION WITH ETHYLENE OXIDE WITH SPECIAL REFERENCE TO ITS USE IN PLASTIC MATERIALS

Bruhin, H., Beuhlmann, X., Vischer, W. A., Lammers, T.
***Schweizerische Medizinische Wochenschrift*, v. 91, pp. 607–613, May 20, 1961 (in German)**

284. POPULATION HETEROGENEITY IN THE RESISTANCE OF AEROBIC SPORES TO ETHYLENE OXIDE

Church, B. D., Halvorson, H., Ramsey, D. S., Hartman, R. S.
***Journal of Bacteriology*, v. 72, no. 2, pp. 242–247, 1956**

Mixed spore populations were obtained in strains of *Bacillus polymyxa* and *Bacillus cereus* var. *terminalalis.* Populations were heterogeneous in ethylene oxide resistance and surface charge density, as measured by microelectrophoresis. In both cases, the major population component had the lower surface density charge and was sensitive to ethylene oxide. Extraction of lipid of such heterogeneous populations resulted in a population uniformly sensitive to ethylene oxide and electrophoretically homogeneous. An emulsion of the extracted lipid had a protective effect for spores treated with ethylene oxide. Correlation between resistance to ethylene oxide and electric charge density was established definitely for the major or lower velocity component which, upon actual isolation, was sensitive to ethylene oxide. (*BA*, v. 31, 1957, #4923)

285. EVALUATION OF ETHYLENE OXIDE AS A STERILIZING AGENT FOR FIELD USE

Eisman, L. P.
September 1950
Naval Medical Field Research Lab., Camp Lejeune, Jacksonville, N.C.
Report on Expeditionary Aspects of Preventive Medicine, v. 1, pp. 104–120, JU 12927
(Project NM-005-052.19)

286. ETHYLENE OXIDE GASEOUS STERILIZATION I. CONCENTRATION AND TEMPERATURE EFFECTS

Ernst, R. R., Shull, J. J.
***Applied Microbiology*, v. 10, pp. 337–341, 1962**

The relationships of reaction temperature and concentration of gaseous ethylene oxide to the time required for inactivation of air-dried *Bacillus subtilis* var. *niger* spores are more complex than previously reported. A plot of temperature vs. the logarithm of "thermochemical death time" (TCDT) resulted in a straight line between 18 and 57 C for systems of high ethylene oxide concentration. The TCDT values were independent of ethylene oxide concentrations above certain temperature-dependent limits. A given ethylene oxide concentration produced a TCDT curve identical in the upper temperature regions with that for higher concentrations. As the temperature was lowered beyond a critical point, this curve diverged from that for higher concentrations, as a straight line of lesser slope. Thus, a series of curves exists for a range of ethylene oxide concentrations. They are characterized by two segments, both logarithmic, intersecting at a critical temperature for each concentration. The intersecting point is at a temperature inversely related to the ethylene oxide gas concentration. The temperature quotient for the high temperature segments of all systems was 1.8. This value was characteristic for ethylene oxide concentrations of 440 and 880 mg/l at temperatures above 40.6 and 33.4 C, respectively. Below these critical temperatures, 3.2 and 2.3 were the Q_{10} values for the respective systems. 9 references.

287. ETHYLENE OXIDE GASEOUS STERILIZATION II. INFLUENCE OF METHOD OF HUMIDIFICATION

Ernst, R. R., Shull, J. J.
***Applied Microbiology*, v. 10, pp. 342–344, 1962**

The duration of the equilibration period between admission of water vapor and subsequent introduction of gaseous ethylene oxide to an evacuated sterilizer chamber was studied with respect to its effect on the inactivation of spores of *Bacillus subtilis* var. *niger* under simulated practical conditions. Introduction of a water-adsorbing cotton barrier between the spores and an incoming gas mixture of water vapor and ethylene oxide caused a marked increase in the observed thermochemical death time of the spore populations. This effect was negated by admission of water vapor one or more minutes prior to introduction of ethylene oxide gas. Increases

in temperature and relative humidity of the system promoted passage of water vapor through the cotton barriers and diminished their effect. 4 references.

288. CONCENTRATION AND TEMPERATURE EFFECTS IN ETHYLENE OXIDE GASEOUS STERILIZATION [ABSTRACT]
Ernst, R. R., Rimer, V. G., Shull, J. J.
***Bacteriological Proceedings*, v. 61, p. 89, 1961**

289. ETHYLENE OXIDE STERILIZATION IN HOSPITAL PRACTICE
Freeman, M. A., Barwell, C. F.
***Journal of Hygiene*, London, v. 58, pp. 337–345, September 1960**

290. DIE STERILISATION VON CATGUT MIT GASFÖRMIGEM ÄTHYLENOXYD (STERILIZATION OF CATGUT WITH GASEOUS ETHYLENE OXIDE
Heicken, K., Bellinger, H.
***Zentralblatt für Bakteriologie, Parasitenkunde, Infektionskrankheiten und Hygiene, Erste Abteilung. Originale*, v. 179, no. 1, pp. 113–140, 1960**

291. A TECHNIQUE FOR THE INVESTIGATION OF BACTERIAL CONTAMINATION INSIDE ELECTRON COMPONENTS
Hoffman, R. K.
March 11, 1960
Army Dept., Physical Defense Division, Fort Detrick, Frederick, Md.
Report of Test 7-60

Ethylene oxide has remarkable penetrating capabilities but it cannot enter hermetically sealed areas, as can heat or certain ionizing radiations. Many of the newer electronic components are sealed units into which the gas can not penetrate, but in which living microorganisms may have been trapped during manufacture. The lack of information on the subject prompted this investigation. The main purpose of this preliminary study was to develop satisfactory techniques for such investigations, following which routine investigations of all types of components could be made. In the course of this study certain electronic components were screened for possible internal contamination, but only a few items were so tested, and the fact that a few types were found to be sterile should not be interpreted as a statistically valid study on this subject.

292. STERILIZATION BY ETHYLENE OXIDE
Kelsey, J. C.
***Journal of Clinical Pathology*, v. 14, pp. 59–61, January 1961**

293. VIRUCIDAL ACTION OF ETHYLENE OXIDE GAS
Klarenbeek, A., van Tongeren, H. A. E.
***Journal of Hygiene*, v. 52, pp. 525–528, 1954**

For materials of low thermostability ETOH is simple, inexpensive and useful as a disinfectant: CO_2 has as strong a germicidal effect as ETOH.

294. PRIMENENIE OKISI ETILENA DLIA TSELEI DEZINFEKTSII I STERILIZATSII; PO DANNYM ZARUDEZHNYKH ISSLEDOVANII (USE OF ETHYLENE OXIDE IN DISINFECTION AND STERILIZATION; SURVEY OF FOREIGN INVESTIGATION)
Korovin, F. T., Piankov, B. F.
***Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii*, v. 28, no. 8, pp. 60–63, August 1957**

295. STERILIZATION OF DRUGS WITH ETHYLENE OXIDE
Kossler, G.
***Farmaco*, Pavia, v. 16, pp. 165–167, 1961**

A short review is given of the use of ethylene oxide gas to sterilize drugs. 4 references.

296. EFFECT OF ETHYLENE OXIDE ON SOME WOOD-DESTROYING FUNGI
Kowalik, R., Sadurska, I.
***Acta Microbiologica Polonica*, v. 9, pp. 67–69, 1960 (in Polish with English summary)**

Polyporus versicolor grown on wooden blocks has greatest resistance to a 10:90 mixture of ETOH and CO_2. Others tested were *Coniphora cerebella*, *Poria vaporaria*, and *Merulius domesticus*.

297. TUBERCULOCIDAL EFFECT OF GASEOUS ETHYLENE OXIDE
Lammers, T., Tuncer, O.
***Gesundheitswesen und Desinfektion*, v. 53, no. 1, pp. 1–4, 1961**

Bed linen infected with *Mycobacterium tuberculosis* Hv 37, and linen patches infected with sputum were employed as testing materials in an experiment to ascertain

the tuberculocidal effect of a mixture of ETOH (15%) and CO_2 (85%). In experiments conducted at a pressure of 3 kg/cm² at 45 C, it was found that sterilization was achieved after 10 min.

298. A NEW STERILIZATION METHOD WITH PRESSURIZED ETHYLENE OXIDE

Lammers, T., Gewalt, R.
***Zeitschrift für Hygiene und Infektionskrankheiten*, v. 144, pp. 350–358, 1958**

By using 1 part ETOH with 8.5 parts CO_2 with a pressure of 5–6 atm, sterilization is obtained at 45–80°C. Sterilization is safe and reliable, even at high relative humidity.

299. ETHYLENE OXIDE GAS IN STERILIZATION

Lentini, E. S.
***American Journal of Hospital Pharmacy*, v. 18, pp. 670–673, 1961**

The action of ethylene oxide gas is reviewed.

300. STERILIZATION WITH ETHYLENE OXIDE GAS

Liebermeister, K.
***Deutsche Medizinische Wochenschrift*, v. 87, pp. 552–555, 1962**

A review is presented. 19 references.

301. GASEOUS STERILIZATION WITH ETHYLENE OXIDE

Lloyd, R. S., Krahe, J. B.
May 1961, Revised
American Sterilizer Company Research and Development Labs., Erie, Pa.
Report

Research studies in the past decade have yielded important findings in the field of gaseous sterilizing agents. The cause of these investigations is the ever-present need for a reliable "cold" sterilizing process, whereby a variety of materials of low thermostability may be rendered sterile with comparative ease, rapidity, and economy. Of chief importance are those studies relating to the microbicidal action of the compound known as ethylene oxide, in both the liquid and gaseous states. The methodology of handling ethylene oxide is rapidly expanding and, today, equipment and procedures are being used for sterilization purposes in the pharmaceutical, surgical dressing, and surgical appliance industries, research institutions and hospital. The paper is intended to serve as a guide to those considering the proper gaseous mixture and equipment for sterilization with ethylene oxide.

302. THE STERILISING PROPERTIES OF ETHYLENE OXIDE

Phillips, C. R.
Paper presented at the Symposium on Recent Developments in the Sterilization of Surgical Materials, School of Pharmacy, University of London, April 13, 1961

Basic chemical, physical, and biological properties of ethylene oxide are mentioned. Activity of ethylene oxide against microorganisms, effect of moisture, and practical applications are some of the topics covered. 10 references.

303. ACTION OF ETHYLENE OXIDE ON POLIO VIRUS ADSORBED ON HeLa CELLS

Raunio, V., Taipale, A.
***Annales Medicinae Experimentalis et Biologiae Fenniae*, Helsinki, v. 39, pp. 352–355, 1961**

Ethylene oxide in Freon at 0.8 atm was used to treat virus retained on monolayer cultures of HeLa cells. The process was carried out at 20°C for 10–40 min. Inactivation was practically complete after 40 min.

304. THE STERILIZING ACTION OF GASEOUS ETHYLENE OXIDE ON FOOT-AND-MOUTH DISEASE VIRUS; A PRELIMINARY REPORT

Savan, M.
***American Journal of Veterinary Research*, v. 16, no. 58, pp. 158–159, January 1955**

305. THE EFFECT OF GASEOUS ETHYLENE OXIDE ON DRIED FOOT-AND-MOUTH DISEASE VIRUS

Tessler, J., Fellowes, O. N.
***American Journal of Veterinary Research*, v. 22, no. 89, pp. 779–782, 1961**

Dried foot-and-mouth disease virus (FMDV) was inactivated under definite minimal conditions of relative humidity and temperature when exposed to the action of gaseous ethylene oxide (ETOH) mixed with trichloromonofluoromethane (TMM) and dichlorodifluoromethane (DDM). After the FMDV was subjected to a 40% relative humidity (RH) for 30 min and then exposed to ETOH at 90 or 78 F and 40% RH for 5 hr, the virus was inactivated as shown by tests in mice or tissue culture. Virus was not inactivated in two out of three trials after exposure to ETOH for 5 hr at 40% RH and 98 F without prior humidification. The gases TMM and DDM did

not inactivate the dried virus in the absence of ETOH. (*BA*, v. 37, 1962, #23,734)

306. STERILIZING EFFECT OF ETHYLENE OXIDE VAPOR ON DIFFERENT MICROORGANISMS
Toth, L. Z. J.
***Archiv fuer Mikrobiologie*, v. 32, pp. 409–410, 1959 (in English)**

Experimental methods for sterilizing with ETOH gas are given as well as comparative data on the lethal effect of ETOH. Graphs illustrating time exposure vs. ethylene oxide concentration are included.

β-PROPIOLACTONE

307. STERILIZATION OF REGENERATED COLLAGEN SUTURES WITH β-PROPIOLACTONE
Ball, E. L., Dornbush, A. C., Sieger, G. M., Stirn, F. E., Vitucci, J. C., Weidenheimer, J. F.
***Applied Microbiology*, v. 9, pp. 269–272, July 1961**

308. STERILIZATSIYA PYTATELNYKH SRED β-PROPIOLACTONOM (STERILIZATION OF NUTRIENT MEDIA WITH β-PROPIOLACTONE)
Bazhinov, A. G., Garin, N. S., Kamorskii, N. M., Komarov, V. A.
***Laboratornoe Deloe*, v. 5, pp. 46–49, 1962**

The bacteriacidal activity of β-propiolactone and the products of its hydrolysis were studied. The importance of maintaining the pH of the medium at a proper level by the use of suitable buffer solutions was emphasized. (*BA*, v. 40, 1962, #15,590)

309. PROPIOLACTONE AS A STERILANT. II
Beears, W. L., Roha, M.
1959
U. S. Department of Commerce, Office of Technical Services, Washington D. C.
OTS: PB 139,748

Above 0.1 mg/l, β-propiolactone vapor becomes unbearable to human beings. Exposure to a 4% aqueous sterilant solution for 20 min causes skin burns on humans. A 20% lactone in dioxane solution diluted 1:5 with H_2O kills spores in 15 min at 25° C.

310. DECONTAMINATION OF ENCLOSED SPACES WITH β-PROPIOLACTONE VAPOR
Bruch, C. W.
***American Journal of Hygiene*, v. 73, pp. 1–9, 1961**

Disinfection is complete with β-propiolactone. Further determination of the toxicity of the compound will aid the development and application of methods of disinfection.

311. AN EXPERIMENTAL INFECTIOUS BRONCHITIS VIRUS VACCINE INACTIVATED WITH BETA-PROPIOLACTONE
Christian, R. T., Mack, W.
***Poultry Science*, v. 36, no. 6, pp. 1177–1181, 1957**

312. THE EFFECTS OF β-PROPIOLACTONE (BPL) ON BACTERIAL SPORES
Curran, H. R., Evans, F. R.
***Journal of Infectious Diseases*, v. 99, no. 3, pp. 212–218, 1956**

Washed spores were seeded into different substrates, treated with BPL, with or without activation of the spores by mild heat. Colony spore counts were made before and after treatment. BPL (0.3%) rapidly killed spores of *Bacillus subtilis*, *B. cereus*, *B. stearothermophilus*, *Clostridium botulinum* and P. A. 3679 in water, nutrient broth, and skim milk. The spores did not die at a uniform rate, although death rate was essentially linear for 99+% destruction; rapid and complete destruction of spores occurred only at relatively high concentrations of BPL. At 37 C, 0.5 to 1.5% BPL rapidly sterilized nutrient broth, heavily seeded with spores (10^8/ml). A near-to-normal temperature coefficient was indicated. Spores previously treated with BPL were more susceptible to heat at 100 C than were spores not previously exposed to the drug. In aqueous substrates, at room temperature and above, BPL is rapidly converted into compounds (chiefly hydracrylic acid), which have no sporicidal activity. Limitations and possible utility of the drug are discussed. (*BA*, v. 31, 1957, #28,748)

313. INACTIVATION OF POLIOVIRUS BY β-PROPIOLACTONE
D'Alessandro, G., Oddo, F. G., Inserillo, G.
***Giornale di Microbiologia*, v. 8, no. 3, pp. 151–158, 1960 (in Italian with English and German summaries)**

Some aspects of the inactivation of Type I poliovirus (Brunhilde strain) by β-propiolactone (BPL) have been investigated. The minimal concentration of the chemical required for complete destruction of infectivity lies between 0.05 and 0.075%. If the pH of the inactivation mixture is kept at a constant value of 7.4, a slightly higher concentration, i.e. between 0.075 and 0.1%, is required to achieve the same effect. The time required for complete inactivation varies from 35 min with a concentration of BPL of 0.1% to less than 5 min with a concentration of 0.5%. With increasing concentrations of BPL the shape of the inactivation curve closely approaches that of a straight line. Virus treated with concentrations of BPL up to 1% retains a good degree of antigenicity. Treatment with 2% BPL, however, causes a total loss of antigenicity. Keeping the pH at a constant value of 7.4 during the inactivation treatment does not seem to improve the preservation of antigenicity. (*BA*, v 36, 1961, #31,764)

314. FURTHER INVESTIGATIONS ON THE INACTIVATION OF POLIOMYELITIS VIRUS WITH β-PROPIOLACTONE

D'Alessandro, G., Oddo, F. G., Inserillo, G.
***Rivista dell'Istituto Sieroterapico Italiano*, v. 31, pp. 464–468, 1956 (in Italian with English summary)**

After exposure of Type I poliomyelitis virus to β-propiolactone at a concentration up to 1% for 2 hr at 37 C followed by 24 hrs at 2 C, the power to produce antibodies in guinea pigs was retained.

315. VIRUCIDAL ACTIVITY OF β-PROPIOLACTONE VAPOR I. EFFECT OF β-PROPIOLACTONE VAPOR ON VENEZUELAN EQUINE ENCEPHALOMYELITIS VIRUS

Dawson, F. W., Hearn, H. J., Hoffman, R. K.
***Applied Microbiology*, v. 7, pp. 199–201, 1959**

Data are presented which show that a 15-min exposure to a concentration of 2–4 mg BPL/l of air inactivated as much as 10^5 mouse intraperitoneal LD_{50} of Venezuelan equine encephalomyelitis virus per 5⅛-in.-D surface area. These preliminary data suggest that BPL might be used as a replacement for formaldehyde as a gaseous disinfectant for the routine decontamination of large enclosed areas contaminated with virus. This compound has been shown to be highly effective and rapid in action. 6 references.

316. NEW VAPOR-PHASE DISINFECTANT

Feazel, C. E., Lang, E. W.
***Soap and Chemical Specialties*, v. 35, no. 10, p. 113, 1959**

A vapor phase of β-propiolactone is toxic to the skin and attacks metals and plastics, but is very effective as a disinfectant.

317. THE INACTIVATION OF FOOT-AND-MOUTH DISEASE VIRUS, TYPE A-119, WITH β-PROPIOLACTONE

Fellowes, O. N., Edward, A. G., Tessler, J., Poppensieck, G. C., Sharp, J. B.
***American Journal of Veterinary Research*, v. 20, pp. 992–995, 1959**

A concentration of 0.5% β-propiolactone inactivated the viruses in the supernatant fluid of suspensions of infected bovine tongue epethilium. The process took 15 min at 37 C. 16 references.

318. THE ACTIVITY OF HUMAN REAGINS EXPOSED TO THE DISINFECTANT, β-PROPIOLACTONE

Flick, J. A., Feinberg, R. J.
***Journal of Allergy*, v. 26, pp. 262–267, 1955**

Human reagins are not destroyed by β-propiolactone when admixed with serum at 0.2% concentrations. Therefore, it may be used in the treatment of serum for Prausnetz-Kustner testing.

319. INACTIVATION OF PHAGES BY β-PROPIOLACTONE

Hagiwara, S.
***Sapporo Igaku Zasshi*, v. 20, no. 1., pp. 16–18, 1961 (in Japanese with English summary)**

By exposure to β-propiolactone (0.1%) at 37 C for 10 min, approximately 95% of phages P_2 were inactivated, whereas in cells of *Shigella dysenteriae* more than 99.9% were killed. Phages ϵ^{15}, C_{11}, and ϵ^{34} were not inactivated to a demonstrable extent by similar treatment, while in *Salmonella anatum*, strains A and Ado (Uetake, 1959), more than 99.9% of cells were killed. (*BA*, v. 40, 1962, #15,675)

320. COMPARATIVE EFFECTS OF β-PROPIOLACTONE ON MICE, MOUSE-DERIVED CELL CULTURES, AND VENEZUELAN EQUINE ENCEPHALOMYELITIS VIRUS

Hearn, H. J., Dawson, F. W.
***Applied Microbiology*, v. 9, no. 4, pp. 278–282, 1961**

Studies were made comparing the toxicity of β-propiolactone (BPL) for mammalian (mouse) cells *in vitro*, for mice, and for Venezuelan equine encephalomyelitis (VEE) virus which is highly cytopathogenic for each. The mammalian cells grown in tissue culture were found to be adversely affected by BPL in concentrations ranging from 0.001 to 0.1 mg/ml of supernatant fluid. The difference in response was influenced by the menstruum in which the BPL was suspended and the difference in cell types tested. Tenfold less BPL appeared to be required to destroy the cells when it was suspended in a balanced salt solution than when it was suspended in protein-containing solutions such as beef heart infusion broth or medium 199 plus 20% horse serum. Secondary embryonic mouse lung cells seemed slightly more adversely affected by BPL than the established embryonic lung or L cells. BPL given to mice by intranasal instillation and by intracerebral injection was lethal to half of the animals within two days at doses of 0.31 and 0.39 mg, respectively. Higher concentrations of BPL were required to rapidly inactivate the virus *in vitro* than were required to kill mice or to cause a toxic effect on cells in culture. It required 10 mg/ml of BPL to completely inactivate a high-titered VEE virus preparation in 5 min and 1 mg/ml to inactivate most, but not all, of the virus in 15 min. A concentration of 0.1 mg/ml of BPL had only a slight effect on the virus after a period as long as 60 min. Evidence is presented indicating that simultaneous inactivation of all of the properties of the VEE virus particles by BPL aerosols did not occur at the same time but that, after treatment, the virus possessed a limited ability to immunize mice despite a loss in infectivity. (*BA*, v. 36, 1961, #76,663)

321. AN EVALUATION OF β-PROPIOLACTONE FOR THE STERILIZATION OF FERMENTATION MEDIA

Himmelfarb, P., Read, R. B., Jr., Letsky, W.
***Applied Microbiology*, v. 9, pp. 534–537, 1961**

Twenty-five bacterial species were cultured in basal broth plus 1 of 19 different carbohydrates which were sterilized by Seitz filtration, autoclaving (112 C, 10 min), or exposure to 0.2% β-propiolactone (BPL). No significant differences were found either in the visual observations for acid and gas, pH, or titrable acidity determinations after three days of incubation with any of the three preparations tested. An effort was made to further determine the effect of BPL and heat on carbohydrates by assaying for glucose before and after treatment. Results indicated that glucose was not degraded by 0.2% BPL; however, it was shown that autoclave temperatures caused extensive degradation. Statistical treatment of the results from Warburg studies indicated that BPL-treated glucose showed no appreciable toxic effects, although the actual oxygen uptake was not as great as with Seitz or autoclave-treated glucose. The application of the BPL sterilization process was discussed.

322. BETA-PROPIOLACTONE VAPOR AS A DISINFECTANT

Hoffman, R. K., Warshowsky, B.
***Applied Microbiology*, v. 6, no. 5, pp. 358–362, 1958**

The sporicidal efficiency of β-propiolactone is a direct function of the concentration, humidity, and temperature at which it is used. These relationships were defined by determining the death rates of *Bacillus subtilis* var. *niger* spores on cloth patches exposed to the vapor of the disinfectant under various conditions. Specifically, it was determined that the effectiveness of β-propiolactone as a vapor-phase disinfectant is greater at high humidities and temperatures. Comparison with other gaseous disinfectants suggests that β-propiolactone is a highly active vapor-phase disinfectant, safe for routine, general use, and can replace formaldehyde in many practical applications. (*BA*, v. 33, 1959, #22,813)

323. PROCEDURE FOR BONE STERILIZATION WITH BETA-PROPIOLACTONE

Lo Grippo, G. A., Burgess, B., Teodoro, R., Fleming, J. L.
***Journal of Bone and Joint Surgery*, American Volume, v. 39A, no. 6, pp. 1356–1364, 1957**

Following successful sterilization and preservation of human arteries in a solution of β-propiolactone, the procedure for the use of the same chemical agent to preserve homogenous bone for bone graft operations is described in detail. Just prior to use, β-propiolactone was prepared as a 10% solution in the cold. Bone sterilized in this solution has been used in 50 operations for filling large cysts, spine fusion, and un-united fractures. The advantage of the chemical method of sterilization is that it permits use of a cadaver bone and eliminates the possibility of transmitting infection from bacteria or hepatitis from viruses. The depth of penetration of the chemical was 3 mm in cancellous bone. (*BA*, v. 32, 1958, #23,373)

324. INVESTIGATION OF THE USE OF β-PROPIOLACTONE IN VIRUS INACTIVATION

Lo Grippo, G. A.
***Annals of the New York Academy of Science*, v. 83, pp. 578–594, 1960**

A review is presented. 36 references.

325. FIXATION OF POLIOMYELITIS COMPLEMENT WITH LIVING ANTIGENS AND SUCH INACTIVATED WITH β-PROPIOLACTONE

Lo Monaco, G. B.
***Sperimentale*, v. 108, pp. 391–410, 1958**

Complement fixations with living viruses were as reliable as those with β-propiolactone-inactivated viruses. In some experiments an additional 0.2% of the lactone resulted in a loss of antigenic titer; 0.2% β-propiolactone failed to inactivate entirely.

326. SOIL STERILIZATION BY USE OF β-PROPIOLACTONE

Phillips, C. R., Greenberg, L. P., Hoffman, R. K.
U. S. Department of Commerce, Washington, D. C.
January 3, 1961
U. S. Patent 2, 967,100 (assigned to U. S. Government)

Sterilizing soil with β-propiolactone kills microorganisms in 2–3 hr. After 48 hr, germination of seeds is normal; but at the time of sterilization if seeds are present, they will not germinate.

327. THE USE OF BETA-PROPIOLACTONE FOR THE PREPARATION OF VIRUS VACCINES. II. ANTIGENICITY

Polley, J. R., Guerin, M. M.
***Canadian Journal of Microbiology*, v. 3, no. 6, pp. 871–877, 1957**

An investigation has been made of the antigenicity of influenza virus suspensions rendered noninfective with β-propiolactone (BPL). By treatment with BPL under various conditions, influenza vaccines could be prepared which were antigenic as indicated by production of specific antibody response in mice and guinea pigs. These vaccines were also immunizing as evidenced by their capacity to protect mice against challenge with live virus. (*BA*, v. 32, 1958, #9487)

328. INACTIVATION OF FIXED RABIES VIRUS, GROWN ON EMBRYONATED DUCK EGGS, BY MEANS OF β-PROPIOLACTONE

Powell, H. M., Culbertson, C. G.
***Southwestern Veterinarian*, v. 12, pp. 281–285, 1959**

When a combination of β-propiolactone and ultraviolet light is used on anti-rabies vaccine, the vaccine is more potent than if the types of sterilization are used separately.

329. METHOD FOR DISINFECTING LARGE ENCLOSURES WITH β-PROPIOLACTONE VAPOR

Spiner, D. R., Hoffman, R. K.
***Applied Microbiology*, v. 8, no. 3, pp. 152–155, May 1960**

The general procedure for decontaminating enclosed spaces with β-propiolactone (BPL) is relatively simple. In preparing an enclosure, large cracks around doors, windows, etc. should be sealed with masking tape. Ventilating systems must be shut off and preferably sealed. For optimal activity of the disinfectant, the relative humidity should be 70% or higher, and the temperature preferably kept at 24° C or higher. Most commercial insecticide sprayers can be used to disseminate BPL. One gallon of the chemical should be sprayed for each 12,000–16,000 ft³ of space. Generally, a 2-hr contact time is sufficient for decontamination. Under normal conditions of aeration, a day is sufficient before the area can be occupied, although the time for aeration can be greatly reduced by using forced ventilation. Because of the toxicity of BPL care must be taken when handling the chemical. BPL of the purity specified by the manufacturer (97%) does not produce a residue upon spraying; however, BPL containing polymers of the chemical will cause the formation of a residue which is difficult to remove. Summaries of decontamination trials presented indicate the effectiveness of the described decontamination procedure. 8 references.

330. THE INACTIVATION OF RINDERPEST VIRUS BY β-PROPIOLACTONE AND ITS EFFECT ON HOMOLOGOUS COMPLEMENT-FIXING AND NEUTRALIZING ANTIBODY

Stone, S. S., Delay, P. D.
***Journal of Immunology*, v. 87, no. 4, pp. 464–467, 1961**

Cattle inoculated with 5×10^4 lethal doses of Pendik rinderpest virus in an extract from infected mesenteric lymph nodes and treated with 0.4% β-propiolactone

(BPL) did not develop the disease and were susceptible to challenge. The same concentration of BPL inactivated the Nakamura III lapinized virus. Cattle inoculated with the BPL treated Nakamura III virus were susceptible to challenge. BPL in concentrations from 0.1 to 1.0% did not significantly alter the complement-fixing (CF) activity of anti-rinderpest rabbit serum. However, the titers as measured by agar gel diffusion (AD) were lowered. Rabbit anti-rinderpest serum treated with 0.4% BPL retained its virus neutralizing capacity when tested in rabbits. The CF and AD titers of Pendik virus were not altered after treatment with BPL in concentrations ranging from 0.1 to 1%. (*BA*, v. 37, 1962, #14,779)

331. IMMUNE RESPONSE OF CHICKENS TO BETA-PROPIOLACTONE-KILLED NEWCASTLE DISEASE VACCINES

Sullivan, J. F., Gill, E., Somer, A .M.
***American Journal of Veterinary Research*, v. 19, no. 71, pp. 483–488, 1958**

The results of studies of the comparative immunizing potency of three β-propiolactone-killed Newcastle disease vaccines prepared with the GB-Texas, Roakin-New Jersey, and Manhattan-Kansas strains of Newcastle disease virus are presented. A single injection of these vaccines afforded variable degrees of protection to groups of birds vaccinated at two weeks and challenged at four, six, eight, ten, and twelve weeks of age. The vaccine made with the GB-Texas strain of Newcastle disease virus afforded the best protection. Groups of birds receiving a second injection four weeks after the first injection of vaccine exhibited an anamnestic response that could be measured by the serological and post-vaccination virus exposures employed in these studies. When two injections of vaccine were employed, no significant difference could be observed in the various groups of birds, irrespective of the strain of virus employed in the vaccine. (*BA*, v. 32, 1958, #38,090)

332. HOSPITAL DECONTAMINATION WITH BETA-PROPIOLACTONE VAPOR

Woodward, M. F., Clark, A. B.
***U.S. Armed Forces Medical Journal*, v. 11, pp. 459–463, 1960**

On the three occasions of its use, β-propiolactone vapor proved to be a fast, efficient, and safe means of markedly reducing the bacterial count in hospital areas. With proper handling it can be used for decontaminating all items normally found in a hospital. 4 references.

333. NATURE OF THE ANTIBACTERIAL ACTION OF BETA-PROPIOLACTONE [ABSTRACT]

Yerian, R. D., Teodoro, R.
***Bacteriological Proceedings*, v. 61, p. 88, 1961**

OZONE

334. OZONE TREATMENT OF DRINKING WATER

Berger, K.
***Vom Wasser*, v. 25, pp. 82–92, 1958**

An effective saturation method for introducing ozonized air into water is discussed. An experiment using this method revealed there should be an excess of 25–35 mg/l of O_3 for complete sterilization.

335. OZONE AS AN AGENT FOR DISINFECTION OF WATER FROM BACTERIAL SPORES

Bogdanova, T. P.
***Gigiena i Sanitariya*, v. 25, pp. 96–98, October 1960 (in Russian with English Summary)**

336. MICROBIOLOGIC STUDIES WITH OZONE. QUANTITATIVE LETHALITY OF OZONE FOR *ESCHERICHIA COLI*

Davis, I.
March 1961
Air Force School of Aerospace Medicine, Brooks AFB, Texas
Report 61–54
AD–257, 293

A series of studies designed to provide an understanding of the biologic activity of ozone at the cellular level is described. A critical analysis of the quantitative lethality of ozone was undertaken. Maximum lethal effects of ozone over a wide concentration range were expressed in 1 min or less on the bacterial population. The

number of cells surviving exposure is a function of approximately the cube of the initial cell concentration. This holds true over a wide range of ozone values. Percent kill increased sharply over a narrow range of ozone concentrations, and then leveled off. The ozone tolerance of strains B and B/r of *Escherichia coli* appears to be similar, if not identical. Several factors which contribute to an understanding of the biologic activity of ozone are presented. The importance of free radicals in biologic processes is discussed. Literature on the formation of these radicals during the absorption of ozone in aqueous solution is reviewed. 39 references. (ASTIA)

337. MICROBIOLOGIC STUDIES WITH OZONE. MUTAGENESIS OF OZONE FOR *ESCHERICHIA COLI*

Davis, I.
June 1961
Air Force School of Aerospace Medicine, Brooks AFB, Texas
Report 61–60
AD-266, 165

This report is one of a series of studies designed to provide an understanding of the biologic activity of ozone at the cellular level. The possible role of ozone as a biologic mutagenic agent was undertaken. Ozone was produced by a Welsbach water-cooled corona discharge ozonator using dry, clean oxygen. Analyses for ozone in aqueous solutions were carried out spectrophotometrically. Cells of *Escherichia coli* were exposed to aliquots of ozonated-water stock solutions. Bacterial survivors and mutants were determined by recognized plating procedures. The mutagenesis of ozone in aqueous solutions on *E. coli* was studied in two mutational systems. Mutation frequencies in the streptomycin-dependence method appear to increase with increasing concentrations of ozone and decreasing survival. In the phage-resistance method, the frequency of zero-point mutants showed a significant increase after exposure of the cells to ozone. The importance of free radicals in biologic processes is discussed. It is suggested that a common pathway exists in the formation of these active radicals following irradiation, ozonization, or oxygen poisoning of biologic specimens. 22 references. (ASTIA)

338. MICROBIOLOGIC STUDIES WITH OZONE. QUANTITATION OF OZONE IN AQUEOUS SOLUTIONS

Davis, I.
June 1961
Air Force School of Aerospace Medicine, Brooks AFB, Texas
Report 61–78
AD-267,251

A spectrophotometric method for the determination of ozone dissolved in aqueous solution is described. The principle of the method is based on the absorption of ozone in alkaline potassium iodide solution. Iodine is released upon acidification and the chromophoric properties quantitated at the maximum absorption peak in the visible spectra. This method is rapid and accurate within the range of 0.02–4.0 mg O_3/l H_2O. Other methods reported in the literature are reviewed. 11 references. (ASTIA)

339. MICROBIOLOGIC STUDIES WITH OZONE. SOME NOTES ON CONDUCTING EXPERIMENTS WITH OZONE

Davis, I.
June 1961
Air Force School of Aerospace Medicine, Brooks AFB, Texas
Report 61–80
AD–267,249

The technology of ozone research is detailed for the neophyte in this field. A method for construction of an ozonator is described. The instrument is calibrated in terms of relation of primary to secondary voltage, relation of electrical input and oxygen flow rate to ozone production, and reproducibility. The defects inherent in such an instrument are noted. Auxiliary equipment and technics required during ozonization are mentioned. A comparative evaluation of several dispersion devices for gas absorption bottles is reported. The Allihn bell-bubbler type of absorber is recommended. Chemical methods for the analyses of ozone in either the gas or liquid phases are reviewed. A comparison of methods for the analyses of ozone in the gas phase reveals that multiplication of the spectrophotometric results by the factor 1.6 brings this analytic method into approximate agreement with the titrimetric method. Finally, some kinetic data on ozone in aqueous solutions are reported. The latter studies include decomposition of ozone in aqueous solutions, effect of dilution on ozonated-water solutions, and use of different absorbing media for ozone. 45 references. (ASTIA)

340. INVESTIGATION OF OZONE AS AN AERIAL DISINFECTANT

Elford, W. J., Van Den Ende, J.
***Journal of Hygiene*, v. 42, pp. 240–265, 1942**

341. EFFECTS OF OZONE ON ORGANISMS
Giese, A. C., Christensen, E.
Physiological Zoology, v. 27, no. 2, pp. 101–115, 1954

342. ON THE GERMICIDAL ACTIVITY OF OZONE-STERILIZER
Iwahara, S., Kurisu, H., Yamate, N., Kano, K.
Eisei Shikensho Hokoku (Bulletin of National Hygienic Laboratory), v. 78, pp. 151–152, 1960 (in Japanese with English summary)

Three types of ozone-sterilizer were tested for their germicidal activity. *Escherichia coli*, *Staphylococcus aureus* and *Candida albicans* were sterilized in less than 30 min, but 60 min or more were required to sterilize *Mycobacterium* and *Microsporium gypseum*. When a small chamber was used for the test, high ozone concentration was attained in a short time and, consequently, germicidal effect was great. (*BA*, v. 38, 1962, #6814)

343. BACTERICIDAL ACTION OF OZONE. THE ACTION OF OZONE AGAINST BACTERIA IN THE FOOD AND FISH INDUSTRY
Kietzmann, U.
Archiv fuer Lebensmittelhygiene, v. 8, pp. 35–37, 1957

Disinfection with ozone gives negative results for pathogenic and psychrotolerant bacteria, but it is very effective for aerial bacteria in a small space and high concentration.

344. THE ANTISEPTIC EFFECT AND INFLUENCE ON THE IMMUNE ABILITY OF *MYCOBACTERIUM TUBERCULOSIS* OF ELECTROZONE ANTISEPTIC LIGHT
I. THE ANTISEPTIC EFFECT OF OZONE AGAINST *MYCOBACTERIUM TUBERCULOSIS*
Mivazawa, M., Matsuzaki, T.
Hoan Eisei (Japanese Safety Forces Medical Journal), v. 2, pp. 337–340, 1956 (in Japanese with English summary)

The growth of *M. tuberculosis* is inhibited by 4 hr of ozonization. The amount of O_3 in air was about 0.26 mg/l.

345. THE ANTISEPTIC EFFECT AND INFLUENCE ON THE IMMUNE ABILITY OF *MYCOBACTERIUM TUBERCULOSIS* OF ELECTROZONE ANTISEPTIC LIGHT
II. INFLUENCE OF OZONE ON THE IMMUNE ABILITY OF *MYCOBACTERIUM TUBERCULOSIS*
Matsuzaki, T.
Hoan Eisei (Japanese Safety Forces Medical Journal, v. 2, pp. 342–344, 1956 (in Japanese with English summary)

There is a considerable loss in antibody reactivity of *M. tuberculosis* if an emulsion of lymph glands of animals is ozonized.

346. OZONE BIBLIOGRAPHY
Ossefort, Z. T.
United States Government Research Reports, v. 31, p. 409, 1959
(Also obtainable as OTS: PB 136, 486, U.S. Dept. of Commerce, Office of Technical Services, Washington, D. C.)

347. OZONE AS A DISINFECTANT FOR WATER AND SEWAGE
Stumm, W.
Journal of the Boston Society of Civil Engineers, v. 45, pp. 68–79, 1958

Information is given which shows ozone to be a better disinfectant of water than Cl compounds, cysts, and some viruses, since many pathogenic organisms are resistant to the latter forms of sterilants. Contact time with ozone is smaller than with other sterilants.

348. GERMICIDAL ACTION OF OZONE
Sulzer, F., Ramadan, F., Wuhrmann, K.
Schweizerische Zeitschrift fuer Hydrologie, Revue Suisse d'Hydrologie, v. 21, pp. 112–122, 1959

Different microorganisms hold different tolerances toward ozone concentrations. That which has most tolerance against O_3 is *Penicillium notatum* spores; that which has least tolerance is *Escherichia coli*.

349. BACTERIAL AND FUNGICIDAL EFFECTS OF OZONE ON DELIBERATELY CONTAMINATED 3D VIEWERS
Warshaw, L. J.
American Journal of Public Health and the Nation's Health, v. 43, pp. 1558–1562, 1953

350. THE BACTERICIDAL ACTION OF OZONE SOLUTIONS
Wuhrmann, K., Meyrath, J.
Schweizerische Zeitschrift fuer Allgemeine Pathologie und Bakteriologie, v. 18, pp. 1060–1069, 1955

Similar concentrations of O_3, ClO_2 and ClO were compared as to their effectiveness on *Bacillus megatherium-cereus*. Ozone killed the microorganisms 300 times faster than ClO_2 and ClO. Plots and determinations are given.

351. OZONE CHEMISTRY AND TECHNOLOGY

***Advances in Chemistry Series*, no. 21, 1959**

Sixty papers are presented which constitute the Proceedings of the International Ozone Conference held in Chicago, November 1956. Science, technology, and application of ozone are covered as well as ozone chemistry, analysis, formation in electric discharge, toxicity and sterilization, and reaction kinetics. Atmospheric ozone is discussed and applications in organic chemistry and water purification made. (*EI*, 1960)

352. STERILIZATION OF SEWAGE WITH OZONE

U.S. Department of Commerce, Office of Technical Services, Washington, D.C.
OTS: PB 129,375

PROPYLENE OXIDE

353. MICROBICIDAL ACTIVITY OF GASEOUS PROPYLENE OXIDE AND ITS APPLICATION TO POWDERED OR FLAKED FOODS

Bruch, C. W., Koesterer, M.G.
***Journal of Food Science*, v. 26, pp. 428–435, 1961**

The time it takes for a 90% kill is expressed by t_{90}. Relative humidity is an important factor to the rate of t_{90}. For 1250 mg/l of propylene oxide in air at 85% RH, t_{90} for *Bacillus subtilis* is 1 hr. As relative humidity decreases, t_{90} appears to increase.

354. THE ANTIBACTERIAL ACTIVITY OF PROPYLENE OXIDE VAPOR AGAINST MAJOR GROUPS OF ORGANISMS WITH REFERENCE TO RELATIVE HUMIDITY REQUIREMENTS. IN: ANNUAL MEETING OF THE AMERICAN SOCIETY FOR MICROBIOLOGY, KANSAS CITY, MISSOURI, MAY 1962 [ABSTRACT]

Himmelfarb, P., Litsky, W.
***Bacteriological Proceedings*, v. 62, p. 33, 1962**

PESTICIDES

355. DEVELOPMENT OF NEW PESTICIDE

Baldit, G. L.
***Chemistry & Industry*, London, no. 1, pp. 2–5, January 7, 1956**

Pesticides are defined as chemicals for destruction of insects, fungi, weeds, bacteria and rodents. The development of crop protection chemicals is presented and a review of work of early pioneers given. Problems to which there are, as yet, no economic solutions are posed. (*EI*, 1956)

356. SOIL DISINFECTION BY STREAM AND BY LARVACIDE

Berg, B.
***Samenfachmann*, Supplement to *Saattut Wirtschaft*, no. 31, pp. 246–248, August 1961**
(Obtainable as 61.8 Sa4, U.S. Dept. of Agriculture, Washington, D.C.)

357. AZIONI COLLATERALI DI ANTICRITTOGAMICI ACUPRICI ED ACUPRICO RAMEICI IMPIEGATI IN VITICOLTURA. NOTA PRELIMINARE (SIDE EFFECTS OF ORGANIC FUNGICIDES USED IN VITICULTURE. PRELIMINARY NOTE)

Borzini, G.
***Notiziario sulle mallatie delle piante*, v. 59–60, no. 38–39, pp. 51–57, 1962 (in Italian with English summary)**

Results are given of a three-year field experiment with zineb fungicides (used for control of vine mildew) in order to study their effect on yield as compared with Bordeaux mixture. There appeared to be a marked increase with zineb. A phytotoxic effect was observed in certain restricted vineyard areas in the Piedmont as a result of copper oxychloride treatments under unfavorable weather conditions during flowering. (*BA*, v. 40, 1962, #3725)

358. THE USE OF PLAQUES TO GAGE THE EFFECT OF SOME HERBICIDES UPON THE MICROFLORA OF THE SOIL
Colmer, A. R.
***Proceedings of the Southern Weed Conference,* v. 7, p. 237, 1954**

Trichloroacetic acid (TCA), 2, 4-D, and DNOSBP, herbicides which were tested, had no deleterious effects on Azotobacter populations in Mhoon and Commerce soils. The concentrations used were similar to field-use rates. Reductions in fungus growth were noted when concentrations of DNOSPB at 100 ppm or lower were used. Gas-producing bacteria show the same general effect.

359. ACTION OF A HERBICIDE CONTAINING SUBSTITUTED UREA ON SOIL AND ITS MICROFLORA
de Barjac, H., Typset, C., Roche, A., Vacher, B.
***Annales de l'Institut Pasteur,* v. 95, pp. 88–97, 1958**

Partial stimulation of the soil microflora was evident after adding 3-*p*-chlorophenyl-1,1-dimethylurea to a rendzina soil over a two-year period. The stimulation may cause a decrease in soil N and C if vegetation is prevented.

360. THE EFFECT OF SOIL FUNGICIDES. III. QUANTITATIVE CHANGES IN THE SOIL FLORA
Domsch, K. H.
***Zeitschrift fuer Pflanzenkrankheiten und Pflanzenschutz,* v. 66, pp. 17–26, 1959**

With allyl alcohol the growth of algae and fungi was inhibited and bacterial growth increased. With Vapam bacterial, algal, and fungal growth decreased while the development of actinomycetes increased. Captan inhibited growth of algae, fungi and actinomycetes. Only fungi was inhibited by Nabam.

361. THE EFFECT OF SOIL FUNGICIDES. IV. VARIATIONS IN SPECTRUM OF SOIL FLORA. V. SENSITIVENESS OF SOIL ORGANISMS *IN VITRO*
Domsch, K. H.
***Zeitschrift fuer Pflanzenkrankheiten und Pflanzenschutz,* v. 67, pp. 129–150, 211–216, 1960**

An organic arsenic compound, TMTD, Nabam, Vapam, and allyl alcohol were administered to a compost soil of Captan. After three days, the fungal flora was analyzed. Allyl alcohol and Vapam allowed an increase of more groups of organisms than were inhibited, and Nabam decimated the dominating fraction of the fungal flora.

362. AROMATIC FLUORINE COMPOUNDS AS FUNGICIDES
Finger, G. C., Reed, F. H., Tehon, L. R.
1955
Illinois State Geological Survey, Department of Registration and Education, University of Illinois, Urbana
Illinois State Geological Survey Circular 199

A concentration of 0.8 ppm of 1-fluoro-3-bromo-4, 6-dinitrobenzene was found to cause complete growth stoppage of *Aspergillus niger* (common mold) in the laboratory. Data are included on vinyl plastic and cotton fiber protection. (*EI*, 1955)

363. THE EFFECT OF HERBICIDES ON SOIL MICROORGANISMS
Fletcher, W. W.
In "Herbicides and the Soil," pp. 20–62
Blackwell Science Publications, Oxford, England, 1960

364. EFFECT OF ORGANIC HERBICIDES ON SOIL MICROORGANISMS
Fletcher, W. W.
***Pest Technology. Pest Control & Pesticides,* v. 3, no. 12, pp. 272–275, September 1961**

365. ÜBER FUNGIZIDE HOEHERMOLEKULARE VERBIDUNGEN VON STICKSTOFFHETEROCYCLEN (ON FUNGICIDAL COMPONENTS OF HIGH MOLECULAR ORDER FROM NITROGEN HETEROCYCLES)
Fuerst, H., Gluch, R.
***Dresden. Technische Hochschule—Wissenschaftliche Zeitschrift,* v. 6, no. 5, pp. 844–850, 1956–1957**

An investigation is presented of fungicidal characteristics of 2-n alkyl-oxypyridine and its quaternary ammonium salts. 33 references. (*EI*, 1958)

366. EFFECT OF HERBICIDES ON SOIL MICROFLORA
Geller, I. A., Khariton, E. G.
***Microbiology,* v. 30, no. 3, pp. 423–427, 1961**
(Translated from *Mikrobiologiya,* v. 30, no. 3, pp. 494–499, 1961)

In the gray podzolic soils, fertile low humus soils, and chernozems, the herbicides ammonium trichloroacetate,

dichloralurea, and isopropylchlorophenyl carbamate applied at rates exceeding 5–8 kg/ha reduced the activity of ammonifying and nitrifying bacteria and the content of Azotobacter and *Clostridium pasteurianum* in the soil. The herbicides applied to the soil were gradually deactivated. The vital activity of soil microorganisms was one of several factors causing deactivation. The increased biological activity in the layer of soil in direct contact with the seeds which had been treated with the bacterial fertilizers, azobacterin and phosphorobacterin, herbicide deactivation, increased the seed germination rate, and raised the sugar beet yield to the level of the controls. (*BA*, v. 38, 1962, #11,025)

367. PRODUCTION OF A FUNGISTATIC EFFECT BY SOIL MICROFLORA IN AUTOCLAVED SOIL

Griffin, G. J.
***Phytopathology*, v. 52, no. 1, pp. 90–91, January 1962**

368. UNTERSUCHUNGEN ÜBER DIE INNER-THERAPEUTISCHE WIRKUNG ORGANISCHER FUNGIZIDE. III. CHINOLIN-DERIVATE UND CAPTAN (INVESTIGATIONS ON THE ENDOTHERAPEUTIC EFFECT OF ORGANIC FUNGICIDES. III. QUINOLINE DERIVATIVES AND CAPTAN)

Grossmann, F.
***Zeitschrift fuer Pflanzenkrankheiten und Pflanzenschutz*, v. 66, no. 7, pp. 385–391, 1959**

Tests with tomato plants showed that 8-quinolinol, 8-quinolinol potassium sulphate and Captan are not taken up by the roots. Endotherapeutic effects, which were observed in previous experiments, are discussed. (*BA*, v. 39, 1962, #20,715)

369. THE EFFECT OF CERTAIN INSECTICIDES AND FUNGICIDES ON FUNGI PATHOGENIC TO THE SPOTTED ALFALFA APHID

Hall, I. M., Dunn, P. H.
***Journal of Economic Entomology*, v. 52, pp. 28–29, 1959**

Parathion, malathion, Tritrion, demeton, and DDT are toxic to the vegetative stages of some of the fungi that attack *Therioaphis maculata*. Insecticides do not kill resting spores of *Entomophthora virulenta*, but germination is retarded.

370. IDENTIFICATION AND ESTIMATION OF PHENOLIC FUNGICIDES IN MILDEW-PROOF MATERIALS

Hilton, C. L.
***Textile Research Journal*, v. 28, no. 3, pp. 263-266, March 1958**

The method developed depends upon the ultraviolet absorption spectrum of fungicide after extraction from fabric. Qualitative identification and quantitative estimation of fungicide are accomplished by comparison with data for known compounds. Accuracy and precision of ±3% were obtained. A table is presented which shows absorption spectra of twelve compounds (30 commercial fungicides). (*EI*, 1958)

371. CONCERNING THE EFFECT OF THE HERBICIDE 2, 4-D ON SOIL MICROORGANISMS

Ilin, A. M.
***Microbiology*, v. 30, no. 6, pp. 855–856, 1962**
(Translated from *Mikrobiologiya*, v. 30, no. 6, pp. 1050–1051, 1961)

The herbicide 2, 4-D in doses used for weed eradication favors the reproduction of soil microorganisms which can grow on meat-peptone-agar. Protozoa are inhibited by 2, 4-D. The increase in the number of soil microorganisms may be due to the inhibition of protozoan activity. (*BA*, v. 40, 1962, #3167)

372. EFFECT OF REPEATED APPLICATIONS OF HERBICIDES ON SOIL MICROFLORA

Klyuchnikov, L. Yu., Petrova, A. N.
***Microbiology*, v. 29, no. 2, pp. 177–179, 1960**
(Translated from *Mikrobiologiya*, v. 29, no. 2, pp. 238–241, 1960)

Repeated treatments of the following herbicides are reported: 2, 4-D, tractor kerosene, and 2M-4Kh which were used for two years did not cause noticeable changes in the number of bacteria in the rhizosphere of the oak seedlings. A certain decrease in the number of actinomycetes and a change in the specific and quantitative composition of fungi was noted. (*BA*, v. 36, 1961, #18,357)

373. STUDIES ON THE FUNGICIDAL EFFECT OF ELEMENTARY SULFUR ON THE CONIDIA OF *FUSARIUM DECEMCELLULARE* (BRICK)
Meyer, H.
***Archiv fuer Mikrobiologie*, v. 39, pp. 139–157, 1961 (in German)**

374. GERMICIDAL EFFECT OF ORANGE PEEL OIL AND *d*-LIMONENE IN WATER AND ORANGE JUICE. I. FUNGICIDAL PROPERTIES AGAINST YEAST
Murdock, D. I., Allen, W. E.
***Food Technology*, v. 14, no. 9, pp. 441–445, 1960**

Fungicidal effect of orange peel oil and *d*-limonene (stripper oil) was determined against *Zygosaccharomyces major* in water and in single strength orange juice at 25 C. Both oils exhibited lethal properties in water (pH 7.0) in concentrations as low as 0.02%, while in orange juice 0.1% was required; *d*-limonene was more effective than orange peel oil in both water and orange juice. The fungicidal properties of these oils in orange juice adjusted to various pH levels were determined. It was found that orange peel oil and *d*-limonene were more effective pH 6.0 and 7.0 than they were at pH 3.0 and 4.0. Orange juice adjusted to pH 7.0 with NaOH and, containing 0.1% *d*-limonene, was sterile 3 hr after being inoculated with 10^6 yeast cells/ml. In juice adjusted to pH 3.0 with citric acid, there were 10^4 viable cells/ml remaining at the end of a like period. Results of this study indicate that the preservative properties of sodium benzoate can be greatly enhanced by the addition of orange peel oil and *d*-limonene in concentrations as low as 0.02%. It appears that these oils are synergistic to sodium benzoate. (*BA*, v. 36, 1961, #2321)

375. EFFECT OF INSECTICIDE-FUNGICIDE COMBINATIONS ON EMERGENCE OF PEAS AND GROWTH OF DAMPING-OFF FUNGI
Richardson, L. T.
***Plant Disease Reporter*, v. 44, no. 2, pp. 104–108, 1960**

Pea seed treated with commercial preparations of aldrin, dieldrin, or lindane, singly or in combinations with thiram, captan, or chloranil, were planted in sterile sand artificially infested with a series of concentrations of inoculum of *Pythium ultimum* or *Rhizoctonia solani*. In the absence of these pathogens none of the treatments had any effect on the emergence of seedlings. In infested soil, however, seeds treated with insecticides alone were more vulnerable to pre-emergence damping-off than untreated seeds, whereas seeds treated with insecticide-fungicide combinations were better protected than those treated with fungicides alone. The insecticides were also added, with and without the fungicides, to culture media inoculated with the same fungi. By themselves the insecticides (particularly lindane) retarded mycelial growth, and in combination they added to the inhibitory effect of the fungicides. (*BA*, v. 35, 1960, #39,533)

376. O DEISTVII GERBITSIDOV NA MIKROFLORU POCHVY PRI OBRABOTKE POSEVOV DO POYAVLENIYA VSKHODOV KULTURNYKH RASTENII (THE EFFECT OF HERBICIDES ON SOIL MICROFLORA WHEN YOUNG CROPS ARE TREATED BEFORE THE APPEARANCE OF SPROUTS)
Shklyar, M. Z., Voevodin, A. V., Beshanov, A. V.
***Agrobiologiya*, v. 2, pp. 222–225, 1961 (in Russian)**

Treatment of young crops before the appearance of sprouts on well-cultivated sod-podzolic, loamy, and sandy loam soils of the Leningrad oblast with sodium salt, 2, 4-D, simazine, monuron, 1-dimethyl urea, chlor-inositophosphoric acid, Amizol, and diesel oil from shale in the accepted doses did not suppress the growth of microflora on meat peptone agar: cellulose-decomposing and butyric bacteria, anaerobic N fixers, fungi, and also microorganisms from bacterial fertilizers applied to the soil (*Bacillus megatherium* var. *phosphaticum*). Repeated treatment with chlorinositophosphoric acid and 2, 4-D caused partial suppression of the microflora. (*BA*, v. 39, 1962, #3178)

377. HERBICIDAL ACTION ON SOIL MICROORGANISMS AS A FUNCTION OF THE NUTRIENT SUBSTRATE
Voderberg, K.
***Nachrichtenblatt fuer den Deutschen Pflanzenschutzdienst*, Berlin, v. 15, no. 2, pp. 21–23, 1961**

The effect of MCPA, 2, 4-D, DNOC, IPC, CMU, dalapon, trichloropropionic acid, and simazine on four species each of soil bacteria and streptomycetes and seven species of soil fungi was tested. The effect of the herbicides on soil bacteria and streptomycetes was small, and independent of nutrient media. Only IPC, when applied at a rate much higher than the recommended 200 ppm, gave 50–80% inhibition of growth. The effect of the herbicides on soil fungi was much more pronounced, and was influenced by the nutrient media. For example,

40 ppm DNOC resulted in the complete destruction of Penicillium U 8 on glucose-NH_4 NO_3 agar, but gave only 30–50% inhibition to the growth of the organism on glucose-Na NO_3-yeast agar. The inhibiting effects decreased with decreasing concentration of the herbicides. (*BA*, v. 36, 1961, #16,890)

ANTIBIOTICS

378. COMPORTAMIENTO DE LA FLORA BACTERIANA AEROBICA DE LACTANTES FRENTE A LOS ANTIBIOTICOS (EFFECTS OF ANTIBIOTICS ON THE AEROBIC BACTERIAL FLORA OF INFANTS)
Alonso, M. L., Portoles, A.
***Microbiologia Espanola*, v. 13, no. 2, pp. 101–109, 1960 (in Spanish with English summary)**

Bacteriological tests were done on 107 samples of feces from babies of different ages. Conclusions were made about the aerobic microorganisms. Their behavior with nine antibiotics and their 36 binary combinations were studied. The advantages of some combinations have been proved, especially, dihydrostreptomycin with chloramphenicol, and penicillin with erthromycin for the inhibition of the respectively Gram-negative and Gram-positive microorganisms. (*BA*, v. 36, 1961, #31,647)

379. LA RÔLE DE L'ÉVOLUTION BIOLOGIQUE DU GERME DANS LA RÉSISTANCE AUX TRAITMENTS ANTIBIOTIQUES. A PROPOS D'UNE OBSERVATION DE SEPTICÉMIE À STAPHYLOCOQUES (THE ROLE OF THE BIOLOGICAL EVOLUTION OF THE MICROORGANISM IN ITS RESISTANCE TOWARD ANTIBOTIC TREATMENT. AN OBSERVATION OF STAPHYLOCOCCAL SEPTICEMIA)
Bertrand-Fontaine, T., Schneider, J.
***Bulletin de l'Academie Nationale de Medecine*, Paris, v. 143, no. 15/16, pp. 342–345, 1959**

A case of malignant endocarditis with a negative hemoculture due to a granular form of *Staphylococcus aureus* is presented. (*BA*, v. 36, 1961, #8138)

380. RESISTANCE OF BACTERIA TO CHEMOTHERAPEUTIC AGENTS, WITH SPECIAL REFERENCE TO ANTIBIOTICS
Ciuca, M., Nestorescu, N., Popovici, M., Agavriloaei, A.
***Medicina Interna*, v. 13, pp. 827–844, June 1961 (in Rumanian with English summary)**

381. COMPARATIVE STUDY OF THE BACTERICIDAL EFFECT OF COMBINATIONS OF ANTIBIOTICS WITH A COLISTINE BASE ON ENTEROBACTERIACEAE AND PSEUDOMONADACEAE
Cluzel, R., Michel, J., Vaurs, R., Cluzel-Nigay, M.
***Annales de l'Institut Pasteur*, v. 101, pp. 203–210, August 1961 (in French)**

382. BIOCHEMICAL MECHANISMS INVOLVED IN THE EFFECT ON MICROORGANISMS OF SEVERAL ANTIBIOTICS
Krěmery, V.
***Biológia*, v. 14, pp. 221–231, 1959**

A review is presented. 65 references.

383. THE *IN VITRO* ACTIVITY OF SOME CHEMOTHERAPEUTIC AGENTS AND ANTIBIOTICS AGAINST SOME MICROORGANISMS AND BACTERIAL RESISTANCE
Luigi, R.
***Igiene Moderna*, Parma, v. 47, pp. 259–288, 1954 (in Italian with English summary)**

The activity of some chemotherapeutic agents was determined, each alone and in combination with each other, against twelve microorganisms. Results are given. Microorganisms show varied degrees of sensitivity against the agents.

384. *IN VITRO* EFFECTS OF ANTIBIOTICS ON YEAST PHASE OF *BLASTOMYCES DERMATITIDIS* AND OTHER FUNGI
McDonough, E. S., Ajello, L., Georg, L. K., Brinkman, S.
***Journal of Laboratory and Clinical Medicine*, v. 55, no. 1, pp. 116–119, 1960**

Nine strains of *B. dermatitidis* showed more sensitivity to cycloheximide at 37°C than at 25°C. At 37°C, two isolates failed to grow on media containing 0.4 mg/ml cycloheximide. Chloramphenicol had a lesser but similar effect. It has not been possible to detect a definite 25 C

to 37°C sensitivity differential with the few strains of *Paracoccidioides brasiliensis* so far studied. Such a differential exists for some strains of *Histoplasma capsulatum* and *Sporotrichum schenckii*, but to a lesser degree than for *B. dermatitidis*. (*BA*, v. 40, 1962, #16,035)

385. EFFECTS OF ANTIBIOTICS ON TRACHOMA VIRUS IN TISSUE CULTURES

Pollard, M., Tanami, Y.
***Society for Experimental Biology and Medicine, Proceedings of the*, v. 107, no. 3, pp. 508–511, 1961**

Six antibiotic drugs were tested for inhibitory effect on trachoma virus in human tissue cells. Chlortetracycline hydrochloride and tylosin tartrate interrupted the cytochemical sequence which reflected maturation of the virus. Penicillin and sulfanilamide only delayed maturation and streptomycin had no effect on the virus. A cytochemical procedure for detection of trachomastatic drugs is described. (*BA*, v. 36, 1961, #85,481)

386. EFFECT OF ANTIBIOTIC AND CHEMICAL DIPS ON THE MICROFLORA OF PACKAGED SALAD MIX

Shapiro, J. E., Holder, I. A.
***Applied Microbiology*, v. 8, no. 6, pp. 341–345, 1960**

Commercially packaged cut salad greens were cultured to identify the microbial flora associated with this foodstuff. Organisms recovered from these mixes were tested for sensitivity to biostat (oxytetracycline plus citric acid), pure oxytetracycline, citric acid, and tartaric acid. The chemicals were made up in varying concentrations and the solutions used as dips for the vegetables in order to determine their effectiveness in depressing microbial populations of cut vegetables and in prolonging the shelf life by maintaining a reduced bacterial flora. The microorganisms recovered were found to be those commonly occurring in water and soil and were predominantly Gram-negative rods. Almost all were sensitive to oxytetracycline and most showed some degree of susceptibility to the inhibitory action of citric and tartaric acids. The inhibition of microbes by citric and tartaric, while not as prolonged as the activity of oxytetracycline, is significant enough to merit exploration as a sanitizing agent for packaged vegetables. (*BA*, v. 36, 1961, #18,323)

387. AKLAVIN, AN ANTIBIOTIC SUBSTANCE WITH ANTIPHAGE ACTIVITY

Strelitz, F., Flon, H., Weiss, U., Asheshov, I. N.
***Journal of Bacteriology*, v. 72, no. 1, pp. 90–94, 1956**

A new antibiotic product, Aklavin, active against a wide variety of bacterial viruses, was isolated from an unidentified streptomycete. Yellow crystalline salts (hydrochloride, picrate, helianthate) of the antibiotic were prepared. Analysis of the salts suggests the formula $C_{30}H_{37}O_{11}N$ for Aklavin base, which itself was not obtained crystalline. Spectra in the ultraviolet and visible regions and some reactions of the material are given. The crude hydrochloride completely inhibited 12 and partially inhibited 29 of the 60 bacteriophages tested. In serial dilution tests, bacterial lysis was prevented for the two most sensitive phages, *Bacillus megaterium* phage and cholera phage C in concentrations of 0.013 μg/ml and 0.2 μg/ml, respectively. Much higher doses were required to inactivate free phage particles, indicating interference with some stage of the host-phage relationship as the essential action of Aklavin. Aklavin also shows some effect against animal viruses. Antibacterial and antifungal activities are likewise reported. (*BA*, v. 31, 1957, #5134)

388. THE MECHANISM OF EFFECTIVENESS OF ADDITIONS OF ANTIBIOTICS TO PIG FODDER

Szilvinyi, A., Leithenmayr, H.
***Mitteilungen der Versuchsstation fuer das Gaerungsgewerbe sowie des Institutes fuer Angewandt Mikrobiologie und der Dozentur fuer Lagertechnik und Vorratsschutz der Hochschule fuer Bodenkultur in Wien*, v. 9, pp. 91–93, 1955**

Gram-negative coli-forming flora are favored and the Gram-positive are suppressed by the addition of antibiotics to pig fodder. *Escherichia coli* formed a vitamin B_{12} factor which adds to the nutritive value of the fodder rather than being consumed by the Gram-positive flora.

MISCELLANEOUS AGENTS

GENERAL AGENTS

389. ON THE DEFENCE MECHANISMS AGAINST INFECTION

Amano, T.
September 30, 1961
Osaka University, Medical School, Japan
Final Report 2 for October 1, 1960–September 30, 1961, DA 92-557-FEC-31897
AD-268,965

Leucozyme C, A alpha, A beta of guinea pig leucocytes were purified and studied. Leucozyme C was active upon almost all gram negative bacteria except a few species. The difference of the sensitivity in two variants (L+O and L −O) of *Escherichia coli* K_{235} led to studying the effect of leucozyme C on O antigen of L + O variant (sensitive) bearing colicine K activity and the decomposition of the O antigen was proven. Leucozyme A alpha was proved to be quite similar to plakin. The mode of action of leucozyme A beta on nonpathogenic staphylococci was studied: it kills the bacteria evoking bacteriolysis and the cessation of oxygen uptake for the substrate of glutamate. The studies on the antibacterial substances of rabbit leucocytes and macrophages were also undertaken. Antibacterial spectra were studied on various extracts of the cells. The antistaphylococcal substance was found in bovine spleen and purified. Gamma-glutamylase in dog liver (resistant animal to anthrax) was completely purified to a homogenous preparation. The identity of gamma-glutamylase with the decapsulating agent for *Bacillus anthracis* was demonstrated. Plakin was fairly purified. Some kinetic studies were made on the protoplast-lysis of *Bacillus megaterium* by plakin. 23 references. (ASTIA)

390. O VLIYANII AKTINOMITSETOV-ANTAGONISTOV NA FITOPATOGENNYE BAKTERII (THE EFFECT OF ANTAGONIST ACTINOMYCETES ON PHYTOPATHOGENIC BACTERIA)

Buyanova, N. D.
***Biulleten Nauchnich Tekhnologricheskuch Informatzii po Selskoklozaystvehhoi Mikrobiologii*, v. 4, pp. 39–41, 1958**

Stable forms of *Xanthomonas campestris* and *Corynebacterium michiganense* have been readily obtained under the influence of antagonist actinomycetes, and a stable form of *Erwinia carotovora* was not successfully separated on a solid nutrient medium. The stable forms obtained did not differ from the initial forms in morphological, cultural or biochemical properties, as well as in virulence. The stability of strains of *X. campestris* and *C. michiganense* was preserved over a period of three years during subculturing on artificial media without an antibiotic and during subinoculation through a plant. (*BA*, v. 36, 1961, #82,422)

391. CULTIVATION OF MICROORGANISMS IN HEAVY WATER

Crespi, H. L., Conrad, S. M., Uphaus, R. A., Katz, J. J.
***Annals of the New York Academy of Sciences*, v. 84, pp. 648–666, 1960**

Many peculiar biological and chemical changes were observed and described during adaptation of the algae to the D_2O environment. "Monster" cells appeared in many cases. A variety of changes were observed in the different species of algae. *Paramecium caudatum* was unsuccessfully grown in more than 50–60% D_2O.

392. EFFECT OF ANAEROBIOSIS ON THE EMERGENCE OF STREPTOMYCIN-RESISTANT BACTERIA

Farkas-Himsley, H.
***Canadian Journal of Microbiology*, v. 7, no. 3, pp. 411–422, 1961**

This paper deals with the increase in numbers of streptomycin-resistant mutants (SM) of *Virus comma* and *Escherichia coli* B in a so-called streptomycin-sensitive population, when grown under anaerobic conditions. This increase is demonstrated in the presence and even in the absence of SM. Experiments of a qualitative and quantitative nature are described and a statistical evaluation of the results is given. A relation between the degree of anaerobiosis and SM resistance is demonstrated, and the time required for streptomycin resistance to become apparent is shown. Former observations of SM inactivation under anaerobic conditions are discussed in view of the present findings, and a different interpretation suggested. (*BA*, v. 36, 1961, #73,098)

393. SOIL STERILIZATION
Geard, I. D., Allen, A. G.
***Tasmanian Journal of Agriculture*, v. 31, no. 4, pp. 407–421, 1960**

Many disease producing organisms build up in the soil in intensively used areas. Soil sterilization is a means of controlling them. Sterilization methods, time of steaming, rate of cooling, toxicity problems and means of avoiding contamination are listed. (*BA*, v. 36, 1961, #82,474)

394. FACTORS AFFECTING THE VIRUS CONTENT OF CHEYENNE WHEAT INFECTED BY WHEAT STREAK MOSAIC
Haunold, E.
***Phytopathology*, v. 48, no. 8, pp. 411–414, 1958**

The time required for the virus to reach maximum concentration decreased with temperature. Day length and light intensity had no apparent effect on virus content. Plants supplied with high nitrogen or high phosphorus contained more virus. Potassium nutrition had no apparent effect. All assays were made by infectivity tests using systemically invaded hosts. The loglog of the fraction of inoculated plants remaining healthy was plotted against the log of the dilution, and the dilution which would have infected 67% of the plants was interpolated from the plot. (*BA*, v. 33, 1959, #11,607)

395. FACTORS AFFECTING RESISTANCE OF THE RAT TO *BACILLUS ANTHRACIS* SPORES [ABSTRACT]
Klein, F., Fenelius, A. L., Taylor, M. J., Lincoln, R. E., Rhian, M. A., Mahlandt, B. G.
***Bacteriological Proceedings*, v. 61, p. 118, 1961**

396. PURIFICATION STUDIES ON THE INFECTIOUS CANINE HEPATITIS VIRUS
Kunishige, T., Mifune, Y.
***Japanese Journal of Veterinary Science*, v. 22 Supplement, p. 550, 1960**

397. SOIL AGGREGATION BY MICROORGANISMS FOLLOWING SOIL FUMIGATION
McCalla, T. M., Haskins, F. A., Curley, R. D.
***Soil Science of America Proceedings*, v. 22, pp. 311–314, 1958**

The influence of autoclaving and of fumigation with eight chemical formulations upon microbial numbers in straw-amended Peorian loess and the extent to which these treatments affect the degree of aggregation brought about by subsequently introduced inocula were determined. A mixed soil flora, *Stachybotrys atra* and a blank inoculum consisting of sterile salt solution, were compared. Only in the autoclaved soil was a mixed soil mixed soil flora inoculum aggregation of the Peorian loess. It was found that inoculation with S. *atra* could greatly increase the aggregation of fumigated Peorian loess in treatments where the fumigation was effective in reducing microbial numbers to a low level, and where the fumigant exerted little if any residual toxic effect upon the S. *atra* inoculum. Most promising of the fumigants tested were chloropicrin and Telone. The aggregation brought about by inoculation with S. *atra* in Peorian loess fumigated by appropriate amounts of either of these chemicals was approximately two-thirds as high as that produced by the same organism following autoclaving of the soil material.

398. SEARCH FOR SUBSTANCES WHICH REDUCE THE HEAT RESISTANCE OF BACTERIAL SPORES
Michener, H. D., Thompson, P. A., Lewis, J. C.
***Applied Microbiology*, v. 7, pp. 166–173, 1959**

About 650 substances were tested for their ability to reduce the heat resistance of spores of the clostridium species strain PA 3679 suspended in thermal death time tubes of Andersen's pea-pork medium and heated at 113°C. The tubes were heated sufficiently to kill 75 to 95% of the spores in controls having no test substance, after which they were diluted and plated. The total dilution on plating of the heated spore suspension was at least 1:1000. At this dilution the small amount of test substance carried into the plate usually had no inhibitory effect. From the plate counts of the survivors, the effect of each test substance on the *D* value of the spores (the heating time required to reduce survival by 90%) was calculated.

Of the substances tested, 26 reduced the *D* value of these spores by 45 to 85% at concentrations of 7 – 3000 ppm. Activity was frequent among substances known to be mutagenic for higher organisms and among organic sulfur compounds. It was frequent among antimicrobial chemicals, antibiotics, and substances selected at random. Among the more active substances were subtilin and its methyl esters, nisin, ethylene oxide, diepoxybutane, hydrogen peroxide, formaldehyde, dodecylguanidine,

HBr, cetyltrimethylammonium bromide, nordihydroguaiacetic acid, 2-methyl-1, 4-naphthoquinone (vitamin K_1), and tetrachlorohydroquinone.

399. GIANT SENSITIVE PLANT INVESTIGATIONS; SOIL STERILIZATION OF SMALL SEED-INFESTED AREAS

Skinner, S. O., Freshwater, I. T.
***Can Growers Quarterly Bulletin*, v. 25, no. 2, pp. 57–60, 1961**

Recent experiments indicate that soil sterilization, using 2, 4-D, Borascu, or Karmex, will control *Mimosa invisa* for at least one growing season. (*BA*, v. 38, 1962, #7408)

400. ADVANCES IN VIRUS RESEARCH [VOLUME IV]

Smith, K. M., Lauffer, M. A., Editors
Academic Press, Inc., New York, N.Y., 1957

This annual volume contains latest information on specific areas of virology. Authors and titles of articles presented are as follows:

"Factors in Virus Evolution," by C. H. Andrews

"Bacteriophages as Genetic and Biochemical Systems," by A. D. Hershey

"Attachment and Penetration of Cells by Viruses," by L. J. Tolmach

"Particle Counts and Infectivity Titrations for Animal Viruses," by A. Isaacs

"The Anatomy of Tobacco Mosiac Virus," by N. W. Pirie

"Effects of Non-ionizing Radiations on Viruses," by A. Kleckowski

"Effects of Changing Temperature on Plant Virus Diseases," by B. Kassanis

"The Nature of Serological Relationships Among Influenza Viruses," by K. E. Jensen

References and author indexes complete this work. The subject matter is such that it will be of interest to both virologists and biologists. (*BA*, v. 31, 1957, #25,211)

401. THE EFFECT OF DECOMPOSING PLANT RESIDUES ON THE METABOLIC ACTIVITY OF THE SOIL MICROFLORA

Stevenson, I. L.
In "International Botanical Congress, 9th, Montreal, Canada, 1959," v. 2, pp. 381–382
University of Toronto Press, Canada, 1959

402. MICROBIAL ECOLOGY. SYMPOSIUM OF THE SOCIETY FOR GENERAL MICROBIOLOGY HELD AT THE ROYAL INSTITUTION, LONDON, APRIL 1957 [NUMBER 7]

Williams, R. E. O., Spicer, C. C., Editors
Cambridge University Press, New York, N.Y., 1957

The 7th Symposium of the Society dealt with the overall question of microbial ecology. Papers covered the relationship between microorganisms and their physical environment, interaction between microbes, and interaction with higher organisms. Articles presented are as follows:

"The Genome as a Component of the Ecosystem," by C. J. Shepherd

"Nutritional Aspects of Microbial Ecology," by J. Gibson

"Influence of Hydrogen-Ion Concentration and Oxidation-Reduction Conditions on Bacterial Behavior," by L. F. Hewitt

"The Role of Light in the Microbial World: Some Facts and Speculations," by R. Y. Stanier and G. Cohen-Bazire

"Microorganisms Resisting High Concentrations of Sugars or Salts," by M. Ingram

"The Action of Pressure and Temperature," by F. H. Johnson

"The Ecological Significance of Antibiotic Production," by P. W. Brian

"The Relations of Bacteriophages to Bacterial Ecology," by E. S. Anderson

"The Predacious Fungi and Their Place in Microbial Ecology," by C. L. Duddington

"Ecological Factors and the Survival of Fungi," by L. E. Hawker

"Some Factors in the Life of a Free-Living Protozoa," by J. A. Kitching

"Ecology of Microorganisms in Soils as Observed During Their Development Upon Buried Cellulose Film," by H. T. Tribe

"The Role of Plant Hosts in Microbial Ecology," by F. C. Bowden

"The Biological Influences of Man and Animals on Microbial Ecology," by R. Lovell

"Ecology of Viruses," by C. H. Andrews

"The Selective Action on Bacteria of Various Factors Inside and Outside the Animal Body, With Particular Reference to Their Effect on Virulence," by G. S. Wilson

"Some Factors Influencing the Spread of Plant Viruses by Arthropod Vectors," by K. M. Smith. (*BA*, v. 31, 1957, #38,697)

403. **RESEARCH SUMMARY NO. 36-6, VOLUME I FOR THE PERIOD OCTOBER 1, 1960 TO DECEMBER 1, 1960**
December 15, 1960
Jet Propulsion Laboratory, California Institute of Technology, Pasadena
RS 36-6, Vol. I

404. **RESEARCH SUMMARY NO. 36-12, VOLUME I FOR THE PERIOD OCTOBER 1, 1961 TO DECEMBER 1, 1961**
January 2, 1962
Jet Propulsion Laboratory, California Institute of Technology, Pasadena
RS 36-12, Vol. I

405. **STERILIZATION OF SEED BED SOIL**
February 1, 1961
New South Wales Department of Agriculture, Australia
Biology Brochure on Plant Disinfectants
(Also obtainable as 464.9 N27, U.S. Dept. of Agriculture, Washington, D.C.)

406. **ABSTRACTS**
January 1962
Office of Naval Research, Washington, D.C.
Progress Report ACR-66
AD-273,271

407. **STERILIZATION SPACE PROBE COMPONENTS**
September 1, 1961
Wilmot Castle Company, Rochester, N.Y.
Status Report 2 for June 1–August 31, 1961, NASr-31

PHYSICAL–CHEMICAL COMBINATIONS

408. **PHYSICAL AND MEDICAL ASPECTS OF OZONE**
Clamann, H. G.
In "Proceedings of the 2nd International Symposium on the Physics and Medicine of the Atmosphere and Space, San Antonio, Texas, 1958," pp. 143–156
John Wiley and Sons, Inc. New York, N.Y., 1960

A review is presented. 34 references.

409. **GENETIC ACTION OF MUTAGENS**
Demerec, M.
***Proceedings of the International Congress of Genetics, 9th Congress, Bellagio, Italy*, 1953**
(Supplement to *Caryologia*, v. 6, pt. 1, pp. 201–217, 1954)

Radiation and chemical means are used to investigate the induction of genetic changes in bacteria. In order to make quantitative studies of mutability, three methods using three systems of mutation were developed. The systems used were (1) the phage system, (2) the streptomycin system, and (3) the nutritional deficiency system.

410. **EFFECT OF COMBINED ACTION OF IONIZING RADIATION AND CHEMICAL PRESERVATIVES ON MICROORGANISMS. I. VITAMIN K_5 AS A SENSITIZING AGENT**
El-Tabey Shehata, A. M.
***Radiation Research*, v. 15, pp. 78–85, July 1961**

Test results showed that vitamin K_5 (4-amino-2-methyl-1-naphthol hydrochloride) increased the radiosensitivity of *Escherichia coli*, *Micrococcus radiodurans*, *Pseudomonas fragi*, and *Torulopsis rosae*. The magnitude of the sensitizing effect and the influence of oxygen varied with different microorganisms. The sensitizing action was demonstrated on these bacteria in the presence of nitrogen, but not in the presence of air, and only under aerobic conditions for the yeast. The presence of organic material during irradiation decreased the potency of vitamin K_5 against *P. fragi*. The sensitizing action of the vitamin was more pronounced in an acid medium than in a neutral one. Several hypotheses were suggested as possible interpretations of these results.

411. REDUCTION IN THE LETHAL EFFECTS OF RADIATIONS ON *ESCHERICHIA COLI* B BY TREATMENT WITH CHLORAMPHENICOL
Gillies, N. E., Alper, T.
***Nature*, London, v. 183, no. 4656, pp. 237–238, 1959**

412. PRACTICAL METHODS AND PROBLEMS OF STEAM AND CHEMICAL STERILIZATION
Glick, C. A., Gremillion, G. G., Bodmer, G. A.
***Proceedings of the Animal Care Panel*, pp. 37–44, February 1961**

Although steam under pressure has long been an accepted method of sterilization, certain practical problems arise in its routine application. The use of chemicals, in a liquid or gaseous state, is also subject to limitations which are too seldom recognized. In this report the limitations of each method are considered in applying sterilizing agents such as steam, ethylene oxide, formaldehyde and β-propiolactone. 5 references.

413. VITAMIN K NUTRITION AND IRRADIATION STERILIZATION
Johnson, B. C., Mameesh, M. S., Metta, V. C., Rama Rao, P. B.
***Federation Proceedings*, v. 19, pp. 1038–1044, December 1960**

414. AÇÃO DO FORMOL, CALOR E LUZ ULTRAVIOLETA SÔBRE A CAPACIDADE PROLIFERATIVA DO VIRUS DA GRIPE (EFFECT OF FORMALIN, HEAT, AND ULTRAVIOLET LIGHT UPON THE PROLIFERATIVE ABILITY OF INFLUENZA VIRUS
Lacorte, J. G., Monteiro, E., Loures, J. C.
***Sociedade de Biologia do Rio de Janeiro. Atas*, v. 4, no. 6, pp. 80–81, 1960**

Formalin in 1:10,000 dilution, at 4° C, acting for 48 hr, inhibited growth of the virus in chick embryo. Heat at 65° C for a duration of from 10 – 30 min gave similar results. Heat at 55° C for 10 min permitted some growth. Virus subjected to ultraviolet irradiation for more than 2 hr and inoculated into chick embryo failed to proliferate. (*BA*, v. 40, 1962, #19,704)

415. THE EFFECT OF GLUCOSE AND HEAT STERILIZATION ON BACTERIAL ASSIMILATION OF CYSTINE
Lankford, C. E., Ravel, J. M., Ramsey, H. H.
***Applied Microbiology*, v. 5, no. 2, pp. 65–69, 1957**

Conditions of sterilization which affect the utilization of cystine by lactic acid bacteria were studied in a H₂O₂-treated peptone medium. At least two mechanisms may operate in autoclaved media to destroy fractions of the cystine, or to render it nutritionally unavailable to the organism. Evidence suggests that extensive "inactivation" occurs as a result of a Maillard-type reaction of cystine with aldehyde degradation products of glucose. Additional thermal destruction occurs independently of glucose, to yield products inhibitory under certain conditions. (*BA*, v. 31, 1957, #35,534)

416. ANTIGENICITY OF COMBINED β-PROPIOLACTONE AND ULTRAVIOLET INACTIVATED VIRUS VACCINES
LoGrippo, G. A.
***Journal of Immunology*, v. 80, no. 3, pp. 198–203, 1958**

Comparison of inactivated and live vaccines is made in mice. Eastern equine encephalomyelitis virus and rabies virus were treated with β-propiolactone (BPL) and ultraviolet and in combination. The combination of the virucidal agents shows a synergistic effect upon inactivation of both viruses. Vaccines prepared by the combined treatment of BPL and ultraviolet maintained greater antigenic potency than the vaccines inactivated by either agent alone. (*BA*, v. 32, 1958, #27,785)

417. STERILIZATION OF PLASMA PROTEINS
Pennel, R. B., Keller, W., Winkler, M. H., Melin, M.
November 3, 1961
Protein Foundation Labs., Jamaica Plain, Mass.
Final Report for December 1, 1957–January 31, 1961, DA 49-007-md-911
AD-266,104

The following three techniques were studied for reducing the possibility of transmission of viruses in the clinical use of plasma proteins. (1) Heat Sterilization — Optimal conditions were found for heating solutions of transferrin and of gamma globulin for 10 hr at 60° C, a procedure that has been shown to destroy the virus of serum hepatitis. Transferrin appears to be unaltered by the heating procedure. Gamma globulin solutions retain antibody titers but are more viscous following heating. (2) Millipore Filtration — Of six proteins studied, solutions of albumin, gamma globulin, fibrinogen and properdin, but not of β lipoprotein or Factor V (AcG) will pass through

Millipore V F filter sheets with purported pore size of 10 mμ, a dimension smaller than that of any known virus. Acceptance of the technique will depend upon demonstration of the failure of hepatitis virus to pass such filters. (3) Ethylene Oxide Gas—Using C_{14} labelled ethylene oxide, conditions have been determined permitting maximum interaction of the gas with lyophilized nucleic acids and minimum interaction with lyophilized plasma proteins. The technique has been shown to inactivate tobacco mosaic virus. Experiments with inactivation of coxsackie virus in plasma have been equivocal. 39 references. (ASTIA)

418. COMBINED EFFECT OF IRRADIATION AND ANTIBACTERIAL SUBSTANCES ON BACTERIA
Pershina, Z. G., Vasileva, I. G.
***Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii*, v. 32, no. 8, pp. 132–137, 1961**

Shigella flexneri containing 25 to 50 × 10^9 cells/ml were subjected to various physical and chemical treatments, both independently and in different combinations.

419. ACTION OF SOME PHYSICAL AND CHEMICAL AGENTS ON THE INFECTIVITY OF NUCLEIC ACIDS ISOLATED FROM VIRUSES. I. INFLUENCE OF SOME OXIDIZING AND REDUCING AGENTS ON THE NUCLEIC ACID EXTRACT OF MM VIRUS
Portocala, R., Samuel, I., Boeru, V.
***Academia Republiciii Populare Romine, Institutul de Inframicrobiologie, Studii si Cercetari de Inframicrobiologie*, v. 13, pp. 187–195, 1962**

It is suggested that physical factors play an important role in the loss of infectivity, although no modification of infectivity was noted under the effect of chemical factors.

420. EFFECT OF CHEMICAL ENVIRONMENT ON THE LETHALITY OF γ-RADIATION FOR ANAEROBIC BACTERIAL SPORES
Williams-Walls, N. J. (University of Michigan, Ann Arbor, 1959, Thesis)
***Dissertation Abstracts*, v. 20, pp. 1975–1976, 1959**
(Also obtainable as Mic 59-5007, University Microfilms, Ann Arbor, Mich.)

AUTHOR INDEX