DDT in Water. A Bibliography

Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
A5393L1 FLD: 13B, 6F, 68D, 57H USGRDR7223
Oct 71 283p*
REPT NO: WRSIC-71-211
MONITOR: W72-14431

ABSTRACT: The bibliography on DDT in water contains 196 abstracts with full bibliographic details for selected reports, journal articles, and various documents published mostly since 1967. Produced from a computerized information base containing 32,719 abstracts at the time of search, the bibliography is representative of the information on DDT in water contained in the journal 'Selected Water Resources Abstracts' through October 15, 1971 (Volume 4, Number 20). A significant descriptor index is given of representative weighted terms that best describe the information content of the abstracted items. A comprehensive index is also given that represents all descriptors and identifiers used to index the various papers and documents represented by the abstracts in the bibliography. (Author)

DESCRIPTORS: (*Water pollution, *DDT), (*Bibliographies, DDT), Adsorption, Algae, Toxicology, Water analysis, Aquatic plants, Aquatic animals, Fishes, Chlorine organic compounds, Dieldrin, Ecology, Insecticides, Phosphorus organic acid esters

IDENTIFIERS: DDD pesticide, DDE pesticide, Heptachlor, Water pollution effects(Plants), Water pollution effects(Animals), Biphenyl/chloro

PB-212 262 NTIS Prices: PC$3.00/MF$0.95

Sewage Sludge Incineration

Environmental Protection Agency, Washington, D.C. (390 139)
A5074F1 FLD: 13B, 68D, 68C, 68A USGRDR7219
Aug 72 95p*
REPT NO: EPA-R2-72-040
PROJECT: EPA-B-12043
MONITOR: W72-12631

ABSTRACT: The report presents the findings of a Task Force which was established to evaluate sludge incineration as an acceptable alternative to ocean disposal. Multiple-hearth and fluidized bed furnaces, containing scrubbing devices for particulate removal, were selected for performance evaluation. The sludge, particulate, stack gas, scrubbing liquid, and ash were sampled and analyzed for heavy metals, pesticides, and oxides of nitrogen and sulfur. The results indicated that incinerators are capable of achieving low emission concentrations for the common pollutants. Particulate samples showed a measurable concentration of lead. The ash samples normally showed a higher concentration of the heavy metals when compared with the sludge samples. The pesticides and PCB results indicated complete destruction.

DESCRIPTORS: (*Sludge disposal, *Incinerators), (*Sewage treatment, Sludge disposal), Fluidized bed processors, Furnaces, Air pollution control equipment, Waste disposal, Air pollution, Water pollution, Oceans, Performance evaluation, Abatement, Metals, Pesticides, Trace elements, Particles, Sulfur dioxide, Nitrogen oxides, Lead, Mercury, Chlorine organic compounds, Scrubbers, Ashes, Combustion products

IDENTIFIERS: *Air pollution control, *Water pollution abatement, *Solid waste disposal, Ocean waste disposal, Biphenyl/chloro

PB-211 323 NTIS Prices: PC$3.00/MF$0.95

Noncombustible Hydraulic Fluids

Foreign Technology Div., Wright-Patterson AFB, Ohio. (141 600)
AUTHOR: Hyska, Karol
A4765E3 FLD: 11H, 71K USGRDR7216
3 Mar 70 11p
REPT NO: FTD-HT-23-104-70
PROJECT: FTD-7230178
Edited trans. of Ropa a Uhlie (Czechoslovakia) v11 n3 p159-162 1969, by H. Peck. Distribution Limitation now Removed.

ABSTRACT: Czech fire-resistant hydraulic fluids, based mainly on chlorinated byphenyl, are discussed. The properties and applications of these fluids are compared with medium pydraul F-9. (Author)

DESCRIPTORS: (*Hydraulic fluids, *Halogenated hydrocarbons), (*Diphenyl, Hydraulic fluids), Viscosity, Fire resistant materials, Chlorine compounds, Czechoslovakia, Translations

IDENTIFIERS: Chlorine arcmatic compounds

AD-868 456 NTIS Prices: PC$3.00/MF$0.95

Polychlorobiphenyls (PCBs) and Related Chlorophenyls: Effects on Health and Environment. I. Bibliography---1881-1971

Oak Ridge National Lab., Tenn. Toxicology Information Response Center.
AUTHOR: Quinby, Griffith E.
A4551E3 FLD: 6F, 6T, 13B, 68A, 68D, 57H, 57Y USGRDR7214
Apr 72 141p*
REPT NO: TIRC-1, ORNL-EIS-72-20

ABSTRACT: Medical and public health interest in polychlorobiphenyls (PCBs) in the United States was meager before 1970. The expanding literature since then has reflected the realization of the importance of these substances as environmental pollutants. The analytical confusion of PCB with DDT and other chlorinated hydrocarbon pesticides prior to 1969 is of special interest. The concern over PCBs was heightened in 1971 by the recognition of gross contamination of certain animal feeds and of trace contamination of some human foods. The 870 articles cited in this bibliography are believed to cover the majority of articles in all languages available through January, 1972. (Author)

DESCRIPTORS: (*Air pollution, Chlorine aromatic compounds), (*Chlorine aromatic compounds, *Bibliographies), (*Water pollution, Chlorine aromatic compounds), Biphenyl, Chromatographic analysis, Toxicology, Insecticides, Biochemistry, Food contamination, Public health, Ecology, Lubricating oils, Insulating oil

IDENTIFIERS: *Biphenyl/chloro

PB-209 944 NTIS Prices: PC$3.00/MF$0.95

The Mass Spectra of Polychlorinated Biphenyls

National Research Council of Canada Halifax (Nova Scotia) Atlantic Regional Lab (045500)
AUTHOR: Safe, S., Hutzinger, O.
A4491C1 FLD: 7D, 59G USGRDR7214
17 Sep 71 7p
Availability: Pub. in Jnl. of the Chemical Society, p685-691 1972.

ABSTRACT: The mass spectra of several di- and tetra-chlorobiphenyls suggested randomization of chlorine over both phenyl rings in the molecular ion prior to fragmentation. The exceptions, 2,2'- and 2,6-dichloro-, 2,2',4,4'-,2,2',5,5'-, 2,3,5,6-, and 2,2',6,6'-tetrachloro-biphenyls, all contain two or more chlorine atoms ortho to the Ph--Ph bond and their metastable ion intensities which result from the M to M - Cl2 reaction are markedly different from those of the other isomers. The primary ion spectra of most isomeric compounds are similar, with successive losses of Cl radical from the molecular ion. This process is often accompanied by expulsion of HCl from the lower chlorine homologues. The ion kinetic energy spectra of the di- and tetra-chloroisomers confirm the suggested fragmentation pathways. (Author)

DESCRIPTORS: (*Diphenyl, Mass spectrum), (*Halogenated hydrocarbons, *Mass spectrum), Chlorine compounds, Gas ionization, Chemical bonds, Dissociation, Canada

IDENTIFIERS: *Chlorine aromatic compounds, *Biphenyl/chloro

AD-742 588 NTIS Price: Not available NTIS

PCBs and the Environment

Interdepartmental Task Force on PCBs, Washington, D.C.

Final rept.
A4214J1 FLD: 13B, 6F, 6T, 68A, 68D, 57Y, 57H, 65D, 57U, 86A
USGRDR7211
20 Mar 72 192p*
REPT NO: ITF-PCD-72-1

ABSTRACT: The report is the product of a six month review of the chemicals known as PCBs--polychlorinated biphenyls--by five Federal agencies, with participation by other agencies. The task force made nine findings, conclusions, and recommendations, primarily pointing out that PCBs should be restricted to essential or nonreplaceable uses which would minimize the likelihood of human exposure or leakage to the environment. Supplementing the 20-page report are eight appendices detailing current knowledge about various aspects of PCBs, including their use and replaceability; occurrence, transfer, and cycling in the environment; occurrence and sources in food; and PCBs effects on man and animals. (Author)

DESCRIPTORS: (*Chlorine aromatic compounds, *Pollution), (*Air pollution, Chlorine aromatic compounds), (*Water pollution, Chlorine aromatic compounds), (*Toxicology, Chlorine aromatic compounds), Environmental surveys, Insulating oil, Industrial wastes, Lubricant additives, Plasticizers, Biphenyl, Public health, Economic factors, Government policies, Chemical properties, Food, Epidemiology, Humans, Animals, Ecology

IDENTIFIERS: *Biphenyl/chloro

COM-72-10419 NTIS Prices: PC$6.00/MF$0.95

PCB in Water: A Bibliography

Office of Water Resources Research, Washington, D.C. Water Resources Scientific Information Center.
A3801A4 FLD: 13B, 6F, 68D, 57H USGRDR7207
Jan 72 43p*
REPT NO: WRSIC-72-201
MONITOR: W72-04439

ABSTRACT: The bibliography contains a collection of 25 abstracts for selected reports and journal articles published in 1969, 1970, and 1971 on polychlorinated biphenyls (PCB). The abstracts include full bibliographical citations and a set of descriptors from the Water Resources Thesaurus. A significant descriptor index is given of representative weighted terms that best describe the information content of the abstracted items.

DESCRIPTORS: (*Water pollution, *Chlorine organic compounds), (*Bibliographies, Water pollution), (*Pesticides, Water pollution), Insecticides, Chlorine aromatic compounds, Biphenyl, Aquatic biology, Water analysis, Plasticizers, Oceans, Industrial wastes, Toxicology, Biodeterioration, DDT, Dieldrin, Ecology

IDENTIFIERS: *Biphenyl/chloro, *Water pollution effects(Animals), Water pollution detection

PB-206 534 NTIS Prices: PC$3.00/MF$0.95

Chlorinated Hydrocarbons in the Marine Environment

National Academy of Sciences-National Research Council, Washington, D.C. Committee on Oceanography. (091 500)
AJ415L2 FLD: 6F, 8B, 68D, 57H, 78 USGRDR7203
1971 47p*
PROJECT: EPA-WQO-16070
MONITOR: EPA-WQO-16070-00/71

ABSTRACT: The report discusses the fact that the oceans are the ultimate accumulation site for the persistent chlorinated hydrocarbons. The report presents material to support its recommendations: A massive effort should be made immediately to check the escape of persistent toxicants into the environment; Rates of entry of each pollutant into the marine environment be determined; and The laws relating to the registration of chemical substances and the release of production figures by the government be examined.

DESCRIPTORS: (*Water pollution, *Insecticides), (*Chlorine organic compounds, Water pollution), (*Oceans, Water pollution), Recommendations, DDT, Ecology, Biphenyl, Ocean currents, Fishes, Birds, Marine biology

IDENTIFIERS: Biphenyl/chloro

PB-204 738 NTIS Prices: PC$3.00/MF$0.95

The Use and Disposal of Electrical Insulating Liquids

National Industrial Pollution Control Council, Washington, D.C.

Sub-council rept.
A240273 FLD: 13B, 11H, 68D, 71K, 86A USGRDR7115
Jun 71 23p
Paper copy available from GPO $0.25/copy as 5254-0028.

ABSTRACT: Electrical insulating liquids (EIL), their application and disposal were studied against a background of similar information relating to pretroleum products in total. Naphthenic mineral oils are found to comprise over 80 percent by volume of the total usage of EIL. Polybutenes are second, at almost 10 percent. Thus, 90 percent of EIL are petroleum-based. Being relatively non-toxic and biodegradable, they represent no environmental threat when subjected to conventional secondary waste treatment. Furthermore, assistance in reclaiming or proper disposal of used mineral oils can usually be obtained from the suppliers of these products. The third largest-volume EIL group is the askarels, or polychlorobiphenyls. This group has some toxic properties and contains members which have recently become suspect ecologically. Accordingly, the report contains recommendations regarding the control and disposition of askarels. (Author)

DESCRIPTORS: (*Insulating oil, *Waste disposal), (*Mineral oils, Waste disposal), (*Chlorine aromatic compounds, Waste disposal), Electric insulation, Ecology, Water pollution, Toxicology, Naphthalene, Biphenyl, Decomposition, Water pollution, Incinerators, Recommendations

IDENTIFIERS: *Water pollution control

COM-71-50247 NTIS Prices: PC-GPO/MF$0.95-NTIS

INTERBUREAU BY-LINES. VOLUME 6, NUMBER 6

Food and Drug Administration, Washington, D.C. (140 700)
AUTHOR: Reynolds, Helen L., Palmer, Nancy J., Kovach, Laura A., Blair, Alberta E., Mahoney, Dorothy H.
A0633K3 FLD: 6O, 6H, 7D, 6M, 57Q, 52D, 59A, 57K, 57Y USGRDR/017
May 70 57p*
REPT NO: Consecutive-36
See also Volume 6, No. 5, PB-190 961.

ABSTRACT: Contents: Collaborative study of the determination of ammonia as an index of decomposition in crabmeat; Spectrofluorometric determination of Rauwolfia Serpentina tablets and whole root; Application of neutron activation analysis to food products: A bibliography; Polarographic determination of nitrates in aqueous media containing nitrites; Correlation of organoleptic evidence with pH, volatile bases, and indole as indices of decomposition in raw, frozen shrimp; Differential effects of DDT and polychlorinated biphenyls on the central nervous system; Microbiological contamination bibliography (Continued); Comulative index to Interbureau By-Lines, Vols. 1-6.

DESCRIPTORS: (*Food, *Degradation), (*Seafood, Chemical analysis), (*Radioactivation analysis, Food), (*Nitrates, *Polarographic analysis), (*DDT, Central nervous system), (*Biological contamination, *Bibliographies), (*Rauwolfia alkaloids, Spectroscopy), Halogenated hydrocarbons, Diphenyl, Ammonia, Chlorine compounds, Phenols, Reserpine, Indexes, Crustacea, Insecticides, Microorganisms

IDENTIFIERS: *Crabs, *Shrimps, *Neutron activation analysis, *Chlorine aromatic compounds, Rauwolfia serpentina, Fluorometric analysis, *Spectroscopic analysis

PB-192 766 CFSTI Prices: HC$3.00 MF$0.65

NTIS - PR-186
July 1975

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U.S. DEPARTMENT OF COMMERCE
Springfield, Virginia 22161

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PRICES SUBJECT TO CHANGE

AVAILABLE PUBLISHED SEARCHES

The list of Published Searches following these introductory pages includes all those available to July, 1975. Titles are arranged in 34 subject categories as shown at the bottom of this page and are cross-referenced to all appropriate categories.

The citations in this listing include the following information:

+ Order Number (Please use when ordering any information item).
+ Title
+ Number of technical report summaries (in parentheses) in the search.
+ Date of preparation of the search.

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SUBJECT CATEGORIES AND PAGE LOCATION

PRICES SUBJECT TO CHANGE

SAMPLE OF DATA SUPPLIED IN BIBLIOGRAPHIC ENTRY

Title — Industry, Innovation and the Municipal Market

Corporate Author — Franklin Inst. Research Labs., Philadelphia, Pa. (142 925)

Final rept.
AUTHOR: Blair, John F. Jr.
C1872L3 FLD: 5C, 96*, 88K USGRDR7324
Report Date — 15 Oct 73
Pages in Report — 103p*
REPT NO: FIRL-F-C3431
PROJECT: EDA-99-6-09281
MONITOR: EDA-73-046

Abstract or Technical Report Summary —

ABSTRACT: The summary report is made on work done under the auspices of the Economic Development Administration and funded through The Experimental Technology Incentives Program (ETIP). It delineates the form and content of the policies and programs required to develop the municipal local government market into a force for technological innovation and economic development. In addition to this document, a series of eighteen background papers is on file that deals in considerable depth with the more important aspects of the study. This supplementary documentation is referenced in footnotes throughout the text of the summary volume.

Key Words —

DESCRIPTORS: (*Industrial engineering, *Urban planning), (*Public administration, *Urban development), Procurement, Reviews, Optimization, Economic development, Industrial relations, Marketing, Productivity, Systems engineering, Local government, Policies, Recommendations, Pennsylvania

IDENTIFIERS: Technological development, Innovations, Philadelphia (Pennsylvania), EDA

Item Number — COM-73-11748/3 NTIS Prices: PC$4.25/MF$2.25

Paper Copy Price — Microfiche Price

NOTE: Prices are subject to change.

AVAILABLE PUBLISHED SEARCHES-July 1975

ADMINISTRATION

Order Number	
COM-74-11194	Technology Transfer (144) 1972-Jul 74
COM-74-11319	Urban Information Systems (196) 1970-Aug 74 Includes USAC reports
COM-74-11571	Productivity (126) Oct 74
NTIS/PS-74/112	Management Games (163) Nov 74
NTIS/PS-74/121	Inventory Control (195) 1970-Dec 74
NTIS/PS-74/122	Job Satisfaction (216) Dec 74
NTIS/PS-74/124	Production Planning and Scheduling (143) Dec 74
NTIS/PS-75/150	Time Series Forecasting and Prediction (96) Jan 75
NTIS/PS-75/276	Career Development. Part 1. Military Careers (143) Feb 75
NTIS/PS-75/277	Career Development. Part 2. Civilian Careers (186) Feb 75
NTIS/PS-75/352	Construction Management (103) Apr 75
NTIS/PS-75/405	Replacement Theory (85) Apr 75
NTIS/PS-75/406	Linear Programming in Management (38) May 75
NTIS/PS-75/439	PERT (123) May 75

AERONAUTICS AND AERODYNAMICS

Order Number	
COM-74-10519	Air Traffic Control Simulation Models (125) May 74
NTIS/PS-74/058	Airport Noise (113) Nov 74
NTIS/PS-75/036	Collision Avoidance Systems (156) Dec 74
NTIS/PS-75/115	Holographic Flow Visualization (53) Jan 75
NTIS/PS-75/116	Flow Visualization (106) Jan 75 Excludes shadowgraph, schlieren, and holographic techniques
NTIS/PS-75/164	Aircraft Wake Vortices (137) Dec 1974
NTIS/PS-75/318	Aircraft Sonic Boom. Part 1. Studies on Aircraft Flight and Design (99) Feb 75
NTIS/PS-75/319	Aircraft Sonic Boom. Part 2. Effects on Buildings (60) Feb 75
NTIS/PS-75/320	Aircraft Sonic Boom. Part 3. Biological Effects (52) Feb 75
NTIS/PS-75/332	Surface Effect Vehicles/Ships in Marine Environments (108) Jan 75
NTIS/PS-75/333	Surface Effect Vehicles and Surface Effect: General Studies. Vol. 1. 1964-1971 (134) Jan 75 Does not include marine environments
NTIS/PS-75/334	Surface Effect Vehicles and Surface Effect: General Studies. Vol. 2. 1972-1974 (67) Jan 75 Does not include marine environments

AERONAUTICS AND AERODYNAMICS (Cont.)

Order Number

NTIS/PS-75/336 Flight Simulator Training (119) Feb 75

AGRICULTURE AND FOOD

Order Number

COM-74-11203 Animal Waste Pollution and Its Control (115) Jul 74
NTIS/PS-74/083 Food Processing Waste Treatment (167) Nov 74
NTIS/PS-74/119 Food Processing (207) Dec 74
NTIS/PS-75/057 Food Taste (137) Oct 74
NTIS/PS-75/068 Agricultural Resources Surveys (53) 1973-Jan 75

NTIS/PS-75/072 Ground Water Pollution. Part 2. Pollution From Irrigation and Fertilization (132) Jan 75
NTIS/PS-75/093 Fish Protein Concentrates (117) Jan 75
NTIS/PS-75/101 Air Pollution Effects on Plants (135) Jan 75
NTIS/PS-75/111 Fishery Law (126) Jan 75
NTIS/PS-75/304 Aquaculture. Part 1. Fish (212) Feb 75 Excludes studies on salmon

NTIS/PS-75/305 Aquaculture. Part 2. Shellfish (129) Feb 75
NTIS/PS-75/306 Aquaculture. Part 3. Salmon (63) Feb 75
NTIS/PS-75/356 GRAS(Generally Recognized as Safe) Food Ingredients (253) April 75
NTIS/PS-75/360 Medical Entomology. Vol. 2. 1970-1975 (192) 1970-Jan 1975
NTIS/PS-75/361 Medical Entomology. Vol.1.1964-1969 (137) 1964-1969

NTIS/PS-75/380 Food Packaging and Storage (187) 1970-Apr 75

NTIS/PS-75/460 Sewage and Organic Waste Irrigation (111) May 75
NTIS/PS-75/468 Sport Fishing (150) Jun 75

ASTRONOMY AND ASTROPHYSICS

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NTIS/PS-75/031 Mars Environment (93) 1971-Oct 74
NTIS/PS-75/134 Cosmic Rays (129) 1973-Jan 75
NTIS/PS-75/225 Quasars, Pulsars, Black Holes (170) Feb 75
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NTIS/PS-75/008 Clear Air Turbulence (220) Dec 74
NTIS/PS-75/045 Atmospheric Echo Sounding (50) Dec 74
NTIS/PS-75/078 Weather Modification Effects and Management (117) Jan 75
Excludes theory and physics of cloud seeding and nucleation
NTIS/PS-75/099 Fog Dispersal (167) Jan 74
NTIS/PS-75/187 Hurricane Forecasting, Modification, and Research (174) Jan 75

NTIS/PS-75/228 The Chemistry and Physics of Ozone in the Stratosphere (91) Jan 75
NTIS/PS-75/229 Solar Eclipses (140) Feb 75
NTIS/PS-75/231 Ice and Fog: Detection and Warning Systems (58) Dec 74
NTIS/PS-75/314 Automobile Air Pollution, Part 6, Atmospheric Motion (42) 1970-Dec 74
NTIS/PS-75/395 Cloud Seeding (231) Apr 75 Includes effects on water resources

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COM-74-10100 Juvenile Delinquency Prevention Programs (100) Dec 73
COM-74-10928 Vocational Rehabilitation of the Physically Handicapped (78) May 74
COM-74-11376 Computer Aided Instruction (252) 1970-Aug 74
COM-74-11393 The Elderly (139) Sep 74
COM-74-11571 Productivity (126) Oct 74

NTIS/PS-74/110 Alcoholism (135) Nov 74
NTIS/PS-74/122 Job Satisfaction (216) Dec 74
NTIS/PS-74/125 Quality of Life in the Urban Environment (131) 1970-Dec 74
NTIS/PS-74/134 Ocean Law (123) Dec 74
NTIS/PS-75/002 Civil Insurgency (84) Jan 75

NTIS/PS-75/005 Rehabilitation of Criminal and Public Offenders (100) 1967-Oct 74
NTIS/PS-75/007 Disasters (131) Dec 74
NTIS/PS-75/012 Medicare and Medicaid Programs (64) Dec 74
NTIS/PS-75/032 Computational Linguistics (108) Jan 75
NTIS/PS-75/034 Family Counseling (35) Jan 75

NTIS/PS-75/047 Crime Prevention and Enforcement Through Community Relations (72) Jan 75

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NTIS/PS-75/052 Psycholinguistics (60) Jan 75
NTIS/PS-75/053 Speech Intelligibility (170) Jan 75
NTIS/PS-75/056 Behavior and Psychology as Related to Law Enforcement (103) Jan 75
NTIS/PS-75/058 Health Manpower (86) Jan 75 Excludes allied health personnel

NTIS/PS-75/062 Audiovisual Education (69) Dec 74
NTIS/PS-75/073 Signs and Display Systems: Graphic Design and Human Engineering (92) Jan 75
NTIS/PS-75/079 American Indians (122) Jan 75
NTIS/PS-75/082 Industrial Psychology (161) Jan 75
NTIS/PS-75/083 The Use of the Mass Media by Local and Regional Governments (58) Jan 75

NTIS/PS-75/087 Information Processing in Humans (221) Jan 75
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NTIS/PS-75/103 Behavior and Physiological Effects of Noise. Vol 2. 1973-1974 (72) Jan 75
NTIS/PS-75/131 Rehabilitation of the Physically Handicapped (119) Jan 75 Excludes reports sponsored solely by the Atomic Energy Commission
NTIS/PS-75/132 Rehabilitation of the Mentally Retarded (79) Jan 75

NTIS/PS-75/144 Driver Education (109) Jan 75
NTIS/PS-75/145 Probation and Parole (55) Jan 75
NTIS/PS-75/147 Drug Abuse (113) Jan 75
NTIS/PS-75/161 Effects of Fatigue on Human Behavior and Performance (104) Jan 75
NTIS/PS-75/168 Ghettos (65) Jan 75

NTIS/PS-75/195 Individualized Instruction (72) Jan 75
NTIS/PS-75/232 Attitudes, Opinions, and Motivations among Adolescents (186) Feb 75
NTIS/PS-75/240 Migrant Workers (38) Jan 75
NTIS/PS-75/245 Forensic Medicine (39) Jan 75
NTIS/PS-75/253 Historical Background Studies of the National Park Service (168) Jan 75

NTIS/PS-75/261 Student Teacher Interaction (69) Feb 75
NTIS/PS-75/266 Social Change (147) Feb 75
NTIS/PS-75/276 Career Development. Part 1. Military Careers (143) Feb 75
NTIS/PS-75/277 Career Development. Part 2. Civilian Careers (186) Feb 75
NTIS/PS-75/281 Human Aggression (41) Feb 75

NTIS/PS-75/290 Labor Relations (169) Feb 75 Excludes job satisfaction, bargaining, and productivity

BEHAVIOR AND SOCIETY (Cont.)

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NTIS/PS-75/297	Human Memory (130) Feb 75
NTIS/PS-75/298	Work Attitudes in the Military (98) Feb 75
NTIS/PS-75/300	Work Attitudes in the Civilian Sector (178) Feb 75
NTIS/PS-75/323	Population Mobility (127) Feb 75
NTIS/PS-75/335	Simulators in Education and Training (99) Feb 75
NTIS/PS-75/336	Flight Simulator Training (119) Feb 75
NTIS/PS-75/358	Adult Education (98) Feb 75
NTIS/PS-75/373	Public Opinion and Sociology of Water Resource Development (82) 1970-Apr 75
NTIS/PS-75/393	Arms Control (234) Apr 75
NTIS/PS-75/425	Crimes and Crime Prevention (134) May 75
NTIS/PS-75/427	Blindness (113) May 75
NTIS/PS-75/443	Police (200) Jun 75

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minute did deaths occur among the guinea pigs and mice (Table 4). In the experiments in which the duration of exposure was 3.5 hours, fatalities occurred among guinea pigs and mice when the liquid was delivered at 267 mg. per minute, but all of the guinea pigs and mice survived when the rate was 118 mg. per minute. The responses of mice were somewhat inconsistent, since some of them died when the Gargoyle was delivered at 70 mg. per minute. When the liquid was delivered at the rate of 70 mg. or more per minute, a fog resulted that induced deaths among the rats. Some of the rabbits also died in consequence of these conditions except in the experiment in which the rate of delivery was 118 mg. per minute when all survived (Table 4). All of the animals died, with the exception of one guinea pig, when they were exposed for 7 hours to the fog induced by the delivery of the material at the rate of 123 mg. per minute.

As the temperature of the Inconel tube was elevated to 1050° F. and higher, the fog (and smoke at the higher temperatures) so generated became progressively less toxic. The data in Tables 5 and 6 give the details of the several experiments. The death of the animals in Experiment No. 1 (Table 6) is attributed largely to the high temperature to which they were subjected.

It is apparent from the data of Tables 4 and 5, that, in the experiments in which the Gargoyle was dropped upon

Inconel heated to 800° F. and 1050° F., respectively, the rabbits were more susceptible, in terms of over-all mortality, than rats, which in turn were more susceptible than mice and guinea pigs.

The mortality in the several groups of guinea pigs, mice, rabbits and rats exposed to the fogs arising from contact with Inconel at 800° F. is plotted logarithmically in relation to the severity of exposure in Figures 6, 7, 8 and 9, respectively. In these graphs, the duration of each exposure in hours is plotted along the axis of the abscissae and the corresponding rates of delivery of Gargoyle into the Inconel tube in milligrams per minute along the axis of ordinates. Accordingly, the location of a point anywhere on such a graph indicates the severity of exposure, as expressed in terms of the rate at which the Gargoyle was added to the Inconel and the duration of the exposure of the animals to the fogs. The outcome of each experiment, in terms of mortality among the animals, has been represented by a circle, the extent to which each circle is filled indicating the percentage of animals that died under the indicated conditions.

In Figures 6 to 9, two lines, almost parallel, have been drawn. The one to the left separates non-lethal conditions of exposure from those associated with the death of some, but not all, of the group, while the one

to the right separates the latter from uniformly lethal conditions of exposure. The few notable exceptions (guinea pigs, Experiment No. 13, mice, Experiment No. 15, and rabbits, Experiment No. 10) may have been the result of biological variation or, possibly, of an inconstancy in the concentration of the fog. The slopes of these lines are from 18° to 21° for guinea pigs and mice (Figures 6 and 7), 27° to 32° for rabbits (Figure 8), and 55° and 56° for rats (Figure 9). When the slope is 45°, the law of Haber holds, that is, the concentration multiplied by the duration of exposure (time) equals a constant. This means that concentration and time are equally important factors in the determination of the lethal limits. When the slope is less than 45°, as in Figures 6, 7 and 8 (guinea pigs, mice and rabbits), the concentration is more important than time, and when it is greater than 45°, as in Figure 9 (rats), time is more important than the concentration in the determination of the lethal limits.

The findings, when guinea pigs, mice, rabbits and rats were exposed to the fog arising at 1050° F., are given in Figures 10, 11, 12 and 13, respectively. In these graphs only one line, that which separates non-lethal conditions of exposure from those associated with death of either some or all of a group, has been drawn.

Comparisons of the mortality among guinea pigs, mice, rabbits and rats, subjected to fogs formed at 800° F. and 1050° F., are given in Tables 10 to 13. Under the less severe conditions of exposure, in general, the toxicity of the fogs formed at 800° and 1050° F. seemed to differ but little, but as the conditions became more severe the toxicity of the fog formed at 800° F. became more apparent. All of a group of 15 animals died, following their exposure for 3.5 hours to the fog formed when 267 mg. of Gargoyle per minute were dropped into the Inconel tube at 800° F. (Experiment No. 6); however, only 13 of the 15 animals died as the result of their exposure over the period of 6.17 hours, when 280 mg. per minute were dropped upon the Inconel at 1050° F. (Experiment No. 3). Likewise, all of the members of a group of 15 animals died after being subjected for 7.0 hours to fog arising when Gargoyle was delivered at the rate of 192 mg. per minute upon the tube heated to 800° F. (Experiment No. 5), but only 5 of the 15 animals died after the same period of exposure to the fog generated by dropping the material at the rate of 181 mg. per minute into the Inconel tube heated to 1050° F. (Experiment No. 8).

It is evident that the smoke resulting from complete burning of Gargoyle (Table 6) was much less toxic than the fog formed below the fire point (800° F. - Table 4)

or that formed when partial burning occurs (1050° F. - Table 5). Thirteen of 15 animals died when they were exposed for 6.17 hours to the fog formed by dropping 280 mg. per minute into the Inconel at 1050° F. (Experiment No. 3), but only 4 of 15 animals died following their exposure to the smoke formed by dropping the material onto the Inconel at almost twice the rate (500 mg. per minute, Experiment No. 11).

Inhalation of the thermal decomposition products of Gargoyle induced (1) escape reactions, such as pawing the nose and retracting the head, (2) irritation of the mucous membranes, with lacrimation, and (3) dyspnea.

Pathologic Effects. All of the animals were subjected to routine postmortem examinations. The viscera of animals representative of each species and of the various conditions of exposure were examined microscopically. The toxic degenerative lesions of the viscera were the same regardless of the species of animal.

Group 1 (600° F.) Table 1. Guinea pigs, mice, rabbits and rats (Experiments 5, 9 and 6) that died following inhalation of fogs formed from Gargoyle, had diffuse degeneration of the brain, heart, liver, kidneys and adrenal glands. Each species exhibited a characteristic pulmonary lesion indicative of severe irritation. There was degeneration and necrosis of the epithelium within

the primary, secondary and part of the tertiary bronchi. The alveoli were filled with extravasated red blood cells and fluid. The endothelium of the alveolar capillaries was swollen, and the alveolar walls and septa were infiltrated with neutrophiles and eosinophils. A fibrinoid membrane lined some of the alveoli and terminal bronchioles. A guinea pig (B-61, Experiment 9) that survived and was killed 22 days after that on which he had been subjected to exposure, had degeneration of the viscera and residua of the pulmonary lesion. The proximate cause of death in the animals of this group was acute pulmonary damage.

In Experiments 10 and 15, guinea pigs had normal viscera and only slight pneumonitis; mice, rats and rabbits had degeneration of the brain, liver and kidneys that persisted up to 13 days after that on which the exposure had occurred. Rabbits and mice that died (Experiment 15) had the previously described pulmonary lesion. The rats had slight pneumonitis.

In the subsequent experiments, animals that died had severe pulmonary irritation and degeneration of the brain, liver and kidneys, and animals that survived had slight to moderate pneumonitis and normal viscera.

Group 2 (1050° F.) Table 2. In Experiment 3, animals of the 4 species that died had diffuse degeneration of the brain, heart, liver and kidneys, and a severe pulmonary

irritation that was similar to that found in Group 1. It was characterized by edema, hyperemia and necrosis of the bronchial mucosa. A guinea pig and mouse survived and were killed 8 days after that on which the exposure had occurred. The guinea pig had residual signs of degeneration of the liver and pneumonitis, whereas the viscera of the mouse were normal.

In the subsequent experiments, animals that died had diffuse degeneration of the brain, liver and kidneys and a diffuse "chemical" pneumonitis. Animals that survived had residual degeneration of the viscera which persisted for as long as 13 days afterward. Most of the animals had a slight degree of pneumonitis.

In Experiments 21 and 20 the viscera of all species were normal, and there was no pulmonary lesion.

Group 3, Table 3. All species that died exhibited diffuse degeneration of the brain, heart, liver and kidneys, and evidences of pulmonary irritation. There was acute pulmonary hyperemia and edema, and varying degrees of acute bronchitis. Carbon particles were found within the bronchi and alveoli. The pulmonary lesion differed from that observed in Groups 1 and 2. Animals of the various species that survived and were killed 7 or 8 days later, had residual degenerative changes of the liver and kidneys, and a slight degree of pneumonitis.

The pulmonary lesions induced by the exposure of the animals to the products of partial combustion of the material under study, were characterized by necrosis of the epithelium of the bronchial system and severe edema and hyperemia of the parenchyma of the lung. Evidence of injury to the blood vessels was manifested by swelling of the endothelial cells lining the vessels. In contrast, the pulmonary lesions which resulted from the complete combustion of the compound resulted in pulmonary hyperemia and edema and varying degrees of acute bronchitis without any necrosis of the epithelium. There was carbon pigment within the bronchi and alveoli, and associated with this there were macrophages phagocytizing the carbon. The former lesion was obviously one of severe irritation from the materials that were inhaled, whereas the latter was one of mild irritation plus a reaction to foreign material that had been inhaled.

Composition of Fogs and Smoke to Which Animals Were Exposed. The atmospheric concentrations of the various decomposition products in the several experiments are given in Tables 7 to 9. In general, the concentrations of the contaminants of the atmosphere were related to the rate at which the Gargoyle was added to the tube, although there was some variability, particularly in the case of carbon monoxide.

When the Inconel was heated to 800° F. (Table 7) the air in the chamber contained total aldehydes, expressed as formaldehyde, in the concentrations of 44 to 285 p.p.m., formaldehyde in the concentrations of 7 to 81 p.p.m., carbon monoxide in the concentrations of 76 to 989 p.p.m., carbon dioxide in the concentrations of 1,191 to 5,729 p.p.m., and total particulate matter in the concentrations of 0.24 to 3.04 mg. per liter, of which 95.6 to 100.0 per cent was soluble in ether.

When the Inconel was heated to 1050° F. (Table 8), lesser concentrations of all the atmospheric contaminants, with the exception of carbon dioxide, resulted as follows: total aldehydes, expressed as formaldehyde, 7 to 45 p.p.m.; formaldehyde, 1 to 18 p.p.m.; carbon monoxide, 39 to 358 p.p.m.; carbon dioxide, 1,628 to 6,126 p.p.m.; and total particulate matter, 0.13 to 0.86 mg. per liter, of which 73.2 to 97.0 per cent was soluble in ether.

When the Gargoyle was apparently consumed (Experiments 2 and 11 - Table 9), the air in the chamber contained total aldehydes, expressed as formaldehyde, in the concentrations of 11 to 15 p.p.m., formaldehyde in the concentrations of 1.8 to 3.1 p.p.m., carbon monoxide in the concentrations of 316 to 335 p.p.m., carbon dioxide in the concentrations of 10,039 to 10,493 p.p.m., and total particulate matter in the concentrations of 0.047 to

0.22 mg. per liter, of which 19.4 to 26.1 per cent was soluble in ether and 62.6 to 77.8 per cent was carbon black.

In general, more total aldehydes, formaldehyde and carbon monoxide resulted from the contact of the material with the metal heated to 800° F. than to 1050° F. This was also true of the total particulate matter, especially that which resulted from the delivery of the material upon the heated tube at the higher rates (Table 14). The content of carbon dioxide did not appear to be related to the temperature.

When the Gargoyle was apparently consumed by the combustion, the concentrations of total aldehydes, formaldehyde, carbon monoxide and total particulate matter were relatively low, and the concentration of carbon dioxide was correspondingly high. Under corresponding conditions, the percentage of carbon-black in the particulate matter was relatively high, and the percentage of ether-soluble material was reciprocally low. Significant quantities of ash also resulted from the more complete combustion, whereas only traces of ash resulted from the less severe thermal decomposition.

Discussion

It is probable that neither formaldehyde nor carbon monoxide alone would have been lethal under the conditions of concentration and duration of exposure reported herein. A cat is reported to have survived exposure to air containing 0.8 mg. of formaldehyde per liter (650 p.p.m.) for 4 hours, but another died when exposed to the same concentration for 8 hours (Patty, Ind. Hyg. and Toxicol., New York Inter. Science 2:934, 1949, and Iwanoff, Arch. F. Hygiene 73:307, 1910-11). Skog (Acta Pharmacol. Tox. 6:299, 1950) reported the results of his experiments in which rats were exposed to various concentrations of formaldehyde in air for 0.5 hour. These were as follows: LD-0, 0.6 mg./l.; LD-50, 1 mg./l.; and LD-100, 1.7 mg./l. He also gave the LD-50 values for rats, exposed correspondingly to acetaldehyde, propionaldehyde, butyl aldehyde, acrolein and croton aldehyde, respectively, as 37, 62, 174, 0.3 and 4 mg. per liter; the corresponding values for the LD-0 of the series acetaldehyde to croton aldehyde, respectively, were 14, 32, 66, 0.1 and 0.1 mg. per liter.

The toxicity of carbon monoxide, according to Flury and Zernik (Schädliche Gase, Berlin, Springer, 1931, pp. 203-204), is represented in the following observations: guinea pigs tolerated the inhalation of air containing

carbon monoxide in the concentration of 5,000 - 7,000 p.p.m. for 2 to 3 hours with only transient intoxication; they tolerated 10,000 p.p.m. for 1.5 hours, but died in 20 to 50 minutes under conditions of exposure to 20,000 p.p.m.; rabbits recovered after having been exposed to the concentration of 2,000 p.p.m. for 9 hours; they exhibited severe effects if exposed to 3,500 p.p.m. for 1.5 hours, and died after 30 - 60 minutes when subjected to exposure to 4,000 p.p.m.; cats, which Flury and Zernik found to be more susceptible than men to carbon monoxide, tolerated 1,000 p.p.m. for 2.5 hours without any damage; they were prostrated by exposure to 2,500 p.p.m., but recovered if their exposure was discontinued after 1 hour; cats died within 1.5 hours following exposure to the concentration of 4,000 p.p.m. over the period of 1.5 hours.

Whether the fatalities among the animals of our experiments resulted from the combined effects of the two demonstrated decomposition products, or from the action of some other unidentified substance or substances, has not been established. Recently, LaBelle (personal communication) observed a considerable augmentation of the toxicity of the vapor of formaldehyde in association with aerosols in the atmosphere to which animals were exposed.

A comparison of the fogs of thermal decomposition products of Gargoyle and Pydraul F-9 is made in Table 15.

It is readily apparent that fogs formed from Gargoyle are more toxic to rabbits and rats than to guinea pigs and mice, whereas the reverse was true of fogs from Pydraul F-9. The fogs formed by Gargoyle at 800° F. and 1050° F. have about the same toxicity as those formed by Pydraul F-9 at 1050° F. (report of March 11, 1953). For example, 12 of 15 animals died when exposed for 7 hours to the fogs formed by dropping 0.141 ml. of Gargoyle per minute into an Inconel tube, heated to 800° F., through which air was passing at the rate of 30 liters per minute (0.0047 ml. of Gargoyle per liter of air), and 5 of 15 animals died when exposed for 7 hours to fog formed by dropping 0.208 ml. of Gargoyle per minute into an Inconel tube, heated to 1050° F., through which air was passing at the same rate, whereas 9 of 12 animals died when exposed for 6.8 hours to the fogs formed by dropping 0.125 ml. of Pydraul F-9 per minute into an Inconel tube heated to 1050° F., through which air was passed at the rate of 20 liters per minute (0.0063 ml. of Pydraul F-9 per liter of air).

The fogs formed at 1250° F. from Pydraul F-9 are more toxic than those formed from Gargoyle under roughly comparable conditions. Seven of 11 animals (report of March 11, 1953) died when exposed for 3.1 hours to the fogs formed by dropping 0.167 ml. of Pydraul F-9 per minute into an Inconel tube, heated to 1250° F., through

which air was passing at the rate of 20 l. per minute (0.0084 ml. per liter), whereas a group of 8 animals survived when exposed for 5 hours to the smoke formed by dropping 0.517 ml. of Gargoyle per minute into an Inconel tube heated initially to 1250° F., through which air was passing at the rate of 30 liters per minute (0.017 ml. per liter). Although the products of the essentially complete combustion of Gargoyle are not toxic per se, a hazard results from the flame itself, and the intense heat generated may be dangerous to life under suitable conditions, as illustrated by Experiment No. 1 (Table 6) in which all animals died from the excessive heat which was not dissipated by sufficient cooling before the air entered the chamber.

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Table 1

The Mortality, Length of Survival, and Changes in Weight of Animals Exposed to Fogs Formed by Dropping Gargoyle Into an Inconel Tube Heated to a Temperature of 800° F. (427° C.)

Experiment Number	Rate of Liquid Delivery mg./min.	Duration of Exposure Hours	Identification Number	Initial Weight kg.	Change in Weight Expressed as Percentage of Initial Weight		Fate	Length of Survival After Exposure Unless Otherwise Stated
					Loss as Result of Period of Exposure	Subsequent Gain		
5	192	7.0	Guinea Pig B-51	0.914	-	-	Died	During exposure
			Guinea Pig B-52	0.775	5.0	-	Died	During exposure
			Mouse A-964	0.019	-	-	Died	During exposure
			Mouse A-965	0.021	23.8	-	Died	During exposure
			Mouse A-966	0.021	23.8	-	Died	During exposure
			Mouse A-967	0.019	10.5	-	Died	During exposure
			Mouse A-968	0.020	25.0	-	Died	During exposure
			Rabbit H-524	3.431	2.1	-	Died	During exposure
			Rabbit H-525	3.897	3.0	-	Died	During exposure
			Rabbit H-526	4.009	1.7	-	Died	During exposure
			Rabbit H-527	3.463	-	-	Died	During exposure
			Rat K-385	0.153	7.2	-	Died	During exposure
			Rat K-386	0.157	9.6	-	Died	During exposure
			Rat K-387	0.145	-	-	Died	During exposure
			Rat K-388	0.142	7.8	-	Died	During exposure
9	123	7.0	Guinea Pig B-61	0.855	7.3	15.0	Survived	Killed 22 days
			Guinea Pig B-62	0.674	18.7	-	Died	3 days
			Mouse A-994	0.020	-	-	Died	Within 0.7 hour

Table 1 (Page 2)

Experiment Number	Rate of Liquid Delivery mg./min.	Duration of Exposure Hours	Identification Number	Initial Weight kg.	Change in Weight Expressed as Percentage of Initial Weight		Fate	Length of Survival After Exposure Unless Otherwise Stated
					Loss as Result of Period of Exposure	Subsequent Gain		
9	123	7.0	Mouse A-995	0.020	30.0	20.0	Survived	Killed 25 days
			Mouse A-996	0.023	21.7	8.7	Survived	Killed 25 days
			Mouse A-997	0.020	-	-	Died	During exposure
			Mouse A-998	0.021	-	-	Died	During exposure
			Rabbit H-559	2.621	2.8	-	Died	During exposure
			Rabbit H-560	2.544	13.8	-	Died	2 days
			Rabbit H-561	1.591	13.3	-	Died	4 days
			Rabbit H-562	2.796	3.5	-	Died	4.5 hours
			Rat K-430	0.202	7.5	-	Died	Within 0.7 hour
			Rat K-431	0.204	9.8	-	Died	Within 0.7 hour
			Rat K-432	0.227	11.9	-	Died	Within 0.7 hour
			Rat K-433	0.214	11.7	-	Died	Within 0.7 hour
6	267	3.5	Guinea Pig B-55	0.698	1.3	-	Died	During exposure
			Guinea Pig B-56	0.746	2.9	-	Died	During exposure
			Mouse A-979	0.020	20.0	-	Died	During exposure
			Mouse A-980	0.019	15.8	-	Died	During exposure
			Mouse A-981	0.019	5.3	-	Died	During exposure
			Mouse A-982	0.019	13.2	-	Died	During exposure
			Mouse A-983	0.021	19.0	-	Died	During exposure
			Rabbit H-538	3.165	1.4	-	Died	During exposure
			Rabbit H-539	3.097	3.9	-	Died	1 day
			Rabbit H-540	2.198	2.2	-	Died	During exposure
			Rabbit H-541	2.194	1.1	-	Died	During exposure
			Rat K-418	0.188	5.9	-	Died	During exposure
			Rat K-419	0.152	9.2	-	Died	1 day

Table 1 (Page 3)

Experiment Number	Rate of Liquid Delivery mg./min.	Duration of Exposure Hours	Identification Number	Initial Weight kg.	Change in Weight Expressed as Percentage of Initial Weight		Fate	Length of Survival After Exposure Unless Otherwise Stated
					Loss as Result of Period of Exposure	Subsequent Gain		
6	267	3.5	Rat K-420	0.157	5.1	-	Died	During exposure
			Rat K-421	0.155	2.9	-	Died	During exposure
10	118	3.5	Guinea Pig B-63	0.692	20.4	31.1	Survived	Killed 18 days
			Guinea Pig B-64	0.688	6.1	5.3	Survived	Killed 21 days
			Mouse A-1000	0.016	31.2	37.5	Survived	Killed 9 days
			Mouse B-1	0.019	10.5	21.1	Survived	Killed 9 days
			Mouse B-2	0.016	12.5	12.5	Survived	Killed 23 days
			Mouse B-3	0.019	5.3	5.3	Survived	Killed 9 days
			Mouse B-4	0.019	15.8	15.8	Survived	Killed 9 days
			Rabbit H-568	2.236	0	7.2	Survived	Killed 9 days
			Rabbit H-569	2.382	7.0	11.0	Survived	Killed 9 days
			Rabbit H-570	2.434	0	0.7	Survived	Killed 9 days
			Rabbit H-571	2.353	0	9.8	Survived	Killed 9 days
			Rat K-440	0.212	24.5	31.6	Survived	Killed 12 days
			Rat K-441	0.214	19.2	-	Died	1 day
			Rat K-442	0.175	29.7	-	Died	4 days
			Rat K-443	0.210	20.5	24.3	Survived	Killed 12 days
15	70	3.5	Guinea Pig B-83	0.848	3.8	5.7	Survived	Killed 13 days
			Guinea Pig B-84	0.822	5.6	5.0	Survived	Killed 13 days
			Mouse B-35	0.027	22.2	18.5	Survived	Killed 17 days
			Mouse B-36	0.019	6.8	-	Died	4 hours
			Mouse B-37	0.018	5.5	33.3	Survived	Killed 17 days
			Mouse B-38	0.025	10.0	-	Died	During exposure
			Mouse B-39	0.022	18.2	36.4	Survived	Killed 17 days

Table 1 (Page 4)

Experiment Number	Rate of Liquid Delivery mg./min.	Duration of Exposure Hours	Identification Number	Initial Weight kg.	Change in Weight Expressed as Percentage of Initial Weight		Fate	Length of Survival After Exposure Unless Otherwise Stated
					Loss as Result of Period of Exposure	Subsequent Gain		
15	70	3.5	Rabbit H-710	2.255	13.3	-	Died	2 days
			Rabbit H-711	2.709	24.0	-	Died	1 day
			Rabbit H-712	3.113	8.5	-	Died	2 days
			Rabbit H-713	3.217	7.6	-	Died	2 days
			Rat K-572	0.202	8.9	9.9	Survived	Killed 13 days
			Rat K-573	0.217	13.8	17.5	Survived	Killed 13 days
			Rat K-574	0.205	30.7	-	Died	13 days
			Rat K-575	0.204	14.7	18.1	Survived	Killed 13 days
12	358	1.0	Guinea Pig B-67	0.849	17.0	-	Died	3 days
			Guinea Pig B-68	0.841	20.3	-	Died	2 days
			Mouse B-10	0.020	22.5	17.5	Survived	Killed 12 days
			Mouse B-11	0.023	41.3	-	Died	11 days
			Mouse B-12	0.018	8.3	13.9	Survived	Killed 13 days
			Mouse B-13	0.018	16.7	-	Died	9 days
			Mouse B-14	0.021	23.8	19.0	Survived	Killed 12 days
			Rabbit H-587	2.069	13.3	-	Died	2 days
			Rabbit H-588	3.094	12.4	-	Died	1 day
			Rabbit H-589	2.427	18.0	-	Died	3 days
			Rabbit H-590	2.553	14.3	-	Died	3 days
			Rat K-450	0.161	15.5	13.0	Survived	Killed 1.4 months
			Rat K-451	0.168	11.3	20.2	Survived	Killed 19 days
			Rat K-452	0.157	18.5	-	Died	2 days
			Rat K-453	0.164	20.7	-	Died	2 days
7	214	1.0	Guinea Pig B-57	0.823	0.4	0.7	Survived	Killed 13 days
			Guinea Pig B-58	0.814	0	4.7	Survived	Killed 13 days

Table 1 (Page 5)

Experiment Number	Rate of Liquid Delivery mg./min.	Duration of Exposure Hours	Identification Number	Initial Weight kg.	Change in Weight Expressed as Percentage of Initial Weight		Fate	Length of Survival After Exposure Unless Otherwise Stated
					Loss as Result of Period of Exposure	Subsequent Gain		
7	214	1.0	Mouse A-984	0.020	25.0	30.0	Survived	Killed 16 days
			Mouse A-985	0.022	36.4	36.4	Survived	Killed 16 days
			Mouse A-986	0.019	15.8	26.3	Survived	Killed 16 days
			Mouse A-987	0.019	10.5	36.8	Survived	Killed 16 days
			Mouse A-988	0.021	9.5	14.2	Survived	Killed 16 days
			Rabbit H-549	2.357	3.3	-	Died	1 day
			Rabbit H-550	2.064	4.7	22.9	Survived	Killed 13 days
			Rabbit H-551	2.049	9.2	-	Died	1 day
			Rabbit H-552	1.863	7.1	8.1	Survived	Killed 30 days
			Rat K-422	0.187	17.1	23.5	Survived	Killed 16 days
			Rat K-423	0.183	27.9	-	Died	6 days
			Rat K-424	0.185	28.6	-	Died	25 days
			Rat K-425	0.184	9.8	11.4	Survived	Killed 16 days
16	114	1.0	Guinea Pig B-85	0.846	0	0.1	Survived	Killed 16 days
			Guinea Pig B-86	0.724	0	8.7	Survived	Killed 16 days
			Mouse B-40	0.015	0	23.3	Survived	Killed 14 days
			Mouse B-41	0.021	0	25.7	Survived	Killed 14 days
			Mouse B-42	0.020	15.0	29.0	Survived	Killed 14 days
			Mouse B-43	0.020	10.0	7.0	Survived	Killed 14 days
			Mouse B-44	0.022	13.6	23.6	Survived	Killed 14 days
			Rabbit H-729	3.466	5.0	13.2	Survived	Killed 19 days
			Rabbit H-730	2.258	12.5	17.8	Survived	Killed 15 days
			Rabbit H-731	3.057	6.3	17.2	Survived	Killed 15 days
			Rabbit H-732	2.907	13.2	-	Died	26 days

Table 1 (Page 6)

Experiment Number	Rate of Liquid Delivery mg./min.	Duration of Exposure Hours	Identification Number	Initial Weight kg.	Change in Weight Expressed as Percentage of Initial Weight		Fate	Length of Survival After Exposure Unless Otherwise Stated
					Loss as Result of Period of Exposure	Subsequent Gain		
16	114	1.0	Rat K-576	0.180	0	13.9	Survived	Killed 16 days
			Rat K-577	0.202	7.9	24.3	Survived	Killed 15 days
			Rat K-578	0.191	0	12.0	Survived	Killed 15 days
			Rat K-579	0.196	5.1	21.9	Survived	Killed 15 days
18	59	1.0	Guinea Pig B-89	0.719	4.0	7.1	Survived	Killed 14 days
			Guinea Pig B-90	0.864	0	6.1	Survived	Killed 14 days
			Mouse B-50	0.031	11.6	-	Survived	Killed 14 days
			Mouse B-51	0.017	0	-	Survived	Killed 14 days
			Mouse B-52	0.022	18.1	-	Survived	Killed 14 days
			Mouse B-53	0.017	0	-	Survived	Killed 14 days
			Mouse B-54	0.023	0	26.1	Survived	Killed 14 days
			Rabbit H-737	2.383	8.2	21.2	Survived	Killed 13 days
			Rabbit H-738	3.073	1.6	7.5	Survived	Killed 13 days
			Rabbit H-739	3.712	1.0	3.4	Survived	Killed 13 days
			Rabbit H-740	3.145	2.5	9.2	Survived	Killed 13 days
			Rat K-584	0.199	3.5	17.6	Survived	Killed 13 days
			Rat K-585	0.199	0.5	7.0	Survived	Killed 13 days
			Rat K-586	0.188	1.6	13.3	Survived	Killed 13 days
			Rat K-587	0.182	2.2	11.0	Survived	Killed 13 days
13	560	0.5	Guinea Pig B-77	0.574	5.4	16.2	Survived	Killed 19 days
			Guinea Pig B-78	0.484	3.5	18.8	Survived	Killed 19 days
			Mouse B-25	0.017	29.4	35.3	Survived	Killed 14 days
			Mouse B-26	0.020	-	-	Died	During exposure
			Mouse B-27	0.027	0	7.4	Survived	Killed 20 days

Table 1 (Page 7)

Experiment Number	Rate of Liquid Delivery mg./min.	Duration of Exposure Hours	Identification Number	Initial Weight kg.	Change in Weight Expressed as Percentage of Initial Weight		Fate	Length of Survival After Exposure Unless Otherwise Stated
					Loss as Result of Period of Exposure	Subsequent Gain		
13	360	0.5	Mouse B-28	0.025	28.0	24.0	Died	14 days
			Mouse B-29	0.022	27.3	27.3	Survived	Killed 20 days
			Rabbit H-668	2.412	28.2	-	Died	4 days
			Rabbit H-669	3.234	23.1	-	Died	5 days
			Rabbit H-670	2.841	18.7	-	Died	2 days
			Rabbit H-671	2.652	12.9	-	Died	2 days
			Rat K-564	0.193	5.2	22.3	Survived	Killed 19 days
			Rat K-565	0.169	16.6	36.7	Survived	Killed 19 days
			Rat K-566	0.174	12.1	38.5	Survived	Killed 19 days
			Rat K-567	0.210	15.7	17.1	Survived	Killed 19 days
14	222	0.5	Guinea Pig B-79	0.759	5.9	9.9	Survived	Killed 17 days
			Guinea Pig B-80	0.857	5.0	8.2	Survived	Killed 17 days
			Mouse B-30	0.023	17.4	21.7	Survived	Killed 18 days
			Mouse B-31	0.017	17.6	-	Survived	Killed 18 days
			Mouse B-32	0.022	9.1	13.6	Survived	Killed 18 days
			Mouse B-33	0.027	3.7	7.4	Survived	Killed 18 days
			Mouse B-34	0.024	5.2	10.3	Survived	Killed 18 days
			Rabbit H-706	2.342	6.9	20.8	Survived	Killed 17 days
			Rabbit H-707	2.730	7.1	23.8	Survived	Killed 17 days
			Rabbit H-708	3.024	5.3	6.8	Survived	Killed 17 days
			Rabbit H-709	3.354	12.7	16.5	Survived	Killed 17 days
			Rat K-568	0.181	0	3.9	Survived	Killed 17 days
			Rat K-569	0.213	5.2	11.3	Survived	Killed 17 days
			Rat K-570	0.182	3.3	12.1	Survived	Killed 17 days
			Rat K-571	0.203	0	14.3	Survived	Killed 17 days

Table 1 (Page 8)

Experiment Number	Rate of Liquid Delivery mg./min.	Duration of Exposure Hours	Identification Number	Initial Weight kg.	Change in Weight Expressed as Percentage of Initial Weight		Fate	Length of Survival After Exposure Unless Otherwise Stated
					Loss as Result of Period of Exposure	Subsequent Gain		
17	367	0.25	Guinea Pig B-87	0.778	3.0	12.2	Survived	Killed 19 days
			Guinea Pig B-88	0.866	15.7	-	Died	17 days
			Mouse B-45	0.019	5.3	5.3	Survived	Killed 15 days
			Mouse B-46	0.021	4.8	14.3	Survived	Killed 15 days
			Mouse B-47	0.023	8.1	-	Died	6 days
			Mouse B-48	0.018	0	16.7	Survived	Killed 15 days
			Mouse B-49	0.022	13.6	-	Died	6 days
			Rabbit H-733	2.837	4.2	7.0	Survived	Killed 14 days
			Rabbit H-734	2.317	1.7	22.5	Survived	Killed 14 days
			Rabbit H-735	2.929	1.3	6.0	Survived	Killed 14 days
			Rabbit H-736	2.438	11.6	-	Died	11 days
			Rat K-580	0.194	0	14.4	Survived	Killed 15 days
			Rat K-581	0.201	0	11.9	Survived	Killed 14 days
			Rat K-582	0.193	0	12.4	Survived	Killed 14 days
			Rat K-583	0.185	0	14.6	Survived	Killed 14 days

Table 2

The Mortality, Length of Survival, and Changes in Weight of Animals Exposed to Fogs Formed by Dropping Gargoyle Into an Inconel Tube Heated to a Temperature of 1050° F. (566° C.)

Experiment Number	Rate of Liquid Delivery mg./min.	Duration of Exposure Hours	Identification Number	Initial Weight kg.	Change in Weight Expressed as Percentage of Initial Weight		Fate	Length of Survival After Exposure Unless Otherwise Stated
					Loss as Result of Period of Exposure	Subsequent Gain		
3	280	6.17	Guinea Pig B-46	0.905	8.3	-	Died	Within 2 hours
			Guinea Pig B-47	0.869	4.7	6.3	Survived	Killed 8 days
			Mouse A-954	0.020	-	-	Died	During exposure
			Mouse A-955	0.020	20.0	15.0	Survived	Killed 8 days
			Mouse A-956	0.019	-	-	Died	During exposure
			Mouse A-957	0.016	-	-	Died	During exposure
			Mouse A-958	0.019	-	-	Died	During exposure
			Rabbit H-516	3.487	-	-	Died	During exposure
			Rabbit H-517	3.067	-	-	Died	During exposure
			Rabbit H-518	2.676	2.8	-	Died	During exposure
			Rabbit H-519	3.459	-	-	Died	During exposure
			Rat K-377	0.280	8.2	-	Died	During exposure
			Rat K-378	0.292	-	-	Died	During exposure
			Rat K-379	0.124	-	-	Died	During exposure
			Rat K-380	0.134	-	-	Died	During exposure
8	181	7.0	Guinea Pig B-59	0.767	11.7	11.1	Survived	Killed 11 days
			Guinea Pig B-60	0.816	11.4	11.0	Survived	Killed 11 days
			Mouse A-989	0.020	25.0	20.0	Survived	Killed 11 days
			Mouse A-990	0.019	26.3	26.3	Survived	Killed 11 days

Table 2 (Page 2)

Experiment Number	Rate of Liquid Delivery mg./min.	Duration of Exposure Hours	Identification Number	Initial Weight kg.	Change in Weight Expressed as Percentage of Initial Weight		Fate	Length of Survival After Exposure Unless Otherwise Stated
					Loss as Result of Period of Exposure	Subsequent Gain		
8	181	7.0	Mouse A-991	0.019	26.3	26.3	Survived	Killed 11 days
			Mouse A-992	0.018	27.8	38.9	Survived	Killed 11 days
			Mouse A-993	0.021	23.8	23.8	Survived	Killed 11 days
			Rabbit H-553	2.433	12.2	16.0	Survived	Killed 19 days
			Rabbit H-554	2.188	9.8	-	Died	5 days
			Rabbit H-555	2.288	13.4	-	Died	1 day
			Rabbit H-556	2.323	25.5	-	Died	6 days
			Rat K-426	0.201	16.9	19.9	Survived	Killed 14 days
			Rat K-427	0.186	43.5	-	Died	6 days
			Rat K-428	0.188	25.0	-	Died	6 days
			Rat K-429	0.209	17.7	21.5	Survived	Killed 14 days
4	64	5.0	Guinea Pig B-49	0.965	9.6	9.1	Survived	Killed 29 days
			Guinea Pig B-50	0.902	12.9	14.9	Survived	Killed 1.8 months
			Mouse A-959	0.018	0	-	Survived	Killed 7 days
			Mouse A-960	0.018	-	8.3	Survived	Killed 7 days
			Mouse A-961	0.017	0	11.8	Survived	Killed 7 days
			Mouse A-962	0.018	0	0	Survived	Killed 7 days
			Mouse A-963	0.016	0	12.5	Survived	Killed 7 days
			Rabbit H-520	3.431	35.0	-	Died	10 days
			Rabbit H-521	3.500	4.7	10.6	Survived	Killed 7 days
			Rabbit H-522	3.268	5.5	20.0	Survived	Killed 26 days
			Rabbit H-523	3.315	1.7	7.7	Survived	Killed 7 days
			Rat K-381	0.152	5.9	12.5	Survived	Killed 7 days
			Rat K-382	0.136	7.4	11.8	Survived	Killed 7 days

Table 2 (Page 3)

Experiment Number	Rate of Liquid Delivery mg./min.	Duration of Exposure Hours	Identification Number	Initial Weight kg.	Change in Weight Expressed as Percentage of Initial Weight		Fate	Length of Survival After Exposure Unless Otherwise Stated
					Loss as Result of Period of Exposure	Subsequent Gain		
4	64	5.0	Rat K-383	0.166	5.4	19.9	Survived	Killed 7 days
			Rat K-384	0.159	0	10.7	Survived	Killed 7 days
19	116	3.5	Guinea Pig B-93	0.929	5.6	3.8	Survived	Killed 13 days
			Guinea Pig B-94	0.762	25.6	-	Died	14 days
			Mouse B-65	0.022	13.6	27.3	Survived	Killed 13 days
			Mouse B-67	0.014	0	42.9	Survived	Killed 14 days
			Mouse B-68	0.020	5.0	15.0	Survived	Killed 14 days
			Mouse B-69	0.022	22.7	31.8	Survived	Killed 14 days
			Rabbit H-749	2.725	27.8	-	Died	8 days
			Rabbit H-750	2.108	12.5	21.4	Survived	Killed 12 days
			Rabbit H-751	2.385	2.9	-	Died	1 hour
			Rabbit H-752	2.174	16.1	-	Died	3 days
			Rat K-592	0.170	8.8	12.4	Survived	Killed 13 days
			Rat K-593	0.191	4.7	11.0	Survived	Killed 14 days
			Rat K-594	0.182	37.4	-	Died	9 days
			Rat K-595	0.179	6.7	12.3	Survived	Killed 14 days
21	48	3.5	Guinea Pig B-97	0.704	0.6	4.3	Survived	Killed 11 days
			Guinea Pig B-98	0.700	0.3	2.7	Survived	Killed 11 days
			Mouse B-75	0.019	0	15.8	Survived	Killed 11 days
			Mouse B-76	0.019	0	5.3	Survived	Killed 12 days
			Mouse B-77	0.017	0	17.6	Survived	Killed 12 days
			Mouse B-78	0.017	0	29.4	Survived	Killed 12 days
			Mouse B-79	0.019	15.8	-	Survived	Killed 12 days

Table 2 (Page 4)

Experiment Number	Rate of Liquid Delivery mg./min.	Duration of Exposure Hours	Identification Number	Initial Weight kg.	Change in Weight Expressed as Percentage of Initial Weight		Fate	Length of Survival After Exposure Unless Otherwise Stated
					Loss as Result of Period of Exposure	Subsequent Gain		
21	48	3.5	Rabbit H-757	1.891	1.3	9.8	Survived	Killed 11 days
			Rabbit H-758	2.156	1.6	19.3	Survived	Killed 10 days
			Rabbit H-759	2.285	0	21.4	Survived	Killed 10 days
			Rabbit H-760	1.957	2.2	6.3	Survived	Killed 10 days
			Rat K-600	0.203	0	6.4	Survived	Killed 11 days
			Rat K-601	0.191	0	6.3	Survived	Killed 11 days
			Rat K-602	0.179	0	8.4	Survived	Killed 12 days
			Rat K-603	0.193	0	7.8	Survived	Killed 12 days
20	109	1.0	Guinea Pig B-95	0.895	1.2	0.1	Survived	Killed 12 days
			Guinea Pig B-96	0.596	2.0	7.7	Survived	Killed 12 days
			Mouse B-70	0.019	0	21.1	Survived	Killed 12 days
			Mouse B-71	0.020	0	10.0	Survived	Killed 13 days
			Mouse B-72	0.024	8.3	4.2	Survived	Killed 13 days
			Mouse B-73	0.019	0	5.3	Survived	Killed 13 days
			Mouse B-74	0.020	0	5.0	Survived	Killed 13 days
			Rabbit H-753	2.255	0	16.2	Survived	Killed 11 days
			Rabbit H-754	3.127	1.9	3.7	Survived	Killed 11 days
			Rabbit H-755	2.246	4.1	19.7	Survived	Killed 11 days
			Rabbit H-756	2.333	0	12.6	Survived	Killed 15 days
			Rat K-596	0.180	0	7.8	Survived	Killed 12 days
			Rat K-597	0.178	0	3.9	Survived	Killed 13 days
			Rat K-598	0.195	2.1	6.7	Survived	Killed 13 days
			Rat K-599	0.202	0	4.0	Survived	Killed 13 days

Table 3

The Mortality, Length of Survival, and Changes in Weight of Animals Exposed to the Smoke Formed by Burning Gargoyle on a Surface of Heated Inconel

Experiment Number	Rate of Liquid Delivery mg./min.	Duration of Exposure Hours	Identification Number	Initial Weight kg.	Change in Weight Expressed as Percentage of Initial Weight		Fate	Length of Survival After Exposure Unless Otherwise Stated
					Loss as Result of Period of Exposure	Subsequent Gain		
1	132	7.0	Guinea Pig B-38	0.939	3.8	-	Died	During exposure
			Guinea Pig B-39	1.007	7.6	-	Died	During exposure
			Mouse A-944	0.020	14.0	-	Died	During exposure
			Mouse A-945	0.016	-	-	Died	During exposure
			Mouse A-946	0.014	-	-	Died	During exposure
			Mouse A-947	0.014	-	-	Died	During exposure
			Mouse A-948	0.017	-	-	Died	During exposure
			Rabbit H-506	3.535	3.0	-	Died	During exposure
			Rabbit H-507	3.236	2.2	-	Died	During exposure
			Rabbit H-508	3.170	2.2	-	Died	During exposure
			Rabbit H-509	3.284	2.1	-	Died	During exposure
			Rat J-991	0.184	2.2	-	Died	During exposure
			Rat J-992	0.199	2.0	-	Died	During exposure
			Rat J-993	0.198	-	-	Died	During exposure
			Rat J-994	0.140	-	-	Died	During exposure
11	500	7.0	Guinea Pig B-65	0.784	2.4	3.6	Survived	Killed 8 days
			Guinea Pig B-66	0.881	2.4	-	Died	0.5 hour
			Mouse B-5	0.019	21.1	21.1	Survived	Killed 8 days
			Mouse B-6	0.018	16.7	22.2	Survived	Killed 8 days
			Mouse B-7	0.019	21.1	21.1	Survived	Killed 8 days
			Mouse B-8	0.021	19.0	19.0	Survived	Killed 8 days
			Mouse B-9	0.020	15.0	15.0	Survived	Killed 8 days

Table 3 (Page 2)

Experiment Number	Rate of Liquid Delivery mg./min.	Duration of Exposure Hours	Identification Number	Initial Weight kg.	Change in Weight Expressed as Percentage of Initial Weight		Fate	Length of Survival After Exposure Unless Otherwise Stated
					Loss as Result of Period of Exposure	Subsequent Gain		
11	500	7.0	Rabbit H-578	2.498	3.1	10.5	Survived	Killed 8 days
			Rabbit H-579	2.635	4.8	6.1	Survived	Killed 8 days
			Rabbit H-580	3.911	5.1	6.4	Survived	Killed 8 days
			Rabbit H-581	1.937	1.0	4.5	Survived	Killed 8 days
			Rat K-444	0.182	5.5	-	Died	0.5 hour
			Rat K-445	0.183	16.4	41.5	Survived	Killed 16 days
			Rat K-446	0.200	21.5	43.5	Survived	Killed 20 days
			Rat K-447	0.324	5.9	-	Died	0.5 hour
2	516	5.0	Guinea Pig B-44	0.852	3.9	5.6	Survived	Killed 7 days
			Guinea Pig B-45	0.702	0	3.1	Survived	Killed 7 days
			Mouse A-949	0.020	5.0	0	Survived	Killed 7 days
			Mouse A-950	0.018	11.1	11.1	Survived	Killed 7 days
			Mouse A-951	0.021	9.5	9.5	Survived	Killed 7 days
			Mouse A-952	0.018	2.8	5.6	Survived	Killed 7 days
			Mouse A-953	0.018	0	5.6	Survived	Killed 7 days
			Rabbit H-510	2.801	2.7	4.4	Survived	Killed 7 days
			Rabbit H-511	3.202	0	2.0	Survived	Killed 7 days
			Rabbit H-512	3.007	3.2	8.4	Survived	Killed 7 days
			Rabbit H-513	3.277	1.0	2.0	Survived	Killed 7 days
			Rat K-373	0.289	3.1	5.5	Survived	Killed 7 days
			Rat K-374	0.327	7.0	8.0	Survived	Killed 7 days
			Rat K-375	0.251	0	4.8	Survived	Killed 7 days
			Rat K-376	0.287	3.5	5.2	Survived	Killed 7 days