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LITERATURE ABSTRACTS

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INDUSTRIAL HYGIENE FOUNDATION

MELLON INSTITUTE

4400 FIFTH AVENUE -- PITTSBURGH, PA. 15213



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INDUSTRIAL HYGIENE FEATURES

Who should learn external cardiac message? See the answer in Abst. No. 821.

Abst. No. 823 reports on sudden deafness associated with adenovirus infection.

Medical complications of contact lenses and their aeromedical implications are discussed in Abst. No. 826.

Human cholesterol metabolism is reviewed in Abst. No. 828.

Abst. No. 841 discusses the bacterial flora of the skin and its relation to post-operative wound infection.

Abst. No. 845 is concerned with toxic hazards in the manufacture and use of surface coatings.

See Abst. No. 846 for data on accidental child poisonings.

Consult Abst. No. 858 for a rare case of chronic lead poisoning: polyneuropathy traced to lead shot in the appendix.

Pulmonary disease in a chicken-plucker is investigated in Abst. No. 864.

Abst. No. 865 reviews mortality among talc miners and millers in New York State.

Abst. No. 868 looks at foundry pollution problems.

A study on the endurance of fiberglass filter fabrics is made in Abst. No. 871.

Progress in high-temperature electrostatic precipitation is described in Abst. No. 872.

Cold exposure of farm and laboratory workers is studied in Abst. No. 878.

Abst. No. 883 presents details on testing chemical detonation characteristics.

A system for the safe handling of perchloric acid fumes is discussed in Abst. No. 884.

FOUNDATION FACTS

STAFF ACTIVITIES: Dr. Robert T. P. deTreville, IHF Managing Director, and Dr. Paul Gross, IHF Research Laboratory Director, attended the Industrial Medical Association of the Pittsburgh-Cleveland Area Fall Scientific and Annual Business Meetings on September 8 at Mellon Institute.

Dr. deTreville spoke to the Pittsburgh Chapter, Public Relations Society of America on "Informed Public Relations—An Essential Element in Industry's Pollution Control Programs" at their September 21 luncheon meeting at the Pittsburgh Press Club.

Dr. deTreville attended the American Medical Association's 27th Congress on Occupational Health in Atlanta, Georgia September 25-26.

Dr. Gross chaired the luncheon Conference on Air Pollution and Pulmonary Disease: Its Prevention and Treatment, during the Pennsylvania Medical Society's 118th Annual Session held in Philadelphia, September 27-30.

32nd ANNUAL MEETING: Preliminary invitational programs for the 32nd Annual Meeting October 10-11 at Chatham Center have been mailed. Please contact IHF headquarters if additional programs are needed.

PUBLICATIONS: Medical Series Bulletin No. 12, "The Pneumoconioses," was mailed to all members with the August issue of the Industrial Hygiene Digest. Additional copies are available from IHF headquarters at \$1.00 per copy.

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IN RE: AIRWAYS

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THRESHOLD LIMIT VALUES FOR 1967

Adopted at the 29th Annual Meeting of the American Conference of Governmental Industrial Hygienists, Chicago, Illinois, May 1-2, 1967.

The Threshold Limit Values refer to air-borne concentrations of substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, without adverse effect. Because of wide variation in individual susceptibility, exposure of an occasional individual at or even below the threshold limit may not prevent discomfort, aggravation of a pre-existing condition, or occupational illness.

Clinical tests are becoming available that permit detection of those individuals who will hyperreact upon exposure to certain industrial substances. Being predictive in character, they may be applied as screening tests in the preplacement job examination. Requests for further details of these tests should be directed to the Chairman of the Committee.

Threshold limits should be used as guides in the control of health hazards and should not be regarded as fine lines between safe and dangerous concentrations. Exceptions are the substances given in Appendix A and certain of the substances given a "C" listing. The values not given a "C" listing refer to time-weighted average concentrations for a conventional 7 or 8 hour workday.

Time-weighted average concentrations permit excursions above the limit, provided they are compensated by equivalent excursions below the limit during the work day. The degree of permissible excursion is pegged to the threshold limit value of the particular substance as given in table in Appendix C under "Test TLV Factor." Hence, it is not considered appropriate to interpret air concentration values as exceeding time-weighted average limits, if such values lie within the permissible excursions. (See section on Legislative Code.)

The amount by which these concentrations may be exceeded for short periods without injury to health depends upon a number of factors such as the nature of the contaminant, whether very high concentrations even for short periods produce acute poisoning, whether the effects are cumulative, the frequency with which high concentrations occur, and the duration of such periods.

All must be taken into consideration in arriving at a decision as to whether a hazardous situation exists. Enlightened industrial hygiene practice inclines toward controlling exposures below the limit rather than maintenance at the limit.

Threshold limits are based on the best available information from industrial experience, from experimental human and animal studies, and when possible, from a combination of the three. The basis on which the values are established may differ from substance to substance; protection against impairment of health may be the guiding factor for some, whereas reasonable freedom from irritation, narcosis, nuisance or other forms of stress may dominate the basis for others. The Committee holds to the opinion that limits based on physical irritation should be considered no less binding than those based on physical impairment; growing bodies of evidence indicate that physical irritation may promote and accelerate physical impairment.

These limits are intended for use in the field of industrial hygiene and should be interpreted and applied only by persons trained in this field. They are not intended for use, or for modification for use, (1) as a relative index of toxicity, by making a ratio of two limits, (2) in the evaluation or control of community air pollution or air pollution nuisances, (3) in estimating the toxic potential of continuous uninterrupted exposures, (4) as proof or disproof of an existing disease or physical condition, or (5) for adoption by countries whose working conditions differ from those in the United States of America and where substances and processes differ.

Documentation of Threshold Limit Values:
A separate companion piece to the TLVs is issued by ACGIH under this title. This publication gives the pertinent scientific information and data with reference to literature sources that were used to base each limit. Each documentation also contains a statement defining the type of response against which the limit is safeguarding the worker. For a better understanding of the TLVs it is essential that the Documentation be consulted when the TLVs are being used.

Ceiling vs. Time-Weighted Average Limits:
Although the time-weighted average concentra-

tion provides the most satisfactory, practical way of monitoring air-borne agents for compliance with the limits, there are certain substances for which it is inappropriate. In the latter group are substances which are predominantly fast acting and whose threshold limit is more appropriately based on this particular response. Substances with this type of response are best controlled by a ceiling "C" limit that should not be exceeded. It is implicit in these definitions that the manner of sampling to determine compliance with the limits for each group must differ; a single brief sample, that is applicable to a "C" limit, is not appropriate to the time-weighted limit; here, a sufficient number of samples are needed to permit a time-weighted average concentration throughout a complete cycle of operations or throughout the work shift.

Whereas the ceiling limit places a definite boundary which concentrations should not be permitted to exceed, the time-weighted average limit requires an explicit limit to the excursions that are permissible above the listed values. The magnitude of these excursions may be pegged to the magnitude of the threshold limit by an appropriate factor shown in Appendix C. It should be noted that the same factors are used by the Committee in making a judgment whether to include or exclude a substance for a "C" listing.

"Skin" Notation: Listed substances followed by the designation "Skin" refer to the potential contribution to the over-all exposure by the cutaneous route including mucous membranes and eye, either by air-borne, or more particularly, by direct contact with the substance. Vehicles can alter skin absorption. Thus attention-calling designation is intended to suggest appropriate measures for the prevention of cutaneous absorption so that the threshold limit is not invalidated.

These values are reviewed annually by the Committee on Threshold Limits for revision or additions, as further information becomes available.

Mixtures: Special consideration should be given also to the application of these values in assessing the health **HWBB-0020206** as-

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sociated with exposure to mixtures of two or more substances. A brief discussion of basic considerations involved in developing threshold limit values for mixtures, and methods for their development, amplified by specific examples are given in Appendix B.

"Inert" or Nuisance Particulates. A number of dusts or particulates that occur in the working environment ordinarily produce no specific effects upon prolonged inhalation. Some insoluble substances are classed as inert (e.g. iron and steel dusts, cement, silicon carbide, titanium dioxide, cellulose); others may be soluble (starch, soluble oils, calcium carbonate) but are of such a low order of activity that in concentrations ordinarily encountered do not cause physiologic impairment; still others may be rapidly eliminated or destroyed by the body (vegetable oils, glycerine, sucrose). In the case of the insoluble substances, there may be some accumulation in the respiratory passages. In the case of the soluble substances, this accumulation will ordinarily be temporary but may interfere to some extent with respiratory processes. Hence, it is desirable to control the concentrations of such particulates in the air breathed by any individual, in keeping with good industrial hygiene practice.

A threshold limit of $15\text{mg}/\text{m}^3$, or 50 mppcf, whichever is less, is recommended for substances in these categories and for which no specific threshold limits have been assigned. This limit, for a normal work day, does not apply to brief exposures at higher concentrations. Neither does it apply to those substances which may cause physiologic impairment at lower concentrations but for which a threshold limit has not yet been adopted. Some "inert" particulates are given in Appendix D.

Simple Asphyxiants—"Inert" Gases or Vapors. A number of gases and vapors, when present in high concentrations in air, act primarily as simple asphyxiants without other significant physiologic effects. A TLV may not be recommended for each simple asphyxiant because the limiting factor is the available oxygen. The minimal oxygen content should be 18 percent by volume

under normal atmospheric pressure (equivalent to a partial pressure, pO_2 , of 135 mm Hg). Atmospheres deficient in O_2 do not provide adequate warning and most simple asphyxiants are odorless. Several simple asphyxiants are listed in Appendix E. Some asphyxiants present an explosion hazard. Account should be taken of this factor in limiting the concentration of the asphyxiant.

Physical Factors. It is recognized that such physical factors as heat, ultraviolet and ionizing radiation, humidity, abnormal pressure and the like may place added stress on the body so that the effects from exposure at a threshold limit may be altered. Most of these stresses act adversely to increase the toxic response of a substance. Although most threshold limits have built-in safety factors to guard against adverse effects of moderate deviations from normal environments, the safety factors of most substances are not of such a magnitude as to take care of gross deviations. For example, continuous work at temperatures above 90°F or over-time, extending the work-week more than 50%, might be considered gross deviations. In such instances judgment must be exercised in the proper adjustments of the threshold limit values.

"Notice of Intent" At the beginning of each year, proposed actions of the Committee for the forthcoming year are issued in the form of a "Notice of Intent." This Notice provides not only an opportunity for comment, but solicits suggestions of substances to be added to the list. The suggestions should be accompanied by substantiating evidence.

As Legislative Code. The Conference does not consider the Threshold Limit Values appropriate matter for adoption in legislative codes and regulations and recommends against such use. If, however, the list is so used, the intent of the concepts contained in the Preface should be maintained and provisions should be made to keep the list current.

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RECOMMENDED VALUES (In Alphabetical Order)

Substance	ppm*	Mg M ¹⁰⁰
Acetaldehyde	200	360
Acetic acid	10	25
Acetic anhydride	5	20
Acetone	1,000	2,400
Acetonitrile	40	70
Acetylene dichloride, see 1,2 Dichloroethylene		
Acetylene tetrabromide	1	14
Acrolein	0.1	0.25
+ Acrylamide-Skin	-	0.3
Acrylonitrile-Skin	20	45
Aldrin-Skin	-	0.25
Allyl alcohol-Skin	2	5
Allyl chloride	1	3
Allyl glycidyl ether (AGE)	10	45
Allyl propyl disulfide	2	12
+ 2-Aminoethanol, see Ethanolamine		
+ 2-Aminopyridine	0.5	2
Ammonia	50	35
Ammonium sulfate (Ammate)	-	15
n-Amyl acetate	100	525
+ sec-Amyl acetate	125	650
Aniline-Skin	5	19
Anisidine (o, p-isomers)-Skin	-	0.5
Antimony & compounds (as Sb)	-	0.5
ANTU (alpha naphthyl thiourea)	-	0.3
Arsenic & Compounds (as As)	-	0.5
Arsine	0.05	0.2
+ Azinphos-methyl-Skin	-	0.2
Barium (soluble compounds)	-	0.5
C Benzene (benzol)-Skin	25	80
Benzidine-Skin	-	A1
p-Benzquinone, see Quinone		
Benzoyl peroxide	-	5
Benzyl chloride	1	5
Beryllium	-	0.002
+ Biphenyl, see Diphenyl		
Boron oxide	-	15
C Boron trifluoride	1	3
Bromine	0.1	0.7
+ Bromoform-Skin	0.5	5
Butadiene (1,3-butadiene)	1,000	2,200

* Parts of vapor or gas per million parts of contaminated air by volume at 25°C and 760 mm. Hg pressure.
 ** Approximate milligrams of particulate per cubic meter of air.

A Numbers, See Appendix A

+ 1967 Addition

† See Intended Values

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TIN RITE: AIRBAMS November 1992

Substance	ppm*	Mg M***	Substance	ppm*	Mg M***	Substance	ppm*	Mg M***
Butanethiol, see Butyl mercaptan			Copper fume			Dimethyl 1, 2-dibromo-2, 2-dichloroethyl phosphate, (Dibrom) (R)		
2-Butanone	200	590	Dusts and Mists			Dimethylformamide-Skin	10	30
+ Butyl acetate (Butyl Cellosolve)-Skin	50	240	Cotton dust (raw)			2,6-Dimethylheptanone, see Diisobutyl ketone		
+ n-Butyl acetate	150	710	Crab (R) herbicide			1,1-Dimethylhydrazine-Skin	0.5	1
+ sec-Butyl acetate	200	950	+ Crotonaldehyde	5	22	Dimethylsulfate - Skin	1	5
+ tert-Butyl acetate	200	950	+ Cumene-Skin	2	6	Dinitrobenzene (all isomers)-Skin		
Butyl alcohol	100	300	+ Cyanide (as CN)-Skin	50	245	Dinitro-o-cresol (R)	0.2	
tert. Butyl alcohol	100	300	Cyclohexanol	50	200	Dinitrotoluene-Skin	1	5
C Butylamine-Skin	5	15	Cyclohexanone	50	200	Dioxane (Dihethylene dioxide)-Skin	100	360
C tert. Butyl chromate (as CrO3)-Skin	50	270	+ Cyclohexene	300	1,015	Diphenylmethane diisocyanate (See Methylene bisphenyl isocyanate (MDI))		
Butyl mercaptan	10	35	Cyclopentadiene	75	200	Dipropylene glycol methyl ether-Skin		
p-tert. Butyltoluene	10	60	2,4-D			Di-sec. octyl phthalate (Di-2-ethylhexyl-phthalate)		
+ Cadmium (Metal dust and soluble salts)			DDVP-Skin			Endrin-Skin	100	600
+ Cadmium oxide fume			DDVP-Skin			Epichlorohydrin-Skin		
+ Calcium arsenate			Decaborane-Skin	0.05	0.3	EPN-Skin	5	19
+ Camphor			Demeton (R)-Skin			1,2-Epoxypropane, see Propyleneoxide		
+ Carbaryl (Sevin) (R)			Diacetone alcohol (4-hydroxy-4-methyl-2-pentanone)	0.1	0.1	2,3-Epoxy-1-propanol, see Glycidol		
+ Carbon black			1,2-Diaminopropane, see Ethylenediamine			Ethanethiol, see Ethylmercaptan		
+ Carbon dioxide	5,000	9,000	+ Diazomethane	0.2	0.4	Ethanolamine	3	6
+ Carbon disulfide-Skin	20	60	Diborane	0.1	0.1	2-Ethoxyethanol-Skin	200	740
+ Carbon monoxide	50	55	+ 1,2-Dibromopropane (ethylene dibromide)-Skin	25	190	2-Ethoxyethylacetate (Cellosolve acetate)-Skin	100	540
+ Carbon tetrachloride-Skin	10	65	C o-Dichlorobenzene	75	450	Ethyl acetate	400	1,400
Chloroform-Skin			p-Dichlorobenzene	1,000	4,950	Ethyl acrylate-Skin	25	100
Chlorinated camphene, Skin			Dichlorodifluoromethane			Ethyl alcohol (ethanol)	1,000	1,900
Chlorinated diphenyl oxide			1,3-Dichloro-5,5-dimethyl hydantoin			+ Ethylamine	10	18
Chlorine dioxide	1	3	1,1-Dichloroethane	100	400	+ Ethyl sec-amy ketone (5-methyl-3-heptanone)	25	130
Chlorine trifluoride	0.1	0.3	1,2-Dichloroethane	50	200	+ Ethyl benzene	100	435
C Chloroacetaldehyde	1	3	+ 1,2-Dichloroethylene	200	790	Ethyl bromide	200	890
Chlorobenzene (monochlorobenzene)	75	350	Dichloromethane, see Methylenechloride			+ Ethyl butyl ketone (3-Heptanone)	50	230
+ o-Chlorobenzylidene malonitrile (OCBM)			Dichloromono-fluoromethane	1,000	4,200	Ethyl chloride	1,000	2,600
Chlorobromomethane	0.05	0.4	1,1-Dichloro-1-methoxyethane	10	60	Ethyl ether	400	1,200
2-Chloro-1,3-butadiene, see Chloroprene	200	1,050	1,2-Dichloropropane, see Propylenedichloride			+ C Ethyl formate	100	300
Chlorodiphenyl (42% chlorine)-Skin			Dichlorotetrafluoroethane	1,000	7,000	Ethyl formate	10	25
Chlorodiphenyl (54% chlorine)-Skin			Dieldrin-Skin			Ethyl silicate	100	300
1-Chloro-2,3-epoxypropane, see Epichlorohydrin			Diethylamine	25	75	Ethylene chlorohydrin-Skin	100	850
2-Chloroethanol, see Ethylene chlorohydrin			+ Diethylamine ethanol-Skin	10	50	Ethylene diamine	5	16
Chloroethylene, see Vinyl chloride			Dichylether, see Ethyl ether			Ethylene dibromide, see 1,2-Dibromoethane	10	25
Chloroform (trichloromethane)			Difluorodibromomethane	100	860	Ethylene dichloride, see 1,2-Dichloroethane		
1-Chloro-1-nitropropane	50	240	Dihydroxybenzene, see Hydroquinone	0.5	2.8	Ethylene glycol dimethyl ether acetate	0.2	1.2
Chloroprene	20	100	Diisobutyl ketone	50	290	+ Ethylene glycol monomethyl ether acetate		
Chloroprene (2-chloro-1,3-butadiene)-Skin	0.1	0.7	Dimethoxymethane	10	35	+ Ethylene imine-Skin	0.5	1
Chloric acid and chromates (as CrO3)	25	90	Dimethyl acetamide-Skin	10	18	Ethylene oxide	50	90
+ Coal tar pitch volatiles (benzene soluble fraction) (anthracene, BaP, phenanthrene, acridine, chrysene, pyrene)			Dimethylamine			Ethylidene chloride, see 1,1-Dichloroethane		
+ Cobalt			Dimethylaminobenzene, see Xylidene dimethylamine (N-dimethylaniline)-Skin	5	25	+ N-Ethylmorpholine-Skin	20	94

* 1 See Intended Values

1 1967 Addition

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Substance	ppm*	Mg M ¹⁰⁰	Substance	ppm*	Mg M ¹⁰⁰	Substance	ppm*	Mg M ¹⁰⁰
Feibam	-	15	Methanethiol, see Methyl mercaptan	-	-	C Nitroglycerin-Skin	0.2	2
Ferovanadium dust	-	1	Methoxychlor	-	15	Nitromethane	100	250
Fluoride (as F)	-	2.5	2-Methoxyethanol, see Methyl cellosolve	-	-	1-Nitropropane	25	90
Fluorine	0.1	0.2	Methyl acetate	200	610	2-Nitropropane	25	90
Fluorotrichloromethane	1,000	5,600	Methyl acetylene (propyne)	1,000	1,650	N-Nitrosodimethylamine (Di-methyl- nitrosamine)-Skin	-	A ¹
C Fomaledehyde	5	6	Methyl acetylene-propadiene mixture (MAPP)	1,000	1,800	Nitrotoluene-Skin	5	30
+ Fomic acid	5	9	Methyl acrylate-Skin	10	35	Nitrotrichloromethane, see Chloropicrin	-	-
Furfural-Skin	5	20	Methylal (dimethoxymethane)	1,000	3,100	1 Octane	500	2,350
Furfuryl alcohol	50	200	Methyl alcohol (methanol)	200	260	Oil mist (mineral)	-	5
Gasoline	-	A6	+ Methylamine	10	12	Osmium tetroxide	-	0.002
Glycidol (2,3-Epoxy-1-propanol)	50	150	Butyl amyl alcohol, see Methyl iso- butyl carbinol	-	-	Oxalic acid	-	1
Glycol monomethyl ether, see 2-Ethoxy- ethanol	-	-	+ Methyl (n-amy) ketone (2-Heptanone)	100	465	Oxygen difluoride	-	0.05
Gulthion, see Azuphosphomethyl	-	-	C Methyl bromide-Skin	20	80	Ozone	0.05	0.1
Halium	-	0.5	Methyl butyl ketone, see 2-Hexanone	25	80	Pentaborane	0.1	0.2
Heptachlor Skin	-	0.5	Methyl cellosolve-Skin	25	120	Pentachloronaphthalene-Skin	0.005	0.01
Heptane (n-heptane)	500	2,000	Methyl cellosolve acetate-Skin	25	120	Pentachlorophenol-Skin	0.005	0.5
Hexachloroethane-Skin	500	1,800	Methyl chloride	100	210	Pentane	1,000	2,950
Hexane (n-hexane)	100	410	Methyl chloroform	350	1,900	2-Pentanone	200	700
2-Hexanone	100	410	Methylcyclohexane	500	2,000	Perchloroethylene	100	670
Hexone	100	410	Methylcyclohexanol	100	470	Perchloromethyl mercapto	0.1	0.8
+ sec-Hexyl acetate	50	300	o-Methylcyclohexanone-Skin	100	460	Perchloryl fluoride	3	13.5
Hydrazine-Skin	1	1.3	Methyl ethyl ketone (MEK), see 2-Butan- one	-	-	Petroleum Distillates (naphtha)	500	2,000
Hydrogen bromide	3	10	Methyl formate	100	250	Phenol-Skin	5	19
Hydrogen chloride	5	7	+ Methyl iodide - Skin	5	28	p-Phenylene diamine-Skin	-	0.1
Hydrogen cyanide-Skin	10	11	Methyl isobutyl carbinol-Skin	25	100	Phenyl ether (vapor)	1	7
Hydrogen fluoride	1	1.4	Methyl isobutyl ketone, see Hexone	-	-	Phenyl ether-Biphenyl mixture (vapor)	-	-
Hydrogen peroxide, 90%	0.05	0.2	+ Methyl isocyanate - Skin	10	20	Phenylethylene, see Styrene	-	-
Hydrogen selenide	10	15	C Methyl mercaptan	100	410	Phenyl glycidyl ether (PGE)	50	310
Hydrogen sulfide	-	2	Methyl methacrylate	100	410	Phenylhydrazine-Skin	5	22
Hydroquinone	0.1	1	Methyl propyl ketone, see 2-Pentanone	-	-	Phosdin (Mevinphos) (R)-Skin	0.1	0.1
C Iodine	-	10	C Methyl styrene	100	480	Phosgene (carbonyl chloride)	0.1	0.4
+ Iron oxide fume	100	360	C Methylene bisphenyl isocyanate (MDI)	0.02	0.2	Phosphine	0.3	0.4
Isamyl alcohol	100	525	Methylene chloride (dichloromethane)	500	1,740	Phosphoric acid	-	-
+ Isamyl acetate	150	700	Molybdenum (soluble compounds)	-	5	Phosphorus (yellow)	-	-
+ Isobutyl acetate	25	140	(insoluble compounds)	-	15	Phosphorus pentachloride	-	-
Isophorone	250	950	Monomethyl aniline-Skin	2	9	Phosphorus pentasulfide	-	-
+ Isopropyl acetate	400	980	C Monomethyl hydrazine-Skin	20	70	Phosphorus trichloride	0.5	3
Isopropyl alcohol	5	12	Morpholine-Skin	20	70	Phthalic anhydride	2	12
Isopropylamine	500	2,100	+ Naphtha (coal tar)	200	800	Picric acid-Skin	-	0.1
Isopropylether	50	240	Naphthalene	10	50	Pival (2-Pivalyl-1,3-indandione)	-	0.1
Isopropyl glycidyl ether (IGE)	0.5	0.9	β-Naphthylamine	-	A ²	Platinum (Soluble Salts)	-	0.002
Ketene	-	0.2	Nickel carbonyl	0.001	0.007	Polytetrafluoroethylene decomposition products	-	A ¹
Lead	-	0.2	Nicotine-Skin	-	1	Propane	1,000	1,800
Lead arsenate	-	0.15	Nitric acid	-	0.5	Propanol	-	A ²
Lindane-Skin	-	0.5	p-Nitroaniline-Skin	2	5	γ-Propiolactone	200	840
L. P. G. (Liquified petroleum gas)	1,000	1,800	Nitrobenzene-Skin	1	5	n-Propyl acetate	25	110
Lithium hydride	-	15	p-Nitrochlorobenzene-Skin	-	1	Propyl nitrate	75	350
Magnesium oxide fume	-	15	Nitroethane	100	310	Propylene dichloride	2	5
Malathion-Skin	-	5	C Nitrogen dioxide	5	9	Propylene imine - Skin	100	240
Manganese	-	0.1	Nitrogen trifluoride	10	29	Propyne, see Methylacetylene	-	-
Mercury-Skin	-	0.01				Pyridium	5	5
Mercury (organic compounds)-Skin	-	0.01						
Mesityl oxide	25	100						

+ 1967 Addition

† See Intended Values

03122603

Substance	ppm*	Mg M ¹⁰⁰	Substance	ppm*	Mg M ¹⁰⁰
Pyridine	5	15	+ 1,1,2-Trichloroethane - Skin	10	45
Quinone	0.1	0.4	Trichloroethylene	100	535
+ Rhodium, Metal fume and dusts	-	0.1	Trichloromethane, see Chloroform	-	-
Soluble salts	-	0.001	Trichlorophthalene - Skin	-	5
Rotenone (commercial)	-	5	1,2,3-Trichloropropane	50	300
Selenone compounds (as Se)	-	0.2	1,1,2-Trichloro 1,2,2-trifluoroethane	1,000	7,600
+ Selenium hexafluoride	0.05	0.4	Trichloroethylene	25	100
Silver, metal and soluble compounds	-	0.01	Trifluoromonomonobromomethane	1,000	6,100
Sodium fluoroacetate (1080) - Skin	-	0.05	2,4,6-Trinitrophenol see Picric acid	-	-
Sodium hydroxide	-	2	2,4,6-Trinitrophenylmethylnitranine, see Tetryl	-	-
Stibine	0.1	0.5	Tetralin	-	-
+ Stoddard solvent	500	2,900	Trinitrobenzene - Skin	-	1.5
Styrene	-	0.15	Trichlorocresyl phosphate	-	0.1
C Styrene monomer (pentaethylene)	100	420	Triphenyl phosphate	3	-
Sulfur dioxide	5	13	Turpentine	100	560
Sulfur hexafluoride	1,000	6,000	+ Uranium (soluble compounds)	-	0.05
Sulfuric acid	-	1	(insoluble compounds)	-	0.25
Sulfur monochloride	1	6	C Vanadium (V ₂ O ₅ dust)	-	0.5
Sulfur pentachloride	0.025	0.25	(V ₂ O ₅ fume)	-	0.1
Sulfuryl fluoride	5	20	Vinyl benzene, see Styrene	-	-
Systox, see Demeton	-	-	Vinyl chloride	500	1,300
2,4,5 T	-	10	Vinylcyanide, see Acrylonitrile	-	-
Tantalum	-	5	Vinyl toluene	100	480
TEDP - Skin	-	0.2	Wax	-	0.1
Tellurium	-	A*	Xylene (xylol)	100	435
Tellurium hexafluoride	0.02	0.2	Xylylene - Skin	5	25
TEPP - Skin	500	4,170	Yttrium	-	1
1,1,1,2-Tetrachloro-2,2-difluoroethane	500	4,170	Zinc oxide fume	-	5
1,1,2,2-Tetrachloro-1,2-difluoroethane	500	4,170	Zinc compounds (as Zn)	-	5
1,1,2,2-Tetrachloroethane-Skin	5	35			
Tetrachloroethylene, see Perchloroethylene	-	-			
Tetrachloromethane, see Carbon tetrachloride	-	-			
Tetraethyl lead (as Pb) - Skin	-	0.075			
Tetrahydrofuran	200	590			
+ Tetramethyl lead (TML) (as lead) - Skin	-	0.075			
+ Tetramethyl succinonitrile - Skin	0.5	3			
Tetranitromethane	1	8			
Tetrayl (2,4,6-trinitrophenylmethylnitranine) - Skin	-	1.5			
Thallium (soluble compounds) - Skin	-	0.1			
Thiram	-	5			
Tin (inorganic emps, except oxide)	-	2			
Tin (organic emps)	-	0.1			
Titanium dioxide	-	15			
Toluene (toluol)	200	750			
C Toluene-2,4-dithiocyanate	0.02	0.14			
o-Toluidine - Skin	5	22			
Toxaphene, see Chlorinated camphene	-	-			
1,1,1-Trichloroethane, see Methyl chloroform	-	-			

! See Intended Values

+ 1967 Addition

Radioactivity: For permissible concentrations of radioisotopes in air, see U.S. Department of Commerce, National Bureau of Standards, Handbook 69, "Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and in Water for Occupational Exposure," June 5, 1959. Also, see U.S. Department of Commerce National Bureau of Standards, Handbook 59, "Permissible Dose from External Sources of Ionizing Radiation," September 24, 1954, and addendum of April 15, 1958.

RESPIRABLE DUSTS EVALUATED BY COUNT

Substance	ppm*	Mg M ¹⁰⁰
SILICA		
Crystalline		
Quartz, Threshold Limit calculated from the formula	250**	250**
Amorphous, including natural diatomaceous earth	20	20
+ Tremolite	5	5
SILICATES (less than 1% crystalline silica)		
Asbestos	5	5
Mica	20	20
Soapstone	20	20
Talc	20	20
Portland Cement	50	50
GRAPHITE (natural)	15	15
"Inert" or Nuisance Particulates	50 (or 15 mg m ⁻³ whichever is the smaller)	50 (or 15 mg m ⁻³ whichever is the smaller)
see Appendix D		
Conversion factors		
mppcf x 35.3 = million particles per cubic meter		
: particles per c. c.		

* Millions of particles per cubic foot of air, based on impinger samples counted by light-field technique.
 ** The percentage of crystalline silica in the formula is the amount determined from air-borne samples, except in those instances in which other methods have been shown to be applicable.

NOTICE OF INTENDED CHANGES

These substances, with their corresponding values, comprise those for which either a limit has been proposed for the first time, or for which a change in the "Recommended" listing has been proposed. In both cases, the proposed limits should be considered trial limits that will remain in this listing for a period of at least two years. During this time, the previously Recommended Limit will remain in effect. If, after two years no evidence comes to light that questions the appropriateness of the values herein, the values will be placed in the "Recommended" list. Documentation is available for each of these substances.

Substance	ppm*	Mg M ¹⁰⁰
++ Abate	15	
++ Boron trioxide	1.0	
++ Bromine pentafluoride	0.1	
++ sec-Butyl alcohol	150	450
++ Camphor	2	
++ Chlorine	1	
++ 1-Chloroacetylene (phenylchloride)	0.05	0.3
++ Chromium, sol. chromic, chromous salts, as Cr		0.5
++ Cobalt, Metal fume & dust	1	
++ Cyanogen	10	0.1
++ Dibutyl phosphate	1	5
++ Diethylphthalate	10	5
++ Diethylene triamine-Skin	10	
++ Diisopropylamine-Skin	5	20
++ Dimethylphthalate	0.2	5
++ Diphenyl amine	0.2	1
++ Ethylene glycol dimethylate and or Nitroglycerin-Skin	0.2 ¹	10
++ Fibrous glass		5
++ Gasoline	A ⁶	
++ Heptane	200	800
++ Hexachloronaphthalene-Skin		0.2

* Parts of vapor or gas per million parts of air plus vapor by volume at 25°C and 760 mm. Hg pressure.

** Approximate milligrams of particulate per cubic meter of air.

* An atmospheric concentration of not more than 0.02 ppm, or personal protection may be necessary to avoid headache.

+ 1967 Revision

++ 1967 Additions

Appendix A

A¹ Benzidine Because of high incidence of bladder tumors in man, any exposure, including skin, is extremely hazardous.

A² β-Naphthylamine Because of the extremely high incidence of bladder tumors in workers handling this compound and the inability to control exposures β-naphthylamine has been prohibited by the State of Pennsylvania from manufacture, use and other activities that involve human contact.

A³ N-Nitrosodimethylamine Because of extremely high toxicity and presumed carcinogenic potential of this compound, contact by any route should not be permitted.

A⁴ Polytetrafluoroethylene* decomposition products.

Thermal decomposition of the fluorocarbon chain in air leads to the formation of oxidized products containing carbon, fluorine and oxygen. Because these products decompose in part by hydrolysis in alkaline solution, they can be quantitatively determined in air as fluoride to provide an index of exposure. No TLV is recommended pending determination of the toxicity of the products, but air concentrations should be minimal.

A⁵ Propiolactone Because of high acute toxicity and demonstrated skin tumor production in animals, contact by any route should be avoided.

A⁶ Gasoline. The composition of gasoline varies greatly and thus a single TLV for all types of gasoline is no longer applicable. In general, the aromatic hydrocarbon content will determine what TLV applies. Consequently the content of benzene, other aromatics and additives should be determined to arrive at the appropriate TLV (Elkins, et al. A.I.H.A.J. 24, 99, 1963).

* Trade Names: Algoton, Fluon, Halon, Teflon, Tetran

Appendix B

B.1 THRESHOLD LIMIT VALUES FOR MIXTURES

When two or more hazardous substances are present, their combined effect, rather than that of either individually, should be given primary consideration. In the absence of information to the contrary, the effects of the different hazards should

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be considered as additive. That is, if the sum of the following fractions.

$$\frac{C_1}{T_1} + \frac{C_2}{T_2} + \dots + \frac{C_n}{T_n}$$

exceeds unity, then the threshold limit of the mixture should be considered as being exceeded. C_i indicates the observed atmospheric concentration, and T_i the corresponding threshold limit. (See Example 1A.a.).

Exceptions to the above rule may be made when there is good reason to believe that the riot effects of the different harmful substances are not in fact additive, but independent as when purely local effects on different organs of the body are produced by the various components of the mixture. In such cases the threshold limit ordinarily is exceeded only when at least one member of the series (C_1 or C_2 etc.) itself has a value exceeding unity. (See Example 1A.b.)

Antagonistic action or potentiation may occur with some combinations of atmospheric contaminants. Such cases at present must be determined individually. Potentiating or antagonistic agents are not necessarily harmful by themselves. Potentiating effects of exposure to such agents by routes other than that of inhalation is also possible, e.g. imbibed alcohol and inhaled narcotic (trichloroethylene). Potentiation is characteristically exhibited at high concentrations, less probably at low.

When a given operation or process characteristically emits a number of harmful dusts, fumes, vapors or gases, it will frequently be only feasible to attempt to evaluate the hazard by measurement of a single substance. In such cases, the threshold limit used for this substance should be reduced by a suitable factor, the magnitude of which will depend on the number, toxicity and relative quantity of the other contaminants ordinarily present.

Examples of processes which are typically associated with two or more harmful atmospheric contaminants are welding, automobile repair, blasting, painting, lacquering, certain foundry operations, diesel exhausts, etc. (Example 2.)

THRESHOLD LIMIT VALUES FOR MIXTURES EXAMPLES

1A. General case, where air is analyzed for each component.

a. ADDITIVE EFFECTS

$$\frac{C_1}{T_1} + \frac{C_2}{T_2} + \frac{C_3}{T_3} + \dots + \frac{C_n}{T_n} = 1$$

Air contains 5 ppm of carbon tetrachloride (TLV, 10), 20 ppm of ethylene dichloride (TLV, 50) and 10 ppm of ethylene dibromide, (TLV, 25).

$$\frac{5}{10} + \frac{20}{50} + \frac{10}{25} = \frac{65}{50} = 1.3$$

Threshold limit is exceeded.

b. INDEPENDENT EFFECTS

Air contains 0.15 mg/m³ of lead (TLV, 0.2) and 0.7 mg/m³ of sulfuric acid (TLV, 1).

$$\frac{0.15}{0.20} = 0.75; \quad \frac{0.7}{1} = 0.7$$

Threshold limit is not exceeded.

1B. Special case when source of contaminant is a mixture and atmospheric composition is assumed similar to that of original material, i.e. vapor pressure of each component is the same at the observed temperature.

2. ADDITIVE EFFECTS, approximate solution.

1. A mixture of equal parts (1) trichloroethylene (TLV, 100), and (2) methyl chloroform (TLV, 350).

$$\frac{C_1}{100} + \frac{C_2}{350} = \frac{C_m}{T_m}$$

Solution applicable to "spot" solvent mixture usage, where all or nearly all, solvent evaporates.

$$C_1 = C_2 = \frac{1}{2} C_m$$

$$\frac{C_1}{100} + \frac{C_1}{350} = \frac{2C_1}{T_m}$$

$$\frac{1}{700} + \frac{2C_1}{700} = \frac{2C_1}{T_m}$$

$$T_m = 700 \times \frac{2}{2} = 155 \text{ ppm}$$

1B. b. General Exact Solution for Mixtures of n Components With Additive Effects and Different Vapor Pressures.

$$(1) \quad \frac{C_1}{T_1} + \frac{C_2}{T_2} + \dots + \frac{C_n}{T_n} = 1$$

$$(2) \quad C_1 + C_2 + \dots + C_n = T$$

$$(2.1) \quad \frac{C_1}{T_1} + \frac{C_2}{T_2} + \dots + \frac{C_n}{T_n} = 1$$

By the Law of Partial Pressures,

$$(3) \quad C_1 \dots \text{ap}$$

And by Raoult's Law,

$$(4) \quad p_1 \dots F_1 p^s$$

Combine (3) and (4) to obtain

$$(5) \quad C_1 \dots aF_1 p^s$$

Combining (1), (2), (1) and (5), we obtain

$$(6) \quad \frac{F_1 p_1^s}{T_1} + \frac{F_2 p_2^s}{T_2} + \dots + \frac{F_n p_n^s}{T_n}$$

$$\frac{F_1 p_1^s}{T_1} + \frac{F_2 p_2^s}{T_2} + \dots + \frac{F_n p_n^s}{T_n}$$

and solving for T ,

$$(6.1) \quad T = \frac{F_1 p_1^s + F_2 p_2^s + \dots + F_n p_n^s}{\frac{F_1 p_1^s}{T_1} + \frac{F_2 p_2^s}{T_2} + \dots + \frac{F_n p_n^s}{T_n}}$$

$$\text{or } \sum_{i=1}^n \frac{F_i p_i^s}{T_i} = \frac{F_i p_i^s}{T}$$

$$(6.2) \quad T = \frac{1}{\sum_{i=1}^n \frac{F_i p_i^s}{T_i}}$$

T : Threshold Limit Value in ppm.
 C : Vapor concentration in ppm.
 p : Vapor pressure of component in solution.

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Appendix C

BASES FOR ASSIGNING LIMITING "C" VALUES

By definition in the Preface, a listed value bearing a "C" designation refers to "ceiling" value that should not be exceeded; all values should fluctuate below the listed value. In general the bases for assigning or not assigning a "C" value rest on whether excursions of concentration above a proposed limit for periods up to 15 minutes may result in a) intolerable irritation, b) chronic, or irreversible tissue change, or c) narcosis of sufficient degree to increase accident proneness, impair self rescue or materially reduce work efficiency.

In order for the Committee to decide whether a substance is a candidate for a "C" listing, some guidelines must be formulated on the permissive fluctuation above the limit in terms of the seriousness of the response in the categories a, b, c, given above. For this the factors given in the table below have been used by the Committee. For both technical and practical reasons, the factors have been pegged to the concentration in an inverse manner. It will be noted that as the magnitude of the T. L. V. increases a correspondingly decreased range of fluctuation is permitted; not to decrease the factor for T. L. V. s of increasing magnitude would permit exposures to large absolute quantities, an undesirable condition, a condition that is minimized at low T. L. V. s. Moreover, larger factors at the lower T. L. V. s are consistent with the difficulties in analyzing and controlling trace quantities.

T.L.V. RANGE ppm* or mg/m ³	Test T.L.V. Factor	Examples
0 to 1	3	Toluene diisocyanate-T. L. V., 0.02 ppm, if permitted to rise above 0.06 ppm may result in sensitization in a single sub- sequent exposure! "C" listing recommended on category b.
1 + to 10	2	Manganese -T.L.V., 5mg/m ³ , contains little or no safety factor. All values should fluct- uate below 5mg/m ³ . "C" listing recommended on category b.

$$\frac{C_1}{0.1} + \frac{C_2}{0.5} = \frac{C_m}{T_m} \quad C_2 = 2C_1$$

$$C_m = 3C_1$$

$$\frac{C_1}{0.1} + \frac{2C_1}{0.5} = \frac{3C_1}{T_m}$$

$$\frac{2C_1}{0.5} = \frac{3C_1}{T_m}$$

$$T_m = \frac{1.5}{7} = 0.21 \text{ mg/m}^3$$

1C. T. L. V. for Mixtures of Mineral Dusts.

For mixtures of biologically active mineral dusts the general formula for mixtures may be used. With the exception of asbestos, pure minerals are assigned TLV of 2.5, 20 or 50.

For a mixture containing 80% talc and 20% quartz, the TLV for 100% of the mixture "C" is given by:

$$TLV = \frac{1}{\frac{0.8}{20} + \frac{0.2}{2.5}} = 8.4 \text{ mppcf}$$

Essentially the same result will be obtained if the limit of the more (most) toxic component is used provided the effects are additive. In the above example the limit for 20% quartz is 10 mppcf.

For another mixture of 25% quartz 25% amorphous silica and 50% talc:

$$TLV = \frac{1}{\frac{0.25}{2.5} + \frac{0.25}{20} + \frac{0.5}{20}} = 7.3 \text{ mppcf}$$

The limit for 25% quartz approximates 8 mppcf.

p° = Vapor pressure of pure component.
 F = Mol fraction of component in solution.

a = A constant of proportionality. Subscripts 1, 2, . . . n relate the above quantities to components 1, 2, . . . n, respectively. Subscript i refers to an arbitrary component from 1 to n. Absence of subscript relates the quantity to the mixture.

Solution to be applied when there is a reservoir of the solvent mixture whose composition does not change appreciably by evaporation.

Exact Arithmetic Solution of Specific Mixture

Mol. wt.	Density	T °C	Mol frac- tion in half-and half solu- tion by volume
Trichloro- ethylene (1) 131.4	1.46 g/ml	100	73mm Hg, 0.527
Methylchloro- form (2) 133.42	1.33 g/ml	350	125mm Hg, 0.473

$$F_{1p1}^\circ = (0.527) (73) = 38.2$$

$$F_{2p2}^\circ = (0.473) (125) = 59.2$$

$$T = \frac{38.2 + 59.2}{\frac{38.2}{100} + \frac{59.2}{350}} = \frac{(97.4) (350)}{133.8 + 59.2} = \frac{(97.4) (350)}{193.0} = 177$$

$T = 177$ ppm (Note difference in T. L. V. when account is taken of vapor pressure and mol fraction in comparison with above example where such account is not taken).

- A mixture of one part of (1) parathion (TLV, 0.1) and two parts of (2) EPN (TLV, 0.5).

T.L.V. RANGE ppm* or mg/m ³	Test T.L.V. Factor	Examples
10 + to 100	1.5	Methyl styrene-T. L. V. 100 if encountered at levels of 150 ppm will prove intensely irritating. "C" listing recommended on category a.
100 + to 1000	1.25	Methyl chloroform-T. L. V. 350ppm, at 438 ppm for pe- riods not exceeding 15 min- utes is not expected to re- sult in untoward effects relating to category c. No "C" listing recommended.

* Whichever unit is applicable

PERMISSIBLE EXCURSIONS FOR TIME-WEIGHTED AVERAGE (TWA) LIMITS

As stated in the preface, the same factors may be used as guides for reasonable excursions above the limit for substances to which the time-weighted average applies. The time-weighted average implies that each excursion above the limit is compensated by a comparable excursion below the limit. Thus, a value of 6-ppm HF is permissible for periods not exceeding 15 minutes, provided an equivalent decrease below the limit of 3-ppm obtains.

Appendix D

Some "Inert" or Nuisance Particulates*	
Alundum (Al ₂ O ₃)	Limestone
Calcium carbonate	Magnesite
Cellulose	Marble
Portland Cement	Plaster of Paris
Corundum (Al ₂ O ₃)	Rouge
Emery	Silicon Carbide
Glycerine Mist	Starch
Graphite (synthetic)	Sucrose
Gypsum	Tin Oxide
Vegetable oil mists (except castor, cashew nut, or similar irritant oils)	Titanium Dioxide

*When toxic impurities are not present.

Appendix E

Some Simple Asphyxiants - "Inert" Gases and Vapors.

Acetylene	Hydrogen
Argon	Methane
Ethane	Neon
Ethylene	Nitrogen
Helium	Nitrous Oxide

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The 2nd edition of the Documentation of Threshold Limit Values, rewritten and greatly enlarged to include the approximately 400 substances in the list, is available and may be purchased from the Secretary-Treasurer. The Documentation should be consulted when using the Threshold Limit Values herein (Price - \$4.50)

E.J. Baier
Hervey B. Elkins, Ph.D.
W. W. Fredrick, Ph.D.
Bernard Grabois, P.E.
Paul Gross, M.D.
Wayland J. Hayes, Jr., M.D.

Herbert E. Stokinger, Ph.D., Chairman

Harold N. MacFarland, Ph.D.
Consultant
Fredrick T. McDermott
E. Mastromatteo, M.D.
Walter W. Melvin, M.D.
Ralph G. Smith, Ph. D.
Mitchell R. Zvon, M.D.

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INDUSTRIAL HYGIENE DIGEST
Literature and News

NEWS ITEMS

805 Discouraging Figures.

The economic loss from highway carnage continues to climb. The Insurance Information Institute has estimated that traffic accidents in March cost this country \$981 million, a figure that is about \$120 million over the comparable month for 1966. For the first quarter of 1967, the loss has climbed to \$2.78 billion, almost \$200 million over the 1966 quarterly total. In March there were 14.3% more traffic accidents than in the previous March and traffic injuries were up 6.9%. The National Safety Council reported 3,940 traffic deaths for March, 210 over the 1966 total.
-- Safety Maint. 134, 8 (Aug. 1967).

806 Encouraging Figures.

In 1963 the federal government passed the Clean Air Act to make industry and private citizenry do something to clean up the air we all breathe. In that year the total sales of the member companies of the Industrial Gas Cleaning Institute amounted to \$32 million. In 1964 the figure rose to \$45 million, in 1965 to \$53 million. In 1966 even more factories and private incinerators were installing electrostatic precipitators, mechanical collectors, fabric collectors, and wet scrubbers—to the tune of \$69-1/2 million in the United States and \$9 million in Canada. These figures do not include auxiliary equipment such as foundations, ductwork, instrumentation, cooling towers, fans, or motors. It is estimated that the Institute membership accounts for about 75 percent of the industrial air pollution and dust control equipment sold in the U.S. The progress indicated by these sales figures are encouraging, but the clean air program still has a vast amount of dusts, gases and fumes to precipitate.
-- Safety Maint. 134, 8 (Aug. 1967).

807 Hormones and Drugs in Heart Disease.

The role of hormones and drugs in heart disease is being studied under individual and blanket grants from the National Institutes of Health (NIH). The mechanism by which the hormone angiotensin controls blood pressure is the research project of Dr. H. Peter Metzger of the University of Colorado's chemistry department. Dr. Metzger finds that blood pressure correlates with the blood level of angiotensin. If the hormone's production and release mechanisms can be elucidated, certain kinds of blood pressure may be controlled, Dr. Metzger says. NIH grants totaling \$1.2 million to 19 new clinical centers brings to 55 the organizations participating in the study of blood cholesterol levels. The study seeks to find the relationship between long-term heart attack survival and levels of cholesterol and fatty substances in blood. Drugs such as ethyl chlorophenoxyisobutyrate, D-thyroxine, estrogens, and nicotinic acid lowered blood-lipid levels in previous tests and were not seriously toxic.
-- Chem. Eng. News 45, 41 (July 24, 1967).

808 Aspirin.

Tissue damage by aspirin is being investigated by scientists at Purdue University's School of Pharmacy, Lafayette, Ind. Using C-14-labeled aspirin, Erdie Morris, A. J. Noujaim, T. S. Miya, and J. E. Christian find that doses of 50 to 600 mg. per kg. in rats cause damage to stomach tissue. However, the Purdue workers conclude, localized breakdown by particles is not the sole cause of gastric tissue damage. Capillary wall damage may be important.
-- Chem. Eng. News 45, 41 (Aug. 14, 1967).

809 Pep Pills—A New On-the-Job Hazard.

Narcotic authorities are turning up well-supplied pep pill pushers in many companies having assembly-line workers. A major farm equipment manufacturer and a food processor report increased use. One worker's tool box, for example, contained 100 "bennies." Some executives are blaming this "underground" factory-safety problem on today's fast production pace and moonlighting. Many employers are reluctant to attack the problem for fear of stirring unfavorable publicity. The true extent of the drug menace is not known; but it may explain the underlying cause of some on-the-job accidents now blamed on poor judgment.

-- Natl. Safety News 96, 12 (Aug. 1967).

810 STP

The hallucinogenic drug STP has been identified by the Food and Drug Administration (FDA) as being identical to an experimental compound called DOM developed at Dow Chemical. The compound is 4-methyl-2, 5-dimethoxy-alpha-methylphenethyl-amine and is chemically related to mescaline (3, 4, 5-trimethoxyphenethylamine) and amphetamine (alpha-methylphenethylamine). Dow has filed no application for an investigational new drug (IND) exemption from FDA and has published no information concerning DOM. Little information on the toxicological, pharmacological, or therapeutic properties of the substance is available. Many persons who have allegedly used STP have suffered severe psychotomimetic reactions, FDA says. Because of lack of information on the effects of the substance, FDA considers its use potentially extremely hazardous.

-- Chem. Eng. News 45, 39 (Aug. 14, 1967).

811 Handling Organic Peroxides.

Nineteen incidents illustrating the dangerous potential of organic peroxides are contained in a new 90-page booklet, Fire, Explosion and Health Hazards of Organic Peroxides, published by the American Insurance Association. The publication lists the properties of almost 100 organic peroxides, points out why they are intrinsically unstable and potentially hazardous. It notes that the expanded use of the volatile chemicals is linked closely to the growth of the plastics industry, where they are utilized as chain reaction initiators in the manufacture of plastics. The growth in consumption of peroxide catalysts has been phenomenal. It has increased from 3.5 million pounds of concentrated organic peroxides in 1955 to about 15 million pounds at present. By 1969, it is expected to climb to 17.4 million pounds. The booklet offers precautionary recommendations for storage and handling of organic peroxides, including suggestions to manufacturers for storing specially classified forms of these chemicals in isolated areas, and a table showing the minimum distance for storage from flammable liquids, combustible materials in the open and from any building or highway. The publication, which costs 75 cents a copy, may be obtained by writing the Engineering and Safety Department of the American Insurance Association, 85 John Street, New York, N. Y. 10038

-- Safety Main. 134, 38 (July, 1967).

812 FDA's New Laboratory.

A Senate-House conference will decide where FDA's new laboratory will be located. As approved by the House, the appropriations for the Food and Drug Administration for fiscal 1968 included \$950,000 in planning money for a new laboratory (eventual cost \$14 million). However, the bill forbade construction of the new lab within a radius of 50 miles of Washington, D. C. This would have ruled out Beltsville, Md., (FDA's first choice) and favored Madison, Wis., (FDA's second choice). The Senate approved the planning money but knocked out the language restricting FDA's choice of a suitable location.

-- Chem. Eng. News 45, 35 (Aug. 14, 1967).

813 Public Health Service Awards Research Grants.

The Public Health Service awarded more than \$83.6 million in research grants and fellowships (including research career development awards) during June, according to Surgeon General William H. Stewart. Of the total, \$20 million is allocated to support 788 new projects, while \$63.6 million is to continue 1347 previously approved research grants totaling \$55.7 million and 494 fellowships amounting to \$7.9 million. Of the new projects, research grants were made to 205 institutions.

-- Chem. Eng. News 45, 39 (Aug. 14, 1967).

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814 Disposal of Unwanted Pesticides.

Safe methods to dispose of unwanted pesticides and their containers may be developed at Mississippi State University under a \$111,864 grant from the U.S. Department of Agriculture. Mississippi State scientists Dr. B. J. Stojanovic, Dr. F. L. Shuman, Jr., and Dr. M.V. Kennedy will direct the three-year project. They will study combustion temperatures and volatile products of some pesticides; chemicals as possible aids in decomposing pesticides and decontaminating used containers; and the decomposition of pesticides by microorganisms in soil.

-- Chem. Eng. News 45, 41 (July 24, 1967).

815 Fluoride Drinkers Increase.

Americans in 5445 communities in the U.S. now drink fluoridated water, according to the Public Health Service. More than 62 million consumers live in 3145 communities where water is adjusted to the proper fluoride level, and 10 million people live in 2300 communities where the water contains sufficient natural fluorides to protect teeth.

-- Chem. Eng. News 45, 86 (Aug. 14, 1967).

COMING EVENTS

- 816 Oct. 2- 4 Automation in Analytical Chemistry, Annual Technicon Symposium, New York, N.Y.
 Oct. 2- 5 American Petroleum Institute, API Division of Refining, Autumn Meeting, Dallas, Texas.
 Oct. 2- 6 17th Annual Instrument Symposium & Research Equipment Exhibit, Bethesda, Md.
 Oct. 3- 5 American Council of Independent Laboratories, Annual Meeting, Atlanta, Ga.
 Oct. 4- 6 Ultrasonics Symposium, Bayshore Inn, Vancouver, B.C.
 Oct. 7-12 Institute of Sanitation Management, National Conference and Exposition, Washington, D.C.
 Oct. 8-11 ASTM Committee E-19, The Practice of Gas Chromatography, San Francisco, Cal.
 Oct. 8-13 Water Pollution Control Federation. Conference, New York, N.Y.
 Oct. 9-12 Association of Official Analytical Chemists, 81st Annual Meeting, Washington, D.C.
 Oct. 10-11 Industrial Hygiene Foundation, 32nd Annual Meeting, Chatham Center, Pittsburgh, Pa.
 Oct. 10-12 11th Conference on Analytical Chemistry in Nuclear Technology. Gatlinburg, Tenn.
 Oct. 12-13 Selenium-Tellurium Development Association. International Symposium on Physics of Selenium and Tellurium, Montreal, Quebec.
 Oct. 15-20 American Occupational Therapy Association. Boston, Massachusetts.
 Oct. 18-20 Association of Life Insurance Medical Directors, Hartford, Conn.
 Oct. 20-24 American Heart Association, San Francisco, California
 Oct. 21 Conference of State and Provincial Health Authorities of North America, Miami Beach, Florida.
 Oct. 23 American Association of Poison Control Centers, Washington, D.C.
 Oct. 23 American Society of Safety Engineers, 6th Annual Conference, Chicago, Ill.
 Oct. 23-24 National Academy of Sciences, Fall Meeting, University of Michigan, Ann Arbor, Michigan.
 Oct. 23-27 American Public Health Association, 95th Annual Meeting, Miami Beach, Florida.
 Oct. 25-27 American Society for Microbiology, 7th Interscience Conference on Antimicrobial Agents & Chemotherapy, Chicago, Ill.
 Oct. 25-27 Parenteral Drug Association, Annual Convention, New York, N.Y.
 Oct. 26-27 Eye-Bank Association of America, Chicago, Ill.
 Oct. 27-28 Burn Research Seminar (8th Annual) Birmingham, Ala.

LEGAL DEVELOPMENTS

817 Criteria For Lead.

The nation's first criteria for lead in the ambient air (5 micrograms/cu. m.) has been established and passed by the Pennsylvania Air Pollution Control Commission. The level set is significant because it will likely be used as an example for other highly populated industrial states contemplating the setting of criteria for lead. Also passed by the commission was a criteria of 1.5 milligrams per sq. cm. per month for settleable particulates, not to be exceeded in any three successive samples. The approved criteria for carbon monoxide was set at 25 ppm for a 24-hour average.

-- Air Eng. 9, 8 (July, 1967).

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BOOKS, PAMPHLETS AND NOTICES

- 818 Malformations and Amputations of the Upper Extremity. Treatment and Prosthetic Replacement. G. Jentschura, K.H. Mueller, and C.N. Lambert. AVAILABLE FROM: Grune & Stratton, Inc., 381 Park Ave., South, New York, N.Y. 10016. 124 pp. (July 21, 1967). PRICE: \$7.75.

A translation from the German, this book is a very definitive work, covering the subject of prosthetic replacement in great detail, with numerous illustrations. It will be of value to all those in industry responsible for directing and supporting rehabilitative efforts following amputations in adults or congenital absence of limbs in children (amelia, phocomelia, ectromelia, and peromelia) of the type which has been found to be associated with thalidomide, for example.

-- RTPdeT.

- 819 How to Keep Fit and Enjoy It. A Step-by-Step Approach to Fitness After 30. Revised, June, 1967 ed. W. R. Guild. Special edition published in association with Corn Products Co. by Benjamin Company, Inc., 485 Madison Avenue, N.Y. 10022. 170 pp. PRICE: not given.

In 1962 when this book was first published it brought together for the first time in one place a collation of certain "universally applicable and helpful ground rules" on this important subject. Dr. Paul Dudley White said (in the preface) "...keeping fit does pay richly in dividends of health and longevity. Many laymen have independently discovered for themselves—though not as yet adequately advised by the medical profession, absorbed as it is in the diagnosis and treatment of disease—that keeping fit has kept them not only healthier in body but also keener in mind and more vigorous and at the same time more tranquil in spirit. As a cardiologist I have concluded from my practice of more than 40 years and from current scientific investigations that keeping fit also delays in all probability the onset of crippling rusting of the arteries themselves, which we call atherosclerosis, the great epidemic of today. I can heartily recommend this book." This edition dated June 1967 contains certain revisions of importance such as an admonition against deep knee bends ("squats"), rigorous efforts at toe-touching, and straight-leg raises (lying supine and bringing up extended legs repeatedly) except where part of a specific rehabilitation program. Cutting out smoking and use of polyunsaturated fats in the diet are recommended.

-- Cond. from Preface & Intro.

Editor's Note: Another in this series, "Your Heart Has Nine Lives" by A. Blakeslee and J. Stamler, appeared as Abstract No. 927 in the Oct. 1966 issue of the Industrial Hygiene Digest.

- 820 Research on Oxygen Toxicity at the Cellular Level. W. H. Riesen, et al. AVAILABLE FROM: Chief, Storage and Dissemination Section, Clearinghouse for Federal Scientific & Technical Information, Sills Bldg., 5285 Port Royal Rd., Springfield, Virginia 22151. 76 pp. (July, 1967). PRICE: not given.

The use of pure oxygen atmospheres at reduced pressure in manned spacecraft has stimulated new research interest. Exposure of humans to pure oxygen at total pressures of 5 to 7 psia for up to 30 days has generally produced only subjective and occasional symptomatic distress. Nevertheless, studies with animals have clearly documented toxicity if the exposure to pure oxygen is at higher total pressures. The selection of suitable oxygen atmospheres for manned space flight and the development of protective measures against toxic manifestations will be considerably facilitated by a clearer understanding of the toxic syndrome. Rats, dogs, and monkeys were exposed to pure (98.5%) oxygen at 1 atm and 1/3 atm in a closed, recirculating chamber and in a non-recirculating chamber. Rats exposed at a pressure of 1 atm showed significant reduction in efficiency of liver mitochondrial oxidative phosphorylation. Only preliminary experiments with the dogs and monkeys were conducted, therefore no conclusions can as yet be made. There is an indication that monkeys are more resistant to oxygen toxicity at 1 atm than rats.

-- Cond. from Abstract

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INDUSTRIAL MEDICAL PRACTICE

- 821 Who Should Learn External Cardiac Massage? W. R. Lee.
Trans. Soc. Occ. Med. 16, 94-97 (Oct. 1966).

Although external cardiac massage is effective, the low success rate, except in the operating suite, indicates that more could be learned about the indications for its use. This is especially true when it is remembered that it should not be used to add one more indignity to the life (or death) of a hopelessly ill patient (J. D. Johnson, J. Am. Med. Assn. 186, 468-472 (1963)). Furthermore, five years' experience has shown that, in the hands of carefully trained persons, serious damage is relatively uncommon. These observations suggest that while this technique should be known by first aid personnel careful attention should be paid to the teaching. Competency in the possibly dangerous technique of external cardiac massage demands a high standard of first aid. It has been suggested that only selected persons who already possess a knowledge of first aid should be taught the technique, so that a longer period may be devoted to training, and the candidates should be specially examined in cardiac massage. There is a precedent for this in the training of selected first aiders in mines to give morphia. If it is considered that external cardiac massage should form a part of the basic first aid training there are strong reasons for suggesting that considerably more time should be devoted to it—even if this is at the expense of some of the traditional topics still included.

-- Author's conclusions cond.

- 822 Closed Chest Cardiac Massage. S. Miles.
Trans. Soc. Occ. Med. 16, 15-18 (Jan., 1966).

Although closed chest cardiac massage is now an established and effective procedure, there are many aspects of its use, which still remain to some extent controversial. This is particularly true in industry where some organizations seem to be more influenced by fears of claims for compensation for damage done during massage than by humanitarian demands. The recent history of the introduction of closed chest cardiac massage covers the past five years and although in 44% of cases a return of heart beat is achieved the ultimate recovery rate is about 18%. Attention to detail in carrying out the technique is of paramount importance and provided that this can be assured the method should be widely taught in conjunction with that of exhaled air resuscitation. Cardio-respiratory resuscitation is, however, an interim measure to postpone the onset of death. It must be followed by more strenuous emergency hospital treatment and a period of intensive care.

- 823 Sudden Deafness Associated With Adenovirus Infection. B. F. Jaffe and H. F. Maassab.
New. Engl. J. Med. 276, 1406-1408 (June 22, 1967).

Sudden deafness occurred in a 37-year-old white female who was proved to have an acute upper respiratory infection due to adenovirus type 3. The hearing loss was severe in the left ear and mild and unnoticed in the right ear. Recovery of hearing occurred gradually over a nine-month period, but was incomplete in the left ear. This is the first patient reported with sudden deafness caused by virus which was proved by isolation of the virus and by a diagnostic rise in antibody titer to the same isolate.

-- J. Am. Med. Assn. References & Reviews

- 824 Sudden Deafness. B. F. Jaffe.
Arch. Otolaryngol. 86, 55-60 (July, 1967).

Sudden unilateral deafness is an otological emergency since recovery depends on prompt therapy. Sudden deafness can be a complication of viral infection, vascular disorders, metabolic toxicities, trauma, postoperative status, pregnancy, and a large group where no cause is recognized. It is probable that the common pathway for the sudden deafness is a sudden vascular occlusion. Viral infections can cause vascular obstruction by three mechanisms. Arteriosclerosis, hypercoagulation, hyperviscosity, and increases in platelet number and adhesiveness can each produce sudden vascular obstruction. Treatment consists of immediate hospitalization so that therapy can be aimed at improving the blood flow in the inner ear.

-- J. Am. Med. Assn. References & Reviews

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- 825 Sensorineural Hearing Loss for Low Tones. T. Iinuma et al.
Arch. Otolaryngol. 86, 110-116 (July, 1967).

Investigation of 41 cases of bilateral sensorineural hearing loss for low tones suggests that this type of hearing loss might originate from various sites in the auditory system. A combined approach with vestibular function tests did not yield any definite parallelism as to the sites of lesions. Conflicting data obtained in the same patients suggest either that the present hearing tests cannot be completely relied upon, or, that in the present cases several portions of auditory system are actually involved. The latter possibility appears a more likely explanation. Taking into consideration insidious onset of hearing loss at younger ages, a slowly progressive course of the hearing loss, and the tendency to occur in the same family, some degenerative change in the auditory system resulting from some hereditary disturbance is suggested as the possible causative agent. Polytomography was not performed.

-- J. Am. Med. Assn. References & Reviews

- 826 Medical Complications of Contact Lenses and Their Aeromedical Implications. S. Diamond.
Aerospace Med. 38, 739-741 (July, 1967).

Complications and serious ocular sequelae occur in a noteworthy number of contact lens wearers. If any one of these acute medical complications had occurred in a commercial pilot, it would have meant an unexpected period of disability, a layover, with possible visual defects. He would have become a liability to himself as well as to his employer, caused unnecessary disruption of schedules, and posed a hazard to his future career. It would seem to be an unnecessary personal risk for a transport pilot to wear contacts, if the refractive error could be corrected simply by spectacles. Contacts may be a blessing to overcome a disability and keep an experienced pilot in the air, with adequate safeguards of multiple crew. This has been accomplished in certain selected cases. If one pilot wears a contact lens, the co-pilot should not. The insurance companies offering pilot disability insurance, also have a stake in this question. It is to their advantage to keep experienced pilots in the air, but detrimental to their interests to have disabilities which could have been avoided by a simple spectacle correction. Complications causing in-flight rejection of lenses, or effects of spatial confusion might be an additional hazard to aviation safety. Five references are given.

-- Author's comment

- 827 Eye-Survey Study of Nuclear-Reactor Workers. G. L. Voelz.
J. Occ. Med. 9, 286-292 (June, 1967).

The results of a 13-year special slit-lamp eye examination program on nuclear reactor workers indicates that no lens changes related to occupational radiation exposure were identified. The need for such special eye examinations in radiation workers appears to be limited to a few special circumstances in which the radiation exposures are particularly difficult to measure. Medicolegal problems due to cataracts that are clinically similar to radiation type cataracts can arise in any person in radiation areas. Four illustrative cases are briefly described. It is essential to have well documented personnel and plant radiation records which will give reliable dose determinations for employees. Periodic physical examinations on all radiation workers should include an ophthalmoscopic examination of the eye with particular attention to the lens, regardless of exposure history. There are 15 references.

-- Author's summary

- 828 Review of Human Cholesterol Metabolism. C. B. Taylor and K. J. Ho.
Arch. Pathol. 84, 3-14 (July, 1967).

Current knowledge of man's cholesterol metabolism indicates a quite meager capacity for maintenance of homeostasis. There is an essential absence of hepatic "feedback" mechanism for compensation for absorbed dietary cholesterol. In man there is a continuous unaltered rate of delivery of endogenously synthesized cholesterol to the plasma regardless of dietary cholesterol absorption. The ability of the human organism to increase fecal output of cholesterol and bile acids when absorbing large quantities of cholesterol is also minimal. Man's principal protection from diet-induced hypercholesteremia is his limited capacity of intestinal absorption. Possible sequestration of excess amounts of cholesterol in compartments such as skeletal muscle skin and connective tissue may be an important homeostatic mechanism. Since only about 10% of the body's cholesterol is in the plasma-erythrocyte-hepatic pool, it would seem that the other 90% of body cholesterol deserves study.

-- J. Am. Med. Assn. References & Reviews

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- 829 Back Injuries and Disabilities. C. J. Mock.
J. Occ. Med. 9, 293-298 (June, 1967).

Injuries to the bones, joints, and soft tissues of the back are discussed from the standpoints of mechanism of injury, symptoms and signs, diagnosis, treatment, prognosis, and permanent disability. The differential diagnosis, particularly of herniated disc, is considered, including differentiation of radiating from referred pain. Sundry soft-tissue conditions frequently confused with disc protrusion are described. Conservative treatment is described in some detail, including the proper use of physical therapy and mechanical back supports, and the importance of exercise. Short and long-term results of conservative treatment are shown to compare favorably with those of surgical treatment. Emotional factors are described as frequently playing a role in cases of low back pain. Medicolegal aspects of back injuries are discussed. There are 16 references.

-- Author's summary

- 830 The Employability of the Epileptic Sufferer. A. V. Bird.
Med. Proc. (Johannesburg) 12, 238 (June 4, 1966).

Of the 382 patients with epilepsy examined within a period of 3 years, the majority are successfully employed. Among the patients advised to change occupation were a boiler maker, a miner, a winding-engine driver, a mine electrician, and an apprentice fitter. One may consider 50% of all epileptic persons as completely free of seizure under proper treatment and another 30% as having occasional relapses, but not sufficient to interfere with employment. Probably less than 10% of all patients present evidence of steady deterioration and only 20% may need sheltered occupations. A brief description of five patients encompasses the range of problems and successes encountered in the employment of epileptics.

-- J. Occ. Med. Absts.

- 831 Tobacco Habits in Carcinoma of the Upper Respiratory Tract. C. L. Dykstra and W. I. Dunn.
Arch Otolaryngol. 86, 79-81 (July, 1967).

A series of 427 cases of oral and upper respiratory-tract epidermoid carcinomas have been classified as to location and type of tobacco used. The authors' opinion is that tobacco is a major etiological agent in the production of carcinoma of these areas. It is a good practice to discourage tobacco usage, especially in patients with chronic inflammatory changes, hyperplasia, or leukoplakia of the respiratory tract or oral mucosa. Some effort has been made to filter the tars and nicotine out of the smoke but the filter's effect has been thwarted by the use of cheaper and stronger tobacco so the net gain has been minimal. If any significant reduction in the death rate from carcinoma of the oral and respiratory tracts is to be made, it must take the form of prevention rather than cure.

-- J. Am. Med. Assn. References & Reviews

- 832 Morphological Constitution and Smoking. A Further Evaluation. J. M. Peters and B. G. Ferris, Jr.
Arch. Environmental Health 14, 678-681 (May, 1967).

A total of 1,972 Harvard College students from the classes of 1964 and 1965 was investigated with regard to smoking habits and health. Among other variables, height and weight were examined. There were no significant differences found between smokers and nonsmokers in height and weight. There were significant differences in age and religious categories between smoking groups. Nonsmokers were younger and contained more Jews than smokers. It was also noted that Jews were significantly smaller than non-Jews. This would offer an explanation for the findings of Seltzer which have created some controversy. There are 13 references.

-- Authors' summary

- 833 The Gas Phase Toxicity of Cigarette Smoke for Paramecium. W. Weiss and Winifred A. Weiss.
Arch. Environmental Health 14, 682-686 (May, 1967).

The cells of *Paramecium aurelia* died when exposed in a hanging drop to cigarette smoke gas phase in a Rose perfusion chamber. Survival time is inversely related to gas concentration. The relationship is linear on semilogarithmic coordinates between 100% and 10%. At lower concentrations survival time becomes progressively longer and more variable within a 90-minute period of observation. Concentrations of 1.25% do not usually cause death of the protozoa but produce a significant diminution in motility as recorded by a photographic technique.

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Thus, a simple method is available for the semiquantitative bioassay of cigarette smoke gas-phase toxins, and it may be useful for the study of the toxicity of expired air in smokers during and after smoking. There are 10 references.
-- Authors' summary

- 834 Smoking Patterns and Specialty Training of Oregon Physicians. M. Weitman and S.S. Meighan. Cancer 20, 974-982 (June, 1967).

The effects of the current anti-smoking campaign on the smoking habits of physicians were studied specifically as related to: (1) probable level of familiarity with pathology imputed to smoking as estimated from type of specialty practice, and (2) probable amount of exposure to the campaign as estimated by rural-urban site of practice. A pre-coded questionnaire was mailed to all members of the Oregon Medical Association residing in Oregon in May 1964; 1,790 (90%) usable, completed questionnaires were obtained. The type of medical specialty practice was found to be related to present smoking habit, mention of smoking as a cause of cancer, the number of illnesses attributed to smoking, and the frequency and recency of cessation of smoking; the type of medical practice is not related to the degree of hazard ascribed to smoking or to the stated reason for stopping smoking. The geographical location of an Oregon physician's medical practice is not related to these variables. These and other reported findings suggest that anti-smoking campaigns, by themselves, may produce marked changes in the smoking habits of some individuals but these represent only a rather small minority of the population. To attain more widespread reduction in smoking it will be necessary to employ a broad and diversified array of approaches.

-- J. Am. Med. Assn. References & Reviews

- 835 Risk of Staphylococcal Infection Among Human Beings and Animals in a Veterinary Hospital Environment. S. L. Silberg, D. C. Blenden, and A. Novick. Am. J. Vet. Research 28, 267-273 (Jan. 1967).

There is no significant difference between staphylococcal infection rates in faculty, staff members, and veterinary students exposed to the veterinary hospital and clinic and the rates of those not exposed. Although outpatient and hospitalized animals occasionally harbored the same phage types that were in the human population, there was little evidence to indicate these types were directly transmitted from animals to man. There are 10 references.

-- Public Health Eng. Absts.

- 836 Exposure of Man to Rabies. S. L. Hendricks. J. Am. Vet. Med. Assn. 149, 1648-1650 (Dec. 15, 1966).

Closer interprofessional liaison between physicians and veterinarians in a community is suggested as a method of precluding communication breakdowns in instances of definite exposure of man to rabies. Six references are given.

-- Summary cond., Public Health Eng. Absts.

- 837 Major Zoonoses of Primates. S. F. Mattingly. J. Am. Vet. Med. Assn. 149, 1677-1680 (Dec. 15, 1966).

Primates harbor many diseases that are debilitating or lethal to man, making working conditions hazardous for research workers. A management system must be employed to reduce exposure to pathogens by means of a sound personnel health program. There are 10 references.

-- Public Health Eng. Absts.

- 838 Development of Rabies Inhibiting Substance in Skunks Infected With Rabies Virus. R. L. Parker and R. K. Sikes. Public Health Repts. 81, 941-944 (Oct. 1966).

Rabies inhibiting substance (RIS), shown to develop late in the clinical course of rabies infection, may produce in vivo neutralization rabies virus to various degrees. RIS in tissues may interfere with the diagnosis of rabies by mouse inoculation, but does not appear to affect the diagnosis of rabies by the fluorescent antibody technique. In skunks and foxes, fluorescent antibody and mouse inoculation tests of rabies may be in disagreement. If either of these tests is positive, a diagnosis of rabies is valid. There are 12 references.

-- Authors' abst., Public Health Eng. Absts.

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- 839 Primary Coccidioidomycosis. P. L. Roberts.
Military Med. 132, 625-633 (Aug., 1967).

Coccidioidomycosis is a disease of relatively low mortality, but it is of considerable military importance because of high morbidity in endemic areas and the fortuitous geographic disposition of military bases in these areas. Indeed, it is in the military population that the disease has been most extensively studied. Coccidioidomycosis was first reported by Posadas and Wernicke in an Argentine soldier who developed tumors of the skin in 1887 and died with a chronic febrile, military disease in 1898. The sporangium of Coccidioides immitis was described at that time; it was thought to be a protozoan similar to Coccidia of fowl. Similar cases of fatal coccidioidal granuloma were reported subsequently from California and Texas. It was not until 1936 that Dickson and Gifford associated this malady with the benign San Joaquin Valley fever which was well recognized throughout the southern Central Valley of California. Valley fever consisted of acute respiratory infections associated with erythema nodosum and variable joint manifestations. Following recognition that fatal coccidioidal granuloma was an unusual progressive form of this entity, the natural history of primary coccidioidomycosis was delineated. Coccidioidal disease has been very carefully studied and a large body of ecological, epidemiological and clinical data has accumulated. Amphotericin B remains the only effective antimicrobial agent for C. immitis, however, toxicity precludes its use in uncomplicated primary infections and makes its use in complicated infections less than optimal. Dust control measures which can reduce morbidity among transient military populations could not affect morbidity among life-long residents. Considerable effort is being directed toward the development of an effective vaccine which would afford more ideal protection. With rapid troop movements and increased travel through endemic areas, coccidioidomycosis has been detected with increasing frequency in places far removed from endemic areas. There are 58 references.

- 840 Surgeon's Glove Powder (Starch) Middle Ear Granuloma. E. H. Rock.
Arch. Otolaryngol. 86, 8-17 (July, 1967).

Surgeons have used different glove powders. Complications of starch in the abdomen is a known entity. Two cases of extensive granulomas involving the middle ear and mastoid followed routine stapedectomies. Studies showed that starch in the form of glove powder was the causal agent acting as a foreign body in granuloma formation. There is complete destruction throughout the middle ear and mastoid with direct invasion of the inner ear. Eventually, radical surgery was necessary to eliminate the granulomas. Excess powder on the hands and gloves is condemned. If powder is used, all operating room personnel should wash it from their gloves. However, powder-free gloves and hands is the sine qua non for the prevention of starch middle ear granulomas. The complete elimination of the use of the powder either on the hands or the glove by all operating personnel is stressed.

-- J. Am. Med. Assn. References & Reviews

- 841 The Bacterial Flora of the Skin and its Relation to Post-Operative Wound Infection.
T. Black. Trans. Soc. Occ. Med. 16, 18-23 (Jan., 1966).

An outline has been given of the bacterial flora of the skin and an attempt has been made to assess its relationship to post-operative wound infection. The patient's skin, nose and hair harbour germs capable of giving rise to such infections. By the use of bacteriophages it was shown that certain strains of Staphylococcus aureus causing post-operative wound infection were carried by the patient in one or other of these sites before operation; other pathogenic bacteria similarly carried were found in post-operative wound infections but a direct causal relationship could not be shown by the methods available.

-- Author's summary

- 842 Body Temperature Monitoring in the External Auditory Meatus. L. V. Gibbons.
Aerospace Med. 38, 671-675 (July, 1967).

The data substantiated a positive correlation between sublingual and aural temperatures. The method and ear temperature monitoring device described in this report can be employed to predict oral temperature within $\pm 0.60^\circ$ F at the 95 per cent confidence level. The differences in what might be termed critical response time, i.e., time differences in reflecting temperature rise and time to reach maximum temperature, were never greater than two minutes. When all of the data were considered, ear temperatures averaged almost 1.0° F below oral temperature but some data here as well as in the literature suggests that the temperature

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difference was a function of the positioning of the thermistor on the wall of the meatus. Differences between subjects in ear thermistor placement relative to the tympanic membrane may have been a major contributing factor in the $\pm 0.60^\circ\text{F}$ error associated with oral temperature prediction. When properly inserted, the ear plug was well tolerated by all subjects; however, care must be taken to insure that no pressure points exist. In any situation requiring rapid movement and continuous monitoring, the device should be advantageous. Treadmill studies, investigations of the physiology of exercise, field evaluation of protective clothing and equipment, etc., are notable examples. Widespread use might also be found in certain long term animal studies, where rectal probes are not feasible.

- 843 Autopsy Incidence of Diseases Among Southwestern American Indians. D. D. Reichenbach. Arch. Pathol. 84, 81-86 (July, 1967).

An autopsy study of 328 American Indians from southwestern tribes, representing about one fifth of all southwestern Indian deaths over a five-year period, showed that the incidence of malignant disease among this group is not decreased. The gallbladder and biliary tree were the most frequent primary site of malignancy, and its incidence was more than six times that for the general population. Carcinoma of the stomach, colon, and lung fell below the incidence expected for the general population. The prominence of diabetes mellitus, congenital malformation, active tuberculosis, and portal cirrhosis in southwestern Indians suggests that there are genetic, socio-economic, and environmental factors in this population which differ from those of the general population. -- J. Am. Med. Assn. References & Reviews

SKIN DISEASES AND BURNS

- 844 Levitation in Treatment of Large Area Burns. J. T. Scales, et al. Lancet 1, 1235-1240 (June 10, 1967).

In the treatment of large areas burns, patients can be supported on an air cushion bed which uses pressures less than those obtained by normal support on buttocks and shoulders. The bed consists of a series of air pockets which deform to the shape of the patient and maintain an air seal. Volunteers found the bed comfortable, and no physiological changes were noted. In two cases of large area burns the wounds dried rapidly. Sterile air environment was provided to reduce the risk of bacterial infection.

-- J. Am. Med. Assn. References & Reviews

CHEMICAL HAZARDS

- 845 Toxic Hazards in the Manufacture and Use of Surface Coatings. J. Steel. Paint Technol. 30, 26-34 (Nov., 1966).

The recognition of the hazards inherent in the handling of more than 2,000 raw materials is a prerequisite for any program to promote healthy working conditions among the 50,000 workers involved in the manufacture of paints, varnishes, lacquers, and printing inks. The maximum allowable concentrations assigned by the British Ministry of Labor are given for a large number of materials used in the manufacture of paint. Although there has been a steady decline in the incidence of lead poisoning over the last few decades, 1/6 of the 407 cases in the 1960-64 period were caused by the manufacture and industrial use of lead paints, enamels, and pigments. The problems of the newer hazards such as toluylene diisocyanate which because of its potential for sensitizing action has required an extremely low maximum allowable concentration of 0.02 ppm are discussed. The hazards from the degradation of surface coatings during burning or cutting operations are discussed. The application of research to the development of safer paints is advocated. Any toxic hazard involved in the manufacture or use of surface coatings can be controlled. -- APCA Absts.

- 846 Accidental Child Poisonings. S. E. Gould. J. Am. Soc. Safety Eng. 12, 5 (Aug., 1967).

A national problem, which has been becoming increasingly acute, is accidental poisonings. The latest statistics show that 1,000,000 persons are exposed to this hazard annually. Of this figure, 600,000 are children and 400,000 are children under five years of age. Efforts

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to combat this problem have been sporadic and generally ineffective. They consist mainly of a once-per-year "Poison Prevention Week" and small local programs of poison prevention committees, usually timed to coincide with the national effort. The basic problems are lack of thorough communications and lack of adequate safe packaging methods. The entire field of child safety has not received the attention it deserves.

- 847 Behavioral Measure of Effect of Carbon Monoxide on Rats. H. D. Goldberg and M. N. Chaplin. Arch. Environmental Health 14, 671-677 (May, 1967).

Carbon monoxide was selected as the contaminant to be studied first by behavioral methods. Originally, interest in carbon monoxide was associated chiefly with mining. Current interest is associated chiefly with its production through combustion—in space heating, automotive engines, industrial and power plants, in disposal of combustible refuse and in smoking. The direction of the authors' search for a potentially sensitive measure of effects of carbon monoxide on behavior was influenced by reports of successful application of modern conditioning techniques in measuring effects of certain industrial air pollutants on the behavior of animals, but no systematic program for behavioral study of any air pollutant seems ever to have been undertaken. This paper presents some results of early explorations of methods and apparatus which might be employed in such a systematic program. Carbon monoxide might effect behavior at any or all of four levels, development of biological functions and activities, unlearned general activity level (over-all drug-like effect), simple learned performance, and acquisition of complex learned behavior, such as reversal of a previously learned discrimination. To simplify the experimental problem, nonverbal organisms—initially white rats—were selected as subjects. There are 10 references.

- 848 Significance of Carbon Monoxide as an Air Pollutant. P. M. Giever. J. Occ. Med. 9, 265-270 (June, 1967).

Carbon monoxide is one of our most common asphyxiant gases; its acutely toxic characteristics are well known and of great concern. Toxicity of exposures below the level of subjective symptoms has yet to be more thoroughly explored, although some research data have indicated that such toxic exposure does exist. The significance of this chronic effect is not clearly indicated at this time, and even though changes in physiological reactions have been shown to occur, it has not been established that such changes are injurious in any way. Adequate methods for the evaluation of carbon monoxide in the laboratory, both for the gas and for blood carboxyhemoglobin, are available, although as is true for many procedures, experience and careful manipulation in both sampling and analysis are necessary to yield reproducible results within the required accuracy. Instruments for continuous sampling and analysis employing a nondispersive infrared method have proven to be satisfactory for laboratory and field studies, and grab-sampling devices of somewhat lesser accuracy are adaptable to industrial health applications. Surveillance and education must be continued to curtail the frequency of excessive exposure in the home and accidental injury in industry resulting from ignorance or improper control measures. Continued research into the significance of detectable changes in reaction at low concentrations is imperative to retain the proper perspective in regard to the relationship of concentration to damage or impairment of bodily functions. There are 21 references.

-- Author's summary

- 849 Control of Gaseous Fluoride Emissions. A. J. Teller. Chem. Eng. Progr. 63, 75-79 (March, 1967).

Fluoride effluents from industrial operations vary in both composition and concentration of the process involved. The design and selection of equipment for recovery of a specific chemical constituent may vary as a function of the process source. The primary problems in the design of recovery systems are multiple contaminants within a single effluent stream, low concentration of inlet gas and requirement for effluent, limitation in choice of scrubbing medium, solids formation resulting from absorption of contaminants, multiple product use requirement for recovery vessels, and low pressure drop requirements for the system.

-- APCA Absts.

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- 850 Data to Substantiate the Hygienic Standard Content of Tellurium in Water Bodies. V. G. L'nchenko. *Gigiena i Sanit.* 32, No. 1, 15-18 (1967). Russian.

Because oral doses of from 0.005 to 1.0 mg. of sodium tellurite per kg caused functional and morphological shifts in the body of experimental animals, the author recommends that the maximum permissible concentration of tellurium in water bodies be 0.01 mg./liter. There are 8 references.

-- English abst. cond., Public Health Eng. Absts.

- 851 Effect of Nitrogen Dioxide on Resistance to Respiratory Infection. R. Ehrlich. *Bacteriol. Rev.* 30, 604-614 (Sept., 1966).

The effects of acute and chronic exposures to nitrogen dioxide (NO_2), one of the most abundant atmospheric contaminants in many communities, on the resistance to infection produced by respiratory challenge with airborne *Klebsiella pneumonia* is discussed. The reduction in the resistance to infection by a synergistic effect provides a sensitive indicator of the biological effect of NO_2 . A single two-hour exposure of inbred mice to 3.5 ppm of NO_2 before or after respiratory challenge with aerosol of *K. pneumonia* significantly increases the mortality. The same effect produced in squirrel monkeys and hamsters required 35 ppm for two hours. The effect of a single two-hour exposure was not persistent and a return to normal resistance to infection occurred in hours after the NO_2 exposure. Exploratory studies of the mechanism of the increased susceptibility to infection suggests that the NO_2 permits better colonization in the lungs of mice and hamsters. Extrapolation of this work to man or to the resistance to other species of pathogenic organisms can be only speculative.

-- APCA Absts.

- 852 Enzyme Alterations Following Nitrogen Dioxide Exposure. R. D. Buckley and O. J. Balchum. *Arch. Environmental Health* 14, 687-692 (May, 1967).

Oxygen consumption (QO_2) and aldolase and lactic dehydrogenase (LDH) determinations were performed on guinea pig lung, liver, kidney, and spleen tissue homogenates following continuous exposure to 10 ppm nitrogen dioxide (NO_2) for varying periods of time. Inhalation of NO_2 resulted in increased QO_2 values not only in the lung but also in kidney tissue for each exposure period. The QO_2 in the liver and spleen homogenates were significantly elevated following 32 days' exposure but did not show a consistent increase after other exposure periods. Aldolase activity was significantly elevated in lung following 12 days' exposure and in lung and liver following 32 days' exposure to NO_2 . Significant decreases in aldolase activity were noted in lung, kidney, and spleen after 26 days' exposure. The LDH values were increased in lung, liver, and kidney as a result of inhalation of NO_2 . The possibility of the presence of circulating substances resulting from the interaction of NO_2 and lung or blood tissue or from a general physiological "stress" reaction or both were suggested as possible explanations for enzyme and QO_2 alterations observed in kidney, liver, and spleen. The possible effects of respiratory infection (L-form of *Pseudomonas aeruginosa*) on the metabolism of lung tissue was also discussed. There are 22 references.

-- Authors' summary

- 853 Pulmonary Mechanics Associated With Oxygen Toxicity and a Suggested Physiological Test for Susceptibility to the Effects of Oxygen. E. J. Burger, Jr., *Aerospace Med.* 38, 507-513 (May, 1967)

Five healthy male subjects were exposed to pure oxygen at 0.39, 0.5, 1.0, and 2.0 atmospheres absolute for a three-hour period each. The subjects were admonished not to take deep breaths during the period of exposure. Transpulmonary pressures were measured at known absolute lung volumes following exposure and were compared with air control curves. The results of these measurements and of their relationship to symptoms indicated that absorption atelectasis had occurred in 14 of 24 trials. Further evidence for this phenomenon was obtained by comparing the results of these experiments with others in which atelectasis had purposely been provoked. These results were contrasted with apparent direct toxicity of oxygen during an additional, prolonged exposure to oxygen at 2.0 atmospheres.

-- J. Am. Med. Assn. References & Reviews

- 854 Hematologic Effects of Increased Oxygen Tensions. H. P. Kaplan. *Aerospace Med.* 38, 676-685 (July, 1967).

Exposure of humans and experimental animals to increased oxygen tensions has yielded conflicting data. Resultant depressions in hemoglobin, hematocrit and red blood cells, without

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compensatory reticulocytosis, have been reported but have not been consistent findings. Recent human exposures to simulated space-craft atmospheres (100 per cent oxygen at 258 mm. Hg) have failed to show any evidence of oxidative hemolysis except in one controversial study. However, Gemini astronauts exposed to this atmosphere for 4 to 14 days have developed transient and reversible depletions of circulating red cell mass, the etiology of which is unclear. It has been shown that exposure to hyperbaric concentrations of oxygen (1500-3000 mm. Hg) causes hemolysis in trocopherol deficient animals, probably by peroxidation of unsaturated lipid in the red cell membrane. In addition, the blood of normal animals, similarly exposed, subsequently demonstrates decreased resistance to in vitro hemolytic stress. Blood from animals exposed to isobaric concentrations of oxygen (760 mm.Hg) contains significantly increased numbers of morphologically and physiologically "older" red cells, also more susceptible to lysis. Whether these effects can be extrapolated to the smaller increase in oxygen tensions present in space-craft atmospheres is unclear. There are a number of components within the red cell that could be significantly and, perhaps, detrimentally altered by slight changes in oxygen tension. These include the lipid of the cell membrane, the hemoglobin, oxygen sensitive enzyme systems in the glycolytic pathway, intracellular pyridine nucleotides, intracellular energy-rich phosphate bonds, and naturally occurring antioxidant defenses.

- 855 Cadmium Hypertension. Its Reversal in Rats by a Zinc Chelate. H. A. Schroeder and J. Buckman. Arch. Environmental Health 14, 693-697 (May, 1967).

Rats were made hypertensive by feeding cadmium acetate in drinking water (5 micrograms/ml.) for 400 days or by injecting cadmium acetate intraperitoneally in doses of 1.5, 2 and 3 mg/kg of body weight. They were then treated with disodium zinc CDTA by injection of 9.1 mg zinc in the chelate. Hypertension regressed in all animals to normal levels without toxicity appearing. Transient escape from this regression occurred in one animal injected with cadmium. Of eight rats fed cadmium continuously, four remained normotensive for two months and four for five months after the chelate was given. Ratios of renal cadmium to zinc were significantly elevated in hypertensive animals and were reduced after injection of the chelate. A relationship appeared between these ratios and the levels of blood pressure. Six references are given.

-- Authors' summary

- 856 United States Beryllium Case Registry (1952-1966). Review of its Methods and Utility. Harriet L. Hardy, Emily W. Rabe, and S. Lorch. J. Occ. Med. 9, 271-276 (June, 1967).

The use of beryllium and its compounds is increasing; the hazard of certain levels of exposure to respirable beryllium compounds is definitely established. There is good evidence that the risk can be controlled by conventional industrial hygiene methods. Retrospective and on-going studies of a central file of workers ill with a newly recognized job-related disease, as exemplified by the United States Beryllium Case Registry, in spite of its deficiencies, has given and is giving, with computer help, useful knowledge of the disease, its medical management, and its control. Three references are given.

-- Authors' conclusion

- 857 A Rare Case of Chronic Lead Poisoning: Polyneuropathy Traced to Lead Shot in the Appendix. F.E. Hillman. Ind. Med. & Surg. 36, 488-492 (July, 1967).

Muscular paralysis, wasting, and especially a clawhand, were first attributed to amyotrophic lateral sclerosis or polyneuritis of unknown origin. Later, a roentgen study demonstrated lead shot in the appendix. Finding of fragmented pellets at appendectomy indicated lead absorption as the cause of the neuromuscular symptoms. No previous case of this kind seems to have been reported. There are 39 references.

-- Author's summary

- 858 Human Responses to Controlled Vanadium Pentoxide Exposure. C. Zenz and B. A. Berg. Arch. Environmental Health 14, 709-712 (May, 1967).

Nine volunteers were studied in an environmental chamber. They were exposed to measured concentrations of respirable vanadium pentoxide dust for eight-hour periods. Studies made before and after exposure included physical examination, pulmonary function tests and special laboratory tests. Quantitative vanadium determinations were made on blood, urine, and feces samples to correlate clinical findings with absorption and excretion. On the basis of the findings in this study of severe respiratory irritation at levels below the current threshold limit values, it is recommended that the present threshold limit value for vanadium pentoxide dust be lowered. Exposure to vanadium pentoxide dust produces a clinical syndrome characterized by irritation of the eyes, nose, and throat, followed by rales throughout the lungs and acute

bronchospasm similar to bronchial asthma. A striking feature of acute intoxication is increased severity of symptoms after, second, third, or subsequent exposure, so dramatic as to suggest a sensitivity-type reaction rather than an effect of accumulative dosage. Such reactions were encountered by the authors in a large pilot plant operation engaged in pelletizing pure vanadium pentoxide. There were 18 workers who became acutely ill. These workers recovered spontaneously following removal from exposure. The authors' studies and observations revealed neither evidence of pulmonary damage nor sequelae. Several other major industrial exposures to vanadium pentoxide have occurred in the recent past, and risks of toxic exposure are increasing with the trend toward increased use of vanadium compounds in industry. There are 12 references.

- 859 Cohort Study of Workers Exposed to Betanaphthylamine and Benzidine. T. F. Mancuso and A. A. El-Attar. *J. Occ. Med.* 9, 277-285 (June, 1967).

A cohort study of 639 males employed in 1938 or 1939 in a company manufacturing betanaphthylamine (BNA) and benzidine (B), and followed to 1965, was established through the use of Social Security resources and company records, and the mortality pattern determined. The following observations were made: Cancer of the pancreas (6 cases) constituted 32% of the malignant neoplasms of the digestive system. The mortality rate due to cancer of the pancreas for white men, ages 25-64, was 39/100,000 for the cohort, as compared with 7.5/100,000 for white Ohio men of the same age. Three cancers of the pancreas occurred in the "Exposed" group, and none was expected, in the age group 45-64 of the white men in the cohort. This observation might well be further explored. There was an under-reporting of bladder malignancy on the death certificates. The findings constitute a conservative estimate of the number of cases and the severity of the attack rate for the population studied. Malignancy of the bladder and kidney constituted 35% of all malignant neoplasms. The observed mortality rate for cancer of the bladder was 78/100,000 for white men, ages 25-64, in the cohort, as compared with 4.4/100,000 for white Ohio men of those ages. All cancers of the bladder for the white males in the cohort (14) occurred in the "Exposed" group and none occurred in the "Non-exposed" group. The average annual mortality rates for cancer of the bladder for the "Exposed" group were 335 and 971/100,000 for age groups 45-64 and 65 and over, respectively. In a study of comparative carcinogenicity, the observed attack rate for those exposed to B was 237; for BNA, 952; and for both, 1590 per 100,000. There were 42 cancers of the bladder and kidney in the combined cohort and retrospective data. Of the 42 bladder and kidney cases, 8 were attributed to BNA, 16 to B, and 18 to combined exposure. However, these observations have certain limitations. A broader epidemiological approach in the U. S. is needed. Such an approach would utilize the combined data from a number of sources pertaining to mortality, clinical, hospital, company employment, and exposure information, so that the long-term biological effects of exposure to BNA and B could be more completely appraised and evaluated. There are 32 references. -- Cond. from authors' summary

- 860 Effects of Hydrazine on Heat Balance and Source of Metabolic Energy. H. L. Bitter, et al. *Aerospace Med.* 38, 699-702 (July, 1967).

Evidence suggests that hydrazine mobilizes free fatty acids (FFA), produces a fatty liver, and impairs the ability of animals to catabolize protein. Nicotinic acid inhibits the mobility of FFA and protects against fatty liver without altering blood glucose. In the present study, the effects of hydrazine alone, and with nicotinic acid, on oxygen consumption (V_{O_2}), respiratory quotient (RQ), carbohydrate pool, and heat losses have been investigated in two-day fasted rats through the use of a gradient calorimeter. Nicotinic acid raised RQ without altering carbohydrate pool size, indicating stimulation of protein catabolism. Hydrazine, when given to nicotinic acid pretreated animals, lowered RQ below that of nicotinic acid controls, slowed V_{O_2} , reduced carbohydrate pool size, decreased body temperature, and increased evaporative heat losses at the expense of radiative heat losses. It appears that plasma FFA elevation in hydrazine toxicity should not be interfered with in the treatment of hydrazine poisoning. There are 11 references. -- Authors' abst.

- 861 Effect of Hydrazine on Carbohydrate Metabolism in Vivo and in Vitro. S. R. Fortney. *Aerospace Med.* 38, 727-731 (July, 1967).

The action of hydrazine has been studied in anesthetized dogs and in rat liver mitochondria. In vivo, hydrazine injection resulted in hyperlactatemia with hypoglycemia. To explain these

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findings, the possibility that hydrazine inhibited oxygen consumption with mitochondrial substrates was entertained. Significant inhibition only occurred with keto acids as substrates and only with very high levels of hydrazine. Evidence is presented that keto acid hydrazone formation was responsible for this inhibition in O_2 consumption. Phosphorylation was not affected. Mitochondrial GOT was found to be strongly and non-competitively inhibited with hydrazine. The inhibition of GOT is discussed with reference to hydrazine induced hyperlactatemia and hypoglycemia. There are 18 references.

-- Author's abstr.

- 862 Insecticidal Compounds. Effects on Replication of Vaccinia and Polio Viruses in Human Chang-Strain Liver Cells. J. Gabliks. Arch. Environmental Health 14, 698-702 (May, 1967).

Insecticidal compounds DDT, chlordane, dicofol, trichlorophen, malathion, and dinocap at subtoxic concentrations inhibited vaccinia virus replication in human Chang-strain liver cells. Under the same experimental conditions, the replication of polio virus was inhibited only by chlordane and malathion, whereas dicofol and dinocap increased the virus yields 4 and 18 times, respectively, and DDT exhibited a light stimulatory effect. Since the reduction in virus yields was not due to extracellular inactivation of virus, the results suggest that some insecticides exert an antiviral activity by altering some physiological activities of cells. Consequently, the magnitude of virus replication may be useful as a parameter for the detection of toxicity in insecticides and other chemicals below their acute toxicity levels. There are 14 references.

-- Author's summary

- 863 Determination of Dieldrin (HEOD) in Blood. A. Richardson, et al. Arch. Environmental Health 14, 703-708 (May, 1967).

Two methods for the determination of HEOD in blood have been assessed. The procedure using acetone as an extraction solvent gives reproducible results and is rapid. The precision of the extraction procedure, as reassured by the coefficient of variation, is of the order of 6%. The accuracy, assessed by comparison with the destructive hydrolysis technique, does not appear to differ significantly from 100%. Evidence has been obtained that the concentration of HEOD in the blood of the same person can vary in a random manner from time to time, and the coefficient of variation for samples of blood collected at different times from the same person is about 25%. The acetone extraction procedure is nondestructive and should therefore be applicable to the determination of the organochlorine insecticides (particularly those which are unstable to alkalis and their metabolites). There are 9 references.

-- Authors' summary

INDUSTRIAL DUSTS

- 864 Pulmonary Disease in a Chicken-Plucker. W. C. Lowe. Military Med. 132, 621-624 (Aug., 1967).

A man who had been a chicken-plucker for over 40 years suffered from repeated attacks of respiratory infection while working with chickens. Respiratory distress improved following retirement, but chest x-ray after 10 years of separation from chickens showed emphysema, interstitial fibrosis numerous round densities. Lung biopsy showed emphysema, mild fibrosis, proliferation of macrophages and lymphocytes. Intradermal testing showed a delayed reaction to feather, chicken, chicken's serum and droppings. A causal relationship with the occupational history is suggested. There are 11 references.

-- Author's summary

- 865 Mortality Among Talc Miners and Millers in New York State. M. Kleinfeld, et al. Arch. Environmental Health 14, 663-667 (May, 1967).

Mortality data on 91 talc miners and millers in New York state who had 15 or more years of exposure to talc dust by 1940 or had achieved 15 years between 1940 and 1965 were reviewed. The average age at death was 60.4 years with a range of 38 to 84 years. Proportional mortality from carcinoma of the lung and pleura among talc workers was four times that of the control population. However, the significant increase in incidence appeared in the 60 to 79 year age group rather than in the 40 to 59 year group. This was at variance with our findings in asbestos workers who had a similar duration of exposure covering a similar period where the increase in observed incidence was present in both age categories. The earlier

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occurrence in the asbestos workers was attributed to the greater carcinogenicity and possibly to exposure to asbestos dust of greater concentration as compared to commercial talc. Carcinoma of the gastrointestinal tract and peritoneum showed no significant difference in the talc and control populations. However, in the asbestos workers gastrointestinal and peritoneal malignancies were elevated significantly. Death due to pneumoconiosis or its complications, or both, was recorded in 28 individuals, 19 of whom died from cor pulmonale. The cause of death in the remaining nine was tuberculosis (5) or bronchopneumonia (4). The lapsed time from first talc exposure to death from pneumoconiosis or complications, or both, averaged 25.9 years, with a range from 15 to 39 years. Excluding cor pulmonale, there were 25 cardiac deaths, 19 of which were due to coronary artery disease, three to hypertensive heart disease, and three to rheumatic heart disease. Of the 91 death cases, data on environmental exposure were available in 80. The mean duration of exposure for this group was 24.7 years with a range of 15 to 47 years. Previous studies have indicated that cor pulmonale was a major cause of death among talc miners and millers. This was also found in the present study. However, what has not been previously brought out is the increase in observed incidence of carcinoma of the lung among these workers as demonstrated in this study. There are 9 references.

-- Authors' summary

- 866 Health Hazards of Asbestos. Recent Studies on its Biological Effects. Wyers Memorial Lecture, 1965. J.C. Gilson. Trans. Soc. Occ. Med. 16, 62-74 (July, 1966).

The author discusses the subject under the following headings: Types of fiber and production recent animal experimental work with asbestos; inhalation of fibers; experimental asbestosis; experimental carcinogenesis; health hazards of asbestos; asbestosis-present position in the U. K.; asbestos exposure and cancer; bronchial tumors; diffuse mesothelial tumors; and outstanding problems.

- 867 Danger of Asbestos for General Population. J. Cuthbert. Munch. med. Wochschr. 109, 1369-1372 (June 23, 1967).

Formation of asbestos bodies and the development of interstitial pulmonary fibrosis are possible sequelae of the inhalation of asbestos. The increase in pulmonary carcinoma can be traced back to extensive contact with asbestos and to asbestosis. Heavy air pollution with asbestos dust leads to the classical form of asbestosis. A decrease in asbestos dust possibly provides the time necessary for the development of the carcinogenic effect of asbestos. Cases are presented in which endotheliomas have formed many years after a short contact with asbestos. Increased import and use of asbestos increase the danger connected with it. Carpenters who manufacture asbestos plates or persons who live in the neighborhood of asbestos factories, are especially exposed.

-- J. Am. Med. Assn. References & Reviews

- 868 Looking at Foundry Air Pollution Problems. M. Sterling. Foundry 95, 136-138 (March, 1967).

The need to control emissions associated with sand handling and preparation, shakeout, grinding, chipping, cleaning, control of cupola emission, and similar activities are discussed. Degrees of code severity associated with estimated cupola and collector performance requirement and levels currently specified in several major urban areas are shown in tables. The approach to control dust and fumes was to install a water spray system utilizing a wetted cone baffle or similar configuration. Venturi scrubbers and other devices have been installed. Control codes, systems, future cupola control, and specific needs are discussed.

-- APCA Absts.

- 869 Measurement of the Projected Area of Dust Samples. G. B. Rodgers. J. Sci. Instr. 44, 217-218 (March, 1967).

A diffraction instrument for determining the size distribution and respirable surface area of dust samples is described. The dust sample is collected on a glass slide which is aluminized so that each dust particle is imaged as an aperture of the projected area in the aluminum film. Stability and a logarithmic scale are obtained by placing the photovoltaic detector in the feedback loop of an operational amplifier using a logarithmic diode as the feedback element. Absolute calibration is done by using a number of artificial samples consisting of one or more circular apertures of 50 millimicron diameter punched in aluminum foil.

-- APCA Absts.

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- 870 Electrostatic Aerosol Sampler for Light and Electron Microscopy. B. Y. H. Liu, et al. Rev. Sci. Instr. 38, 100-102 (Jan., 1967).

A two-stage electrostatic aerosol sampler, capable of obtaining a uniform deposit of aerosol on any flat collecting surface, is particularly suitable for use with electron microscope grids, microscope slides, and cover slips. Aerosol particles can be collected on diverse types of surfaces by the use of separate charging and precipitating electric fields; the uniform deposition of aerosol over the collecting surface is achieved through the use of a novel pulsed precipitating electric field. Five references are given. -- Public Health Eng. Absts.

- 871 Endurance of Fiberglass Filter Fabrics. P.W. Spaite and R.E. Harrington. J. Air Poll. Control Assoc. 17, 310-313 (May, 1967).

A study was made to determine the effect of production process variables on fiberglass filter life in an accelerated endurance test at high temperatures. Tests were conducted in a unit designed to provide conditions simulating those encountered in field use. Test variables investigated included filtering temperature, fabric finish, bag tension, and aging at elevated temperatures. The paper discusses the relative effect of these variables with respect to the endurance of four standard, commercially available, filtration fabrics. Two references are given. -- Authors' abst.

- 872 Progress in High-Temperature Electrostatic Precipitation. C.C. Shale J. Air Poll. Control Assoc. 17, 159-160 (March, 1967).

Current-voltage relationships for negative corona are given for a pilot-scale electrostatic precipitator with 3-inch electrode spacing at 80°-1500°F. and 35-80 psig. Direct comparison is made with the electrical characteristics for a 1-inch spacing at 1200°F. over the same pressure range. Experimental results on both spacing agree well with electrostatic theory. Initial dust removal efficiencies for the pilot-scale precipitator ranged from 90 to 98% at 1460°F. and 80 psig, but continuous operation was not achieved owing to excessive thermal expansion of the internal parts of the unit. -- Author's abst.

PHYSICAL ASPECTS OF THE ENVIRONMENT

- 873 Influence of Elevation of Origin, Rate of Ascent and a Physical Conditioning Program on Symptoms of Acute Mountain Sickness. J. E. Hansen, C. W. Harris, and W. O. Evans. Military Med. 132, 585-592 (Aug., 1967).

Acute mountain sickness was found in young normal subjects travelling rapidly from sea level to 11,400 feet or 14,100 feet. It was not found in residents of 5-6,000 feet travelling rapidly to 11,400 feet. It was significantly decreased in sea level residents sent to 14,100 feet with one week delays at 5200 feet and 11,400 feet. Cardiovascular fitness alone did not protect against illness. Headaches were the most distressing symptom; in several individuals they were lessened at high elevation by strenuous exercise. The present study has isolated and identified some of the variables that influence the symptoms of acute mountain sickness. The ultimate cause may be recognized with the finding of an effective drug therapy or serial measurement of cerebrospinal fluid pressure, cerebral blood flow, or blood and cerebrospinal fluid pH and composition. There are 10 references. -- Authors' summary

- 874 Activity of the Human Eccrine Sweat Gland During Exercise in a Hot Humid Environment Before and After Acclimatization. J. Peter and C.H. Wyndham. J. Physiol. 187, 583-594 (Dec., 1966).

After acclimatization by exercise in a hot humid environment, increased sweat rates were found to be due mainly to increased glandular activity. On prolonged exposure the decline in sweat rates was attributed to glandular fatigue. There are 21 references.

-- Public Health Eng. Absts.

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- 875 Acclimatization of Highly Trained Men to Work in Severe Heat. R. W. Piwonka and S. Robinson. *J. Appl. Physiol.* 22, 9-12 (Jan., 1967).

When highly trained athletes, acclimatized to work in heat, performed the same work in a more intense heat stress, they experienced marked elevations of body temperature and heart rate in the first exposures, followed by significant improvements in heat tolerance in the succeeding days. Their principal adjustments with acclimatization involved a greatly increased cutaneous blood flow and a higher sweat rate per degree rise of rectal temperature. There are 16 references.

-- Public Health Eng. Absts.

- 876 Shivering and Heat Production in Men Exposed to Intense Cold. N. Glickman, et al. *J. Appl. Physiol.* 22, 1-8 (Jan., 1967).

Heat production and integrated electrical activity of skeletal muscles related to shivering and muscle tenseness were simultaneously observed in 10 experiments on 9 healthy, clothed male subjects seated in a cold room (-28.9°C) for 4 hours. There was no evidence of increased heat production without an increase in muscle tenseness or shivering. There are 33 references.

-- Abst. cond., Public Health Eng. Absts.

- 877 Rate of Loss of Acclimatization in Summer and Winter. C.G. Williams, C.H. Wyndham, and J.F. Morrison. *J. Appl. Physiol.* 22, 21-26 (Jan., 1967).

After being in cool conditions for 1, 2, and 3 weeks, there was a progressive rise in rectal temperature and heart rate and fall in sweat rate in the groups exposed to 4 hours of moderate work at 90°F wet bulb. There was no significant difference between summer and winter values. Men who have been away from work in hot conditions for one week should be re-acclimatized for one day before going back to work in hot conditions. There are 12 references.

-- Public Health Eng. Absts.

- 878 Cold Exposure of Farm and Laboratory Workers. R. Goldsmith. *J. Appl. Physiol.* 22, 47-49 (Jan., 1967).

After recording the time spent outdoors, hours of sleep, and amount of clothing worn by farm workers and laboratory workers, the author suggests that farm workers would be good subjects for cold acclimatization studies and that their relatively light clothing indicates a decreased sensitivity to cold. Six references are given.

-- Public Health Eng. Absts.

- 879 Appraisal of Apollo Launch Noise. B. O. French. *Aerospace Med.* 38, 719-722 (July, 1967).

This study describes a noise program completed at the National Aeronautics and Space Administration Manned Spacecraft Center to assure that the Apollo mission launch noise would not be detrimental to the crew. A preliminary appraisal of the predicted noise environment indicated that the physiological effects of low-frequency noise had to be investigated and that the noise environment the crew would experience had to be carefully defined. Studies were initiated to define the external and internal environment during development missions; to define the noise reduction of the spacecraft, helmet, and space suit; and to investigate the physiological effects and performance impairment when human subjects were exposed to low-frequency (below 100 cycles per second) acoustic environments. The results of the study indicate that the noise generated during launch will not adversely affect the Apollo crew. There are 14 references.

-- Author's abst.

RADIOACTIVITY AND X-RADIATION

- 880 Radiation Protection Training of Industrial Employees. W.C. Reining and G.E.C. Kauffman. *Health Physics* 13, 223-225 (Feb., 1967).

Radiation safety training at the Savannah River Plant since the beginning of operations in 1951 is described. The plant includes fuel preparation facilities, reactors, and radio-chemical separation areas. The objective of minimizing radiation exposure and the training program is to alleviate the apprehension of employees working with radioactive materials by making them aware of the potential hazards and giving the workers the knowledge to cope with these hazards.

-- APCA Absts., modified

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ENVIRONMENTAL MEASUREMENTS

- 881 Computer Analysis of the California Cycle. R. S. Spindt.
J. Air Poll. Control Assoc. 17, 166-167 (March, 1967).

The current trend toward greater instrumentation in analysis of automobile exhaust gases is sure to increase in future years. This will come about as a result of increased activity to find a solution to air pollution problems resulting from automobile exhaust gases. Owing to the complex driving cycle needed to evaluate vehicle emission, considerable time has been required to analyze and interpret the records from any run. To alleviate this analytic problem, an automatic data logger was obtained that records on magnetic tape the signal from a number of analytical instruments each second (in binary coded decimal form). These records are then analyzed on a computer to give integrated and averaged results over the specified driving cycle. There is no longer any need for manual evaluation of the data. In addition to the standard analyses already mentioned, the use of the data logger permits a much more complete analysis of what is happening in a vehicle. For example, the analytical instruments used include an oxygen analyzer in addition to carbon dioxide, carbon monoxide, and hydrocarbons. With these measurements the air-fuel ratio of any or all driving conditions can be calculated. Two references are given.

-- Author's abst.

- 882 A Radiometer for Continuous Wave Laser Radiation. J. W. Stearn.
J. Sci. Instr. 44, 218-219 (March, 1967).

The power monitor described was designed to measure the radiated power from continuous wave lasers operating in the visible and near infrared bands. It is absolutely calibrated and is sensitive to the spatial distribution of the incident radiation. The device can be designed for any power level in excess of 10 mw. and its response time, 0-90% is approximately one minute.

-- APCA Absts.

PREVENTIVE ENGINEERING

- 883 Testing Chemical Detonation Characteristics. C. Grelecki.
Natl. Safety News 96, 49-53 (July, 1967).

Detonation testing is a very important phase of new product evaluation. An accurate knowledge of a material's tendency to detonate is required if it is to be handled safely and used efficiently. Unfortunately, a complete evaluation of a material's explosive properties is not an easy task. Subtle interactions between the explosive and its environment make most detonation tests extremely dependent on the test apparatus; and most tests merely give relative ratings under specific conditions. Therefore, a single test is never sufficient to characterize a material's sensitivity or explosive properties. A number of different tests must be employed in order to cover a wide range of experimental variables. The difficulties involved in detonation testing and interpretation of detonation test data was recognized at Thiokol Chemical Corporation's Reaction Motors Division (TCC-RMD) and a systematic detonation test program has been developed. A number of tests are used, depending on the properties of the particular material under investigation. The test program is flexible and versatile and can accommodate the variety of new chemical products currently of interest. Output tests and gap tests have been developed for use with liquids having vapor pressure in excess of 500 psia under the test condition. Output testing is performed in a modified version of the Trauzl Block Test. The procedure can be used with volatile as well as non-volatile materials. The results are helpful in determining the hazards involved in handling small quantities of explosive materials. Materials that do not detonate in small scale tests are tested under increasingly more rigorous conditions in order to define the limits of detonability. The Constant Current Resistance Wire Method of measuring detonation velocities is used as the criterion of detonation. The method is well suited for examining the effect of such variables as composition of container material, temperature, charge size, and geometry. Three references are given.

-- Author's conclusions

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- 884 A System for Safe Handling of Perchloric Acid Fumes. R. B. Boies.
Air Eng. 9, 20-22 (July, 1967).

Between 1959 and 1962, explosions—causing one death and several injuries—occurred during routine maintenance inspections of perchloric acid fume ventilating systems. These explosions spurred an investigation at the laboratory of the National Lead Company of Ohio. A safe system was designed for exhausting perchloric acid fumes, and a quick test developed for the detection of dangerous perchlorates. The story of the investigation and solution of the problem are described in this paper.

- 885 Respiratory Protective Equipment. D. E. Albert.
Natl. Safety News 96, 59-65 (July, 1967).

Selection of the proper type of respiratory protective equipment should be based on the following procedures: (1) identify the substance or substances against which protection is necessary (2) know the hazards and significant properties of each substance (3) determine the conditions of exposure, and level of air contaminant present (4) ascertain whether any human capabilities and limitations are essential to the safe use of the devices (5) fit the respirator carefully and instruct the worker in its use. -- Author's conclusion

COMMUNITY AIR HYGIENE

- 886 A Summary of the New York Urban Air Pollution Dynamics Research Program. B. Davidson.
J. Air Poll. Control Assoc. 17, 154-158 (March, 1967).

A description is given of the experimental techniques employed in a study of urban air pollution in the New York Metropolitan Area. The experimental measurements consist of an anemometer network, a sulfur dioxide ground network, an upper level wind network and programmed flight of a helicopter, and fixed winged aircraft equipped to measure pressure height, temperature, wet bulb depression, and sulfur dioxide concentration. Some highlights of the observational program are shown. These include detailed pictures of the height distribution of the urban heat island, associated wind flow patterns, and their effect on the distribution of concentration within the city. Some examples are given of the three-dimensional distribution of temperature and sulfur dioxide within the urban area. These observations are discussed in the context of a numerical model. Three references are given.

-- Author's abst.

- 887 A Method for Using Air Pollution Measurements and Public Opinion to Establish Ambient Air Quality Standards. W.W. Stalker and C.B. Robison.
J. Air Poll. Control Assoc. 17, 142-144 (March, 1967).

Air quality was comprehensively evaluated by means of sampling at 21 locations over metropolitan Birmingham during a period of one year. Thousands of integrated samples of three common atmospheric gaseous pollutants and two common particulate pollutants were collected and analyzed. Following the year of sampling in 1964, a random household survey was completed by conducting personal interviews at more than 7,200 households over metropolitan Birmingham. Statistical reduction of household survey results by census tract and by neighborhood area provided domestic fuel and waste burning emission data as well as public (resident) opinion on specific air pollution effects. The relationship between ambient air quality and neighborhood opinion of air pollution effects on health and property are evaluated statistically. Ambient standards are suggested which are based upon those air pollution levels shown to have adverse effects on approximately one-third of the people. There are 10 references.

-- Authors' abst.

- 888 Analysis of the Atmosphere for Light Hydrocarbons. E. R. Stephens and F. R. Burleson.
J. Air Poll. Control Assoc. 17, 147-153 (March, 1967).

A procedure has been developed for the analysis of trace quantities of light hydrocarbons in air. A freeze-trap filled with chromatographic packing was installed in place of the gas sample loop of a flame ionization chromatograph. An air sample 0.1-0.5 liter volume was passed through the trap which was chilled with liquid oxygen. The trap was then brought to ice temperature and its contents simultaneously swept into the column. The resulting chromatogram could be used to determine about 25 hydrocarbons through n-hexane. The

minimum detectable concentration was below 1 ppb for these hydrocarbons. With such sensitivity it is possible to make useful measurements even on samples of light air pollution. Air samples from the Riverside (California) area were analyzed in this fashion starting in the summer of 1965. The relative amounts of these hydrocarbons were then compared with the distribution reported for the various known hydrocarbon sources. The attenuation of the more reactive hydrocarbons by photolysis was also observed. A system for irradiating trapped air samples was also constructed. Samples were collected in five-gallon borosilicate bottles which were then irradiated with ultraviolet radiation and the concentration changes followed. There are 9 references.

-- Authors' abst.

- 889 Direct GLC Coulometric Analysis of Kraft Mill Gases. D.F. Adams and R.K. Koppe. J. Air Poll. Control Assoc. 17, 161-165 (March, 1967).

A new bromine, microcoulometric titration cell has been used with a commercially-available microcoulometer for the detection and analysis of sulfur-containing gases in various kraft mill emissions. Separation of the constituents of the gaseous mixtures emitted from mill sources including the recovery furnace, digestors, evaporators, lime kiln, and dissolvers was accomplished on an 8-ft, 3/16-in. stainless steel column packed with 10% Triton X-305 on 60-80 mesh Chromosorb G, DMCS-treated. The column was isothermally operated at 30°C for 4-6 mins. and then rapidly raised to 70°C. The exact program was varied with the type of sample analyzed. Each source gas was initially screened by direct injection of 0.01-0.1 ml. of gas to determine whether or not disproportionately large concentrations of one or more compounds were present. Appropriate sample volumes were then selected to provide "on-scale" recorder peaks for the major constituents. Elution times for the major constituents were observed so that these compounds could be vented at the proper time following injection of large sample volumes (up to 10 ml.) for detection and analysis of minor constituents. Venting of the high concentration compounds was necessary when analyzing large volume samples to maintain near equilibrium titration conditions in the microtitration cell. There are 12 references.

-- Authors' abst.

- 890 Process Evaluation System Developed for the Emission Inventory. P. Loquercio, A.R. Dammkoehler, and R. Goldberg. J. Air Poll. Control Assoc. 17, 168-171 (March, 1967).

Two applications of the newly devised process evaluation criterion are described: (1) The transformation of process data concerning the air pollution sources into machine language so that it may be correlated with Chicago's Emission Inventory; and, (2) the application of its principles to the administration of the permit system. This criterion for the evaluation of process activity is completely different from any other method used throughout the country. Examples of its application are given. There are 7 references.

-- Authors' abst.

- 891 The Interstate Air Pollution Surveillance Program Effects Network. G.A. Jutze, R.L. Harris, Jr., M. Georgevich. J. Air Poll. Control Assoc. 17, 291-293 (May, 1967).

A program has been designed to meet a nationwide intelligence-gathering responsibility to obtain general and relative information on current and potential air pollution in areas where interstate transport of pollution may reasonably be expected to exist. This paper describes the field devices utilized in the program. By means of these static "effects packages", data will be accumulated on: dustfall, particulate impingement, sulfation, corrosion, and tarnishing of metals, and deterioration of textiles, dyes, and rubber. Data accumulated during the "pilot phase" of this program will be discussed. There are 7 references.

-- Authors' abst.

- 892 New and Improved Procedures for Gas Sampling and Analysis in the National Air Sampling Network. G.B. Morgan, C. Golden, and E.C. Tabor. J. Air Poll. Control Assoc. 17, 300-304 (May, 1967).

The National Air Sampling Network (NASN) sampler for the collection of gaseous pollutants has been modified to increase its versatility and efficiency. Oxides of nitrogen are collected in bubblers employing a 70-100 micron frit with a collection efficiency of approximately 50% depending upon the frit porosity. Included in the sampler is a bubbler for the collection of aldehydes in which the aldehyde-3-methyl-2-benzothiazolone hydrozone hydrochloride (MBTH) complex is stable at least two weeks. This inert bubbler, which is constructed of polypropylene and teflon, makes it possible for samples to be collected over the network and analyzed at a central laboratory. In addition, gaseous ammonia is collected in 0.1N sulfuric acid. This

collecting system has an efficiency of greater than 85%. Low-level samples are analyzed automatically employing nesslerization, whereas high-level samples from source emissions may be collected in indicating boric acid and titrated with 0.02N sulfuric acid. The sampler will accommodate either 50 or 100 ml. polypropylene collecting tubes. There are 7 references.

-- Authors' abst.

- 893 Selection of Adhesive-Coated Materials for Particulate Sampling. W. L. Pritchard, C. E. Schumann, and C. W. Gruber. *J. Air Poll. Control Assoc.* 17, 305-307 (May, 1967).

The use of adhesive surfaces for the collection and evaluation of airborne particulates, including radioactive dusts and aeroallergens, is steadily increasing. Although many types of adhesives and adhesive-coated materials are commercially available, very few are suitable for continuous monitoring applications. Late in 1964, the Cincinnati Division of Air Pollution Control received a U.S. Public Health Service, Division of Air Pollution, Research Grant for the refinement and standardization of a method of particulate sampling utilizing adhesive surfaces as collection media. One of the first phases of this project was to select the adhesive-coated material best suited for the method. The research which led to this selection, from a group of 37 different materials, is reported. There are 9 references.

-- Authors' abst.

- 894 Stack Emission Sampling. J. S. Leonard
Tappi 49, 84A-85A (1966).

Potential air pollution in kraft pulping emission consists essentially of solid particulate and sulfur containing malodorous gases. A special device for sampling the air pollutants in kraft pulping emissions, solids and S-containing gases, was constructed and installed at 4 stations on the stack. The device operates on an electrostatic precipitator principle and allows the simultaneous determination of solids and sulfur-containing gases. -- APCA Absts.

- 895 The Effects of Air Pollution on Exposed Cotton Fabrics. R. J. Brysson, et al.
J. Air Poll. Control Assoc. 17, 294-298 (May, 1967).

This report covers the results of one-year exposure studies of cotton fabrics exposed at different environmental sites in the metropolitan St. Louis, Mo., and Chicago, Ill. areas. The 12 sites range from heavy industrial to essentially rural. The data presented definitely establish a relationship between air pollution and accelerated degradation of cotton fabrics. The data include strength retention of several cotton fabrics and air pollution data, as determined by periodic measurement of dustfall, suspended particulate matter, sulfation, and sulfur dioxide. There are 9 references.

-- Authors' abst.

- 896 Measuring the Improvements in the Control Aspects of Programs Aided by Federal Grants. C. D. Yaffe and W. F. Johnson. *J. Air Poll. Control Assoc.* 17, 316-318 (May, 1967).

Ambient air standards, emission standards, and program activities are considered in a search for appropriate indices for measuring program progress and effectiveness. The authors suggest that such indices can best be based on data related to weight of emissions. Several methods for expression accomplishment are presented for consideration. -- Authors' abst.

- 897 Additive Improves Combustion of Residual Fuel Oil. Anon.
Oil Gas J. 65, 104 (Jan. 16, 1967).

A manganese-containing organometallic compound, when used in the approximate ratio of 1.5 gal. to 52,000 gal. of fuel oil, reduced the sulfur trioxide content of flue gas about 45%.

-- Public Health Eng. Absts.

- 898 Removing Solid and Mist Particles From Exhaust Gases. N. Morash, M. Krouse, and W. P. Vasseller. *Chem. Eng. Progr.* 63, 70-74 (March, 1967).

The laboratory and pilot plant development work for a technique which successfully removes submicron size dust and acid mist particles from laden exhaust gases is described. The result obtained when an irrigated, thin, felted fiber filter is used to remove a mixture of fine titanium dioxide pigmentary particles and sulfuric acid mist particles from the exhaust gases of pigment calciners is discussed.

-- APCA Absts.

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- 899 Flame Temperature in Oil-Fired Fuel-Burning Equipment and its Relationship to Carbonaceous Particulate Emissions. H.A. Belyea and W.J. Holland
J. Air Poll. Control Assoc. 17, 320-323 (May, 1967).

Field tests were conducted on 82 fuel-burning installations ranging from 50 to 500 hp, fired with residual fuel oils. A flame pyrometer was used to measure peak flame temperatures. Coarse particulates were measured by impingement on adhesive paper strips inserted at right angles to the gas flow and fine particulates by filtration of the gas sample through filter paper. Both were evaluated using a standard Bacharach Scale. The tests clearly established that both coarse and fine particulate matter invariably occurred with low flame temperatures but decreased appreciably when peak flame temperatures reached approximately 2650°F. Minimum values were observed at temperatures somewhere between 2750° and 2850°F. This research was conducted as a result of the problem of acid smut and carbonaceous (cenosphere) fallout which appears to have increased with the advent of modern high-efficiency low-temperature heating installations and taller, cooler operating chimneys; sudden deluges of particles from the chimney serving large oil-burning plants soil clothing, pit car finishes, and damage nylon stockings and other materials. Four references are given. -- Authors' abst.

- 900 Controlling Problems of Air and Water Contamination. H.F.J. Wenzel and O.V. Ingruber.
Paper Trade J. 151, 42-47 (Jan. 16, 1967).

The recent literature related to technical problems in the reduction of kraft pulp mill gaseous and liquid effluents is reviewed. Sources of odors, gas chromatographic analysis, odor threshold, topographic considerations, black liquor oxidation, liquid effluents, effect on stream oxygen, and biological oxygen demand (BOD) levels are discussed. There are 50 references. -- APCA Absts.

- 901 History of Efforts at Incineration in the Los Angeles Area. N.B. Hume.
J. Air Poll. Control Assoc. 17, 308-309 (May, 1967).

The history of incineration in Los Angeles from 1943 to the present is reviewed as representative of all southern California areas. -- Author's abst.

- 902 Atmospheric Emissions From Open Burning. R.W. Gerstle and D.A. Kemnitz.
J. Air Poll. Control Assoc. 17, 324-327 (May, 1967).

Emission data have been derived from the simulated open burning of municipal refuse, landscape refuse, and automobile components. The data confirm that disposal of refuse by open, uncontrolled burning invariably leads to higher emissions than incineration and creates an unnecessary air pollution problem. There are 10 references. -- Authors' abst.

- 903 Pollution by Exhaust: US Law and UK System. Anon.
Engineering 203, 213-216 (Feb. 10, 1967).

The California regulations for exhaust emissions are based on a test that includes cold starting, idling, accelerating, and stopping, and that closely resembles normal city driving. Four methods to reduce toxic emissions are described: injection method adaptation of a climatic combustion control system, various methods of fuel injection, and the "Duplex" induction system. -- Public Health Eng. Absts.

- 904 The Performance of Positive Crankcase Ventilation Systems on Automobiles in Cincinnati, Ohio: Report No. 2. W.A. Cote. J. Air Poll. Control Assoc. 17, 139-141 (March, 1967).

In January 1966, 483 randomly selected 1963-1966-model automobiles were inspected at the Cincinnati Vehicle Inspection Station to determine the effectiveness of their positive crankcase ventilation systems. All of these automobiles should have had crankcase ventilation systems installed in accord with the voluntary program of the automobile manufacturers. However, 48 of the automobiles inspected had no positive crankcase ventilation system. In addition, 27 cars were equipped with systems which could not readily be tested. Testing of the remaining 408 cars was performed with a combination pressure-vacuum gauge designed to measure the airflow in the crankcase. Results showed that 71% of the positive crankcase ventilation systems tested were operating satisfactorily and impending maintenance of systems was indicated for 29% of the automobiles tested. Although the systems of certain makes of cars performed considerably better than others, a definite decrease in system performance with increasing age and mileage was observed for the cars tested. The performance data indicate that the periodic maintenance required for positive crankcase ventilation systems is not being implemented. Only 47.5% of the drivers questioned were aware of the system and only 10% knew whether their system had been serviced. There are 3 references.

-- Author's abst.

- 905 Magnesium Oxide Recovery System. Design and Performance. J. L. Clement.
Tappi 49, 127A-134A (Aug., 1966).

Equipment arrangements are presented to meet the requirements of a magnesia base pulp mill for complete recovery of heat and chemicals from spent sulfite liquor. Several designs of recovery boilers including alternate arrangements and designs of economizers and air heaters provide heat recovery in an integrated system. Boiler design can incorporate auxiliary fuel firing to assure steam production independent of liquor availability. Recovered magnesium oxide is used to remove SO_2 - sulfur dioxide from combustion gases in a venturi absorption system to prepare acid at a concentration required by the pulp mill. The capacity of a recovery system is about twice as large for a low yield dissolving-grade pulp as for a pulp to be used in newsprint.

-- APCA Absts.

MANAGEMENT ASPECTS

- 906 Some Paradoxes of Workmen's Compensation. J. R. Ong, Jr.
Ind. Med. & Surg. 36, 468-471, 474-476 (July, 1967).

A plea has been set forth for the honest and objective evaluation of permanent disability by physicians doing this type of work. The paradox between rehabilitation and permanent disability achievement for rating purposes has been pointed out. Some factors affecting subjective disability and its evaluation have been discussed, including aggravation and apportionment of preexisting abnormalities; the recommendation is made that "subjective disability" not be rateable. Some aspects of so-called "atrophy" were discussed with the recommendation that joint(s) function (range, strength, stability) be employed in the evaluation, rather than the indirect, inferential, static, circumferential measurement presently used. What price awards? — some of the factors which affect applicants involved in litigation before an Industrial Accident Commission for permanent disability establishment are outlined, together with some of the paradoxical repercussions which occur therefrom. The problem of awards from an employer for death not related to industrial employment, but rather the result of a disease process, has been discussed. This will force industry to take another look at hiring practices.

-- Author's summary

ACCIDENTS AND PREVENTION

- 907 High Pressure Water Injury. A.W. Gardner.
Trans. Soc. Occ. Med. 16, 30 (Jan., 1966).

An oil refinery maintenance operator was one of a team of four who were cleaning the fouled tubes of a heat exchanger, using a high pressure salt (sea) water lance with eight forward-firing jets. The pressure of the water at the nozzle of the lance was 6,000-6,500 lb./sq. inch (420-460 kg./sq.cm.) at the time of the incident. A diagram of the system is shown in the report. In spite of prior realization of this hazard, and considerable efforts to prevent trouble, one of the men sustained an injury from the high pressure water. The potential seriousness of such an injury can be inferred by the fact that it nearly caused a cavity wound of the abdomen. The main reasons for reporting this case are: (1) To call attention to the hazards of high pressure fluids. (2) To report an unusual type of injury. (3) To demonstrate that such cases can be treated at work.

- 908 Research Problems in Industrial Accidents. J. Simpson.
Trans. Soc. Occ. Med. 16, 115-121 (Oct., 1966).

At the root of any accident are human factors of one kind or another; these factors, however, are meaningless without reference to such environmental conditions as the nature of the work

and the physical and chemical aspects of the environment. Most accidents result from non-specific etiology and multiple causes; therefore, the epidemiological approach offers most promise for future studies. This approach is primarily concerned with the identification and control of: (a) the susceptibility of persons to accidents; (b) injurious properties of specific agents; and (c) the harmful interactions between persons and agents of the environment. The human factors that predominate in accident causation relate to age and sex, job experience and training and emotional adjustment. Although most studies have failed to verify the concept of accident proneness, the important role of emotional and personal maladjustments has been demonstrated. Understanding of the influence of environmental variables on human performance is another requirement. In the past, decisions on corrective actions have led to what are improvements in industrial safety. Most of the improvements have been technical ones with obvious justification once attention was directed to the problem. Future improvements, however, will have a much more subtle basis. What is required is a more general method of analyzing and collating the data obtained from individual accident investigations, together with the techniques of acquiring more detailed information about the probable causes of accidents, even when these data are less than perfectly reliable. The application of modern statistical concepts to the study of accidents is desirable and is now being actively pursued. The controlled, univariate experiment in which nothing but the independent variable alters to an important degree is now inapplicable and obsolete. It is the multivariate statistical design that would seem to provide an effective method of handling both the controlled variable and the uncontrolled variable in situations where traditional control is impossible. Therefore, a future step in safety research will be to formulate some sophisticated designs of this multivariate order.

-- Author's summary

- 909 Control of Accidents in Rural Areas. J. A. Waller.
J. Am. Med. Assoc. 201, 176-180 (July 17, 1967).

Rural fatality rates from accidents are much higher than those in urban areas, to a large extent because of less adequate emergency treatment and more hazardous types of occupational and other activities. Carefully designed programs which are subjected to adequate evaluation can make significant inroads on this unnecessary toll of human resources. Greater attention must be paid to specific education related to accidents resulting from ignorance of hazards, to development of more adequate environmental controls to circumvent human failings, and to better coordination of emergency medical services. Unsophisticated programs aimed primarily at motivating people to change their behavior can be expected to have as limited success in the accident field as they have had in all other fields of endeavor. There are 19 references.

-- Author's summary

MISCELLANEOUS

- 910 The Aerospace Revolution. The 1967 Louis H. Bauer Lecture. E. C. Welsh.
Aerospace Med. 38, 667-671 (July, 1967).

"In 1961, this Nation resolved to send a manned expedition to the moon in this decade. Much hard work remains and many obstacles must still be overcome before that goal is met. Yet, in the last few years we have progressed far enough that we must now look beyond our original objective and set our course for the more distant future. Indeed, we have no alternative unless we wish to abandon the manned space capability we have created," President Johnson has advised the Congress. We are just beginning to develop launch vehicles and methods of sending them on their voyages and bringing them back to earth. We will also be melding together the major features of aeronautics and astronautics, so that space vehicles will in fact have great maneuverable reentry ability and will be recovered, refueled, maintained, and reused. We expect not only to have men land on the moon in the next few years, but we expect to follow this with other trips to explore the lunar surface and possibly to establish one or more bases there. We will also have permanent manned earth orbiting stations with a variety of functions and missions. Such activities would include looking away from the earth to take a magnificent step forward in astronomy and looking down toward the earth to increase our knowledge about earth activities, earth characteristics, and earth environment. We would expect to have unmanned probes throughout the solar system and manned expeditions to visit planets whenever that becomes promising and practicable. While all this is going on, we expect great progress in communications, navigation, weather prediction and possibly weather control—all through the use of the space dimension.

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ADDRESSES OF JOURNALS ABSTRACTED

Aerospace Med.

Aerospace Medicine
Washington National Airport, Washington, D.C. 20001

Air Eng.

Air Engineering
450 West Fort St., Detroit, Michigan 48226

Am. J. Vet. Res.

American Journal of Veterinary Research
600 S. Michigan Ave., Chicago, Ill. 60605

Arch. Environmental Health

Archives of Environmental Health
535 N. Dearborn St., Chicago, Ill. 60610

Arch. Otolaryngol.

Archives of Otolaryngology
535 N. Dearborn St., Chicago, Ill. 60610

Arch. Pathol.

Archives of Pathology
535 N. Dearborn St., Chicago, Ill. 60610

Bacteriol. Rev.

Bacteriological Reviews, Williams & Wilkins
428 E. Preston St., Baltimore, Md. 21202

Cancer

J. B. Lippincott Company
East Washington Square, Philadelphia, Pa. 19105

Chem. Eng. Progr.

Chemical Engineering Progress
345 East 47th St., New York, N.Y. 10017

Engineering

36 Bedford St., Strand, London WC2, England

Foundry

Penton Bldg., Cleveland, Ohio 44113

Gigiena i Sanit.

Gigiena i Sanitariya
Medgiz, Gig. i Sanit., Petrovka 12, Moskva U.S.S.R.

Health Phys.

Health Physics,
Pergamon Press, Inc.
122 East 55th St., New York, N.Y. 10022

Ind. Med. & Surg.

Industrial Medicine & Surgery
323 S. Franklin St., Chicago, Ill. 60606

J. Air Poll. Control Assn.

Journal of the Air Pollution Control Association
4400 Fifth Ave., Pittsburgh, Pa. 15213

J. Am. Med. Assn.

Journal of the American Medical Association
535 N. Dearborn St., Chicago, Ill. 60610

J. Am. Soc. Safety Eng.

Journal of the American Society of Safety Engineers
5 N. Wabash Ave., Chicago, Ill. 60602

J. Am. Vet. Med. Assoc.

Journal of the American Veterinary Medical Assoc.
600 S. Michigan Ave., Chicago, Ill. 60605

J. Appl. Physiol.

Journal of the Applied Physiology
9650 Wisconsin Ave., Washington, D.C. 20014

J. Occ. Med.

Journal of Occupational Medicine
Hoebel Medical Div., Harper & Row
2 Park Ave., New York, N.Y. 10016

J. Physiol (London)

The Journal of Physiology
Cambridge University Press
32 East 57th St., New York, N.Y. 10022

J. Sci. Instr.

Journal of Scientific Instruments
47 Belgrave Sq., London SW1, England

Lancet

7 Adam St., Adelphi, London WC2, England

Med. Proc. (Johannesburg)

Medical Proceedings, Juta and Co. Ltd.
P.O. Box 1010, Johannesburg, South Africa

Military Med.

Military Medicine
1500 Massachusetts Ave., N.W.
Washington, D.C. 20005

Munch. med. Wochschr.

Munchener medizinische Wochenschrift
Paul-Heyse-Strasse 26, Munich 15, Germany

Natl. Safety News

National Safety News
425 N. Michigan Ave., Chicago, Ill. 60611

New Engl. J. Med.

New England Journal of Medicine
10 Shattuck St., Boston, Mass. 02115

Oil Gas J.

Oil and Gas Journal
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