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HARVARD UNIVERSITY

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RECEIVED
FEB 26 1982
J. T. BARR

22 February 1982

Dr. John Barr
Manager, Regulatory Response
Air Products and Chemicals
Box 538
Allentown, PA 18105

Dear John,

The reprint came from a book on Health Risk Analaysis, proceedings of the 3rd Life Sciences Symposium at Oak Ridge National Laboratory, 1980, Franklin Institute Press. On your first point I agree; on your second, I now take

Risk (R) = Potency (β animal) x interspecies factor x (K animal/human)

x Dose(D) x Extrapolation factor (E)

If E = 1 we are linear.

Many people would put E = 0, but others who are clever, knowledgeable, and politically influential (Prof. Matthew Meselson), put E = 1. If you can make a decision without arguing this point it is simpler.

Also if you are adding a pollutant which produces (say) lung cancer and we have a large background of lung cancer, even the basic mechanism is non-linear. The additional risk of the additional exposure is linear. Depends on mech, type, etc

I think that we should do our calculations and leave this point to be discussed last--if necessary. We are developing our mathematical formalism to this end.

We believe we have a more consistent policy here than CAG or OSHA, and would like to sell it to you at industry. We include uncertainty--and are willing to discuss carcinogencity even before it is proven (saccharin, formaldehyde, salt).

One application is to end up with an ordered list of risks (with E = 1) which is more consistent than EPA's priority list, and more logical than Squires. Squires even now puts vinyl chloride near the top of his list--yet it has killed only 100 people worldwide so far and exposures are reduced.

Saccharin or aflatoxin may be killing 500 per year!

I hope we have the opportunity to work with you and/or AIHC on this--and of describing disagreements so that the country doesn't get hung up on them.

I enclose papers on waste disposal and Crouch's update on our inter-species potency comparison.

Yours sincerely,

Dick

Richard Wilson
Professor and Chairman
Dept. of Physics

RW:dr
Encls.

Air Products and Chemicals, Inc.
Box 538, Allentown, PA 18105
(215)481-4911

12 February 1982

Dr. Richard Wilson
Chairman, Department of Physics
Harvard University
Cambridge, Massachusetts · 02138

Dear Dick:

Thank you for the reprint which you sent to me last week. It is an excellent article with a number of good points. The reprint did not identify its origin, however, and I would appreciate the citation so that I can refer to the paper.

I would make two comments on the paper. First, in figure 2, I suggest that scientific data input is vital to the benefit assessment, as well as that of the risk and cost. Only if we understand the underlying principles can we estimate the results of changes.

Second, I would encourage you to consider modifying your call to use the proportional dose model in all cases, and to use it only for preliminary priority setting, and in those cases where we do not understand the mechanism or comparative metabolism of the carcinogen. Our experience with the "megamouse" ED_{01} study and other large data bases shows us that no mathematical model taken alone gives a reliable picture of risk very far outside of the experimental range. However, Gehring, Weisberger, Squire, the work at CIIT, and many other studies shows that the linear method almost always is inappropriate when relevant data are available. Thus, we should strive to incorporate all available data in our final decisions.

I am happy at your recognition as Chairman of the Department, and glad to hear that you're back in Cambridge for a while. As you may have read, OSHA is reopening its Cancer Policy, and soon will propose its Hazards Identification Policy, so we have a busy time ahead again in this area.

Very truly yours,

John T. Barr
Manager, Regulatory Response

JTB/sjw

AP00017007

SECTION 112 OF THE CLEAN AIR ACT
PROVIDING FOR
NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (NESHAPS)

From EIA to Senate, fall 82 per request

In view of past experience, EPA has shifted its efforts and devised improved public and internal cancer assessment procedures and protocols. This new approach emphasizes good science and meaningful public participation in the assessment process on a substance by substance basis. EPA's listing and standards will be defensible. Substances posing a significant risk will be identified and regulated.

How EPA's Program is Working Now

- First, EPA screened over 600 chemicals and prioritized them to concentrate on a list of 37 for further review.
- Now, health and exposure assessments are being prepared for those substances. (Nine are completed currently.)
- Next, the Science Advisory Board reviews health and exposure assessments. (Six substances are scheduled for review in early '82.)
- Public comment will follow on the health and exposure assessments.
- The EPA Administrator will decide whether or not to list a substance for regulation.
- Scientific and engineering committee will review the emission standard which is based on assessment of risk to public health.
- EPA proposes the NESHAP in Federal Register.
- EPA promulgates NESHAP.

How Program has Worked

So far, EPA has listed seven substances under Section 112 and promulgated NESHAPS for four of these (mercury, asbestos, beryllium, vinylchloride promulgated, benzene, arsenic, and radionuclides standards not yet promulgated. The pace of listing and subsequently regulating hazardous air pollutants to date has been moderate, at best, for three reasons:

1) Agency resources have been largely devoted to programs concerning the criteria pollutants. As agency resources have been redirected, the hazardous air pollutants program has shown more rapid progress without any legislative change.

2) At this time, there is insufficient evidence to justify listing additional substances as hazardous air pollutants. For example, EPA asserted that four chlorinated compounds are carcinogens. EPA's Science Advisory Board rejected the assertion, pointing out the inadequacy of the Agency's scientific data/evidence.

3) In recent years EPA's focus was on the its Airborne Carcinogen Policy. The proposed generic carcinogen policy has been withdrawn because EPA was unable to resolve many of the scientific questions raised. However, EPA has incorporated key elements of the Airborne Carcinogen Policy into its current program.

2/82

Status Report
Potential Air Toxics

I. Regulated as Hazardous Pollutant Under §112

Mercury
Beryllium
Asbestos
Vinyl Chloride

II. Listed as Hazardous Pollutant under §112; Regulations Under Development

Arsenic (inorganic compounds)
Benzene

III. Health Documents Reviewed by SAB; Regulations Being Considered

Cadmium
Polycyclic Organic Matter (see Coke Oven Emissions, Section IV below)

IV. Health Documents Ready for SAB Review; Source Analyses Complete

Acrylonitrile
Coke Oven Emissions (Carcinogen Assessment)
Methyl Chloroform –
Methylene Chloride –
Perchloroethylene
Trichloroethylene –

V. Health Documents Nearing Completion; Preliminary Source Analyses Complete

Carbon tetrachloride
Nickel
Toluene
Vinylidene Chloride

VI. Health Documents in Preparation; Preliminary Source Analyses Complete

Chloroform
Epichlorohydrin
Ethylene dichloride
Ethylene oxide
Formaldehyde
Manganese

VII. Screening Health Documents in Preparation; Preliminary Source Analysis Complete

Acrolein
Chloroprene
Hexachlorocyclopentadiene
PCB's

VIII. Health Document in Preparation; Source Analyses not initiated

Chromium

IX. Health Assessment not initiated; Preliminary Source Analyses Complete

Acetaldehyde
Allyl chloride
Benzyl chloride
Chlorobenzene
Cresols
Dimethylnitrosamine
Dioxin
Maleic anhydride
para-dichlorobenzene
Nitrosomorpholine
Phosgene
Propylene oxide
Xylenes

SUMMARY DATA
POTENTIAL AIR TOXICS

Substance	Uses, Sources and Quantities	Regulatory Activities
Acetaldehyde	• Exclusively used as a feedstock to produce several other organic chemicals • 500,000 tons produced (1978) • Produced and used at 5 chemical plants, used at 13 others to make other chemicals (1750 tons annual emissions)	• Hazardous water pollutant* • Hazardous solid waste** • Regulated by OSHA***
Acrolein	• Exclusively used as a feedstock to produce other organic chemicals • 175,000 tons produced (1978) • Produced at 4 chemical plants, used at 4 others to make other chemicals (48 tons annual emissions)	• Hazardous and toxic water pollutant • Hazardous solid waste • Restricted pesticide use**** • Regulated by OSHA
Acrylonitrile	• Feedstock for several important plastics and fibers (e.g., acrylics and modacrylics) • 850,000 tons produced (1980) • Produced at 6 chemical plants, used at 25 others to make other chemicals (5100 tons annual emissions)	• Hazardous and toxic water pollutant • Hazardous solid waste • Restricted pesticide use • Regulated by OSHA
Allyl chloride	• Exclusively used as a feedstock to produce epichlorohydrin (see below) • 165,000 tons produced (1978) • Produced at 3 chemical plants. Used only at those plants. (550 tons annual emissions)	• Hazardous water pollutant • Regulated by OSHA

*Hazardous water pollutant (§311 Clean Water Act). Toxic water pollutant (§307 Clean Water Act.

**Hazardous solid waste under Resource Conservation and Recovery Act (RCRA).

***The Occupational Safety and Health Administration has set allowable concentrations for workplace air

****Restricted under the Federal Insecticide, Fungicide, Rodenticide Act (FIFRA)

SUMMARY DATA
POTENTIAL AIR TOXICS

Substance	Uses, Sources and Quantities	Regulatory Activities
Arsenic (Inorganic Compounds)	• Recovered as by-product from copper smelting. Used in production of pesticides, wood preservatives, and glass. Also trace element in coal and contaminant in other non-ferrous ores • About 50 sources (not including coal combustion) • Approximately 14,000 tons air emissions	• Inorganic arsenic listed as a hazardous air pollutant under § 112, CAA, 6/5/80. • Regulations being studied. • Toxic solid waste, toxic and hazardous water pollutant • Regulated under the Safe Drinking Water Act • Inorganic arsenic regulated by OSHA • Restricted pesticide use (voluntary restriction)
Benzene	• Component in gasoline (few percent) • Pure benzene is separated from petroleum and also produced (from toluene) for use as a feedstock in manufacture of several important chemicals • 7,000,000 tons produced (1980) as a chemical. An additional 6,000,000 tons are produced in gasoline • Manufactured at most refineries and coke plants (approx. 300 sources). Used at about 50 chemical plants. • About 50,000 tons air emissions from stationary sources; about 150,000 tons air emissions from mobile sources	• Hazardous and toxic water polluant • Hazardous solid waste • Regulated by OSHA • Listed as hazardous air pollutant under § 112 of CAA. Regulations proposed.

SUMMARY DATA
POTENTIAL AIR TOXICS

Substance	Uses, Sources and Quantities	Regulatory Activities
Benzyl chloride	• Used exclusively as a feedstock to produce other organic chemicals • 57,000 tons produced (1978) • Produced at 4 chemical plants, used at about 13 others to make other chemicals (50 tons annual emissions)	• Hazardous water pollutant • Regulated by OSHA • Hazardous solid waste
Beryllium (pure metal and all stable compounds)	• Used in atomic and aerospace products and for ceramics. Metal mined and processed in U.S. • 3750 tons used in U.S. (1978) • Ore processed at 5 plants. Beryllium metal then processed at more than 50 others • Beryllium is also trace element in coal; released during combustion • 180 tons annual emissions (all sources)	• Regulated in 1973 under CAA §112 for beryllliosis. Standards under review in 1982 • Toxic water pollutant. Some compounds listed as hazardous water pollutants • Hazardous solid waste • Regulated by OSHA
Cadmium (principally inorganic compounds)	• Used in production of pigments, batteries, plastics and in electroplating. Recovered as by-product from non-ferrous smelting. Also trace element in coal. • Approximately 5500 tons consumed (1975) • Several hundred sources (not including coal combustion) • Approximately 900 tons air emissions	• Hazardous solid waste • Toxic and hazardous water pollutant • Regulated under the Safe Drinking Water Act • Regulated by OSHA • FIFRA • Regulatory decision package in preparation

SUMMARY DATA
POTENTIAL AIR TOXICS

Substance	Uses, Sources and Quantities	Regulatory Activities
Carbon tetrachloride	• Principally used as a feedstock for fluorocarbons • Many small solvent uses (30,000 tons annual emissions) • Produced at 10 chemical plants, used at 15 others to make other chemicals (2,500 tons annual emissions)	• Hazardous and toxic water pollutant • Restricted pesticide use • Hazardous solid waste • Regulated by OSHA
Chlorobenzene	• Principally used as feedstock for pesticides and as a cleaning solvent • 178,000 tons produced (1978) • Produced at 6 chemical plants, used at about 5 additional chemical and pesticide plants (24,000 tons annual emissions)	• Hazardous and toxic water pollutant • Hazardous solid waste • Regulated by OSHA • FIFRA
Chloroform	• Principally used as a feedstock in manufacture of fluorocarbons. Some solvent usage • 165,000 tons produced (1978) • Produced at 7 chemical plants and used at about 15 others to make other chemicals (550 tons annual emissions) • Many solvent uses (11,500 tons annual emissions)	• Hazardous and toxic water pollutant • Hazardous solid waste • Regulated by OSHA • Drinking water
Chloroprene	• Exclusively used as feedstock in production of polychloroprene (synthetic rubber) • 139,000 tons produced (1978) • Produced and used at 3 chemical plants (1700 tons ann. em.)	• Regulated by OSHA

SUMMARY DATA
POTENTIAL AIR TOXICS

Substance	Uses, Sources and Quantities	Regulatory Activities
Chromium (Hexavalent form of most concern)	• Metal important in production of iron and steel. Also used in refractories and in paint and pigments. • 1,100,000 tons ore imported (1972) (17,600 tons ann. em.) • Trace element in coal.	• Toxic water pollutant • Hazardous solid waste • Regulated by OSHA
Coke Oven Emissions (Subset of Polycyclic Organic Matter, see below)	• 48,000,000 tons of coke produced each year from coal, principally for use in the iron and steel industry • Produced at 59 iron and steel plants. • Coke oven emissions include particulate matter with many complex organic chemicals adsorbed onto the particle surfaces. The organics are generally removed for analysis by extracting with benzene (Benzene-Soluble Organics, or BSO) • 1600 tons of BSO are emitted annually	• Being considered for listing under §112 of CAA • Several specific polycyclic organics listed as toxic water pollutants • Regulated by OSHA • Several specific polycyclic organics listed as hazardous solid wastes
Cresols (3 isomers)	• Principally used as a feedstock in manufacture of several organic chemicals and plastics. Also used as solvent and in ore processing • 16,000 tons produced (1978) • Produced at 7 chemical plants. Used at more than 250 other plants to make other chemicals (11,000 tons ann. em.) • Also 1,500 tons ann. from coke ovens.	• Hazardous water pollutant • Hazardous solid waste • Regulated by OSHA

SUMMARY DATA
POTENTIAL AIR TOXICS

Substance	Uses, Sources and Quantities	Regulatory Activities
Dimethylnitrosamine	• Produced at one facility as intermediate to make other chemicals • Emission estimated to be very low.	• Hazardous solid waste
Dioxin (2,3,7,8-TCDD)	• Trace contaminant in some chemical processes. Also formed during combustion of some chlorinated compounds. • Rough estimate of less than 100 lb. emitted nationwide each year.	• Under multimedia evaluation by EPA. • Toxic water pollutant • Hazardous solid waste
Epichlorohydrin	• Produced from allyl chloride (see above). Used mainly to make glycerin and epoxy resins and glues. • 150,000 tons produced (1978) • Produced and used at 3 chemical plants to make glycerin. Also used at 11 chemical plants to make epoxies. (240 tons annual emissions).	• Hazardous water pollutant. • Regulated by OSHA
Ethylene dichloride	• Principally used as feedstock in production of vinyl chloride. Also used in leaded gasoline to scavenge lead from engines.) • 5,700,000 tons produced (1978) • Produced at 18 chemical plants, used at 28 others. Used at most U.S. refineries (about 250) • 55,000 tons air emissions (not including emissions from gasoline)	• Hazardous and toxic water pollutant • Hazardous solid waste • Regulated by OSHA • FIFRA

SUMMARY DATA
POTENTIAL AIR TOXICS

Substance	Uses, Sources and Quantities	Regulatory Activities
Ethylene oxide	• Principally used as a feedstock in manufacture of several organic chemicals, mainly ethylene glycol anti-freeze. Small use as a sterilant. • 1,820,000 tons produced (1978) • Produced at 13 chemical plants and used at 2 others (1000 tons annual emissions).	• Hazardous solid waste • Restricted pesticides use • Regulated by OSHA
Formaldehyde	• Feedstock in manufacture of many products. Largest use various plastics (e.g., melamine) and wood resins. • 3,200,000 tons produced (1978). • Produced at 53 plants and used at more than 350 others. • Also product of combustion.	• Hazardous water pollutant • Hazardous solid waste • Regulated by OSHA • FIFRA
Hexachlorocyclo-pentadiene	• Exclusively used as feedstock in manufacture of pesticides and flame retardants • 3500 tons produced (1978) • Produced at 2 chemical plants, used at 5 others (30 tons annual emissions).	• Hazardous and toxic water pollutant • Hazardous solid waste • FIFRA
Maleic anhydride	• Used as the feedstock in the manufacture of polyester resins. • 250,000 tons produced (1978) • Produced at 8 chemical plants, used at several others to make polyester resins. • Maleic anhydride is a solid. Emissions are low.	• Hazardous water pollutant. • Hazardous solid waste • Regulated by OSHA

SUMMARY DATA
POTENTIAL AIR TOXICS

Substance	Uses, Sources and Quantities	Regulatory Activities
para-Dichlorobenzene	• Principally used as a space deodorant and for moth control. Small use as pesticide intermediate. • 27,000 tons produced (1978) • Produced at 7 chemical plants and used by as many as 100 pesticide plants (200 tons ann. em.) Deodorant usage too widespread to quantify	• Hazardous and toxic water pollutant • Hazardous solid waste • Regulated by OSHA
Manganese (Specific compounds not well established)	• Metal important in production of iron and steel • 1,600,000 tons used (1978); most imported • Used at over 600 iron and steel facilities (4500 tons ann. em.) • Also trace element in coal, emitted during combustion e.g., power plants, coke) (3300 tons ann. em.)	• Regulated by OSHA
Methyl Chloroform	• Used principally as a metal cleaning solvent (over 90%) • 310,000 tons produced (1978) • Produced at 4 chemical plants (1500 tons ann. em.) • Used in more than 20,000 small degreasers (270,000 tons ann. em.)	• Toxic water pollutant • Hazardous solid waste • Regulated by OSHA • FIFRA

SUMMARY DATA
POTENTIAL AIR TOXICS

Substance	Uses, Sources and Quantities	Regulatory Activities
Methylene Chloride	• Used principally as a paint remover, metal cleaning solvent and aerosol propellant • 260,000 tons produced (1978) • Produced at 7 chemical plants (600 tons ann. em) • Used in more than 7000 small degreasers. Some household use (204,000 tons ann. em.).	• Toxic water pollutant • Hazardous solid waste • Regulated by OSHA • FIFRA
Nickel (Nickel carbonyl and soluble salts of most concern)	• Metal important in production of iron and steel • 188,000 tons produced (1978), of which 100,000 tons imported • One mine in U.S., two production plants. More than 500 using plants (850 tons ann. em.) • Trace element in coal emitted during combustion (5000 tons ann. em.)	• Toxic water pollutant • Some compounds listed as hazardous solid wastes • Regulated by OSHA • Some nickel compounds - FIFRA
Nitrobenzene	• Almost totally used as feedstock to make aniline (dye intermediate) • Produced at 7 chemical plants, used at 13 others (500 tons annual emissions) • 425,000 tons produced (1978) • Solvent uses (6000 tons annual emissions	• Hazardous and toxic water pollutant • Hazardous solid waste • Regulated by OSHA

SUMMARY DATA
POTENTIAL AIR TOXICS

Substance	Uses, Sources and Quantities	Regulatory Activities
Nitrosomorpholine	• One of a group of nitrosamines formed as contaminants in some chemical processes • Not intentionally produced • Emissions estimates to be very low	• None
Perchloroethylene	• Drycleaning solvent of choice. Also used in metal cleaning • 320,000 tons produced (1978) • Manufactured at 10 chemical plants used at about 45,000 drycleaners and several thousand degreasers • 168,000 tons air emissions	• Toxic water pollutant • Hazardous solvent waste • Regulated by OSHA • FIFRA
Phenol	• Feedstock in production of various organic chemicals and other products. • 1,200,000 tons produced (1978) • Produced at 16 chemical plants and used at more than 25 others (3000 tons ann. ea.)	• Hazardous and toxic water pollutant • Hazardous solid waste • Regulated by OHSA • FIFRA
Phosgene	• Feedstock in production of several organic chemicals and plastics. • 680,000 tons produced (1978) • Produced at 18 chemical plants. and used at 28 others (100 tons ann. ea.)	• Hazardous water pollutant • Hazardous solid waste • Regulated by OSHA

SUMMARY DATA
POTENTIAL AIR TOXICS

Substance	Uses, Sources and Quantities	Regulatory Activities
Polychlorinated biphenyls (PCB's)	• No longer produced in U.S., although PCB containing electrical transformers capacitors still in use. • Emissions predominately during transformer malfunctions and where equipment is disposed of in waste dumps and incinerators. • Emissions estimate 15 tons per year nationwide.	• Hazardous and toxic water pollutant. •TSCA* prohibition and phase-out
Polycyclic Organic Matter (several different organic compound)	• See Coke Oven Emissions • Produced during inefficient combustion (e.g., residential heating, wood stoves).	• Some POM are toxic water pollutants • Some POM are hazardous solid wastes
Propylene oxide	• Feedstock in production of several organic chemicals and plastics. • 1,000,000 tons produced (1978). • Produced at 7 chemical plants, used at 50 others (650 tons ann. emm.).	• Hazardous water pollutant • Regulated by OSHA • FIFRA
Toluene	• Component in gasoline (few per-cent). Pure toluene separated from petroleum to make benzene and for solvent usage. • 33,000,000 tons produced (1978) • Produced at most refineries and coke plants (approx. 300 sources) 4000 tons ann. em.), used at several hundred other sources as a solvent, then emitted from thousands of sources where paints, costings, and adhesives are used. • 1,100,000 tons air emissions.	• Hazardous and toxic water pollutant • Hazardous solid waste. • Regulated by OSHA

* TSCA - Toxic Substances Control Act

SUMMARY DATA
POTENTIAL AIR TOXICS

Substance	Uses, Sources and Quantities	Regulatory Activities
Trichloroethylene	• Principally used as a metal cleaning solvent • 145,000 tons produced (1978) • Produced at 3 chemical sources (400 tons ann. em.) • Used in more than 20,000 degreasers (120,000 tons ann. em.).	• Hazardous and toxic water pollutant • Hazardous solid waste • Regulated by OSHA
Vinylidene chloride	• Feedstock in manufacture of plastics (principally Saran wrap) • 135,000 tons produced (1978) • Manufactured at 3 chemical plants, used at about 33 others (400 tons ann. em.)	• Hazardous water pollutant
Xylenes (3 isomers)	• Component in gasoline (few percent; Pure xylenes separated from petroleum for use as a solvent and in production of various organic chemicals • 40,000,000 tons produced (1978) • Manufactured at most refineries and coke plants (approx. 300 sources)(3700 tons ann. em.). Used at several hundred other sources as solvent (250,000 tons ann. em.) then emitted from thousands of sources where paints, coatings and adhesives are used.	• Hazardous water pollutant • Hazardous solid waste • Regulated by OSHA • FIFRA