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Implications of OSHA's Reliance on TLVs in Developing the Air Contaminants Standard

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This paper evaluates the decision by the Occupational Safety and Health Administration (OSHA) to base its Air Contaminants Standard on the threshold limit values (TLVs) of the American Conference of Governmental Industrial Hygienists. Contrary to the claim made by OSHA in promulgating the standard, the TLV list was not the sole available basis for a generic standard covering toxic air contaminants. The National Institute for Occupational Safety and Health (NIOSH) presented data indicating that the TLVs were insufficiently protective for 98 substances. NIOSH Recommended Exposure Limits (RELs) were available for 59 of these substances. The ratio of PEL to REL ranged up to 1,000, with a median of 2.5 and a mean of 71.4. OSHA excluded 42 substances from the standard altogether despite the availability of NIOSH RELs, solely because no TLV had been established.

Key words: OSHA, air contaminants, permissible exposure limit, threshold limit value, occupational health

INTRODUCTION

The decision by the Occupational Safety and Health Administration (OSHA) to base its Air Contaminants standard [OSHA 1989a] on the Threshold Limit Values (TLVs) of the American Conference of Governmental Industrial Hygienists (ACGIH) has generated considerable controversy. Critics have alleged undue corporate influence on the ACGIH TLV committee [Castleman and Ziem, 1988] and have questioned the quality of the documentation underlying particular TLVs [Roach and Rappaport 1990]. While powerful, these objections do not touch at the fundamental argument used by OSHA in favor of relying on the ACGIH figures. In the preamble to the Air Contaminants Standard, OSHA noted the failure of its traditional substance-by-substance regulatory strategy and emphasized its desire to pursue a generic, multi-substance approach. It focussed on the TLV list with the claim that this constituted the sole readily available basis for a generic standard.

This paper critically examines the "no alternatives to ACGIH" assumption

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used by OSHA in designing the Air Contaminants Standard. Particular attention is placed on the National Institute for Occupational Safety and Health (NIOSH), which unsuccessfully sought to play the role assigned by OSHA to the ACGIH. The paper begins with a short chronology of the development of the Air Contaminants Standard, with emphasis on the systematic exclusion of NIOSH in favor of the ACGIH. The second section describes the principal areas of disagreement between ACGIH and OSHA on the one hand and NIOSH on the other. Detailed tables are included listing the substances for which disagreement existed. A final section presents our conclusions.

Our findings, based on an analysis of the published studies and written testimony available to OSHA at the time the Air Contaminants Standard was promulgated, may be briefly summarized as follows. For 98 substances, NIOSH presented data indicating that the OSHA permissible exposure limits (PELs) based on the ACGIH TLVs were insufficiently protective. For 59 of these 98 substances, NIOSH had developed recommendations concerning exposure controls; numerical recommended limits were available for 50 substances. NIOSH testified that some of its recommended exposure limits (RELs) were outdated and insufficiently protective. The ratio of OSHA PEL to NIOSH REL always exceeded 1 and ranged up to 1000, with a median of 2.5 and a mean of 71.4. NIOSH also presented data questioning the priority-setting mechanism underlying the Air Contaminants Standard, i.e., coverage of only those substances for which TLVs had been established.

EXCLUSION OF NIOSH AND OTHER SCIENTIFIC BODIES

Under provision 6(a) of the Occupational Safety and Health Act (OSHAct), OSHA was empowered for a brief period after its creation in 1970 to adopt occupational safety and health standards established under the Walsh-Healy Public Contracts Act as mandatory standards without going through the formal rule-making procedure (defined in section 6(b) of the OSHAct). At that time, it adopted approximately 400 such standards, largely from the 1968 ACGIH TLV list [Ashford, 1976; Mintz, 1984]. In the following years, however, new exposure limits were pursued using the formal 6(b) process, with the result that only 13 rules, covering 26 hazardous substances, were successfully promulgated. During this period, the ACGIH continued to update its TLV list, adding new chemicals and lowering the TLVs for many substances. By 1987, the TLV list contained 168 substances not regulated by OSHA (added to the TLV list since 1968) and 234 substances for which the 1987–1988 TLVs were lower than the OSHA PELS (based on the 1968 TLV). This growing disparity between the TLVs and PELs was commented upon by academic observers as a symptom of regulatory failure [Mendeloff, 1988], and was a source of embarassment for the Agency.

In the Spring of 1987, John Pendergrass, Director of OSHA, initiated a process to review and update the permissible exposure limits for substances covered under the initial 6(a) process. Charles Adkins, Director of Health Standards at OSHA, was given authority over the project and made the decision to confine the scope to already existing lists of recommended exposure levels. According to the original proposal for an Air Contaminants Standard, OSHA considered the different types of chemical lists published by NIOSH, the Environmental Protection Agency, the National Toxicology Program, and the International Agency for Research on Cancer, among others, as well as the ACGIH [OSHA, 1989a; Adkins, 1988]. Despite NIOSH's statutory role to serve as the scientific resource for OSHA and the source of recommendations for regulatory action, the Institute was not included in the PEL update project, however.

In September 1987, Harry Ettinger was hired by OSHA as a special consultant to oversee the PEL update project. By this time, at least, the purview of the project had been limited to the substances on the ACGIH TLV list, to the exclusion of the lists published by the various scientific agencies [Ettinger, 1988]. In particular, the decision had been made not to rely on the list of RELs developed by NIOSH. In November 1987, Richard Lemen, director of Standards Development and Technology Transfer at NIOSH, approached OSHA and requested that NIOSH be allowed to participate in the PEL update project. Subsequently, John Whalen, assistant director to Lemen, attended biweekly meetings with OSHA [Lemen, 1988].

In the early Spring of 1988, OSHA presented NIOSH with the list of substances to be included in the rule-making, plus OSHA's initial proposals for updated exposure limits (based on the 1987–88 TLV list). The Institute was given six weeks to comment [Lemen, 1988]. During this period, NIOSH hurriedly evaluated the health effects reports for particular substances from various databases. NIOSH based its efforts on a 1983–1984 project to evaluate the health effects literature on a variety of substances. In the Fall of 1983, OSHA had requested information from NIOSH on 115 chemicals and 2 industrial processes for which OSHA had at one time begun, but never completed, rule-making (the so-called "dormant standards project"). NIOSH had provided OSHA with a preliminary analysis in October of 1983 and a final analysis in October of 1984. In performing this review, NIOSH had convened an interdisciplinary panel of in-house scientists to evaluate the literature on each of the substances and processes and concluded by recommending 6(b) rule-making for 51 substances [NIOSH, 1988].

In June 1988, OSHA published the notice of proposed rule-making on toxic air contaminants in the *Federal Register* and set public hearings for July of that year. During the public hearings, actually held between July 28 and August 12 of 1988, NIOSH provided more than 4,000 pages of testimony and documentation concerning the substances to be covered in the rule-making and also on 42 additional chemicals, excluded by OSHA, which NIOSH believed should be included in the Air Contaminants rule-making. As described in the following section of this paper, the NIOSH written testimony and documentation disagreed with OSHA on a large number of points. In December of 1988, however, OSHA submitted the final Air Contaminants Standard to the federal Office of Management and Budget (OMB) largely unchanged from the original proposal. The final Air Contaminants Standard was approved by the OMB and promulgated in January of 1989.

DISCORDANCE BETWEEN OSHA AND NIOSH

Tables I and II present the substances for which documented discordance exists between OSHA and NIOSH. The information included in these tables was obtained by the authors from the voluminous docket of testimony related to the Air Contaminants Standard, available to the public in Washington, D.C. Therefore, all this information was available to OSHA before it promulgated the final Air Contaminants Standard. Tables I and II focus on discordance between the recommendation of NIOSH and the Air Contaminants Standard as finally promulgated, and exclude the

TABLE I. Substances for Which the OSHA Permissible Exposure Limit Was Judged by NIOSH To Be Inadequately Protective*

Substance	OSHA PEL (mg/m^3)	ACGIH TLV (mg/m^3)	PEL/TLV	NIOSH REL (mg/m^3)	PEL/REL
Acetaldehyde	180	180	1	—	—
Acetone	1,780	1,780	1	593	3
Acetonitrile	70	70	1	35	2
Acetylene tetrabromide	14	14	1	—	—
Acrylic acid	30	30	1	—	—
Arsine	0.2	0.2	1	0.002C	>100
Beryllium	0.002	0.002	1	0.0005	4
Borates, tetra, sodium					
Anhydrous	10	1	10	1[a]	10
Decahydrate	10	5	2	5[a]	2
Pentahydrate	10	1	10	1[a]	10
t-Butyl chromate	0.1C	0.1C	1	0.001	<100
n-Butyl glycidyl ether	135	135	1	30C	>4.5
Calcium oxide	5	2	2.5	2[a]	2.5
Camphor, synthetic	2	12	0.17	—	—
Caprolactam vapor	20	20	1	—	—
Carbon black	3.5	3.5	1	0.1	35
Carbon disulfide	12	30	0.4	3	4
Carbon tetrachloride	12	30	0.4	12C	>1
Chlorinated camphene	0.5	0.5	1	—	—
Chlorine	1.5	3	0.5	1.5C	>1
Chlorobenzene	350	350	1	—	—
Chlorodiphenyl					
42% chlorine	1	1	1	0.001	1000
54% chlorine	0.5	0.5	1	0.001	500
Chloroform	10	50	0.2	10C	>1
Chromic acid and chromates	0.1C	0.05	<2	0.025 (0.05C)	2
Chromium (II) cpds	0.5	0.5	1	—	—
Chromium (III) cpd	0.5	0.5	1	—	—
Chromium (VI) cpds					
Water soluble	0.5	0.05	10	0.001	500
Water insoluble	1	0.05	20	0.001	1000
Chromium metal	1	0.5	2	0.5[a]	2
Coal tar pitch volatiles					
Benzene soluble	0.2	0.2	1	0.1	2
Coal dust					
<5% quarts	2	2	1	—	—
>5% quartz	0.1	0.1	1	—	—
Cresol	22	22	1	10	2.2
Dichlorodiphenyltrichloroethane (DDT)	1	1	1	0.5	2
p-Dichlorobenzene	450	450	1	—	—
1,1 Dimethylhydrazine	1	1	1	0.15	6.7
Disulfoton	0.1	0.1	1	—	—
Epichlorohydrin	8	8	1	ME	—
Ethyl acrylate	20	20	1	—	—
Ethyl bromide	890	890	1	—	—
Ethyl chloride	2,600	2,600	1	ME	—
Ethyl ether	1,200	1,200	1	—	—
Ethylene glycol vapor	125C	125C	1	—	—
Fenthion	0.2	0.2	1	—	—

(*continued*)

TABLE I. Substances for Which the OSHA Permissible Exposure Limit Was Judged by NIOSH To Be Inadequately Protective (continued)*

Substance	OSHA PEL (mg/m^3)	ACGIH TLV (mg/m^3)	PEL/TLV	NIOSH REL (mg/m^3)	PEL/REL
Fluorine	0.2	2	0.1	—	—
Formamide	30	30	1	—	—
Furfural	8	8	1	—	—
Gasoline	900	900	1	—	—
Grain dust	10	10	1	4[a]	2.5
Heptane	1,600	1,600	1	350	4.6
Hexane isomers	1,800	1,800	1	350	5.1
2-Hexanone (methyl n-butyl ketone)	20	20	1	4	5
Hydrazine	0.1	0.1	1	0.04	2.5
Iron oxide	10	5	2	5[a]	2
Isopropoxyethanol	105	105	1	—	—
Isopropyl acetate	950	950	1	—	—
Isopropylamine	12	12	1	—	—
Manganese dust and compounds	5C	5C	1	—	—
Manganese tetroxide	1	1	1	—	—
Mesityl oxide	60	60	1	40	1.5
Methyl bromide	20	20	1	LFL	—
Methyl chloride	105	105	1	LFL	—
4,4 Methylene-bis(2-chloroaniline)	0.22	0.22	1	0.003	73.3
Methyl ethyl ketone peroxide	5.25	1.5C	>3.5	1.5[a]	3.5
Methyl hydrazine	0.35C	0.35C	1	0.08C	4.4
Molybdenum (soluble)	5	5	1	—	—
Nickel soluble or inorganic cpds	0.1	0.1	1	0.015	6.7
p-Nitrochlorobenzene	1	3	0.33	—	—
Nitromethane	250	250	1	—	—
2-Nitropropane	35	35	1	LFL	—
Octane	1,450	1,450	1	350	4.1
Ozone	0.2	0.2	1	—	—
Parathion	0.1	0.1	1	0.05	2
Pentane	1,800	1,800	1	350	5.1
2-Pentanone	700	700	1	530	1.3
Perchloroethylene	170	335	0.51	ME	—
Phenyl glycidyl ether	6	6	1	5C	>1.2
Phenylhydrazine	20	20	1	0.6C	>33
Propylene dichloride	350	350	1	—	—
Propylene oxide	50	50	1	—	—
Rosin core solder pyrolysis products	0.1	0.1	1	0.1C	>1
Silica					
Amorphous	6	10	0.6	—	—
Crystalline					
Quartz	0.1	0.1	1	0.05	2
Tripoli	0.1	0.1	1	0.05	2
Silica-fused	0.1	0.1	1	0.05	2
m-Toludine	9	9	1	—	—
o-Toluidine	22.5	9	2.5	9[a]	2.5
p-Toluidine	9	9	1	—	—
Trichloroethylene	270	270	1	135	2
Triethylamine	40	40	1	—	—
Vinyl acetate	30	30	1	15C	>2
Vinyl bromide	20	20	1	ME	—

(continued)

TABLE I. Substances for Which the OSHA Permissible Exposure Limit Was Judged by NIOSH To Be Inadequately Protective (continued)*

Substance	OSHA PEL (mg/m³)	ACGIH TLV (mg/m³)	PEL/TLV	NIOSH REL (mg/m³)	PEL/REL
Vinylidene chloride	4	20	0.2	ME	—
Welding fumes	5	5	1	LFL	—
Wood dust, softwood	5	5	1	—	—
Zinc chromate	0.1	0.05	2	0.001	100
Zirconium cpds	5	5	1	—	—

[a]For 15 substances, NIOSH agreed with the original proposed PEL but disagreed with the final promulgated PEL.

**Abbreviations:* ACGIH, American Conference of Governmental Industrial Hygienists; C, ceiling value, not to be exceeded at any time, in contrast to an 8-hr time-weighted average (TWA); cpds, compounds; LFL, NIOSH recommends that exposures to the substance be reduced to the lowest feasible level; ME, NIOSH recommends that exposure to this substance be minimized; mg/m^3, milligrams per cubic meter of air; NIOSH, National Institute for Occupational Safety and Health; OSHA, Occupational Safety and Health Administration; PEL, Permissible Exposure Limit set by OSHA; REL, Recommended Exposure Limit set by NIOSH; TLV, Threshold Limit Value set by ACGIH.

small number of substances for which OSHA based its action on NIOSH recommendations. As such, Tables I and II present the information and recommendations available to OSHA but not used by OSHA in promulgating the final standard, which was based overwhelmingly upon the ACGIH TLV list.

Table I presents 98 substances for which NIOSH testified that the PEL proposed by OSHA was insufficiently protective, based on NIOSH's evaluation of the published epidemiological and toxicological literature. The first and second columns of the table present the 1987–1988 TLV and the final PEL for the substance. For 76 substances, the PEL equals the TLV. For 10 substances the PEL is lower (more protective) than the TLV, while for 12 substances the PEL is higher (less protective) than the TLV. To facilitate comparisons, the third column of Table I presents the ratio of the OSHA PEL to the ACGIH TLV.

The fourth column of Table I presents the NIOSH RELs, where available. In its testimony, NIOSH made clear that it was not proposing the adoption of all its RELs and submitted published studies casting doubt on the validity of particular TLVs and PELs even where RELs did not exist. Most of the RELs were developed in the 1970s and some were outdated by more recent findings. Nevertheless, they are useful as a standard of comparison against which to evaluate the TLVs and the PELs.

For all 50 substances that had been assigned numerical RELs, the REL is more protective than the PEL, often by substantial amounts. As shown in the fifth column, the ratio of the OSHA PEL to the NIOSH REL ranges up to 1000, with a median of 2.5 and a mean of 71.4. In 7 cases, the PEL exceeds the REL by a factor of $\geq$100.

Table II presents 42 substances excluded from the Air Contaminants Standard but for which NIOSH Recommended Exposure Limits have been developed. These substances were excluded because the ACGIH TLV committee had not evaluated them. During the public hearings, NIOSH testified that these substances should be covered by the standard [Lemen, 1988].

TABLE II. Substances Excluded From OSHA Rule-Making for Which NIOSH Recommended Regulatory Action*

Substance	OSHA PEL (mg/m^3)	ACGIH TLV (mg/m^3)	NIOSH REL (mg/m^3)
Acetone cyanohydrin	—	—	4C
Acetylene	—	—	2662C
Adiponitrile	—	—	18
n-Butyronitrile	—	—	22
Cetylmercaptan	—	—	5.3
Cyclohexylmercaptan	—	—	2.4
Decylmercaptan	—	—	3.6
2,4-Diaminoanisole	—	—	LFL
o-Dianisidine-based dyes	—	—	ME
bis(2-Dimethylaminoethyl)ether	—	—	ME
Dimethylaminoproprionitrile	—	—	ME
Dodecylmercaptan	—	—	4.1
Enflurane	—	—	15.1
Ethylene thiourea	—	—	ME
Fluroxene	—	—	10.3
Glycolnitrile	—	—	5C
Halothane	—	—	16.2C
n-Heptylmercaptan	—	—	2.7C
Hexamethylene diisocyanate (HDI)	—	—	0.035
n-hexylmercaptan	—	—	2.4C
Isobutyronitrile	—	—	22
Kepone	—	—	0.001
Kerosene	—	—	100
Malonitrile	—	—	8
Methoxylflurane	—	—	13.5C
Napthalene diisocyanate (NDI)	—	—	0.04
2-Nitro-napthalene	—	—	LFL
Nitrous oxide	—	—	45
n-Nonylmercaptan	—	—	3.3
Octadecylmercaptan	—	—	5.9C
n-Octylmercaptan	—	—	3
Pentachloroethane	—	—	ME
Pentylmercaptan	—	—	2.1C
Proprionitrile	—	—	14
n-Propylmercaptan	—	—	1.6C
Succionitrile	—	—	20
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	—	—	LFL
1,1,1,2-Tetrachloroethane	—	—	ME
o-Tolidine-based dyes	—	—	ME
1-Undecanethiol	—	—	3.9C
Vinyl fluoride	—	—	9.4
Vinylidene fluoride	—	—	2.6

**Abbreviations:* ACGIH, American Conference of Governmental Industrial Hygienists; C, Ceiling value, not to be exceeded at any time; LFL, NIOSH recommends that exposure to the substance be reduced to the lowest feasible level; ME, NIOSH recommends that exposure to the substance be minimized; mg/m^3, milligrams per cubic meter of air; NIOSH, National Institute for Safety and Health; OSHA, Occupational Safety and Health Administration; PEL, Permissible exposure limit set by OSHA; REL, Recommended exposure limit set by NIOSH; TLV, Threshold limit value set by ACGIH.

EVALUATION OF THE "NO ALTERNATIVES TO ACGIH" ARGUMENT

OSHA's decision to pursue a generic, as distinct from substance-by-substance, approach to rule-making for toxic air contaminants was admirable. The substance-by-substance approach had generated only 13 completed standards in 19 years, clear evidence of regulatory failure. The generic approach to establishing permissible exposure limits fits in well with the larger thrust toward generic approaches to occupational health problems, as exemplified by the standard guaranteeing worker access to medical and exposure records maintained by employers [OSHA, 1980b], the standard guaranteeing workers' right to know about the properties and health effects of substances encountered on the job [OSHA, 1983], and the proposed standards governing use of respirators [OSHA, 1989b], personal protective equipment [OSHA, 1989c], exposure monitoring [OSHA, 1988a], and biological monitoring [OSHA, 1988b]. Combined, these various generic standards contain the potential for a new and more effective regulatory approach to the problem of occupational disease.

In this context, the decision to rely on the TLVs as the basis for the Air Contaminants Standard appears to be particularly unfortunate. Permissible exposure limits are in every way central to what OSHA does and, as such, the Air Contaminants Standard is potentially the most important of the existing and proposed generic standards. Yet the TLV list has been shown to be based on a highly unreliable process for evaluating the scientific literature on particular substances. Castleman and Ziem [1988] reported that 104 of the TLVs were based on nothing more than unpublished allegations, often made to the TLV committee by industry scientists whose employers had a direct financial interest in the particular substance being considered. For example, Castleman and Ziem indicated that TLVs for three of the substances on Table I, ethylene glycol, methyl chloride, and vinylidene chloride, had been influenced by representatives from the Dow Chemical corporation who were consultants to the TLV committee. They found that DuPont representatives were largely responsible for the TLVs for 4,4 methylene bis (2-chloroaniline) (MOCA) and formamide. They reported that unpublished corporate data were important in the development of the TLVs for acrylic acid, n-butyl glycidyl ether, caprolactam, chlorinated camphene, 2-isopropoxyethanol, manganese dust and compounds, manganese tetroxide, and rosin core solder pyrolysis products. In the Air Contaminants Standard, OSHA set the PELs for 12 of these 13 substances at the same level as the TLV (for vinylidene chloride, the PEL was set at 20% of the TLV). NIOSH RELs existed for three of these 14 substances. For n-butyl glycidyl ether, the PEL (and TLV) exceeded the REL by a factor of 4.5, while for MOCA it exceeded the REL by a factor of 73. In the case of rosin core solder pyrolysis products, NIOSH had proposed a ceiling value of 0.1 mg/m^3; both the ACGIH and OSHA adopted 0.1 mg/m^3 as a less protective eight hour time-weighted average.

Roach and Rappaport [1990] analyzed the published literature cited by the ACGIH and found a marked discordance between what many of the papers reported and what the TLV committee concluded in its documentation based on those same papers. Despite the ACGIH claim that the TLVs constitute thresholds of exposure below which all but the most sensitive of workers would be safe, the literature documents adverse health effects at exposure levels at or near the levels ultimately established as the TLVs. For example, 7 of 14 workers exposed to chlorodiphenyl at 10% of the TLV suffered chloracne, 10 out of 10 volunteers exposed to ethyl ether suffered upper respiratory tract irritation at 75% of the TLV, and 5 out of 5 volunteers exposed to 2-nitropropane suffered central nervous system effects such as headaches, nausea, and vomiting at 80–180% of the TLV. In the Air Contaminants Standard, OSHA set the PEL for these three substances at the same level as the TLV.

Two arguments could potentially support OSHA's decision to base its Air Contaminants Standard upon the TLVs. If no alternative body of documentation existed on a range of toxic substances encountered in the occupational environment, then use of the ACGIH list could potentially be defended as an initial step, with subsequent revisions to follow as events permitted. Even if alternative sources of documentation existed, OSHA's reliance on the TLVs might still be defensible as an honest mistake if the Agency were unaware of the deficiencies inherent in the TLVs during the period that the Air Contaminants Standard was being developed.

Unfortunately for OSHA, neither of these arguments can be made. As we have documented in this paper, there existed before and during the period under consideration alternative sets of documentation on occupational air contaminants that could have been incorporated into a generic PEL standard. In particular, NIOSH had published Recommended Exposure Limits containing numerical proposed limits for 160 substances; in its public testimony, NIOSH proposed numerical limits for an additional 16 substances. Only 14 of the 428 PELs established in the Air Contaminants Standard were set at the level contained in the relevant REL. Of the 160 substances, 42 were excluded from the standard altogether, for the simple reason that they were not included in the TLV list.

This alternative source of documentation for the Air Contaminants Standard was known to OSHA before the standard was developed. The data presented in this paper were drawn from the written testimony and supporting documents presented in the public hearings responding to the proposal for a TLV-based standard. One can only conclude that the decision to base the Air Contaminants Standard on the TLV list was made at the very beginning of the project. Under this interpretation, the various claims made by OSHA concerning its attempt to obtain other sources of documentation are suspect. Indeed, OSHA seems to have gone out of its way to exclude NIOSH from the PEL project until it was too late to go back on the decision to rely on the TLVs.

None of this should be taken to imply that OSHA should have uncritically adopted the NIOSH RELs as the basis for the Air Contaminants Standard. NIOSH itself has criticized some of the RELs as based upon outdated literature and as not representing the current state of the Institute's evaluation of particular substances [Lemen, 1988]. If NIOSH had been included in the PEL project at the beginning, it would presumably have had the time and resources to re-evaluate its RELs and extend its evaluation to other substances for which no formal REL existed.

Exclusion of NIOSH from the PEL project constitutes a serious breach of protocol. Inclusion of NIOSH would not have been sufficient, however, to ensure a socially desirable regulatory process. The efforts of NIOSH are devoted strictly to evaluating the potential health effects of exposure to toxic substances. No effort is made to evaluate the technological and economic feasibility of compliance with particular exposure limits. As repeatedly recognized in the tortuous history of rule-making at OSHA, technological and economic feasibility are integral parts of occupational health standards. Elsewhere, two of us have analyzed the issues of technological and economic feasibility as they have evolved in the past 20 years and as they apply to the Air Contaminants Standard [Robinson and Paxman, 1990].

It is only in light of the problems posed by technological and economic feasibility that OSHA's decision to rely upon ACGIH and exclude NIOSH can be understood. Both NIOSH and ACGIH claim to base their recommendations primarily on considerations of health effects. Yet it is clearly evident in the comparisons between NIOSH RELs and ACGIH TLVs in Table I that NIOSH tends to propose more protective exposure limits. Based on their extensive analysis of the documentation underlying the TLVs, Roach and Rappaport [1990] found a surprisingly strong correlation between the TLVs and the exposure levels reported in the studies cited in the documentation. This led them to conclude that the TLVs were based primarily upon considerations of feasibility. Indeed, they noted that the majority of the epidemiological studies cited in the documentation reported adverse health effects at or below the exposure levels which were subsequently established as the TLV.

The Air Contaminants Standard succeeded in lowering, imposing, or confirming 428 permissible exposure limits for toxic substances encountered in the workplace. This is an important accomplishment in view of the history of substance-by-substance rulemaking at OSHA. The process and outcome of the standard are so questionable, however, that they can only be viewed as evidence of dubious judgment on the part of the agency leadership. It is particularly disturbing that OSHA would turn to the ACGIH TLV committee, an anachronistic group with no legal authority and with limited resources, rather than to NIOSH, a governmental body with clear responsibility for developing criteria for standards under the Occupational Safety and Health Act.

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