As we saw last week, Threshold Limit Values (TLVs) are air pollution limits for the workplace. Since 1946, TLVs have been devised and published by a private organization called the American Conference of Governmental Industrial Hygienists (ACGIH), a private group composed of industrial hygienists from state and local governments, plus academics and industry consultants. ACGIH clearly wants its audience to believe that TLVs are health-based standards; the preface to ACGIH's annual TLV list says TLVs "are health-based recommendations derived from assessment of the available published scientific information from studies in exposed humans and from studies in experimental animals." Furthermore the preface to the annual TLV list says TLVs are airborne concentrations "to which nearly all workers may be exposed for 8 hours per day, 40 hours per week for a working lifetime without adverse effect."[1]

In 1970 Congress created the Occupational Safety and Health Administration (OSHA) to protect workers from injury and from toxic chemicals. In 1971, OSHA adopted the ACGIH's 1968 TLVs as official workplace standards called PELs (permissible exposure limits). The rationale at the time was that the Occupational Safety and Health Act (OSH Act) required OSHA to adopt standards quickly and there was no time to develop independent standards. However, the OSH Act created a new process for OSHA to follow in establishing future PELs, and it created a National Institute for Occupational Safety and Health (NIOSH) with official responsibility for providing scientific advice to OSHA. During the next 20 years, NIOSH has conducted and published Recommended Exposure Limits, or RELs, for 160 chemicals. However, OSHA ignored the bulk of NIOSH's recommendations and adopted only 12 new PELs during the 20-year period.

During the 20 years that OSHA spent setting 12 new PELs, the ACGIH TLV Committee revised 234 TLVs downward, making them more protective (and stricter than the corresponding PELs which had been adopted in 1970 but never revised), and adopted 168 new TLVs for which there were no PELs. By 1987, official PELs were lagging badly behind the development in TLVs, and this was a source of embarrassment to OSHA. In the spring of 1987 OSHA began a formal procedure to adopt a new Air Contaminants Standard. OSHA proposed to adopt, once again, all of the ACGIH's TLVs (in their 1987 revision).[2]

During the next 2 years, TLVs came under close scrutiny. In 1988, two occupational hygienists, Barry Castleman and Grace Ziem, examined the official documentation that ACGIH said it had relied upon in setting TLVs. (See REHW #128.) Castleman and Ziem reported that at least 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. [3]

Despite this information, OSHA continued proposing to adopt all TLVs as official PELs.

During public hearings on the proposed Air Contaminants Standard in 1988, NIOSH placed 4000 pages of testimony in the record. They offered evidence that at least 98 of the 400 proposed PELs would not protect the health of workers. For 50 of the 98 substances, NIOSH had already published recommended Exposure Limits (RELs). NIOSH's average (mean) REL was 71 times lower (more protective) than the corresponding TLV.

During the public hearings, the New Jersey State Department of Health (NJS DOH) placed in the record a study that it had conducted of existing and proposed PELs, using EPA's [U.S. Environmental Protection Agency's] Integrated Risk Information System (IRIS) database. [4]

The IRIS database was created by EPA to collect and systematically review human and animal toxicity data on particular chemicals. The IRIS database in 1990 contained reviews of 370 chemicals. The purpose of the IRIS system is to support EPA and other governmental regulators in their efforts to protect public health.

NJS DOH researchers randomly selected 43 existing and proposed PELs. Using widely-accepted risk assessment methods to extrapolate from reference doses and unit risks in the IRIS database, the NJS DOH researchers calculated health-based occupational guidelines. For the 43 chemicals, the average (mean) existing PEL was 9.5 mg/m**3; the average (mean) proposed PEL was 7.5 mg/m**3; and the average (mean) health-based guideline calculated by NJS DOH was 0.004 mg/m**3. Thus average existing PELs exceeded NJS DOH's health-based guidelines by a factor of 2375 and proposed PELs exceeded NJS DOH's health-based guidelines by a factor of 1875, on average. The New Jersey State Department of Health concluded that OSHA's proposed PELs were based on outdated information and weak methodology and would not protect worker health.

Despite these compelling criticisms, OSHA formally adopted all of ACGIH's TLVs as enforceable PELs in January 1989. As a practical matter, this astonishing decision had the effect of making ACGIH's TLV Committee the de facto workplace-standards-setting body in the U.S. Since the TLV Committee operates behind closed doors without peer review of its methods or conclusions, this transfer of authority from OSHA to ACGIH effectively gutted the OSHA Act, which had established a public process for setting occupational standards. (In July 1992, a court declared the new PELs illegal, thus re-establishing the 1971 PELs, based on the 1968 TLVs, as official U.S. standards; the Clinton administration did not appeal that court ruling.[5])

Now, as we saw last week, the TLVs themselves have been subjected to withering criticism. Although they are called THRESHOLD limit values, implying that they are set at a level that would PREVENT disease, in many cases they have been set at or above levels at which disease is known to occur in humans.

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% to 180% of the TLV. In the Air Contaminants Standard, OSHA set the PEL for these three substances at the same level as the TLV.[6]

Today the ACGIH and its TLVs are being subjected to a continuous stream of criticism from knowledgeable authorities. For example, a well-known industrial hygienist in New Jersey recently said, "The reality is that for the vast majority of chemicals, we have little or no chronic toxicity data. Even when we do, we usually don't know the chemical's effects on lung function, nervous system function, immune or endocrine system function, reproductive function, or other vital bodily functions. Without such data, claims that we know what exposures are permissible and will not harm workers are false.

"They [ACGIH] still have not acted rigorously to avoid conflicts of interest among members, however. Instead of requiring disclosure of corporate consulting relationships, they are using an honor system where members merely state upon appointment that they have no conflicts of interest. While some positive changes have been made, they do nothing to undo the damage already done by the present TLVs which were set under the old, dysfunctional system, and the changes do not go far enough to ensure that past mistakes will not be repeated.

"Exposure limits are theoretically helpful to workers. However, if we don't get the numbers right, and it looks like ACGIH and OSHA usually have not, then they are harmful."[4]

In 1993, a researcher recalled a 1956 criticism of TLVs: "In the
introduction to its 1956 list... the Committee on Threshold Limits says, 'Values are given... for the maximum average atmospheric concentrations of contaminants to which workers may be exposed... without injury to health.' Careful study of the data which support the currently accepted values suggests that no such description can be truthfully attached to most of them."[7] [The ... appear in the 1993 original.]

A July 1994 analysis of TLVs finds that 229 of the approximately 600 current TLVs have been criticized, in one technical forum or another, as inadequate to protect workers' health.[8]

What then is the purpose of TLVs, if not to protect the health of workers?

In 1935, a group of industrialists met to devise a comprehensive response to the "industrial dust problem." At that time, lawsuits were pending, demanding hundreds of millions of dollars in damages for occupational lung disease. This meeting led to the formation of the Air Hygiene Foundation in 1936, with 200 corporations and trade associations as members. One goal of the Foundation was to set up "authoritative and approved standards for the control of industrial dusts which, if complied with by industries, or by industrial companies, will act as a defense against personal injury suits."[8]

Though TLVs often may not protect the health of workers, they do provide what is now commonly known as the "TLV defense" when a company is sued for harming workers by exposing them to toxic chemicals. The typical TLV defense quotes the ACGIH saying TLVs are "thought to be safe for workers--based on the best available information." The winners in this sad affair are the business interests and lawyers who use the TLV defense as a shield from liability in personal injury lawsuits. The losers are the 50,000 to 70,000 workers who die each year from diseases they developed after exposure on the job, and the estimated 350,000 workers who develop new cases of occupational disease each year from toxic exposures.

--Peter Montague


Descriptor terms: occupational safety and health; osha; job safety; worker safety; tlvs; american conference of governmental industrial hygienists; congress; niosh; barry castleman; grace ziem; recommended exposure limits; permissible exposure limits; iris database; risk assessment; epa; chlorodiphenyl; ethyl ether; 2-nitropropane; air contaminants standard; air hygiene foundation; lawsuits; morbidity statistics; mortality statistics; eileen tarlau;