

# CHO certification: OEL use and abuse

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Perhaps the most difficult question the CHO will face is one of occupational exposure to chemicals. Chemists know they are exposed to chemical agents, but are the exposures "safe" at a given level? Unfortunately, there is no clear-cut answer to the question.

*Occupational exposure limit (OEL)* is a generic term substituted for organization-specific limits, such as the *threshold limit value (TLV)* of the American Conference of Governmental Industrial Hygienists (ACGIH), or the *workplace environmental exposure level (WEEL)* of the American Industrial Hygiene Association (AIHA).<sup>1</sup>

While the goal of "zero exposure" is quite noble, it is also quite unrealistic in the laboratory or pilot plant. In cases where there is believed to be no safe exposure level (such as the use of very potent carcinogens, extremely toxic chemicals, or lethal biological agents), extreme protection measures must be in place to insure "zero exposure" as much as practicable. It is recognized that OELs may not protect all workers in all cases. The following statement from the ACGIH TLV/BEI booklet is worthy of note:<sup>2</sup>

"Threshold Limit Values (TLVs) refer to airborne concentrations of substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects. Because of the wide variation in individual susceptibility, however, a small percentage of workers may experience discomfort from some substances at concentrations at or below the threshold limit; a small percentage may be affected more seriously by aggravation of a pre-existing condition or by development of an occupational illness. "Individuals may also be hypersusceptible or otherwise unusually responsive to some industrial chemicals because of genetic factors, age, personal habits (e.g. smoking, alcohol, or other drugs), medication, or previous exposures. *Such workers may not be adequately protected from adverse health effects of certain chemicals at concentrations at or below the threshold limits.*" (Emphasis added).

OELs are designed to apply to the working population. The workforce, on average, is generally healthier than the overall US population. The reason for this is, in part, that it has been industry practice to exclude the very old, the very young, and people with infirmities and impairment from hazardous industrial settings because of the nature of the work. This is the so-called healthy

worker effect. As a result, OELs are not to be applied to the general population, nor should any "safety factor," such as dividing an OEL by 1000, be used for community-based exposure limits. Any such attempt to apply OELs to the general population is a clear abuse of OEL concept.

Time weighted average (TWA) exposures limits are normally based on a standard 8-hour workday, 5-day week but there are exceptions. Application of the ACGIH TLVs to workers on schedules significantly different from the standard 8-hour day/40-hour workweek requires special care.

Computation of an applicable OEL for mixtures and for multiple agents in the workplace will be covered in a later column.

## TWA Computation Example

Given the monitoring data in the following graph, what is the TWA exposure to laboratory personnel? Assume an 8-hour workday:

- 10 ppm
- 30 ppm
- 40 ppm
- 50 ppm

*Solution:*

$$\begin{aligned} \text{TWA} &= \frac{\sum(\text{level})(\text{time})}{\text{WorkTime}} = \\ &= \frac{5(0.25) + 25(0.75) + 55(0.75) + 75(0.5) + 25(1.0) + 45(0.5) + 30(0.5) \text{ ppm} \cdot \text{hr}}{8 \text{ hr}} \\ &= 29.5 \text{ ppm} = 30 \text{ ppm} \end{aligned}$$

The most correct answer is "b."

## References

1. The Occupational Environment—Its Evaluation and Control; DiNardi, S. R. Ed.; American Industrial Hygiene Association: Fairfax, VA, 1997; Chapters 2,6.
2. 1999 TLVs and BEIs—Threshold Limit Values for Chemical Substances and Physical Agents—Biological Exposure Indices; American Conference of Governmental Industrial Hygienists: Cincinnati, OH, 1999.

