

ELEMENTS OF INDUSTRIAL TOXICOLOGY

TABLE 40-A
COMBINED TABULATION OF TOXICITY CLASSES

Commonly Used Term	LD ₅₀ Single Oral Dose for Rats (gm/Kg)	4-hr Vapor Exposure Causing 2 to 4 Deaths in 6-Rat Group (ppm)	LD ₅₀ Skin for Rabbits (gm/Kg)	Probable Lethal Dose for Man
Extremely toxic	0.001 or less	More than 10	0.005 or less	Taste (1 grain)
Highly toxic	0.001 to 0.05	10 to 100	0.005 to 0.043	1 tsp (4 cc)
Moderately toxic	0.05 to 0.5	100 to 1,000	0.044 to 0.340	1 oz (30 gm)
Slightly toxic	0.5 to 5.0	1,000 to 10,000	0.35 to 2.81	1 pint (250 gm)
Practically nontoxic	5.0 to 15.0	10,000 to 100,000	2.82 to 22.6	1 quart
Relatively harmless	More than 15.0	More than 100,000	More than 22.6	More than 1 quart

From Handbook of Toxicology, Vol. 1 "Acute Toxieties"
W. S. Spector, ed. Philadelphia, Pa., W. B. Saunders Co. 1956

The commonly used expressions are.

MLD—minimum lethal dose, the smallest dose which kills one of a group of test animals

LD₅₀—lethal dose for 50 per cent, the dose that kills one-half of a group of test animals (usually ten or more)

LD₁₀₀—lethal dose for 100 per cent, the dose that kills all of a group of test animals (usually ten or more).

These doses may also be expressed as lethal concentrations (LC) for airborne toxic substances

Substances can then be "rated" according to their relative toxicity as shown in animal experiments and the probable lethal dose for humans estimated (Table 40-A). These ratings are based on the results of short term exposures only. It is quite possible in actual long term "chronic" exposure for a substance to prove highly toxic even though short term exposure tests indicated a low order of toxicity.

However, animal-experiment data are difficult to interpret and apply to human exposures. Such data are valuable *only* as guides to be used by the industrial toxicologist in estimating the gross toxicity of a substance and as leads for further investigations.

It is from a variety of sources, including animal experiments, lab studies on humans, and field and implant investigations of exposures, that the two prevailing concepts for expressing safe concentrations—threshold limit value and maximal acceptable concentration—have been taken.

Threshold limit values

The American Conference of Governmental Industrial Hygienists (ACGIH) adopts an annual list of threshold limit values (TLV) for about 300 substances (Table 40-B). These are expressed as parts of vapor or gas per million parts of air by volume (ppm) at 25°C and 760 mm Hg pressure or as approximate milligrams of particulate per cubic meter of air (mg cu/m). Mineral dusts are expressed as millions of particles per cu ft (mppcf) based on impinger samples counted by light field techniques. TLVs represent time-weighted average concentrations for a normal workday.

Most of the values averaged in the threshold limits may fluctuate a reasonable amount above the recommended TLV providing an equivalent fluctuation below the limit occurs. A major change in the TLV table for 1963, however, limits fluctuation for some substances to *below* the TLV. These "C" or "ceiling" values, as well as the concepts