

### 7.3. Derivation of AEGL-3

Most of the human reports did not document how long the victims were acutely exposed to CO. Despite this uncertainty in the exposure duration, it was possible to set AEGL-3 values by using the CFK model, which calculated the exposure concentrations at the various AEGL time durations (10 min, 30 min, 1 h, 4 h, and 8 h) that would produce a certain COHb concentration in the blood associated with a lethality threshold. Although victims of CO poisoning exhibit a wide range of COHb levels, a weight-of-evidence analysis of numerous lethal human cases and their COHb levels at their time of death helped to set the lethality threshold at a 40% COHb level. Note that the database included reports of COHb levels in individual cases or summaries where COHb data were averaged or reported by COHb ranges. The approach of using all available data was preferred over the selection of an individual key study for AEGL-3 derivations because it was the only way the evaluation could have a broad picture of COHb levels reported in humans with different demographics (e.g., in sex, age, and disease status), type of CO exposure source, possible variation in sample collection, and absence or presence of oxygen therapy to humans prior to death. Also, the weight-of-evidence approach would average out the studies' uncertainties.

Nelson (2006a) reported on human deaths related to CO poisoning from unvented space heaters. Sixteen of 22 lethal cases had COHb levels at more than 40%. Six of 22 victims had COHb levels at  $\leq 40\%$  and two of six had pre-existing conditions, such as arteriosclerotic disease and cardiorespiratory failure. A 1942 fatality study reported by Nelson (2006a) summarized COHb data for 68 victims that were found dead in a gas-filled room or in a garage containing exhaust gases at high concentrations. CO concentrations were not provided. Sixty-seven percent of the 68 cases died with 40-88% COHb levels. Three-percent of the cases died with 30-40% COHb levels. Summary of another fatality study from Poland showed a similar trend of COHb levels (Nelson 2006a). Individual data were not provided, and the CO source was not discussed. However, the Polish study considered 321 lethal CO poisonings from 1975 to 1976 and provided COHb levels for 220 survivors and 101 fatal cases. The survivors had a mean COHb level of 28.1% (SD = 14.1), whereas the lethal cases showed an average COHb level of 62.3% (SD = 10.1). Over 80% of the survivors had COHb levels below 40%. In contrast, about 90% of the deceased had COHb levels above 50%. Similar percentages of survivors and deceased were observed at COHb levels of 40-50% with a slight increase in the number of survivors when compared with that of the lethal cases. These three studies showed a trend that most lethal cases occurred at COHb levels higher than 40% and that survivorship was likely to be seen at levels below 40%.

Another study from the Center of Forensic Sciences in Canada evaluated 304 fatal cases from 1965 to 1968 (Nelson 2006a). The mean lethal COHb level was  $51\% \pm 12\%$  with a majority range of 40-59% and the highest single frequency range of 45-59%. A report on CO exposure from exhaust fumes in the