

have pushed blood to move into and out of the lungs. Thus, oxygen therapy would have increased the dissociation of COHb in the blood, and the amount of the dissociation would have depended on the vigor and the duration of the artificial respiration. The disassociation would be higher in the blood from the lungs, the heart, and the blood vessels in close proximity to the lungs and heart.

Currently, the standard forensic practice is to collect blood from suitably isolated peripheral sites (e.g., femoral vein), which are less likely to be subject to postmortem chemical redistribution (Flanagan et al. 2005; Drummer 2007). The common practice of procuring blood samples from live persons has been venipuncture of the antecubital area of the arm (Ernst 2005).

Gas chromatography is considered the most precise and accurate technique to measure COHb concentrations, but other techniques, such as spectrophotometric analyses, worked well (Lee et al. 1975; Mahoney et al. 1993; R. Coburn, personal commun., April 8, 2008).

#### **4.4. Other Relevant Information**

##### **4.4.1. Species Variability**

With regard to lethal effects, COHb concentrations of 50-80% have been reported as lethal in rats and guinea pigs (Rose et al. 1970; E.I. du Pont de Nemours and Co. 1981). In apparently healthy people who died from CO poisoning, usually COHb concentrations of 60% or higher are found (Stewart 1975; Winter and Miller 1976; Balraj 1984; Holmes 1985; AIHA 1999).

Syncopes have been reported to occur in children at a threshold of 24.5% COHb (Crocker and Walker 1985). In monkeys with COHb concentrations little higher than 16-21%, syncopelike effects occurred (Purser and Berrill 1983). The lowest COHb that resulted in cognitive-development defects in children in a long-term followup study was 13% (Klees et al. 1985). In mice, memory impairment was found in the offspring of rats exposed continuously at 15.6% COHb during gestation (Mactutus and Fechter 1985).

Taken together, these studies imply a limited variability among species for different effects with regard to the COHb at which these effects occur. However, the exposure conditions necessary to reach a certain COHb differ among species because of different affinities for CO in their hemoglobin.

The equilibrium COHb of different species is determined by the species-specific Haldane (affinity) constant  $M$ . Reported values are 228 for dogs and 195 for monkeys (Sendroy and O'Neal 1955), 170 for rats and 117 for guinea pigs (F.L. Rodkey, and J.D. O'Neal, Naval Medical Research Institute, Bethesda, MD, 1970, as cited in Jones et al. 1971). Jones et al. (1971) reported equilibrium COHb in different species after 48 h continuous exposure as shown in Table 2-13. Using the mathematical model described in Appendix B, corresponding COHb values for a 70-kg man can be calculated as 7.9%, 13.8%, and 25.0% for 51, 96, and 200 ppm, respectively.