

In another study by Peterson and Stewart (1975), data from a series of human exposures to CO were analyzed to determine the fit to the theoretical CFK equation. A group of 19 men and 3 women were exposed to concentrations of 50, 100, or 200 ppm for 0.33-5.25 h. Three exercise levels from sedentary to 0, 150, or 300 kpm/min on an ergometer were used (15 subjects in total). These levels resulted in mean ventilation rates of 10.1 (9.1 for women), 14.0, 24.0 (19.7 for women), and 29.7 L/min, respectively. The CFK model predicted COHb for both men and women as well as for resting and exercising subjects within a standard error of about 2%. In contrast to the original model, which assumes all variables to be constant except t , P_L , COHb_t , and P_{CO} , the following parameter alterations were introduced:

P_{O_2} : When the partial pressure of oxygen in inspired air ($P_{i\text{O}_2}$) is less than the 149-mm Hg found under normal conditions, the partial pressure of oxygen in the lung capillaries will be less than the value of 100 mm Hg assumed by Coburn and coworkers. From measurements of oxygen partial pressure in arterial blood, which is assumed to be the same as the oxygen partial pressure in lung capillaries, the following equation was derived:

$$P_{\text{O}_2} = 1/(0.072 - 0.00079 P_{i\text{O}_2} + 0.000002515 (P_{i\text{O}_2})^2) \text{ and } P_{i\text{O}_2} = F_{i\text{O}_2} (P_B - 47 - P_{i\text{CO}}) \text{ with}$$

$F_{i\text{O}_2}$ = fraction of oxygen in inspired air,
 P_B = barometric pressure (mm Hg), and
 $P_{i\text{CO}}$ = partial pressure of CO in inspired air.

D_L : Body-size effects on diffusivity at rest were calculated from published data as

$$D_L = 1/(-0.0287 + 0.1188/A) \text{ with } A = \text{body surface in m}^2.$$

V_b : The published blood volume relationship of 74 mg/kg of body weight for men and 73 mL/kg for women was used.

V_A : The alveolar ventilation rate was expressed as

$$V_A = V_E - f V_D; \text{ with } V_E = \text{total rate of ventilation (mL/min),}$$

f = respiration rate (min^{-1}), and
 V_D = dead space (mL).

OHb_t : At standard concentrations, 1 g of hemoglobin will hold 1.38 mL of oxygen and thus $\text{OHb}_{\text{max}} = 1.38 [\text{Hb}]/100$, with $[\text{Hb}]$ being the hemoglobin concentration in blood (g/100 mL). During and after CO exposure, the value of OHb_t that must be used is actually $\text{OHb}_t = \text{OHb}_{\text{max}} - \text{COHb}_t$. In this case, the CFK equation can only be solved by iterative procedures.