

Cyanide concentrations in blood and tissues of fire victims

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Abstract

Cyanide poisoning has been regarded to contribute the fatal outcome in fire victims. The toxicity of inhaled hydrogen cyanide (HCN) at the cellular level was evaluated considering the impact of methemoglobin (MetHb) produced by fire gases. Cyanide (CN) concentrations and total hemoglobin contents were measured in right heart blood (RHB) and seven organs/tissues (basal ganglia, brain stem, heart, lung, liver, kidney and psoas muscle) collected from 20 fire fatalities. MetHb and carboxyhemoglobin saturations were also measured in RHB. The amount of CN probably bound to the cytochrome c oxidase (CCO-CN) of the tissue cells was extrapolated from CN and hemoglobin contents in RHB and organs/tissues, MetHb saturation in RHB and binding capacity of MetHb for CN. CN concentrations in RHB showed a wide range with the highest concentration of 8.927 $\mu\text{g/mL}$. The lung contained the largest CN content among organs/tissues with the mean concentration of 2.219 $\mu\text{g/g}$, then the heart (0.259 $\mu\text{g/g}$) and it was lower than 0.100 $\mu\text{g/g}$ in others. Exceedingly large amount of CN in the lung could be explained by high hemoglobin content, being the port of entry of HCN and postmortem diffusion of fire gases. CCO-CN was theoretically present in about 20% of organ/tissue samples, most commonly in the basal ganglia (10 samples, with the mean of 0.059

$\mu\text{g/g}$) followed by heart (eight samples, with the mean of $0.109 \mu\text{g/g}$). No CCO-CN was found in liver and kidney. HCN might have the effect on brain and heart.

Key words: cyanide; methemoglobin; cytochrome c oxidase; fire fatality