Carboxyhemoglobin Values in Wildland Firefighters

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Carbon Monoxide (CO) is known to be a potentially deadly gas. Headaches may occur at 5%-10% carboxyhemoglobin (COHb) saturation. Symptoms and dysfunction increase to 60% COHb saturation where coma and death are likely. Wildland firefighters (WLFF) are often exposed to CO in wildland fire smoke, from vehicle engine exhaust, generator exhaust, volatile fuels and small engines such as water pumps. **PURPOSE:** The purpose of this project was to obtain preliminary data on carboxyhemoglobin levels in WLFFs. **METHODS:** COHb was measured in 408 WLFF who reported either working in some smoke or near engine sources of CO. COHb data were collected both during wildland fire suppression and in fire camps. Information collected included duration and time of smoke exposure, “intensity” of smoke, cigarette smoking status and WLFF job. COHb data were corrected to a standard half life of 5 hours for measurements made post shift. **RESULTS:** WLFF who worked >10 hours in smoke had higher COHb levels than WLFF with shorter smoke exposures (4.3±4.7% vs. 2.5±1.9%, p<0.05). Workers who reported being near generators had higher COHb values (5.2±3.4%, p<0.05) than those working in wildfire smoke (2.6±2.0%) or those working near diesel trucks (2.2±1.8%). Working in heavy smoke resulted in higher COHb saturation than working in light smoke (5.2±4.8% vs. 2.8±1.9%, p<0.01). Field work around generators and diesel trucks resulted in modest COHb (2.7±2.1%) but Mark 3 pump operators had higher (p<0.05) COHb (6.2±3.0%). Only 6 of 408 individuals exceeded 10% COHb saturation. Smokers had overall higher levels of COHb than non smokers (3.8±2.5% vs. 2.3±1.6%, p<0.05). **CONCLUSIONS:** WLFF averaged modest COHb saturation levels from wildfire smoke or engines but few were found to exceed even 10% COHb saturation. However, there is evidence that chronic low
level CO exposure may have lasting health effects. The evidence from these data is inconclusive to state that CO exposure is a major problem in WLFF. However smoke conditions during the period of study were not extreme with only 12 subjects reporting working in heavy smoke for extended periods. We suggest further study to evaluate COHb saturation during extended work in heavy smoke as well as the cumulative effect that both tobacco smoking and firefighting might have on WLFF. (Values are COHb saturation ± std. deviation).

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