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### **K19 Dangers of Carbon Monoxide (CO) Generated From Small Internal Combustion Engines**

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After attending this presentation, attendees will have greater insight into the different types of small engines capable of generating CO, the technology behind detection devices used by first responders, and the symptoms of CO toxicity.

This presentation will impact the forensic science community by providing information regarding case studies in which CO generation came from unexpected sources. Interestingly, the specificity of sensors used in hand-held detectors may not be selective enough to rule out interfering gases when the source of CO is under investigation.

Small engines and tools have the danger of emitting potentially lethal concentrations of CO if used in a poorly ventilated environment. Forklifts, pressure washers, gas pool heaters, propane-powered construction tools, and lawn mowers are some examples. In fact, efforts are underway, through industrial commissions, to retro-fit forklifts with catalytic convertors or three-way catalytic mufflers for Liquid Petroleum Gas (LPG) engines to reduce emissions, thus increasing worker safety.

The North Carolina Office of the Chief Medical Examiner encountered a case in which a 57-year-old male was found deceased in his air-conditioned garage. The death originally presented as a probable sudden natural death due to a history of hypertension. When analysis revealed a lethal concentration of 55% Carboxyhemoglobin (COHb) saturation in the decedent's blood, the toxicologist immediately informed the medical examiner and law enforcement for further investigation. First responders were initially misled when the Dräger X-am® 2000 gas detector gave a positive reading for CO when operated next to an acetylene/oxygen welding torch and tank assembly. The local fire department was unaware of the cross sensitivities of the device, which will cause erroneous detection if exposed to certain concentrations of other small molecular gases. The actual source of CO was later determined to be a gasoline-powered pressure washer kept inside the garage. A few months later, a public health emergency was investigated in a North Carolina grocery store when a worker passed out and several employees felt ill. The cause was later determined to be toxic levels of CO generated by a propane-powered tile cutter that ultimately sent 17 people to the hospital for treatment.

These and additional cases will be explained in detail in order to educate the forensic community about the dangers of CO produced by engines more esoteric than the automobile. Along with a review of gas-sensing technologies and the signs and symptoms of toxicity, this presentation will be a comprehensive assessment of the hazards of small equipment-generated CO emissions.

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#### **Carbon Monoxide, Death Investigation, Toxicology**