



## **D12 Carbon Monoxide Poisoning in a Heavy Truck: An Investigation of Unknown Causes of a Fatal Crash With Fuel-Fed Fire**

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**Learning Overview:** This investigation explores the case of a Class 8 tractor-trailer that left the roadway for no apparent reason. The investigation included only partial evaluation of the exhaust system integrity. Several steps of the proposed investigation were disallowed by the client, but will be discussed in detail. After attending this presentation, attendees will be better equipped to recognize and analyze cases involving, or potentially involving, Carbon Monoxide (CO) poisoning in moving vehicles, including exhaust system component inspection procedures and testing with the objective of establishing design, materials, or maintenance defects. Professional conflicts with clients over authorization for proper scientific work is also discussed.

**Impact on the Forensic Science Community:** This presentation will impact engineers, scientists, criminologists, attorneys, pathologists, police, and others involved in the forensic aspects of traffic accident investigation and reconstruction and vehicle fire investigation, especially involving heavy trucks.

Diesel engine exhaust gas contains several constituents immediately harmful to man: CO, Hydrocarbons (HC), and aldehydes. CO can rapidly cause headaches, dizziness, lethargy, and loss of consciousness. Engines with defective exhaust systems combined with defective fresh air intake design can cause CO to easily accumulate in one popular heavy truck cab. A driver with no alcohol or drugs in their system was operating one of these day cab tractor-trailers on a familiar freeway when, for no apparent reason, the vehicle drifted to the right off the roadway, struck a fixed object, ruptured the fuel tanks, and ignited. The restrained driver showed no impact trauma, and witnesses claimed no attempt to self-extricate or even cry out. Postmortem blood analysis revealed the driver's carboxyhemoglobin level was extremely high, consistent with unconsciousness leading to the loss of control and collision, as well as the inability to remove the restraints and self-extricate.

Initial investigation of the subject tractor make and model revealed a history of exhaust system component failures, consistent with the subject crash. Evaluation of an exemplar tractor revealed that the cab makeup air intake aperture was located under the hood near the area of exhaust system component failures and that there was a direct open path for the transfer of air containing leaking exhaust gas into the tractor cab. An initial inspection and testing of the heavily burned subject tractor and exhaust system components was completed. Per common experience, fire destruction of seals and gaskets made it impossible to conclusively prove an exhaust leak simply by inspection. Unfortunately, the client refused to allow testing of an exemplar vehicle to scientifically replicate the potential failure that caused the CO contamination of cab air via the defectively designed fresh air intake. The investigation of possible CO sources and gas conduction paths will be discussed and analyzed. This presentation will detail the investigative actions taken and those that were proposed in order to isolate the CO debilitation of the driver that most likely precipitated the crash, but was disallowed. The ethical and professional dilemmas created by client refusal to support proper forensic scientific investigation will also be discussed.

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### **Carbon Monoxide Poisoning, Heavy Truck Fire, Defective Fresh Air Intake**