G128 Death From WD-40™ Ingestion

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After attending this presentation, attendees will understand the pathophysiology of hydrocarbon ingestion deaths and the importance of multidisciplinary consultations in casework.

This presentation will impact the forensic science community by familiarizing attendees with the pathophysiology of deaths resulting from hydrocarbon ingestion and the importance of multidisciplinary consultations in casework.

Hydrocarbon ingestion fatalities are uncommon and case investigations benefit from the effective synchronization of efforts, including active cases. Although hydrocarbon exposures are not uncommon (>43,000 cases in 2009, with 60% in teens and younger), deaths are rare (9 or ~0.02%) and usually associated with the very young (<5 years old) and adolescent abusers. Exposures typically result from inadvertent ingestion by children or complications stemming from inhalational abuse. Common ingestions include gasoline, kerosene, lubricating oil, motor oil, and many others, of which WD-40™ (a lubricant, penetrating oil, and water-displacing) is one. The active ingredient is a non-volatile, low-viscosity hydrocarbon whose primary ingredient is listed as Stoddard solvent; however, the exact formulation is secret. Recognized potential hazards include irritation (skin, eyes, and especially respiratory), narcosis, and renal impairment.

Case Study: At ~3:00 a.m., a 57-year-old, 74½-inch, 287.4-pound male was found by his wife at his residence, retching. He returned to bed but at ~6:30 a.m. complained of respiratory difficulty and was transferred to the local hospital where his condition deteriorated and he was pronounced dead at 6:30 p.m. Hospital staff became concerned because the patient's emesis and skin became green. Eventually, the wife revealed the the decedent might have ingested WD40™ that he kept at the house. At autopsy, the tissues and gastroenteric contents had a mild non-specific chemical odor. The stomach and bowels contained a clear, mildly pale-green fluid. The bowels had apparent sloughed mucosal surface. The tracheobronchial tree contained dull gray-green mucoid material. The hepatic parenchyma had gross necrosis and the kidneys were variegated. Multiple variably prominent petechial hemorrhages were present. Other significant findings at autopsy included concentric left ventricular myocardial hypertrophy (580 grams). The cause and manner of death were certified as suicidal petroleum distillate ingestion — without toxicology results.

Subsequent analysis for volatile organic compounds by headspace gas chromatography revealed:*

** Other than the described findings, examination of the specimens submitted did not reveal any positive findings of toxicological significance*

***A pattern of aliphatic and aromatic hydrocarbons consistent with the fluid sample submitted was detected. In addition, a second group of aliphatic and aromatic hydrocarbons with less volatility was observed in this specimen that was not detected in the fluid sample.*

Source	Hydrocarbons (fuel oils)	Hydrocarbons (compared with submitted fluid)	Ethanol (mg/dL) (mg/100 gm)	Acetaldehyde (mg/dL) (mg/100 gm)	Acetone (mg/dL) (mg/100 gm)
Femoral blood (autopsy)	C21 through C27	N/D	64	4.4	Trace
Gastric content	C12 through C15	Positive**	29	1.0	1.3
Small bowel content	C12 through C15		N/D	N/D	N/D
Large bowel content	C12 through C15		N/D	N/D	N/D
Liver	N/D	N/D	24	36	N/D
Lung	N/D	N/D	N/D	N/D	1.2
Unknown fluid	C9 through C11	Positive			
WD-40™ (purchased)	C9 through C11				

Hydrocarbons are aliphatic (non-ring) or aromatic (ring) with toxicity directly related to the agent's physical properties and the extent dose and route dependent. The most common adverse consequence is aspiration injury, with lower viscosity hydrocarbons associated with increased risk. Aliphatic hydrocarbons have little gastroenteric absorption and commonly result in emesis with aspiration and a secondary severe

chemical pneumonitis. Aliphatic hydrocarbons easily cross the blood-brain barrier and can have acute or chronic effects, depending on the nature of the exposure. Sudden death may be associated with cardiac tachydysrhythmias. One-third of cases are associated with emesis; hydrocarbons are a direct mucosal irritant. The liver may have centrilobular zonal necrosis and lipid peroxidation. Certain chronic renal exposures may have anion gap acidosis. Hematologic abnormalities may include hemolysis (acute) and aplastic anemia, multiple myeloma, and acute myelogenous leukemia (chronic).

In this case study, death was associated with hepatic necrosis and chemical pneumonitis as delayed subacute features of a suicidal ingestion. The communication between the toxicologists and pathologist allowed fairly rapid completion of the death certification process based on scene and historical information without toxicology results, which were delayed for an extended period of time.

Hydrocarbon, Toxicology, Pathophysiology

 ** Presenting Author*