Y13 An Unintentional Drowning With a Contributing Factor of Carbon Monoxide Intoxication

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Learning Overview: The goal of this presentation is to present a case of carbon monoxide exposure contributing to a drowning death of a recreational boater.

Impact on the Forensic Science Community: This case will impact the forensic science community by serving as a public health warning on the dangers of carbon monoxide emission from boats and its potential role in contributing to drowning deaths.

There are approximately 4,200 cases of drowning in the United States every year.[1] Commonly identified risk factors for drowning include male sex, alcohol use, and lack of a life jacket.[2] This case report will examine a less commonly identified risk factor that should be considered for drowning deaths: carbon monoxide exposure.

A 19-year-old female drowned after entering a lake from a boat in which she had been riding. Prior to entering the water, she had reported a cramp and had been riding in the boat at low speed for two hours. She had been sitting on the right back side of the boat directly behind the driver's seat. A passenger reported that she had had two beers that evening. According to other passengers on the boat, she entered the water to urinate and was unable to be located shortly afterward. One passenger reported seeing her head tilt back, then she went underwater without coming back up. The passengers called 911 and unsuccessfully searched for her in the water. The local dive team responded and located her body in the water, approximately three hours after she went missing.

Autopsy revealed muddy water in the mouth, nose, and upper airways, muddy fluid in the trachea and bronchi, and focal hemorrhages in the lungs bilaterally. In addition, bright red lividity and musculature were noted, and the leptomeninges were a bright red-pink. Toxicology testing of postmortem blood revealed an alcohol level of 71mg/dl and a carboxyhemoglobin level of 46.2%. The cause of death was determined to be drowning with a contributory factor of carbon monoxide intoxication.

Carbon monoxide levels on idling and stationary boats frequently exceed 1,000ppm in the rear deck area, enough to cause loss of consciousness within two hours of exposure.[3,4] The addition of a catalytic converter to boat engines can reduce carbon monoxide concentrations by up to 90%. The ability of carbon monoxide intoxication to produce loss of consciousness makes it especially dangerous to persons on or near recreational boats. Recreational boaters in general, and owners of older model boats without catalytic converters in particular, should be made aware of the danger of their engine as a source of carbon monoxide. They should be encouraged to install carbon monoxide detectors. In addition, forensic pathologists should consider carbon monoxide exposure as a possible contributing factor in drowning deaths in situations where such exposure may have occurred.

Reference(s):

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Carbon Monoxide, Drowning, Drowning Risk Factors