NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Washington, DC

Medical Factual Report

July 14, 2016

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Medical Officer

A. **ACCIDENT: DCA16PM008 Cape Ann, Massachusetts**

On December 3, 2015, at 8:16 p.m. eastern standard time, (EST) The commercial fishing vessel ORIN C, while under tow by a USCG station small boat, suffered flooding and three crew donned survival suits and abandoned the vessel. Two crewmembers sustained no injuries, the ORIN C's captain died during rescue efforts.

B. **GROUP IDENTIFICATION:**

No group was formed for the medical evaluation in this accident.

C. **DETAILS OF INVESTIGATION**

Purpose

This investigation was performed to evaluate the captain for any medical conditions, use of medications/illicit drugs, the presence of any toxins, and to document injuries.

Methods

The captain's autopsy, toxicology report, and the investigator's report were reviewed. The 47-year-old commercial mariner did not have and was not required to have a US Coast Guard medical certificate. The medical investigation was limited by the inability to identify and obtain personal medical records for the mariner.

Autopsy

According to the Commonwealth of Massachusetts Office of the Chief Medical Examiner's autopsy report, the captain's cause of death was drowning and the manner of death was accident. Additionally, the medical examiner noted that the captain's cardiac hypertrophy (enlarged heart) and atherosclerotic cardiovascular disease (narrowing of the heart's arteries) contributed to death.

The external examination determined the captain measured 6 feet and weighed 297 pounds. The report described a 5-inch by 2-inch area of abrasion in the center of the chest and a ¾-inch by ¼-inch abrasion on the front of the nose. The internal examination identified a 2-inch by 1-inch bruise on the front of the head and fractures of the right

lateral second through eight ribs and left lateral third through sixth ribs. No other trauma was identified.

The heart was described as enlarged and coronary artery disease was identified. It weighed 690 grams with the right and left ventricular free walls measuring 0.5 and 2.8 cm respectively. The average weight of a heart for a 297-pound man is 453 grams with a range from 343 to 598 grams. The average right and left ventricular free wall thickness is 0.38 cm (standard deviation 0.09 cm) and 1.23 cm (standard deviation 0.16 cm) respectively.[1] In addition, the captain's coronary arteries showed atherosclerotic disease with up to 50% narrowing of the right coronary artery and up to 30% narrowing of the left anterior descending artery. However, the heart muscle showed no evidence of hemorrhage, fibrosis, or softening (no evidence of a prior heart attack).

Toxicology

Postmortem toxicology conducted by the Commonwealth of Massachusetts State Police Forensic Laboratory detected tetrahydrocannabinol (3.3 ng/ml) and carboxy-tetrahydrocannabinol (9 ng/ml) in heart blood. Tetrahydrocannabinol (THC) is the psychoactive compound found in marijuana and carboxy-tetrahydrocannabinol (THC-COOH) is its inactive metabolite. THC has mood-altering effects including euphoria, relaxed inhibitions, disorientation, image distortion, and psychosis. Significant performance impairments are usually observed for at least one to two hours following marijuana use, and residual effects have been reported up to 24 hours.[2] Postmortem redistribution due to movement from storage sites back into the central blood after death has been documented for both THC and THC-COOH. The central levels in heart blood vary compared with peripheral blood levels by approximately 1.5 (range: 0.3–3.1) and 1.8 (range: 0.5–3.0) respectively.[3] Chronic marijuana using volunteers confined to a secure facility have been found to have THC and THC-COOH levels as high as 2 ng/ml and 14 ng/ml respectively 7 days after confinement without access to the drug.[4]

D. SUMMARY OF FINDINGS

No personal medical records were identified for the captain. He did not and was not required to have U.S. Coast Guard medical certification.

The autopsy determined the cause of death was drowning and cardiac hypertrophy (enlarged heart) and atherosclerotic cardiovascular disease contributed to the cause of death. It described fractures of right lateral second through eight ribs and left lateral third through sixth ribs.

Toxicology detected 3.3 ng/ml of tetrahydrocannabinol (THC) and 9 ng/ml of carboxy-tetrahydrocannabinol (THC-COOH) in heart blood.

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[1] Kitzman DW, Scholz DG, Hagen PT, Ilstrup DM, Edwards WD. Age-related changes in normal human hearts during the first 10 decades of life. Part II (Maturity): A quantitative anatomic study of 765 specimens from subjects 20 to 99 years old. Mayo Clinic Proc., 1988. 63(2): p. 137-46.

[2] National Highway Traffic Safety Administration. Drugs and Human Performance Fact Sheets. Marijuana. http://www.nhtsa.gov/people/injury/research/job185drugs/cannabis.htm Accessed 12/29/2015

[3] Holland M, Schwope D, Stoppacher R, Gillen S, Huestis M. Postmortem redistribution of Δ9-tetrahydrocannabinol (THC), 11- hydroxy-THC (11-OH-THC), and 11-nor-9-carboxy-THC (THCCOOH) *Forensic Sci Int*. 2011 October 10; 212(1-3): 247–251

[4] Bergamaschi M, Karschner E, Goodwin R, Scheidweiler K, Hirvonen J, Queiroz R, Huestis M. Impact of Prolonged Cannabinoid Excretion in Chronic Daily Cannabis Smokers' Blood on Per Se Drugged Driving Laws *Clinical Chemistry* 59:3 (2013): 519–526