



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Washington, DC

Medical Factual Report

March 22, 2021

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Chief Medical Officer

A. ACCIDENT: DCA20FM026; Corpus Christi, TX

Time and Date: 08:03; 8/21/2020

Vessel: Dredge Waymon L Boyd

Pipeline: Pipeline Enterprise Products

Event: Dredge struck a hazardous liquid propane pipeline resulting in explosion/fire

B. GROUP IDENTIFICATION

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

C. RELEVANT REGULATION

Title 46, Code of Federal Regulations (CFR) §4.06-3 covers drug and alcohol testing requirements following a serious marine incident:

When a marine employer determines that a casualty or incident is, or is likely to become, an SMI, the marine employer must ensure that the following alcohol and drug testing is conducted:

(a) Alcohol testing. (1) Alcohol testing must be conducted on each individual engaged or employed on board the vessel who is directly involved in the SMI.

(i) The alcohol testing of each individual must be conducted within 2 hours of when the SMI occurred, unless precluded by safety concerns directly related to the incident.

(ii) If safety concerns directly related to the SMI prevent the alcohol testing from being conducted within 2 hours of the occurrence of the incident, then alcohol testing must be completed as soon as the safety concerns are addressed.

(iii) Alcohol testing is not required to be conducted more than 8 hours after the occurrence of the SMI.

...

(b) Drug testing. (1) Drug testing must be conducted on each individual engaged or employed on board the vessel who is directly involved in the SMI.

(i) The collection of drug-test specimens of each individual must be conducted within 32 hours of when the SMI occurred, unless precluded by safety concerns directly related to the incident.

(ii) If safety concerns directly related to the SMI prevent the collection of drug-test specimens from being conducted within 32 hours of the occurrence of the incident, then the collection of drug-test specimens must be conducted as soon as the safety concerns are addressed.

(2) If the drug-test specimens required in paragraphs (b)(1)(i) and (b)(1)(ii) of this section were not collected, the marine employer must document on Forms CG-2692 and CG-2692B the reason why the specimens were not collected.

D. DETAILS OF INVESTIGATION

1. Purpose

This investigation was performed to evaluate the dredge crew and pipeline operator for medical conditions, the use of medications/illicit drugs, and the presence of toxins.

2. Methods

The autopsy reports for those who died, toxicology findings, and the investigator's reports were reviewed. Relevant regulation and medical literature were reviewed as appropriate.

DREDGE CREW

**Fatally injured:
Chief Engineer**

Autopsy

According to the autopsy performed by the Nueces County Medical Examiner's Office, the cause of death was thermal burns and multiple blunt force injuries, and the manner of death was accident. There was some evidence of chronic liver disease of unknown origin.

Toxicology

Toxicology testing performed by NMS Labs at the request of the medical examiner identified 0.160 gm/hg in homogenized tissue and an unquantified amount of beta-phenethylamine in the same sample. Beta-phenylethylamine is a common product of putrefaction in postmortem tissues.

Toxicology testing performed by the FAA's Forensic Sciences Laboratory identified 0.024 gm/hg of ethanol in muscle tissue but no ethanol in liver tissue. No tested-for drugs were identified in liver tissue.¹

Second Engineer

Autopsy

According to the autopsy performed by the Nueces County Medical Examiner's Office, the cause of death was extensive thermal burns and the manner of death was accident. No significant natural disease was identified.

Toxicology

Toxicology testing performed by NMS Labs at the request of the medical examiner identified 0.074 gm/dL in gastric fluid and an unquantified amount of beta-phenethylamine, caffeine, and nicotine, in the same sample. Beta-phenylethylamine is a common product of putrefaction in postmortem tissues. Caffeine is a mild stimulant commonly found in tea, coffee, and some sodas. Nicotine is a mild stimulant found in tobacco products.

Toxicology testing performed by the FAA's Forensic Sciences Laboratory identified 0.012 gm/hg of ethanol in liver tissue but no ethanol in muscle tissue. No tested-for drugs were identified in liver tissue.

Leverman

Autopsy

According to the autopsy performed by the Nueces County Medical Examiner's Office, the cause of death was thermal burns and blunt force trauma and the manner of death was accident. The examination was limited by the extent of damage to the remains; only fragments of the brain and heart were recovered. However, no significant natural disease was identified.

¹ The FAA Forensic Sciences Laboratory has the capability to test for more than 1300 substances including toxins, common prescription and over-the-counter medications as well as illicit drugs. See: <http://jag.cami.jccbi.gov/toxicology/default.asp?offset=0>

Toxicology

Toxicology testing performed by NMS Labs at the request of the medical examiner on homogenized tissue identified an unquantified amount of beta-phenethylamine in the same sample. No ethanol was identified. Beta-phenylethylamine is a common product of putrefaction in postmortem tissues. It is also used in some products as an herbal (unregulated) supplement. In addition, caffeine, a mild stimulant commonly found in tea, coffee, and some sodas, was identified.

Toxicology testing performed by the FAA's Forensic Sciences Laboratory identified 0.011 gm/hg of ethanol in liver tissue and 0.040 gm/hg in kidney tissue.² Acetaminophen, a common over the counter fever reducer and pain medication commonly marketed as Tylenol, was also found in both tissues.

Cook

Autopsy

According to the autopsy performed by the Nueces County Medical Examiner's Office, the cause of death was extensive thermal burns and the manner of death was accident. The severity of injury precluded any examination of the brain, and only part of the heart was available.

Microscopic examination of liver tissue demonstrated liver disease of unknown origin.

Toxicology

Toxicology testing performed by NMS Labs at the request of the medical examiner identified 0.084 gm/hg of ethanol in homogenized tissue and an unquantified amount of beta-phenethylamine as well as amlodipine in the same sample. Beta-phenylethylamine is a common product of putrefaction in postmortem tissues. Amlodipine is a prescription blood pressure medication, commonly marketed with the name Norvasc, that is not generally considered impairing.³

Toxicology testing performed by the FAA's Forensic Sciences Laboratory identified 0.012 gm/hg of ethanol in heart tissue and 0.028 gm/hg of ethanol in liver tissue. In addition, N-propranolol, amlodipine, tamsulosin, and atorvastatin were identified in liver tissue and amlodipine, tamsulosin, and atorvastatin were identified in heart tissue. N-propranolol is a form of alcohol produced in postmortem tissues by microbial action. Amlodipine is described above; tamsulosin is used to treat symptoms of an enlarged

² The units of gm/hg reflect the solid nature of a tissue sample. The results are directly comparable to a blood alcohol concentration in gm/dL.

³ National Institutes of Health. US National Library of Medicine. DailyMed. Amlodipine. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=b52e2905-f906-4c46-bb24-2c7754c5d75b> Accessed 3/18/2021.

prostate and atorvastatin, commonly marketed as Lipitor, is used to treat high cholesterol.^{4,5} None of these are generally considered impairing.

Ethanol

Ethanol is a social drug that acts as a central nervous system depressant. It is commonly found in wine, beer and liquor. After ingestion, at low doses, it impairs judgment, psychomotor functioning, and vigilance; at higher doses alcohol can cause coma and death. However, ethanol may also be produced in postmortem tissues by microbial action; the likelihood of this occurring increases with increasing time between death and specimens being obtained.⁶ Typically, after ingestion, ethanol is distributed rapidly and symmetrically throughout all body tissues. When the cause of the ethanol finding is from postmortem production, the levels in various tissues tend to vary considerably.

Other Dredge Crew: Dredge Captain

Transported from the scene to hospital for emergency care. No toxicology conducted.

Deckhand #1

Transported from the scene to hospital for emergency care; died more than 69 days later. No toxicology conducted.

Deckhand #2

Transported from the scene to hospital for emergency care. No toxicology conducted.

Deckhand #3

Transported from the scene to hospital for emergency care. No toxicology conducted.

Deckhand #4

Uninjured. No toxicology conducted; documented as “Refused” by employer.

Deckhand #5

Uninjured. No toxicology conducted; documented as “Refused” by employer.

⁴ National Institutes of Health. US National Library of Medicine. DailyMed. Tamsulosin.
<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=339c3b57-a339-4578-bfd7-46b25d911ff6>
Accessed 3/18/2021.

⁵ National Institutes of Health. US National Library of Medicine. DailyMed. Atorvastatin.
<https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=1daa6f20-a032-4541-939d-931f36a020dd>
Accessed 3/18/2021.

⁶ Russell J Lewis 1, Robert D Johnson, Mike K Angier, Nicole T Vu. Ethanol formation in unadulterated postmortem tissues. Forensic Sci Int. 2004; Nov 10;146(1):17-24.

Leverman

Transported from the scene to hospital for emergency care. No toxicology conducted.

Mate #1

Transported from the scene to hospital for emergency care. No toxicology conducted.

Mate #2

Uninjured. Breath alcohol and urine DOT drug screen negative.⁷

Dredge Tender Operator

Uninjured. Breath alcohol and urine DOT drug screen negative.

Dredge Welder

Uninjured. No toxicology conducted; documented as “Refused” by employer.

Oiler #1

Uninjured. No toxicology conducted; documented as “Refused” by employer.

Oiler #2

Uninjured. Breath alcohol and urine DOT drug screen negative.

PIPELINE OPERATOR

The pipeline operator underwent DOT toxicology testing including a breath test for ethanol which was negative, and a urine test for drugs, which was also negative.

E. SUMMARY OF MEDICAL FINDINGS

Ethanol was identified in one or more of the specimens from each of the deceased crewmembers. Other identified substances were likely from putrefaction or were in use prior to the event but are not considered impairing.

⁷ DOT drug testing is limited to urine testing for amphetamine, methamphetamine, cocaine metabolites (benzoylecgonine), opiates (codeine, morphine, and the heroin metabolite 6-acetylmorphine), phencyclidine, methylenedioxyamphetamine (MDMA), methylenedioxyamphetamine (MDA), methylenedioxyethylamphetamine (MDEA), and the marijuana metabolite delta-9-tetrahydrocannabinol-9-carboxylic acid (THCA). Urine testing identifies past drug use but not impairment at the time of specimen collection.

For the Chief Engineer, ethanol was found at 0.160 gm/hg in homogenized tissue by one lab and the second found 0.024 gm/hg of ethanol in muscle tissue but no ethanol in liver tissue.

For the Second Engineer, 0.074 gm/dL of ethanol in gastric fluid in one lab and the second lab found 0.012 gm/hg of ethanol in liver tissue but no ethanol in muscle tissue.

For the Leverman, no ethanol was identified by the first lab but the second identified 0.011 gm/hg of ethanol in liver tissue and 0.040 gm/hg in kidney tissue.

For the Cook, 0.084 gm/hg of ethanol was found in homogenized tissue by the first lab and the second lab found 0.012 gm/hg of ethanol in heart tissue and 0.028 gm/hg of ethanol in liver tissue.

Emergency hospital care precluded the testing of the injured; some of the uninjured crew refused testing. None of the testing conducted on the survivors was positive.