



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Washington, DC

Medical Factual Report

February 1, 2016

Mary Pat McKay, MD, MPH
Chief Medical Officer

A. ACCIDENT: DCA15FR006, Richmond, VA

Date of Accident:	April 1, 2015
Time of Accident:	03:20 a.m.
Railroad Owner:	CSX, Acca Yard
Train #1:	Y39131
Train #1 Operator:	CSX
Train #1 Crew Members:	1 RCO Conductor
Injured:	1 Carman, fatal

B. GROUP IDENTIFICATION:

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

C. DETAILS OF INVESTIGATION

1. Purpose

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

2. Methods

The carman's CSX medical file, drug testing records, post accident toxicology results, autopsy report, and the investigator's reports were reviewed. Co-workers reported the carman had medical problems and multiple attempts were made by NTSB investigators to locate personal medical records for the carman. These included contacting the medical insurer CSX reported he used as well as multiple local pharmacies, primary care practices, and attempting to reach his ex-spouse. All attempts were unsuccessful.

3. Results

CSX Medical File

According to his CSX medical records, the 54 year old male carman was first employed by CSX in 1981. He underwent physical examinations in 1981, 1985, 1986, 1987, 1988, and 1990 that included a medical history, review of medications, determination of vital signs, and a physical exam. Each time, he reported no significant medical conditions and no medications. No significant abnormalities were noted until 1990, when the notes reflect he was 70 inches tall, weighed 307 pounds, and his blood pressure was 160/88. Although he was noted to be obese, no comment was made about hypertension. In 1995 he had pulmonary function testing performed and was cleared to use a respirator.

Hearing Tests

For a period, the carman participated in the CSX hearing conservation program. Excerpts from hearing testing performed over the years are demonstrated in Figure 1.

Figure 1. Carman Audiology*

Left Ear Decibel Hearing Loss

Hertz	500	1000	2000	3000	4000	6000	8000
2/5/2003	90	90	95	95	95	95	85
2/22/1999	5	0	5	20	35	35	30
2/18/1987	10	0	5	5	0	20	20

Right Ear Decibel Hearing Loss

Hertz	500	1000	2000	3000	4000	6000	8000
2/5/2003	85	85	60	75	85	95	NR
2/22/1999	0	5	0	40	35	50	40
2/18/1987	5	0	0	0	10	25	10

* Hearing is measured in decibels lost; normal levels are -10 to 15 dB; levels above 56 db are considered “moderately severe hearing loss;” levels above 70 db are considered “severe hearing loss;” and levels above 90 db are considered “profound hearing loss”

On 2/18/2003, CSX sent the carman a letter strongly suggesting he obtain a medical evaluation for his significant hearing loss. He had been sent a similar letter following testing in 1999. No further information regarding the carman’s hearing is present in his CSX medical file.

Drug Testing Results

The carman had several positive urine drug tests for marijuana in the late 1980’s and 1990. CSX asked him to perform a urine drug test in 1986, apparently after a return from furlough. His first attempt on February 25, 1986 did not produce enough urine to test. A specimen from March 4, 1986 was positive for cannabinoids, indicating use of marijuana. He was

not returned to work until an evaluation through the CSX employee assistance program (EAP) found him “not dependent” and follow up urine drug testing was negative on March 16 and April 14, 1986. He was determined to be fit for a return to work on April 25, 1986.

The carman’s urine drug test from February 18, 1987 was also negative. However, his urine specimen from February 15, 1988 was positive for 33 ng/ml of cannabinoids. He underwent an EAP evaluation and was determined to be “non-dependent.” A urine specimen collected March 16, 1988 tested negative and he was returned to work March 23rd.

The carman’s urine specimen from April 3, 1990, provided at the time he returned to work following a furlough, was positive for 56 ng/ml of cannabinoids. When the medical review officer discussed the positive test with him, the handwritten notes reflect the carman admitted he “used to use” marijuana “over a year ago.” He did not have a prescription for marijuana and the test remained positive. Again, he remained out of work until he underwent an EAP evaluation. This found him “not dependent” and on May 15, 1990 he tested negative. The file contains a hand written note dated May 23, 1990, which states the carman was “cleared to return to work” and that this was “not his first time with a drug problem.” On June 4, 1990, the carman was officially cleared to return to work. No further drug test results are in the carman’s CSX file until after his fatal accident.

Autopsy

The Commonwealth of Virginia Office of the Chief Medical Examiner determined the cause of death was decapitation, blunt force trauma to the torso, and bilateral leg amputation; the manner of death was accident. The 54 year old male carman was obese, weighing 349 pounds at autopsy.

In addition, the autopsy identified atherosclerotic and hypertensive cardiovascular disease. The heart was enlarged and weighed 870 grams (average for a man of this weight is about 491 grams with a range from 367 to 649 grams¹). There was left ventricular concentric hypertrophy with thicknesses of 2.2 cm for the left ventricular wall, 3.0 cm for the septum and 0.2 cm for the right ventricular wall. Average values are 1.23 cm for the left ventricular wall, 1.36 for the septum, and less than 0.4 cm for the right ventricular wall.¹

The microscopic evaluation of the heart identified hypertrophy of cardiac myocytes along with interstitial and perivascular fibrosis. The left and right coronary arteries had areas of 70% atherosclerotic narrowing, and this was confirmed by histology. In addition, microscopic evaluation of

the kidneys identified arteriolonephrosclerosis and patchy chronic interstitial inflammation.

The pathologist reported an enlarged liver, which weighed 2,320 grams. Average weight among obese men is 1874 grams with a range of 1238-2530 grams.² Microscopy of the liver identified mild chronic portal inflammation and glycogenated nuclei. Glycogenated nuclei in liver are associated with obesity and diabetes.³

Toxicology

According to toxicology testing performed by the Commonwealth of Virginia Department of Forensic Science, the railway worker's blood contained tetrahydrocannabinol, the psychoactive chemical in marijuana, at 0.0098 ± 0.0023 mg/L. In addition, its metabolite, tetrahydrocannabinol carboxylic acid was verified at 0.015 ± 0.003 mg/L.

Testing performed by the FAA's Bioaeronautical Research Laboratory at the request of the NTSB identified tetrahydrocannabinol at 0.0103 ug/ml and tetrahydrocannabinol carboxylic acid at 0.0238 ug/ml in blood; and tetrahydrocannabinol carboxylic acid at 0.2803 ug/ml in urine. The FAA lab did not receive organ tissue specimens in this case.

Tetrahydrocannabinol, the psychoactive chemical in marijuana, has mood altering effects including inducing euphoria and relaxation. It can effect motor behavior, perception, cognition, memory, and learning. In addition, it can impair concentration, attention, hand-eye coordination, retention time, and tracking.

Tetrahydrocannabinol concentrations typically peak during the act of smoking, while peak tetrahydrocannabinol carboxylic acid concentrations occur approximately 9-23 minutes after the start of smoking. Concentrations of both analytes decline rapidly and are often <0.005 ug/ml at 3 hours. Significant tetrahydrocannabinol concentrations (0.007 to 0.018 ug/ml) are noted following even a single puff or hit of a marijuana cigarette. Tetrahydrocannabinol has been demonstrated to have clinical effects at levels as low as 0.001 ug/ml. However, the exact relationship between a person's marijuana blood or plasma concentration and its performance impairing effects have been difficult to establish. While significant performance impairments are usually observed for at least 1-2 hours following marijuana use, residual effects have been reported up to 24 hours.⁴

However, interpreting post mortem blood and tissue results for marijuana is complex for several reasons. First, the drug is lipophilic and gets stored in fatty tissues; it may leech back into blood from liver, lung, and brain

after death. Thus, post mortem testing may not indicate ante-mortem levels.

The FAA lab also tested the carman's specimens for clinical indicators. No glucose or creatinine were identified in vitreous. The urine contained 134.8 mg/dL of creatinine and 14 mg/dl of glucose. The carman's Hemoglobin A1C was 5.8%. Hemoglobin A1C is a measure of glucose levels over the preceding few weeks. Normal is considered below 5.7%, between 5.8% and 6.4% is "prediabetes," and over 6.4% is diagnostic of diabetes.⁵

D. SUMMARY OF MEDICAL FINDINGS

The medical investigation was limited by the inability to identify and obtain personal medical records for the carman. However, the 54 year old male carman had obesity, coronary artery disease, evidence of hypertensive heart and kidney disease and an enlarged liver identified by autopsy. According to his CSX medical records, he had 60-95 decibel bilateral hearing loss documented in 2003 with no later testing. In addition, he had tested positive for marijuana use on employer requested urine drug tests in 1986, 1988, and 1990; each time he had been assessed as "not dependent" on marijuana, retested with a negative result, and returned to work. His post accident toxicology testing identified 0.0103 ug/ml of tetrahydrocannabinol (THC, the active compound in marijuana) and 0.0238 ug/ml of tetrahydrocannabinol carboxylic acid (an inactive metabolite of THC) in his blood; 0.2803 ug/ml of tetrahydrocannabinol carboxylic acid was also identified in urine.

References

¹ Kitzman DW, S.D., 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 Molina DK, DiMaio VJ. Normal organ weights in men: part II-the brain, lungs, liver, spleen, and kidneys. Am J Forensic Med Pathol. 2012;33(4):368-372

³ Silverman JF, O'Brien KF, Long S et al. Liver pathology in morbidly obese patients with and without diabetes. Am J Gastroenterol. 1990;85(10):1349-1355.

⁴ National Highway Traffic Safety Administration. Drugs and Human Performance Fact Sheets. Cannabis/Marijuana. <http://www.nhtsa.gov/people/injury/research/job185drugs/cannabis.htm> Accessed 12/14/2015.

⁵ US Department of Health and Human Services. National Institutes of Health. National Institute on Diabetes and Digestive and Kidney Diseases <http://www.niddk.nih.gov/health-information/health-topics/diagnostic-tests/a1c-test-diabetes/Pages/index.aspx> Accessed 12/29/2015.