NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Washington, DC

Medical Factual Report

March 11, 2020

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Medical Officer

A. ACCIDENT: RRD19FR010 – Carey, Ohio

Accident Type:	Train collision
Location:	Carey, Ohio; CSX Columbus Subdivision
Date:	August 12, 2019
Time:	5:08 a.m. EDT
Carrier:	CSX Transportation (CSX)
Striking Train:	H70211 (westbound)
Struck Train:	W31411 (eastbound)

B. GROUP IDENTIFICATION

Michelle Watters, MD, PhD, MPH
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C. ACCIDENT SUMMARY (from Preliminary Report[1])

On August 12, 2019, about 5:08 am, eastern daylight time, westbound CSX freight train H70211, collided with eastbound CSX freight train W31411 near Carey, Ohio. The trains were operating on the CSX Columbus Subdivision which extends 90.6 miles from Columbus, Ohio to Fostoria, Ohio in a geographic north-south direction (timetable east-west direction). As a result of the collision, the lead locomotive of train H70211 and 4 railcars were derailed on their side. CSX train movements on the Columbus Subdivision were governed by operating rules, timetable instructions, wayside signal indications and enforced with a Positive Train Control System

[1] NTSB Preliminary Report: Railroad - RRD19FR010. Adopted 10/10/2019. Available at: https://www.ntsb.gov/investigations/accidentreports/pages/rrd19fr010-prelim.aspx

(PTC). The CSX Louisville LF Dispatcher was in Jacksonville, Florida. The subdivision was single main track territory with portions of multiple main track territory and passing sidings. The maximum authorized speed in the vicinity of the accident location was 50 mph. The westbound train tonnage required a speed restriction of 40 mph. Both train engineers were transported by ambulance to a hospital with minor injuries and where they underwent post-accident drug and alcohol testing. The two train conductors were later driven by railroad officials to the hospital for post-accident drug and alcohol testing.

D. DETAILS OF INVESTIGATION

1. Purpose of Study

This investigation was performed to evaluate the engineer and conductor of the striking westbound freight train (H70211) for any medical conditions, use of medications/illicit drugs, or the presence of any toxins.

2. Methods

The H70211 engineer and conductor's CSX occupational health records, historical drug test results, and Federal Railroad Administration (FRA) post-accident testing[2] toxicology reports were reviewed. Post-accident emergency room records for the H70211 engineer were reviewed. Other pertinent scientific and regulatory issues were reviewed.

3. Relevant regulation and protocols

A. Federal Regulation

Per the Code of Federal Regulations, locomotive engineers and railroad conductors are required to meet vision and hearing standards (49 CFR parts 240.121 and 242.117, respectively). The vision and hearing requirements for engineers and conductors are comparable. FRA regulations do not require any other medical evaluation, testing, or any review of medical conditions and medications in use.

FRA regulations in 49 CFR part 219 discuss the control of alcohol and drug use.[3] Under part 219, except for over-the-counter drugs, no regulated employee may use or possess alcohol or any controlled substance while on duty. A regulated employee cannot have an alcohol concentration 0.02 or greater and continue to perform duties, nor may a regulated employee use alcohol within four hours of reporting for regular service. Controlled substances, which include marijuana, cannot be used at any time by a regulated employee, whether on duty or off duty. FRA post-accident toxicological testing is required after events that include an impact accident which involve a reportable injury or damage to railroad property of $150,000 or more; the testing includes about 50 substances.

[2] As part of FRA's post-accident toxicology testing, Quest laboratory performed initial testing on urine specimens for amphetamines, barbiturates, benzodiazepines, cannabinoids, cocaine, MDMA/MDA, methadone, opiates/opioids, phencyclidine, tramadol, brompheniramine, chlorpheniramine, diphenhydramine, doxylamine, and pheniramine and blood specimens for ethyl alcohol. No further testing was performed on compounds that were below their cut-off. Confirmatory testing was performed on both urine and blood specimens for all compounds above their cutoff.

[3] U.S. Government Printing Office. July 19, 2019. Electronic Code of Federal Regulation. Title 49 Subtitle B Chapter II Part 219. https://www.ecfr.gov/cgi-bin/text-idx?SID=a5afae926a591085cd843a66e2e2d69a&mc=true&node=pt49.4.219&rgn=div5

B. CSX Medical Protocols

In accordance with federal regulations, CSX requires engineers and conductors to triennially undergo a medical evaluation in connection with initial certification and re-certification (Title 49 CFR Parts 240 and 242). All CSX employees receive medical examinations with drug testing post-offer, if transferring between crafts, if off work for medical reasons for over one year, or if furloughed for over one year. If furloughed between 6 months and one year, a limited exam (hearing, vision, and urine testing) is required.

Consistent with 49 CFR Part 219, CSX maintains broad drug and alcohol testing programs for all "DOT-regulated employees," including conductors, engineers, dispatchers, signal workers, and maintenance of way employees. These DOT-regulated employees are all subject to pre-employment, reasonable suspicion, reasonable cause, and random drug testing.

In addition to DOT-mandated programs, all CSX employees are subject to Part 106 of its Operating Rules, which is also referred to as "Rule G." Rule G prohibits possession and use of drugs and alcohol on CSX property. Rule 106.1 prohibits "the illegal possession or use of a drug, narcotic, or other substance that affects alertness, coordination, reaction, response or safety" both on and off duty. Rule 106.2 specifically prohibits an employee from reporting to work or performing service while under the influence of medications or substances that will adversely affect safety. Rule 106.3 provides that "Employees are prohibited from possessing, using, or being under the influence of alcoholic beverages or intoxicants when: a) reporting for duty, or b) on duty, or c) on CSX property, or d) operating a company vehicle, or e) occupying facilities provided by CSX."

At CSX, managers have the right to remove someone from work if alcohol or drug use is suspected. There are two possible pathways of removing an employee from work. In the first, if a manager, based on training received at CSX, notes signs or symptoms of intoxication in the employee, the manager can require immediate drug or alcohol testing based on reasonable suspicion. In the second method, as described in the CSX "Withheld from Service" form's fitness for duty instructions, a supervisor or manager "should be observing the employees you supervise to determine whether they are properly and safely performing their jobs and that they are physically able to perform all required functions for their jobs … If you notice that an employee has difficulty safely performing, or is not able to perform, an essential function of his/her job such as lifting, climbing, or other required tasks, and you are unable to resolve the issue after talking with the employee, you should remove the employee from service." The CSX medical department follows up on the Withheld from Service submissions.

Additionally, a CSX employee can self-refer or be referred by another employee to the Employee Assistance Program (EAP) Voluntary Referral Program, which allows the employee affected by an alcohol or drug problem to maintain their employment with CSX if assistance is sought before the employee is charged with conduct that may warrant dismissal.

E. FINDINGS

1. H70211 Engineer

a. CSX Occupational Medical Records and Historical Drug Test Records

The CSX H70211 engineer was 49 years old at the time of the accident.

According to his occupational medical records from CSX, the engineer underwent a post offer medical exam in June 2000 that included a series of questions about previously

diagnosed medical conditions, review of recent medication use, evaluation of vital signs, hearing and vision tests, a urine dip test for sugars and protein, and a physical examination. The engineer reported having hay fever, a history of kidney stones, and neck and back pain from a car accident in 1999. He reported taking several over the counter medications for pain and allergy relief. Other than wearing eyeglasses, no chronic medical conditions, regular medication use, or physical abnormalities were identified.

Periodic hearing and vision testing were performed about every two to three years; the engineer was found to meet FRA standards and he was found medically qualified with the restriction that he must wear corrective lenses or glasses. The most recent exam was on 6/18/19. On this and all previous employee health questionnaires, he denied any medical treatment for conditions that could affect his ability to safely perform the essential functions of his job.

There was a report of the engineer having a sprained neck and lower back following a work-related motor vehicle accident in February 2016. The engineer also had a 5-month leave between November 2012 and March 2013 for a non-work related shoulder injury and surgery.

Historical drug testing records were provided by CSX for the H70211 engineer that included a chain of custody form for pre-employment testing (no results) and two random drug screen results that were both negative (December 2004 and February 2009).

b. Toxicology

FRA post-accident toxicology testing of the H70211 engineer's blood and urine were positive for ethanol (0.115 grams per deciliter [gm/dL] and 0.113 gm/dL, respectively). The engineer's blood and urine were positive for marijuana metabolites (6.3 nanograms per milliliter [ng/mL] and 32.6 ng/mL, respectively). Approximately 6 hours had elapsed between the time of the accident and the collection of the engineer's blood and urine specimens.

c. Post-accident medical records

Emergency records were obtained for post-accident treatment of the H70211 engineer. About three hours after the accident, the engineer was transported from the accident scene by ambulance to the hospital after reporting he felt like he was going to pass out. On arrival, the engineer complained of headache, neck pain, and lower back pain; after physical and radiological exams, he was diagnosed with neck and lower back strain. At his intake assessment, the engineer denied drug use and stated he occasionally used alcohol. During the course of his emergency room visit, he received Toradol (ketorolac, a nonsteroidal anti-inflammatory drug) intramuscularly and Tylenol (acetaminophen, a pain reliever). No IV [intravenous] line was placed, and no labs were drawn. Noted in his patient chart is that the engineer voided 300 ml of urine while in the emergency room. Upon discharge, he was escorted to the on-site occupational health clinic for drug screening.

Description of detected drugs

ETHANOL

Ethanol is a social drug commonly found in beer, wine, and liquor that acts as a central nervous system depressant. After absorption, ethanol is quickly distributed throughout the

body's tissues and fluids uniformly, paralleling the water content and blood supply of each organ.[4]

Unlike many other substances, ethanol is eliminated from the body at a fairly constant rate. The rate varies with the regularity of drinking and whether-or-not the individual has been eating, and ranges from 0.010 gm/dL/hour in infrequent drinkers with an empty stomach to as high as 0.035 gm/dL/hour in heavy drinkers who have eaten. In moderate drinkers, 0.015 gm/dL/hour is a reasonable average elimination rate of alcohol from blood.[5]

While the effects of ethanol can vary depending on an individual's frequency of use and tolerance, in general, at blood ethanol concentrations as low as 0.02 gm/dL there is relaxation and some loss of judgment and at 0.05 gm/dL there is further degradation of judgment, psychomotor functioning, and alertness. At concentrations of 0.08 gm/dL or above an individual is considered legally too impaired to operate a motor vehicle in all 50 states. At blood ethanol concentrations above 0.10 gm/dL, there is prolonged reaction time, altered perception of the environment, lack of coordination, slowed thinking, and mood and behavioral changes. Above 0.15 gm/dL, individuals may have significant loss of muscle control and major loss of balance. In addition to worsening motor coordination and disorientation, at concentrations above 0.20 gm/dL, individuals may experience amnesia or blackouts and double vision.[6,7] Individuals who develop a tolerance to alcohol may have a diminished effect with continued use of the same amount, and the outward and obvious signs of intoxication many not be displayed.[8]

CANNABIS/MARIJUANA

Tetrahydrocannabinol (THC) is the primary psychoactive substance in the marijuana plant (*Cannabis sativa*). THC's mood-altering effects include euphoria and relaxation. In addition, marijuana causes alterations in motor behavior, perception, cognition, memory, learning, endocrine function, food intake, and regulation of body temperature. Specific performance effects include decreased ability to concentrate and maintain attention. Impairment in retention time and tracking, subjective sleepiness, distortion of time and distance, vigilance, and loss of coordination in divided attention tasks have been reported. Significant performance impairments are usually observed for at least 1-2 hours following marijuana use, and residual effects have been reported up to 24 hours. Additionally, when alcohol and marijuana are taken in combination, there is an increased safety risk.[9]

THC is rapidly metabolized but the rate of metabolism is not linear and depends on the means of ingestion (smoking, oil, and edibles), potency of the product, frequency of use,

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[4] FAA. Update 1/16/2019. Forensic Toxicology Drug Information. Ethanol. http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=60.

[5] Jones AW. 2010. Evidence-based survey of the elimination rates of ethanol from blood with applications in forensic casework. *Forensic Sci Int.* 200:1-20.

[6] Centers for Disease Control and Prevention. Blood Alcohol Concentration (BAC). https://www.cdc.gov/motorvehiclesafety/pdf/bac-a.pdf Accessed 7/25/2019

[7] Vonghia L., et al. 2008 Acute alcohol intoxication. *European Journal of Internal Medicine* 19: 561–567.

[8] National Institute of Alcohol Abuse and Alcoholism. April 1995. Alcohol and Tolerance. No.28 PH 356 https://pubs.niaaa.nih.gov/publications/aa28.htm

[9] National Highway Traffic Safety Administration. April 2014. Drugs and Human Performance Fact Sheets. Cannabis/Marijuana. https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/809725-drugshumanperformfs.pdf

and user characteristics. THC is fat soluble, so is stored in fatty tissues and can be released back into the blood long after consumption. There are two primary metabolites of THC, the psychoactive metabolite 11-hydroxy-THC and the inactive (non-psychoactive) metabolite delta-9-tetrahydrocannabinol-9-carboxylic acid (THCA or THC-COOH). THCA can be detectable in plasma up to 2-7 days. Very little THC is excreted in urine. Instead, inactive THCA can be found in urine days to weeks after the last use of the drug. Urine test results are also dependent on dilution as well as drug metabolism. Thus, blood or urine test results for THCA do not necessarily reflect recent use and cannot be used to prove that the user was under the influence of the drug at the time of testing. [10,11]

According to Title 21 USC 812, tetrahydrocannabinol is listed as a Schedule I controlled substance.[12] Although its use is permitted in a number of states for medicinal and recreational purposes, it's use is unacceptable for any safety-sensitive employee and is subject to drug testing under the Department of Transportation's drug testing regulations[13,14] In Ohio, possession and use has been decriminalized and legal for medical use. Ohio has per se laws that make it illegal to drive with amounts of marijuana that exceed specified levels in the body.[15] According to Ohio Code 4511.19, no person shall operate any vehicle within Ohio if the marijuana metabolite in their blood or urine exceeds 50 ng/ml or 35 ng/mL, respectively. Furthermore, if the person is under the influence of alcohol or a drug of abuse, the threshold concentration of the marijuana metabolite is 5 ng/mL in blood and 15 ng/mL in urine.

2. H70211 Conductor

a. CSX Occupational Medical Records and Historical Drug Test Records

The H70211 conductor was 45 years old at the time of the accident.

According to his occupational medical records from CSX, the conductor underwent a post offer exam in April 2007 that included a series of questions about previously diagnosed medical conditions, review of recent medication use, evaluation of vital signs, hearing and vision tests, a urine dip test for sugars and protein, and a physical examination. The conductor reported the use of omeprazole (commonly marketed as Prilosec) for heartburn and seasonal allergies; no other chronic medical conditions, regular medication use, or physical abnormalities were identified. The conductor was found medically qualified but had to wear corrective lenses or glasses while on duty.

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[10] Compton, R. July 2017. Marijuana-Impaired Driving - A Report to Congress. (DOT HS 812 440). Washington, DC: National Highway Traffic Safety Administration.
https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/812440-marijuana-impaired-driving-report-to-congress.pdf

[11] Sharma, P, P Murthy, and MMS Bharath. 2012. Chemistry, metabolism, and toxicology of *Cannabis*: Clinical implications. *Iran J Psychiatry.* 7(4):149-156.

[12] U.S. Department of Justice, Drug Enforcement Administration, Office of Diversion Control, http://www.deadiversion.usdoj.gov/21cfr/21usc/812.htm

[13] U.S. Department of Transportation, Drug and Alcohol Testing, DOT "Medical Marijuana" Notice, 10/22/09, updated 4/29/19. https://www.transportation.gov/odapc/medical-marijuana-notice.

[14] U.S. Department of Transportation, Drug and Alcohol Testing, DOT "Recreational Marijuana" Notice, 10/3/12. https://www.transportation.gov/odapc/dot-recreational-marijuana-notice.

[15] Governors Highway Safety Association. Current as of 4/10/19. Marijuana-Related Laws. https://www.ghsa.org/sites/default/files/2019-04/marijuanalaws_apr2019_0.pdf.

Following recovery from a non-work-related right knee surgery in October 2017, the conductor was found medically qualified to return to work in December 2017. There was also a return to work letter following a week absence for eye surgery in October 2010. Periodic hearing and vision testing were performed about every two to three years; the conductor was found to meet FRA standards and he was declared medically qualified with the restriction that he must wear corrective lenses or glasses.

Historical drug testing records were provided by CSX for the H70211 conductor. The conductor underwent pre-employment and post-furlough drug testing in April 2007 and March 2010, respectively. Over the course of his employment at CSX until the time of the accident, the conductor had random urine drug screens in October 2011, September 2015, and January 2017. The conductor received random ethanol breathalyzer testing in January 2017, May 2017, February 2019, and June 2019. All historical drug and alcohol testing results for the H70211 conductor were negative.

b. Toxicology

The H70211 conductor's FRA post-accident blood alcohol and urine drug testing were negative.

F. SUMMARY OF MEDICAL FINDINGS

The 49-year-old male CSX H70211 engineer was medically certified for his duties but was required to wear corrective lenses. As a result of the collision he was diagnosed with neck and lower back strain and received non-steroidal medications in the emergency room. FRA post-accident toxicology testing of the engineer performed 6 hours after the accident was positive for ethanol (0.115 gm/dL in blood and 0.113 gm/dL in urine) and marijuana metabolites (6.3 ng/mL in blood and 32.6 ng/mL in urine).

The 45-year-old CSX H70211 conductor was medically certified for his duties but was required to wear corrective lenses. His FRA post-accident blood alcohol and urine drug testing were negative.