



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Washington, DC

Medical Factual Report

September 2, 2022

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A. CRASH INFORMATION

Identification: HWY21MH009

Location: Greenville, Alabama

Date: June 19, 2021 (approximately 14:21 local time)

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 involved vehicle drivers for potentially impairing medical conditions and substance use.

2. Methods

This medical investigation included the drivers of all 12 vehicles involved in the crash, as determined by the National Transportation Safety Board (NTSB) Investigator in Charge (IIC). All 12 drivers survived the crash.

Eight of the 12 drivers had post-crash blood specimens collected by law enforcement for toxicological testing by the Alabama Department of Forensic Sciences (ADFS); the results of that testing were reviewed. At the request of the NTSB, leftover specimens from ADFS testing were sent to the Federal Aviation Administration (FAA) Forensic Sciences Laboratory for toxicological testing;

those results were also reviewed. Post-crash medical treatment records were identified for eight of the 12 drivers; those records were reviewed.

For the two commercial motor vehicle (CMV) drivers, selected medical certification records were reviewed. For one of the CMV drivers (2020 Volvo VAH Truck Tractor), selected pre-crash personal medical records were reviewed to clarify information from his medical certification record. Available United States Department of Transportation (DOT) post-accident drug and alcohol testing results were reviewed. One CMV driver (2005 Freightliner) did not undergo DOT post-accident drug or alcohol testing. Results were reviewed of non-DOT toxicology testing that he obtained at a medical facility 2 days after the crash.

Selected investigator reports and relevant regulation and medical literature were also reviewed.

3. Findings

a. 2020 Volvo VAH Truck Tractor Driver

I. CMV Driver Medical Certification Records

This 57-year-old male driver's last CMV driver medical examination before the crash was on March 10, 2021. According to the Federal Motor Carrier Safety Administration (FMCSA) Medical Examination Report Form (commonly referred to as the "long form") from that visit, he reported having high blood pressure, controlled with one prescription medication, and diabetes, controlled with one prescription oral medication. He also reported using an acid reflux medication that is available over the counter. None of those medications are generally considered impairing. The driver reported a hemoglobin A1c in a controlled range (measured December 2020, according to reviewed primary care records).¹ He was found to meet medical certification standards with periodic monitoring required for high blood pressure and diabetes. He was issued a 1-year medical certificate.

II. Pre-Crash Medical Records

According to reviewed primary care records, this driver's last primary care visit before the crash was on April 12, 2021, for a routine checkup. As of that visit he was taking two prescription medications for high blood pressure. He was taking three prescription oral medications for type 2 diabetes; those diabetes medications had been started at the time of his

¹ HbA1c is an indirect measure of a person's average blood sugar over the lifespan of that person's red blood cells, which is usually about 3 months. [American Diabetes Association. Standards of medical care in diabetes – 2022. *Diabetes Care*. 2022;45(Suppl. 1):S1-S264. https://diabetesjournals.org/care/issue/45/Supplement_1. Accessed September 2, 2022.]

initial diabetes diagnosis in September 2020. He was also taking an over-the-counter medication for acid reflux. None of those medications are generally considered impairing. His doctor noted that the driver was doing well on medication, without any low blood sugar episodes, and that his twice-daily blood sugar measurements at home had been in a controlled range. His HbA1c on the date of the visit was also in a controlled range.

III. Toxicology

i. DOT Post-Accident Drug and Alcohol Testing

This driver's DOT post-accident drug and alcohol tests were not performed until the day after the crash, in part due to circumstances of his post-crash medical care.² His DOT post-accident urine test was collected at 15:21 on June 20, 2021. It did not detect any tested-for substances.³ An alcohol saliva test, collected at 15:12 on June 20, 2021, was negative.

ii. ADFS Toxicology

ADFS testing of blood collected from this driver at 20:33 on the crash date did not identify any tested-for substances.⁴

iii. FAA Toxicology

At the request of the NTSB, the FAA Forensic Sciences Laboratory performed a general drug screen on a leftover portion of the blood collected for ADFS testing, and did not identify any potentially impairing tested-for substances.⁵

IV. Post-Crash Treatment Records

Reviewed records from this driver's post-crash medical treatment showed that, at the time of his emergency department evaluation, he had a moderately elevated blood sugar. He did not have any major metabolic disturbance.⁶ His post-crash care did not include toxicology testing.

² In accordance with [49 Code of Federal Regulations 382.303\(d\)](#), the employer was still able to have DOT drug testing administered within 32 hours of the crash, and provided the Federal Motor Carrier Safety Administration with a record stating the reason that DOT alcohol testing was not administered within 8 hours of the crash.

³ Tested-for substances on DOT urine drug testing are marijuana metabolites, cocaine metabolites, amphetamines, opioids, and phencyclidine (PCP), in accordance with [49 Code of Federal Regulations 40.85](#), as detailed in [49 Code of Federal Regulations 40.87](#).

⁴ The ADFS Toxicological Analysis Report listed tested-for substances as: ethanol, acetone, isopropanol, methanol, meth/amphetamine class, barbiturate class, benzodiazepine class, buprenorphine, cannabinoids, carisoprodol/meprobamate, cocaine and/or metabolite(s), cyclobenzaprine, dextromethorphan, fentanyl, methadone, opiates/opioids, phencyclidine (PCP), tramadol, tricyclic antidepressants, and zolpidem.

⁵ The FAA Forensic Sciences Laboratory tests specimens for a wide variety of substances including toxins, prescription and over-the-counter medications, and illicit drugs. In this case, because of limited available specimen, the FAA Forensic Sciences Laboratory performed general drug testing without separate testing for alcohol or drugs of abuse.

⁶ His bicarbonate and anion gap were normal, and his urine tested negative for ketones (normal result).

b. 2005 Freightliner Driver

I. CMV Driver Medical Certification Records

This 41-year-old male driver's last CMV driver medical examination before the crash was on January 7, 2021. According to the FMCSA Medical Examination Report Form (long form) from that visit, he reported no medication use and no medical conditions. He was found to meet medical certification standards and was issued a 2-year medical certificate without restrictions.

II. Toxicology

i. Self-Obtained Drug and Alcohol Testing

This driver did not undergo DOT post-accident drug or alcohol testing. He obtained toxicology testing at a medical facility 2 days after the crash. According to records of that testing provided by the driver, a urine sample collected at 21:43 on June 21, 2021, screened negative for tested-for drugs.⁷ A blood sample collected at 21:56 on June 21, 2021, screened negative for alcohol, acetaminophen, and salicylate.

ii. ADFS Toxicology

ADFS testing of blood collected from this driver at 21:20 on the crash date did not identify any tested-for substances.⁴

iii. FAA Toxicology

At the request of the NTSB, the FAA Forensic Sciences Laboratory performed a general drug screen on a leftover portion of the blood collected for ADFS testing. No tested-for substances were detected.⁵

c. 2020 Ford Explorer Driver

Post-crash treatment records were reviewed for this driver from two treating facilities. No significant pre-crash medical condition or medication use was identified from this driver's documented post-crash medical evaluation and medical history. This driver's post-crash care did not include toxicology testing.

⁷ According to the urine results report, an amphetamine screen, barbiturate screen, benzodiazepine screen, cocaine screen, opiate screen, and tetrahydrocannabinol (THC) screen were performed.

d. 2017 Ford F-350 Transit Van Driver

I. Toxicology

i. ADFS Toxicology

ADFS testing of blood collected from this driver at 19:50 on the crash date did not identify any tested-for substances.⁴

ii. FAA Toxicology

At the request of the NTSB, the FAA Forensic Sciences Laboratory performed a general drug screen on a leftover portion of the blood collected for ADFS testing. No tested-for substances were detected.⁵

II. Post-Crash Treatment Records

No significant pre-crash medical condition or medication use was identified from this driver's documented post-crash medical evaluation and medical history. This driver's post-crash care included a medical blood test for ethanol, collected at 18:03 on the crash date; this test was negative (ethanol less than 0.003 g/dL).

e. Non-Commercial Drivers of Vehicles Without Fatalities

I. Post-Crash Treatment Records

Post-crash medical treatment records were available for five of the eight non-commercial drivers of vehicles without fatally injured occupants. No significant pre-crash medical conditions or medications were identified from the documented post-crash medical evaluations and medical histories in those records. None of those records documented toxicological testing.

II. Toxicology

Post-crash toxicological testing was performed for five of the eight non-commercial drivers of vehicles without fatally injured occupants.

ADFS testing of blood collected from one driver at 19:56 on the crash date identified methamphetamine at 440 ng/mL, along with the methamphetamine metabolite amphetamine at 310 ng/mL.⁴ At the request of the NTSB, the FAA Forensic Sciences Laboratory performed a general drug screen on a leftover portion of this blood. Methamphetamine was identified at 371 ng/mL and amphetamine was identified at 251 ng/mL. Phenylpropanolamine was also detected.⁵

ADFS testing of blood collected from another driver at 20:20 on the crash date identified delta-9-THC at 3.3 ng/mL, along with the delta-9-THC

metabolites 11-hydroxy-delta-9-THC (at 1.4 ng/mL) and carboxy-delta-9-THC (at 30 ng/mL).⁴ At the request of the NTSB, the FAA Forensic Sciences Laboratory performed a general drug screen on a leftover portion of this blood. No tested-for substances were detected.⁵ The FAA general drug screen did not test for delta-9-THC or its metabolites.

Three non-commercial drivers of vehicles without fatally injured occupants underwent ADFS and FAA toxicological testing of blood collected between 20:23 and 21:03 on the crash date, with no potentially impairing tested-for substances identified.

III. Descriptions of Detected Substances

Methamphetamine is a central nervous system stimulant drug. Amphetamine is a metabolite of methamphetamine, and is also a central nervous system stimulant. Both methamphetamine and amphetamine are available as prescription drugs used to treat attention deficit hyperactivity disorder, narcolepsy, and occasionally obesity; each may also be a metabolite of certain other medications. Methamphetamine and amphetamine are Drug Enforcement Administration (DEA) Schedule II controlled substances, with a high potential for abuse and dependence. At low doses used as part of appropriate medical treatment, the drugs may improve reaction time, cognitive function, and fatigue, but may cause people to make higher-risk choices. At higher doses, the drugs may have a variety of impairing effects on psychomotor function, cognition, and perception. The drugs typically carry warnings that they may impair the ability to engage in potentially hazardous activities such as driving a motor vehicle. Such impairment can result from drug or withdrawal effects.^{8,9,10}

In addition to being used medicinally, methamphetamine and amphetamine are frequently produced illicitly and abused recreationally by ingestion, snorting, smoking, rectal insertion, or injection. Seeking an intense euphoric effect, abusers typically use much higher doses than are used medicinally. Consequently, methamphetamine blood levels can sometimes be used to distinguish abuse from medicinal use. In living people, methamphetamine blood levels above 200 ng/mL generally represent abuse (there is no evidence that levels above this improve task

⁸ Couper FJ, Logan BK. Drugs and Human Performance Fact Sheets. National Highway Traffic Safety Administration. DOT HS 809 725. April 2014 (Revised). <https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/809725-drugshumanperformfs.pdf>. Accessed September 2, 2022.

⁹ National Institutes of Health National Library of Medicine. Methamphetamine hydrochloride. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=f31f580f-1f08-4a0f-b078-0b9e3308f712>. Updated April 15, 2022. Accessed September 2, 2022.

¹⁰ National Institutes of Health National Library of Medicine. Amphetamine sulfate. DailyMed. <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=79b9db39-7cdc-5607-f0ce-ac2a2cfd59d5>. Updated March 1, 2020. Accessed September 2, 2022.

performance), whereas typical levels seen with medicinal use are between 20 ng/mL and 50 ng/mL. Physiologic and psychologic effects from methamphetamine/amphetamine abuse can be numerous and severe, following a typical pattern of early effects and late effects. Measuring an abuser's drug level does not help distinguish which effects the person is experiencing.⁸

Phenylpropanolamine is a chemical that can be used in illicit drug production to make amphetamine and may be present as an adulterant in a variety of illicit drugs.^{8,11} It is also a minor metabolite of amphetamine. Phenylpropanolamine was previously available in the United States as a nasal decongestant and weight loss ingredient in multiple over-the-counter and prescription products. In 2000, the United States Food and Drug Administration requested that all drug companies discontinue marketing products with phenylpropanolamine for human use, due to a small increased risk of brain bleeding.¹²

Delta-9-THC (commonly known as THC) is the primary psychoactive chemical in marijuana and hashish, derived from the cannabis plant. It is commonly smoked or ingested recreationally by users seeking mind-altering effects. It may also be used medicinally to treat illness-associated nausea and appetite loss. It is present as an undeclared contaminant in some commercial cannabidiol (CBD) extracts and oils that may be used by a variety of routes for a variety of reasons. In the body, delta-9-THC is metabolized mainly to the psychoactive chemical 11-hydroxy-delta-9-THC, which is then further metabolized to the non-psychoactive chemical carboxy-delta-9-THC. Psychoactive effects of delta-9-THC vary depending on the user, dose, and route of administration. Delta-9-THC can have impairing effects on motor coordination, reaction time, decision making, problem solving, and vigilance. Delta-9-THC is a DEA controlled substance.^{8,13}

¹¹ Drug Enforcement Administration. Notice - phenylpropanolamine can be used in illicit amphetamine manufacture. Diversion Control Division. https://www.deadiversion.usdoj.gov/chem_prog/advisories/ppa.htm. Updated December 1, 2011. Accessed September 2, 2022.

¹² Food and Drug Administration. Phenylpropanolamine (PPA) information page. Food and Drug Administration website. <https://www.fda.gov/drugs/information-drug-class/phenylpropanolamine-ppa-information-page>. Updated October 14, 2016. Accessed September 2, 2022.

¹³ Compton RP. Marijuana-Impaired Driving: A Report to Congress. National Highway Traffic Safety Administration. DOT HS 812 440. July 2017. <https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/documents/812440-marijuana-impaired-driving-report-to-congress.pdf>. Accessed September 2, 2022.

D. SUMMARY OF MEDICAL FINDINGS

1. 2020 Volvo VAH Truck Tractor Driver

This commercial motor vehicle (CMV) driver's last CMV driver medical examination before the crash was on March 10, 2021. He was issued a 1-year medical certificate with periodic monitoring required for high blood pressure and diabetes, treated with prescription medications that generally are not considered impairing. At a primary care visit on April 12, 2021, the driver's doctor noted that the driver was doing well and that his blood sugar was under control. Post-crash toxicological testing found no potentially impairing tested-for substances. At a post-crash emergency department evaluation, his blood sugar was moderately elevated, without any major metabolic disturbance.

2. 2005 Freightliner Driver

This CMV driver's last CMV driver medical examination before the crash was on January 7, 2021. He reported no medication use and no medical conditions, and he was issued a 2-year medical certificate without restrictions. Post-crash toxicological testing found no potentially impairing tested-for substances.

3. 2020 Ford Explorer Driver

No significant pre-crash medical condition or medication use was identified from this driver's post-crash medical record. No toxicology results were available.

4. 2017 Ford F-350 Transit Van Driver

No significant pre-crash medical condition or medication use was identified from this driver's post-crash medical record. Post-crash toxicological testing found no potentially impairing tested-for substances.

5. Non-Commercial Drivers of Vehicles Without Fatalities

Post-crash medical treatment records were available for five of the eight non-commercial drivers of vehicles without fatally injured occupants. No significant pre-crash medical conditions or significant medications were identified from the documented post-crash medical evaluations and medical histories in those records. None of those records documented toxicological testing.

Post-crash toxicological blood testing was performed for five of the eight non-commercial drivers of vehicles without fatally injured occupants. For one of those drivers, two labs identified methamphetamine, at 440 ng/mL and 371 ng/mL, and amphetamine, at 310 ng/mL and 251 ng/mL, in blood collected at 19:56 on the crash date; one lab also detected phenylpropanolamine. For another of those drivers, one lab identified delta-9-THC at 3.3 ng/mL, 11-hydroxy-delta-9-THC at 1.4 ng/mL, and carboxy-delta-9-THC at 30 ng/mL, in blood collected at 20:20 on the crash date. For the remaining three of those drivers, no potentially impairing tested-for substances were identified.