



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Washington, DC

Medical Factual Report

June 9, 2017

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Chief Medical Officer

A. CRASH INFORMATION

Location: US 27A, milepost 29, near Williston, Levy County, Florida,
Vehicle #1: 2015 Tesla Model S 70D
Operator #1: Private operator
Vehicle #2: 2014 Freightliner Cascadia truck-tractor in combination with a
2003 Utility 3000R refrigerated semi-trailer
Operator #2: Okemah Express, LLC
Palm Harbor, FL
Date: May 7, 2016
Time: 4:36 PM EDT

B. GROUP IDENTIFICATION

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

C. RELEVANT STATUTE AND REGULATION

According to Title 49 Code of Federal Regulations (CFR), Part 40, Subpart B, employers are required to have employees meeting the Title 49 CFR Part 382 undergo testing for controlled substances and alcohol. These rules apply to any persons operating a commercial motor vehicle in commerce in any state.

Department of Transportation (DOT) mandated urine drug testing for commercial vehicle drivers is required pre-employment, for a random sample of 25% of commercial drivers annually, and following accidents. Employers are required to develop programs and ensure drug and alcohol testing is performed in compliance with regulations. DOT urine tests identify use of amphetamine, methamphetamine, cocaine, codeine, morphine, heroin, phencyclidine, methylenedioxymethamphetamine (MDMA),

methylenedioxyamphetamine (MDA), methylenedioxyethylamphetamine (MDEA), and marijuana.¹

According to Title 21 USC 812, marijuana is listed as a Schedule I controlled substance.² Although its use is permitted in a number of states and the District of Columbia for medicinal and recreational purposes, according to the Secretary of Transportation, it is unacceptable for any safety-sensitive employee subject to drug testing under the Department of Transportation's drug testing regulations (such as commercial vehicle drivers) to use marijuana.^{3,4}

As of April 2017, 29 states, the District of Columbia, Guam, and Puerto Rico now allow the use of medical marijuana and 8 states and the District of Columbia have legislation allowing retail sales (although not all of these states have completed systems to enable such sales).⁵ Unlike alcohol, there are no accepted scientific standards relating an amount of marijuana in the blood to impairment. According to the Governor's Highway Safety Association, as of June 2017, 9 states have zero tolerance traffic laws for non-commercial drivers with findings of tetrahydrocannabinol (THC, the primary psychoactive component in marijuana) or a metabolite; 3 states have zero tolerance traffic laws for THC but no restriction on metabolites; 5 states have specific per se limits for blood levels indicating impairment while driving for THC (ranging from 1ng/ml to 5 ng/ml), and 1 state (Colorado) has a reasonable inference law for THC set at 5 ng/ml in blood.⁶ Florida has no current statute regarding the blood level of THC that indicates impairment for non-commercial drivers.⁷

D. DETAILS OF INVESTIGATION

1. Purpose

This investigation was performed to evaluate the two drivers involved in this accident for any medical conditions, the use of any medications/illicit drugs, and the presence of any toxins.

¹ US Department of Transportation, Drug and Alcohol testing DOT Rule 49 CFR Part 40 Section 40.87 - cutoff concentrations for drug tests. <https://www.transportation.gov/odapc/part40/40-87> Accessed 06/02/2017

² U.S. Department of Justice, Drug Enforcement Administration, Office of Diversion Control, <http://www.dea/diversion.usdoj.gov/21cfr/21usc/812.htm> Accessed 6/1/2017.

³ U.S. Department of Transportation, Drug and Alcohol Testing, DOT 'Medical' Marijuana Notice, <https://www.transportation.gov/odapc/medical-marijuana-notice> Accessed 09/19/2016.

⁴ U.S. Department of Transportation, Drug and Alcohol Testing, DOT 'Recreational' Marijuana Notice, <https://www.transportation.gov/odapc/dot-recreational-marijuana-notice> Accessed 09/19/2016.

⁵ National Conference of State Legislatures. State Medical Marijuana Laws (Updated 4/21/2017) <http://www.ncsl.org/research/health/state-medical-marijuana-laws.aspx> Accessed 6/5/2017.

⁶ This suggests juries may consider levels above 5 ng/ml as impairing but are not required to do so.

⁷ Governor's Highway Safety Association. State Laws by Issue. Drug Impaired Driving. (updated when states report changes) <http://www.ghsa.org/state-laws/issues/drug%20impaired%20driving> Accessed 6/5/2017.

2. Methods

The Tesla driver's autopsy and local toxicology results and the truck driver's most recent Commercial Driver Medical Examination form and two sets of toxicology results were reviewed.

Tesla Driver

Autopsy

According to the autopsy performed by the Medical Examiner's Office, Gainesville, FL, the cause of the 40 year old male Tesla driver's death was injuries sustained in automobile-tractor trailer collision and the manner of death was accident. No significant natural disease was identified.

Toxicology

Toxicology testing performed by the University of Florida Pathology Laboratories on the driver's blood did not identify any tested-for substances. (See Human Performance Attachment 5.)

Toxicology testing performed on remaining blood by the Federal Aviation Administration's Bioaeronautical Research Sciences Laboratory did not identify any tested-for substances.⁸ (See Human Performance Attachment 6.)

Personal Health Information

According to an interview with the Tesla driver's family, he was in good health, did not take any medication, and did not have a regular physician. (See the Human Performance Group Chairman's Factual Report for more details.)

Truck Driver

Commercial Driver Medical Examination

On his most recent Commercial Driver Medical Examination (long form), dated September 28, 2015, the 62 year old male commercial driver answered "no" to every question about medical history or symptoms and reported no medication use.⁹ During the physical examination he was found to be 68 inches tall and weigh 246 pounds.¹⁰ The examiner noted that he removed a cerumen impaction (ear wax) and after that the driver did not need audiology testing. In addition, he noted "neck circumference 16.5 inches; does not need sleep study; only one risk factor exists."

⁸ Testing included more than 1300 substances, see <http://jag.cami.jccbi.gov/toxicology/default.asp?offset=0> for a complete listing.

⁹ The long form was obtained by subpoena of the motor carrier, who was also the driver. Of note, on the scanned PDF supplied, the medical examiner's name and identifying information has been cut off.

¹⁰ Although the certified medical examiner did not record a body mass index (BMI) it was 37.4kg/m² according to the BMI calculator provided by the National Institutes of Health Heart, Lung, and Blood Institute: https://www.nhlbi.nih.gov/health/educational/lose_wt/BMI/bmicalc.htm Obesity is considered BMI's above 30.0 kg/m². Accessed 6/6/2017.

Records from the provider did not include any additional information; this was a single visit to this provider.

Toxicology

According to the Florida Highway Patrol Blood Withdrawal/Fatal Traffic Crash Checklist, blood was obtained from the truck driver one and a half hours after the accident (at 6:11 and 6:12 pm for two tubes) by paramedics on-scene and retained by the Florida Highway Patrol. Testing performed by the University of Florida Pathology Laboratories confirmed the presence of Delta-9-tetrahydrocannabinol (THC) and 11-Nor-9-carboxy-delta-9-tetrahydrocannabinol (THC-COOH) in the specimen but did not quantify the amounts. (See Human Performance Attachment 9.)

At the request of the NTSB, the remaining portion of the blood specimen obtained by the Florida Highway Patrol was sent to the Federal Aviation Administration's Bioaeronautical Sciences Research Laboratory where they identified 3.1 ng/ml of tetrahydrocannabinol (THC, also called Delta-9-tetrahydrocannabinol) and 66.2 ng/ml of tetrahydrocannabinol carboxylic acid (THC-COOH, also called 11-Nor-9-carboxy-delta-9-tetrahydrocannabinol). (See Human Performance Attachment 10.) Tetrahydrocannabinol (THC) is the main psychoactive compound in marijuana; THC-COOH is its primary (inactive) metabolite.⁸

THC has mood-altering effects including euphoria, relaxed inhibitions, disorientation, time/image distortion, and psychosis. Significant performance impairments are usually observed for at least one to two hours following marijuana use; residual effects have been reported up to 24 hours.¹¹ Blood THC levels peak during the act of smoking and then decline rapidly as the drug is distributed into highly vascular tissues, including the brain. The rate of decline then slows as THC is absorbed into adipose tissue. Peak THC plasma levels in 6 volunteers averaged 84 mg/ml (range 50-129 ng/ml) at an average of 8.4 minutes after beginning to smoke a cigarette containing 15.8 mg of THC (they were allowed 11 minutes to smoke the cigarette). Peak THC-COOH levels occurred at about 2.4 hours and reached an average of 25 ng/ml (range 15-54 ng/ml). By 3.0 hours after beginning to smoke, THC levels averaged 1.2 ng/ml and THC-COOH levels averaged 8.8 ng/ml at 12 hours after smoking.¹²

THC metabolism varies among individuals and is also influenced by chronicity of its use. Terminal half-life, a measure of the amount of time for ½ of a drug to be eliminated after the initial rapid distribution is complete, ranges from 20-57 hours for infrequent users and from 3-13

¹¹ National Highway Traffic Safety Administration. Drugs and Human Performance Fact Sheets. Marijuana. <http://www.nhtsa.gov/people/injury/research/job185drugs/cannabis.htm> Accessed 07/26/2016.

¹² Huestis MA, Henningfield JE, Cone EJ. Blood cannabinoids I. Absorption of THC and formation of 11-OH-THC and THCCOOH during and after smoking marijuana. J Anal Toxicol 1992;16:276 – 82.

days for regular users after smoking.^{13,14} Part of the reason for this is the fact that THC and its metabolites accumulate in adipose tissue and are then released slowly back into the bloodstream. Chronic marijuana-using volunteers confined to a secure facility to ensure abstinence have been found to have THC and THC-COOH levels as high as 2 ng/ml and 14 ng/ml respectively after as many as 7 days of abstinence.¹⁵

Using a single determination of THC levels following an accident to extrapolate back to a smoker's level at the time of the accident is fraught with difficulty, unless the timing of the last dose is known. This is particularly complex when the tested level is below 5 ng/ml.¹⁶ In addition, the large majority of studies have been conducted with drivers who have been smoking marijuana rather than those who are primarily ingesting it. The variation in absorption from the gut along with differences in metabolism for ingested marijuana make extrapolating backwards even more difficult with users who have ingested the drug.¹⁴

Previous Drug Testing Results

Although the NTSB requested and then subpoenaed the truck driver in his role as the motor carrier (an independent owner-operator) to provide evidence of, and results from, previous pre-employment and random drug testing, no such evidence was provided. The truck driver also did not perform the DOT required post accident urine toxicology testing.

E. SUMMARY OF MEDICAL FINDINGS

The 40 year old male Tesla driver's autopsy did not identify any natural disease and toxicology testing performed by two laboratories did not identify any tested-for substances. No medical conditions and no medication use were reported by family members.

The 62 year old male commercial truck driver was obese with a BMI of 37.4 kg/m² but had reported no medical conditions and no medication use on his most recent commercial driver examination long form dated September 28, 2015. Results from blood drawn at the request of the Florida Highway Patrol at about 90 minutes after the accident revealed 3.1 ng/ml of tetrahydrocannabinol (THC, the psychoactive compound in marijuana) and 66.2 ng/ml of tetrahydrocannabinol carboxylic acid (THC-COOH, THC's main, inactive,

¹³ Wall ME, Perez-Reyes M. The metabolism of delta 9-tetrahydrocannabinol and related cannabinoids in man. *J Clin Pharmacol.* 1981;21(8-9 Suppl):178S-189S.

¹⁴ Agurell S, Halldin M, Lindgren JE, Ohlsson A, Widman M, Gillespie H, Hollister L. Pharmacokinetics and metabolism of delta 1-tetrahydrocannabinol and other cannabinoids with emphasis on man. *Pharmacol Rev.* 1986;38(1):21-43.

¹⁵ 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.

¹⁶ Hartman RL, Brown TL, Milavetz G, Spurgin A, Gorelick DA, Gaffney GR, Huestis MA. Effect of Blood Collection Time on Measured Δ9-Tetrahydrocannabinol Concentrations: Implications for Driving Interpretation and Drug Policy. *Clin Chem.* 2016;62(2):367-77.

metabolite). Although mandated, no previous DOT drug test results were provided for the truck driver.