

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



Medical Factual Memorandum for Record

August 16, 2024

A. CASE

NTSB ID: CEN24LA099
Location: Direct, Texas
Date: January 24, 2024

B. MEDICAL SPECIALIST

Specialist Turan Kayagil, MD, FACEP
National Transportation Safety Board
Washington, DC

C. DETAILS

1.0 Description of Review

For purposes of evaluating the pilot for potentially impairing substances and potentially impairing medical conditions, the above Medical Specialist reviewed the following sources of medical information, along with selected relevant regulation, medical literature, and investigator reports.

- Final Federal Aviation Administration (FAA) medical case review
- Autopsy report – pilot
- FAA Forensic Sciences Laboratory toxicology report – pilot

2.0 Summary of Medical Facts

The 23-year-old male pilot's last aviation medical examination was May 29, 2023. At that time, he reported a history of seasonal allergies, treated with the antihistamine medication levocetirizine. The aviation medical examiner commented that the pilot was informed that a 48-hour waiting period was required before flying

after using levocetirizine, and that the pilot would switch to a non-sedating antihistamine. The pilot was issued a first-class medical certificate without limitation.

The Southwestern Institute of Forensic Sciences (SIFS) Office of the Medical Examiner performed the pilot's autopsy. According to the pilot's autopsy report, his cause of death was blunt force injuries, and his manner of death was suicide. The autopsy did not identify significant natural disease.

SIFS postmortem toxicological testing of subclavian blood from the pilot detected ethanol at 0.218 g/dL and tetrahydrocannabinol (THC) at 4.2 ng/mL; the specimen was unsuitable for carboxy-THC testing. SIFS alcohol testing of vitreous fluid detected ethanol at 0.136 g/dL.

Postmortem toxicological testing by the FAA Forensic Sciences Laboratory detected ethanol at 0.253 g/dL in cavity blood, 0.234 g/dL in subclavian blood, 0.130 g/dL in urine, 0.137 g/dL in vitreous fluid, and 0.134 g/hg in brain tissue.¹ N-propanol was detected in cavity blood and urine, but not in subclavian blood, vitreous fluid, or brain tissue. Delta-8-THC was detected at 3.3 ng/mL in subclavian blood and at 4.4 ng/mL in urine. Carboxy-delta-8-THC was detected at 30 ng/mL in subclavian blood and at 214.4 ng/mL in urine. Carboxy-delta-9-THC was detected at 1 ng/mL in urine and was also detected in subclavian blood. 11-hydroxy-THC was detected in urine; 11-hydroxy-THC testing in subclavian blood was inconclusive.

Ethanol is the intoxicating alcohol in beer, wine, and liquor, and, if consumed, can impair judgment, psychomotor performance, cognition, and vigilance.² FAA regulation imposes strict limits on flying after consuming ethanol, including a prohibition on piloting a civil aircraft while having a blood ethanol level of 0.04 g/dL or greater.³ Ethanol may also sometimes be produced by microbes in a person's body after death, potentially elevating ethanol levels in some postmortem specimens but not others (whereas, when consumed and absorbed into circulation, ethanol

¹ In tissue, concentrations in g/hg are approximately equivalent to concentrations in g/dL.

² Cook CCH. Alcohol and aviation. *Addiction*. 1997;92(5):539-555.

³ [14 Code of Federal Regulations § 91.17](#).

distributes relatively uniformly throughout the body). Vitreous fluid is generally the specimen type best protected against postmortem microbial ethanol production.⁴⁻⁷

N-propanol is another alcohol that can be produced by microbes in a person's body after death. Detection of n-propanol in a postmortem specimen is potentially indicative of postmortem microbial activity in the specimen, but does not necessarily mean that microbial activity produced ethanol.^{4,6}

Delta-8-THC is a psychoactive chemical similar to the primary psychoactive chemical in cannabis, delta-9-THC (which was not detected in this case), with similar potential impairing cognitive and psychomotor effects. Delta-8-THC is widely available from retailers in a variety of products for oral consumption, smoking, and inhalation. Very little delta-8-THC is present in the cannabis plant, so delta-8-THC used in consumer products is typically chemically manufactured from cannabidiol (CBD), another chemical in the cannabis plant.^{8,9,10} Delta-8 THC products are marketed with a variety of claims, but have not been evaluated or approved by the United States Food and Drug Administration for safe use in any context, and may contain contaminants (including delta-9-THC).^{11,12} Carboxy-delta-8-THC is a non-

⁴ Spitz WU. Forensic aspects of alcohol. In: Spitz WU, Spitz DJ, eds. *Spitz and Fisher's Medicolegal Investigation of Death: Guidelines for the Application of Pathology to Crime Investigation*. 4th ed. Springfield, IL: Charles C Thomas; 2006:1218-1229.

⁵ Kugelberg FC, Jones AW. Interpreting results of ethanol analysis in postmortem specimens: a review of the literature. *Forensic Sci Int*. 2007;165(1):10-29. doi:10.1016/j.forsciint.2006.05.004.

⁶ Boumba VA, Exadactylou P, Velivasi G, Ziavrou KS, Fragkouli K, Kovatsi L. The frequency of ethanol, higher alcohols and other low molecular weight volatiles in postmortem blood samples from unnatural deaths. *Forensic Sci Int*. 2022;341:111503. doi:10.1016/j.forsciint.2022.111503.

⁷ Oshaug K, Kronstrand R, Kugelberg FC, Kristoffersen L, Mørland J, Høiseth G. Frequency of postmortem ethanol formation in blood, urine and vitreous humor - improving diagnostic accuracy with the use of ethylsulphate and putrefactive alcohols. *Forensic Sci Int*. 2022;331:111152. doi:10.1016/j.forsciint.2021.111152

⁸ Wurz GT, Montoya E, DeGregorio MW. Examining impairment and kinetic patterns associated with recent use of hemp-derived Δ8-tetrahydrocannabinol: case studies. *J Cannabis Res*. 2022;4(1):36. doi:10.1186/s42238-022-00146-9.

⁹ Tagen M, Klumpers LE. Review of delta-8-tetrahydrocannabinol (Δ8 -THC): Comparative pharmacology with Δ9 -THC. *Br J Pharmacol*. 2022;179(15):3915-3933. doi:10.1111/bph.15865. Erratum in: *Br J Pharmacol*. 2023;180(1):130.

¹⁰ United States Centers for Disease Control and Prevention (CDC). Increases in availability of cannabis products containing Delta-8 THC and reported cases of adverse events. CDC Health alert Network. <https://stacks.cdc.gov/view/cdc/109759>. Updated September 14, 2021. Accessed February 8, 2024.

¹¹ United States Food and Drug Administration (FDA). 5 things to know about delta-8 tetrahydrocannabinol - delta-8 THC. FDA Consumer Updates. <https://www.fda.gov/consumers/consumer-updates/5-things-know-about-delta-8-tetrahydrocannabinol-delta-8-thc>. Updated May 4, 2022. Accessed February 8, 2024.

¹² LoParco CR, Rossheim ME, Walters ST, Zhou Z, Olsson S, Sussman SY. Delta-8 tetrahydrocannabinol: a scoping review and commentary. *Addiction*. 2023;118(6):1011-1028. doi:10.1111/add.16142.

psychoactive metabolite of delta-8-THC. Carboxy delta-9-THC is a non-psychoactive metabolite of delta-9-THC. 11-hydroxy-THC may include 11-hydroxy-delta-8-THC (a psychoactive metabolite of delta-8-THC) and/or 11-hydroxy-delta-9-THC (a psychoactive metabolite of delta-9-THC).

Submitted by:

Turan Kayagil, MD, FACEP
Medical Officer