NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Washington, DC

Medical Factual Report

February 11, 2022

Mary Pat McKay, MD, MPH
Chief Medical Officer

A. ACCIDENT: WPR21FA143; Palmer, AK

Date and time: March 28, 2021
Injuries: 5 fatal, 1 serious

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 pilot and ski guides for medical conditions, the use of medications/illicit drugs, and the presence of toxins.

2. Methods

   The autopsy reports, toxicology findings, and, for the pilot, the FAA medical case review were evaluated. Relevant regulation and medical literature were reviewed as appropriate.

Pilot

FAA Medical Case Review

According to the FAA medical case review, the 33 year old male pilot had reported 3,250 hours of flight experiences as of his last aviation medical exam, dated February 10, 2021. At that time, he was 70 inches tall and weighed 225 pounds. He had reported no medical conditions and no use of medications to the FAA. No significant abnormalities were identified and he was issued a first class medical certificate without limitations.

Autopsy

According to the autopsy report issued by the State of Alaska Medical

Examiner's Office, the cause of death was multiple blunt force injuries and the manner of death was accident. No significant natural disease was identified.

Toxicology

Toxicology tests performed by NMS Labs as requested by the medical examiner on femoral blood obtained during the autopsy were negative for all tested-for-substances.[1]

Toxicology testing performed by the FAA's Forensic Sciences Laboratory on femoral blood did not identify any tested-for substances.[2]

Lead Ski Guide

Autopsy

According to the inspection report (external examination only) issued by the State of Alaska Medical Examiner's Office, the cause of death for the 52 year old male lead ski guide was blunt force injury and the manner of death was accident.

Toxicology Testing

Toxicology tests performed by NMS Labs as requested by the medical examiner on subclavian blood obtained during the autopsy identified amphetamine at 96 ng/ml, cocaine at 52 ng/ml and cocaine's inactive metabolite benzoylecgonine at 1000 ng/ml.

Description of Substances

Amphetamine is a Schedule II controlled substance that stimulates the central nervous system and is available by prescription for the treatment of attention deficit disorder and narcolepsy. It carries a boxed warning about its potential for abuse and has warnings about an increased risk of sudden death and the potential for mental health and behavioral changes.[3] In some preparations, a prescription drug is metabolized to amphetamine; commonly marketed names include Adderall, Dexedrine, and Vyvanse. After a single 30 mg oral dose, early blood levels averaged 111 ng/ml and average blood levels in adults using the long acting prescription orally for

[1] NMS Labs tested for carbon monoxide, ethanol and acetone, amphetamines, barbiturates, benzodiazepines, buprenorphine, cannabinoids, cocaine, fentanyls, methadone, Methamphetamine/MDMA, opiates, oxycodone, oxymorphone, and PCP.

[2] The FAA Forensic Sciences Laboratory has the capability to test for more than 1300 substances including toxins, common prescription and over-the-counter medications as well as illicit drugs. See: http://jag.cami.jccbi.gov/toxicology/default.asp?offset=0

[3] National Institutes of Health. US National Library of Medicine. Amphetamine salts. https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=72ddd1c9-ddbd-4c95-acd9-003189a353a3 Accessed 7/20/2021.

a week were about 65 ng/ml.[4] In general, levels between 20 and 100 ng/ml are expected to cause medicinal effects.[5]

However, amphetamine is also prepared and used as a street drug, often by snorting, inhaling, or injecting. Generally, levels above 200 ng/ml are the result of mis-using amphetamine to maximize its psychoactive effects.[6] Of course, those who mis-use amphetamine will have lower levels as the drug wears off.

Cocaine is a strong central nervous system stimulant. Initial effects include: euphoria, excitation, general arousal, dizziness, increased focus and alertness. At higher doses, effects may include psychosis, confusion, delusions, hallucinations, fear, antisocial behavior, and aggressiveness. Late effects, beginning within 1 to 2 hours after use, include: dysphoria, depression, agitation, nervousness, drug craving, general central nervous system depression, fatigue, and insomnia. Additional performance effects are expected after higher doses, with chronic ingestion, and during drug withdrawal including agitation, anxiety, distress, inability to focus on divided attention tasks, inability to follow directions, confusion, hostility, time distortion, and poor balance and coordination.[7]

Cocaine levels in blood is that are thought to elicit a "high" in novice users are between 120 and 270 ng/ml. However, regular users may achieve much higher levels due to the development of tolerance. Cocaine is rapidly metabolized by the body to an inactive compounds including benzoylecgonine and ecgonine methyl ester. The half-life of cocaine ranges from 40 and 90 minutes. Cocaine can continue to converted to benzoylecgonine after death - the amount of postmortem conversion is dependent on time, temperature, and sample storage conditions. While there are no accepted strategies for back calculation to determine an antemortem level from a postmortem sample, the antemortem level of

[4] Amphetamine. In: Disposition of Toxic Drugs and Chemicals in Man. Ed: Randall C. Baselt. 9th edition. (2011) Biomedical Publications, Seal Beach, CA.
[5] Federal Aviation Administration. Forensic Toxicology Drug Information. Amphetamine. https://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=11 Accessed 7/20/2021.
[6] National Highway Traffic Safety Administration. Drugs and Human Performance Fact Sheets. Methamphetamine/Amphetamine. https://www.nhtsa.gov/document/drugs-and-human-performance-fact-sheets Accessed 7/29/2021.
[7] National Highway Traffic Safety Administration Drugs and Human Performance FACT SHEETS: Cocaine https://www.nhtsa.gov/document/drugs-and-human-performance-fact-sheets Accessed 7/29/2021.

cocaine in this case is most likely higher (possibly significantly higher) than the measured postmortem level.[8,9,10]

According to information from the portable global positioning (GPS) device retrieved from the helicopter (see the GPS Device Specialist's Factual Report), the helicopter left the lodge at 15:51 local time. The accident occurred at 18:35 local time. (Total interval, 2 hours, 44 minutes.) Using the measured postmortem level (cocaine 52 ng/ml), the lead ski instructor's blood of cocaine at the beginning of the trip would likely have been at least 184 ng/ml (1.8 half-lives with a 90 min half-life) and may have been as high as 892 ng/ml (4 half-lives with a 40 min half-life).[11] Alternately, the lead ski guide may have used cocaine during the trip.

Second Ski Guide

Autopsy

According to the inspection report (external examination only) issued by the State of Alaska Medical Examiner's Office, the cause of death for the 38 year old male second ski guide was multiple blunt force injuries and the manner of death was accident.

Toxicology Testing

Toxicology tests performed by NMS Labs as requested by the medical examiner on subclavian blood obtained during the autopsy identified delta-9-tetrahydrocannabinol (THC), the primary psychoactive component in marijuana at 1.1 ng/ml.

Substance Description

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

[8] Isenschmid, DS; Levine, BS; Caplan, YH. The Role of Ecgonine Methyl Ester in the Interpretation of Cocaine Levels in Post Mortem Blood. Journal of Analytical Toxicology. 1992; 16:319-324.
[9] Isenschmid, DS; Levine, BS; Caplan, YH. A Comprehensive Study of the Stability of Cocaine and Its Metabolites. Journal of Analytical Toxicology. 1989; 13: 250-256.
[10] Logan, BK; Smirnow, D; Gullber, RG. Lack of predictable site-dependent differences and time-dependent changes in postmortem concentrations of cocaine, benzoylecgonine, and cocaethylene in humans. Journal of Analytical Toxicology. 1997;21(1):23-31.
[11] Calculated using an online half life calculator. Calculator.net. Half-Life Calculator https://www.calculator.net/half-life-calculator.html Accessed 10/13/2021.

hours following marijuana use, and residual effects have been reported up to 24 hours.[12]

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, and user characteristics. THC is fat soluble, so is stored in fatty tissues and can be released back into the blood long after consumption. So, while the psychoactive effects may last a few hours, THC may be detected at low levels in the blood for days or weeks after use.[13]

D. SUMMARY OF MEDICAL FINDINGS

Pilot

The 33 year old male pilot had reported 3250 hours of flight experiences as of his last aviation medical exam, dated February 10, 2021. He had reported no medical conditions and no use of medications to the FAA. No significant abnormalities were identified and he was issued a first class medical certificate without limitations.

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[12] National Highway Traffic Safety Administration. April 2014. Drugs and Human Performance Fact Sheets. Cannabis/Marijuana. https://www.nhtsa.gov/document/drugs-and-human-performance-fact-sheets Accessed 7/20/2021.

[13] Odell, MS; Frei, MY; Gerstamoulos, D; Chu, M; Lubman, D. Residual cannabis levels in blood, urine and oral fluid following heavy cannabis use. Forensic Sci Int. 2015;249:173-80.

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