

National Transportation Safety Board

Office of Research and Engineering

Washington, DC 20594



ERA23FA070

MEDICAL

Specialist's Factual Report

March 16, 2023

A. ACCIDENT

Location: Charlotte, North Carolina
Date: 11/22/2022
Time: 11:57 Local
Airplane: Robinson Helicopter R44; N7094J

B. MEDICAL SPECIALIST

Specialist Michelle Watters, MD, PhD, MPH
National Transportation Safety Board, RE-1
Washington, DC

C. DETAILS OF THE INVESTIGATION

Purpose

This investigation was performed to evaluate the pilot for medical conditions, the use of medications/illicit drugs, and the presence of toxins.

Methods

The Federal Aviation Administration (FAA) medical case review and the pilot's autopsy report, FAA Forensic Sciences Laboratory toxicology report,¹ and personal medical records were reviewed. Other relevant medical and regulatory issues were reviewed.

D. FACTUAL INFORMATION—PILOT

1.0 FAA Medical Case Review

According to the FAA medical case review, at the time of the accident, the 57-year-old male pilot held a second class medical certificate without limitation. At his most recent FAA medical certification exam on 6/30/22, the pilot was 61 inches tall and weighed 136 pounds and reported having 3,616 total flight hours. He reported taking no medications and having a history of hay fever.

2.0 Autopsy

According to the autopsy report from the Mecklenburg County Medical Examiner's Office, Charlotte, North Carolina, the pilot's cause of death was blunt

¹ The FAA Forensic Sciences Laboratory has the capability to test for more than 1,000 substances including toxins, common prescription and over-the-counter medications, and illicit drugs.
<https://jag.cami.jccbi.gov/toxicology/>

force injuries due to helicopter crash. The pathologist reported that the pilot had 75% stenosis of his left anterior descending coronary artery and 50% stenosis of his left circumflex and right coronary arteries.

3.0 Toxicology

Toxicology testing by the FAA Forensic Sciences Laboratory detected tramadol in the pilot's urine at 19,593 nanograms per milliliter (ng/mL) and in his liver tissue. Tramadol's metabolites, o-desmethyltramadol and n-desmethyltramadol, were detected in his urine at 5,199 ng/mL and 3,737 ng/mL, respectively; both metabolites were also detected in his liver tissue. Quinine was also detected in the pilot's urine and liver tissue. No blood specimens were available for analysis. The specimen box sent to FAA from the medical examiner also included a pill container from the pilot's personal effects that contained three medications visually identified as ibuprofen, acetaminophen, and prednisone.

Tramadol, commonly marketed as Ultram, is a centrally acting synthetic opioid pain reliever prescribed to relieve moderate to severe pain. As an opioid, it carries the risk of addiction, abuse, and misuse. It is metabolized into two major metabolites: the pharmacologically active *o-desmethyltramadol* and the inactive *n-desmethyltramadol*. The therapeutic range of tramadol is 50 to 500 ng/mL and it has a half-life of 4.3 to 6.7 hours. Side effects can include dizziness and sleepiness. Tramadol carries the warning that it may impair mental and physical ability to perform potentially hazardous tasks like driving or operating heavy machinery.^{2,3} Tramadol undergoes postmortem redistribution and there is a high degree of inter-individual variation in its distribution in the body.⁴

Quinine is a medication indicated for the treatment of malaria. It is also used off-label to treat leg cramps and muscle pain and is an additive in tonic water. The therapeutic range for quinine for malaria treatment is 1,700 to 9,700 ng/mL. Quinine has a half-life of 4 to 15 hours. Except for those allergic or intolerant to quinine, a review of studies of patients using quinine for leg cramps found no significant difference in severe adverse effects but a difference in minor adverse effects, including gastrointestinal distress and ringing in the ears. At therapeutic doses, side

² FAA. Updated 1/16/19. Forensic Toxicology's WebDrugs.

Tramadol. <http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=199>.

O-desmethyltramadol. <http://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=374>.

³ National Institutes of Health (NIH). U.S. National Library of Medicine (NLM). [DailyMed - TRAMADOL HYDROCHLORIDE tablet \(nih.gov\)](http://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?id=20222). Updated 12/4/22.

⁴ Lewis, RJ, RM Ritter, RD Johnson, and RW Crump. December 2010. Postmortem concentrations of tramadol and O-desmethyltramadol in 11 aviation accident fatalities. Final Report. DOT/FAA/AM-10/19. FAA Office of Aerospace Medicine. Washington, D.C.

effects can also include headaches and vision problems. For FAA medical certification, the FAA does not allow the use of quinine.^{5,6,7}

4.0 Personal Medical Records

The pilot's personal medical records were obtained from his rheumatologist. The most recent progress note included was from 9/14/17. The pilot had the diagnoses of psoriatic arthritis and polyarthralgia. He was prescribed the injectable biologic etanercept and the immunosuppressant methotrexate; he was prescribed tramadol to use as needed for moderate to severe pain and prednisone for flare-ups. The record contained numerous authorizations to pharmacies for other injectable biologics. The most recent was dated 7/27/22 for ustekinumab (marketed as Stelara).⁸

E. SUMMARY OF MEDICAL FACTS

The 57-year-old male pilot held a second class medical certificate without limitation. At his most recent FAA medical certification exam on 6/30/22, he reported taking no medications and having a history of hay fever. According to the autopsy, the pilot's cause of death was blunt force injuries due to helicopter crash. The pathologist reported that the pilot had 75% stenosis of his left anterior descending coronary artery and 50% stenosis of his left circumflex and right coronary arteries.

Toxicology testing detected tramadol in the pilot's urine at 19,593 ng/mL and in his liver tissue. Tramadol's active metabolite, o-desmethyltramadol, and its inactive metabolite, n-desmethyltramadol, were detected in his urine and liver tissue. Quinine was also detected in the pilot's urine and liver tissue. Personal medical records show that the pilot was prescribed methotrexate, an injectable biologic, prednisone, and tramadol as part of his treatment plan for psoriatic arthritis and polyarthralgia.

Submitted by:

Michelle Watters, MD, PhD, MPH
Medical Officer, RE-1

⁵ FAA. Updated 1/16/19. Forensic Toxicology's WebDrugs. Quinine.
<https://jag.cami.jccbi.gov/toxicology/DrugDetail.asp?did=119>

⁶ Saguil, A, R Lauters. 2016. Quinine for leg cramps. *American Family Physician* 93(3):177-178.

⁷ NIH. NLM. [DailyMed - QUININE SULFATE- quinine capsule \(nih.gov\)](#). Updated 12/16/21.

⁸ NIH. NLM. [DailyMed - STELARA- ustekinumab injection, solution STELARA- ustekinumab solution \(nih.gov\)](#). Updated 9/30/22.