

### Acute Marijuana Intoxication Contributes to Fatal Motorcycle Accident

*This case study illustrates how circumstantial evidence can be misinterpreted and how drug-impaired judgment and behavior can be regarded as evidential in a toxicological causation assessment.*

#### Accident Summary

A motorcyclist was fatally injured when he collided with a city bus in a business district. The weather was clear and fair, the posted speed limit was 30 mph and traffic was reported to be light at the time of the collision. The bus (which was empty and traveling at approximately 25 mph) was making a left turn into a bus garage terminal when the collision occurred. The driver died on impact.

Witnesses stated that the motorcyclist attempted to decelerate as the bus turned, but the back tire of the motorcycle rose into the air, causing the bike to flip over and collide with the bus. A multi-camera DOT video recording from the bus revealed no apparent events or unusual distractions. Witnesses reported that the motorcycle was traveling at a high rate of speed (later confirmed through accident reconstruction analyses to have been approaching 100 mph).

The motorcyclist's family alleged negligence on the part of the bus driver and filed a lawsuit, demanding not less than \$3.8 million dollars. Defense attorneys representing the bus company retained Dr. Sawyer to conduct an independent toxicological assessment.

#### Assessment Strategy

Dr. Sawyer compiled and reviewed the case records including accident scene photos, multiple video recordings from the bus cameras, police reports and diagrams, witness statements, climate data, the medical examiner's autopsy report, the forensic toxicology report and the motorcyclist's personal medical records. Upon closer scrutiny, several significant factors relevant to the case came to light:

- Two weeks prior to the accident, the young motorcyclist had been examined by a doctor after complaining of dizziness. At that time, he revealed that he had smoked marijuana earlier in the day. Although there was a history of occasional alcohol consumption noted in his medical report, marijuana consumption appeared to be a more regular activity.
- Several witnesses reported seeing the motorcycle traveling at high speed just prior to the accident. Although this could not be immediately corroborated, closer examination of the video revealed that the motorcycle was approximately 300 feet away when the bus began to turn. Had the motorcycle been traveling at 30 mph, it would have taken 7 seconds to cover that distance; instead, it took less than 3 seconds to reach the turning bus.
- The soundtrack from the video recording revealed that the motorcyclist had downshifted 2 seconds prior to impact rather than initially applying brakes to avoid the collision. This decision was remarkable given the high rate of speed at which the motorcycle was traveling.
- The autopsy revealed no alcohol in the motorcyclist's blood. However, active cannabinoid and its metabolites (the constituents of marijuana) were detected in the postmortem blood analysis.



A motorcyclist was fatally injured when he collided with a city bus in a business district. (a,b)

Based on these findings, Dr. Sawyer elected to conduct a pharmacokinetic assessment to determine when the marijuana was smoked and if the reported cannabinoid blood levels were consistent with impairment sufficient to degrade the motorcyclist's reaction time and judgment at the time of the accident. In toxicology, the metabolite ratios of THC (delta-9-tetrahydrocannabinol, the psychoactive ingredient in marijuana) can be measured for this purpose. Dr. Sawyer relied on controlled studies which documented the ratio of active THC to the carboxy-THC metabolite to determine the time elapsed since dosing. This, in turn, would establish when it was administered and whether the blood level was sufficient to contribute to the accident.

### Pharmacokinetic Methodology

The two primary metabolites at issue are the 11-hydroxy (active) and delta-9-carboxy (inactive) THC metabolites. Initially after smoking, active THC blood levels rapidly rise with peak levels occurring at approximately five minutes and then decreasing. Simultaneously, the delta-9-carboxy THC metabolite slowly increases (accumulates) as THC is transformed into the inactive metabolite. After 10 to 15 minutes, levels of these two metabolites are approximately equal.

The *total* and *relative* amounts of these components were significant in this case. Since the motorcyclist's postmortem blood analysis revealed slightly more active THC vs. carboxy-THC levels (2.8 and 2.7 ng/ml, respectively), Dr. Sawyer was able to offer a supported opinion that the motorcyclist smoked marijuana approximately 10 to 15 minutes before his death.

Additionally, Dr. Sawyer cited a recent peer-reviewed study by Ramaekers, *et. al.*<sup>1,2</sup> which demonstrated that the blood levels of delta-9-THC and delta-9-carboxy-THC (marijuana metabolite) are generally equal at approximately 10 to 15 minutes after smoking. He further cited studies documenting adverse motor control and cognitive effects, using up to 20 subjects in a controlled setting. Primary findings included:

- Peak impairment occurred within the first hour after smoking.
- Impairment was significant at THC levels between 2 and 5 ng/ml. For reference, this level is similar to a blood alcohol concentration (BAC) of 0.08%.
- Cognitive function deficits (based on the "Tower of London" test) and impaired reaction time.
- Impairment was relevant to the safe operation of the motor vehicle.



The total and relative amounts of marijuana metabolites were significant in this case.<sup>(c)</sup>

### Courtroom Showdown

Dr. Sawyer assembled a detailed report and presented his testimony to the court. His findings offered objective reasoning (supported by peer-reviewed studies and substantial toxicological literature) that the motorcyclist displayed impaired judgment with respect to operating his motorcycle at high speed down a city street. The reaction of downshifting rather than braking just prior to the crash strongly suggested an impaired response. Dr. Sawyer further noted that event reconstruction experts estimated a speed in excess of 100 mph before impact. All of these factors were consistent with THC impairment based on the blood analysis. As a consequence, the motorcyclist presented an unreasonable scenario that the bus driver could not have avoided.

Plaintiffs' counsel vehemently denied Dr. Sawyer's findings and filed strongly worded pre-trial Frye motions to exclude his testimony, accusing Dr. Sawyer of presenting testimony which "...lacks foundation, is speculative, is based on hearsay and invades the province of the jury."

Dr. Sawyer addressed these attacks point for point in his rebuttal. In particular, he noted that plaintiffs' assertion that the level of THC was insufficient to induce impairment was incorrect. Dr. Sawyer cited numerous sources from NTSB (National Transportation Safety Board)<sup>3,4</sup> and others demonstrating that the THC dose was more than sufficient to impair judgment, reaction time and corrective actions.

Plaintiffs also asserted that a third THC metabolite (11-hydroxy delta-9 THC) should have been present at one-fifth the level of delta-9 carboxy THC but was not detected in the blood analysis. Dr. Sawyer pointed out that the amount in the motorcyclist's blood was below the laboratory level of detection (LOD). Thus, it did not mean that the chemical was absent but that it was below the minimum level that the laboratory instrument could detect. Dr. Sawyer further noted that if the motorcyclist had smoked the cited quantity of marijuana 10 to 15 minutes before the accident as outlined, the THC blood levels would have been precisely as measured in the autopsy report.

### Outcome

Expert testimony based on scientific principles or procedures is admissible in court but only after a principle or procedure has gained general acceptance in its specified field. All of the sources cited by Dr. Sawyer in his toxicological assessment were from generally-recognized, peer-reviewed and governmental sources accepted by the relevant toxicological community.

Dr. Sawyer's assessment left very little "wiggle room." The judge dismissed plaintiffs' Motion to Exclude without even a written summation. It took the jury a mere 30 minutes to render a defense verdict of "Not Liable."

## Summary

At the present time, some states have legalized marijuana and others are leaning in that direction. As this process unfolds, it will become increasingly important for both scientific and legal professionals to offer causative determinations that are both scientifically credible and socially responsible. However, distinguishing between fact and opinion is not as easy as it may appear. To that end, it is helpful to remember that the "weighing instrument" for "weighing evidence" is always *human cognition*.

In this case, objective blood levels and metabolite ratios provided the court with its most compelling scientific evidence. Dr. Sawyer's attorney client kindly characterized his courtroom testimony as "...truly impressive and the highlight of the case."

*(Disclaimer: Toxicology case studies are impartial and objective summaries of toxicological matters in which TCAS was retained for the purpose of assessing health-based factors which, in some cases, led to a determination of causation. No names or identifying information have been provided due to privacy and legal considerations. In the above matter, Dr. Sawyer was retained by defendant.)*



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### Notes and References

1. Ramaekers, et. al., "[Dose related risk of motor vehicle crashes after cannabis use](#)," 2004 Feb 7;73(2):109-19
2. Ramaekers, et. al., "[Cognition and motor control as a function of delta-9-THC concentration in serum and oral fluid](#)," 2006 Nov 8;85(2):114-22
3. National Highway Traffic Safety Administration, "[Marijuana & Alcohol Combined Increase Impairment](#)," Number 201, June 1999
4. Christopher Hart, National Transportation Safety Board, "[Planes, Trains and Automobiles: Operating While Stoned](#)," Washington, DC July 31, 2014

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## Images

- a. Photo by Krzysztof Szkurlatowski
  - b. Photo by Cathy Kaplan, Pittsburgh, PA
  - c. Photo by Matthew Maaskant, Toronto, ON
  - d. Photo by Jason Morrison
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### A Message from Dr. William R. Sawyer Chief Toxicologist, TCAS, LLC



*"Comparing objective blood levels to generally-accepted, peer-reviewed studies can provide a jury with compelling information upon which to arrive at a verdict, especially when the case facts are consistent with the blood evidence."*

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