

Special Report

The Limits of Tolerance: Convicted Alcohol-Impaired Drivers Share Experiences Driving Under the Influence

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Abstract

Most people are aware that regular alcohol drinkers can become tolerant to the effects of alcohol. Tolerance can lessen the outward manifestations of intoxication, and this poses challenges for the drinker and other observers, including law enforcement officers. On the basis of a National Institutes of Health-funded longitudinal study examining a cohort of convicted alcohol-impaired drivers, this article presents commentary regarding this phenomenon in offenders convicted of driving under the influence and the implications for traffic safety.

B's Story

The arrest for driving under the influence (DUI) came as a surprise to B. Still, he took it pretty well. On one hand, he had known that he was breaking the law; on the other, he had concluded long ago that the law did not apply to him. B, age 47 years, is divorced, employed, and, unless sick, drinks a fifth of rum most days. Drinking is important to B. It calms his nerves and lifts his mood. Besides, he is often bored. Drinking, combined with his fa-

vorite hobby, biking—he owns a Harley—keeps him amused on his days off. During his weekend forays, B stops at bars or parks along the way to drink beer. B says his risky behavior has lessened since his younger days. Now he doesn't drink “hard stuff” on days he rides his motorcycle.

Blood Alcohol Content

Apparently, B assumes beer is more benign than rum. In my experience, this is a common misconception among convicted drunk drivers. A number of offenders have told me flat out that they can't be alcoholics because they only drink beer. Beer does contain less alcohol per ounce than hard liquor, and perhaps people mistakenly equate liquor's quick high with addiction predilection. Beer is by far the preferred drink among convicted DUI offenders, but a standard drink of a 12-oz can of beer, a 1 ½ oz “shot” of 80-proof distilled spirits, or a 5-oz glass of wine all contain the same amount of pure alcohol, 13.7 gr (0.6 oz). The total amount of alcohol consumed, plus other moderating factors, not the type of alcoholic drink, determines the blood alcohol concentration (BAC).

The National Institute on Alcohol Abuse and Alcoholism estimates that consuming five or more drinks in about two hours (four or more drinks for adult females) brings the BAC to 0.08% or above, the legal limit for driving in all 50 states.¹ The estimated BACs for children are different. With five drinks within two hours (the level used to define binge drinking among college students), children, ages 9 to 13 years, may have BACs two to three times the adult legal limit for intoxication.²

Several factors moderate the absorption, distribution, and metabolism of beverage alcohol. The presence of food in the stomach slows absorption. Drinking slowly and drinking more diluted alcohol allows the body to metabolize it while at the same time absorbing an incoming dose. Most people eliminate about one drink each hour from their system. An enzyme produced in the stomach, glutathione-dependent formaldehyde dehydrogenase, breaks down alcohol, decreasing its bioavailability. Alcohol is distributed in tissues according to water content. A person's weight and sex determine the total volume of body water and, therefore, the BAC after drinking a certain

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amount of alcohol. In general, the more a person weighs, the larger the volume of body water and the lower the BAC. Alcohol pharmacokinetics differ by gender.^{3,4} Women have lower glutathione-dependent formaldehyde dehydrogenase activity, leading to increased alcohol absorption. They also generally have a higher fat content and less total body water, where ethanol is distributed. This contributes to higher BACs, an enhanced rate of alcohol oxidation in the liver, a slower rate of gastric emptying of alcohol, and higher vulnerability to the toxic effects of alcohol.⁵ But another phenomenon, “tolerance,” affects not only the BAC, but also the body’s capacity to cope with high levels of this toxic chemical.

Tolerance

It is well known that regular drinkers, like B, develop tolerance, broadly defined as the ability to resist the action of a drug.⁶ Most people, including B, are familiar with the term, “tolerance.” “I have real high tolerance,” he bragged during his interview. “I can drive fine after a few drinks; actually pretty good even after drinking a lot.”

In effect, drink for drink, B feels less drunk and may have less alcohol-induced impairment in speech, gait, and fine and gross coordination than his light-drinking counterparts. The biologic mechanisms of tolerance are complex. Different forms of tolerance have different mechanisms of action. Far from being a simple homeostatic response to the presence of alcohol in the brain, tolerance can develop within various time frames.⁷ Acute tolerance, also called “tachyphylaxis,” happens within a single drinking episode. In acute tolerance, signs of intoxication at the same BAC are more pronounced on the ascend-

ing than the descending portion of the BAC curve.⁸ Most experienced drinkers develop some form of acquired or chronic tolerance. Chronic tolerance is a bodily adaptation that makes a person need to drink more and more alcohol to get the same effect, or inversely, an adaptation that causes less and less response to a recurring dose.

The degree of tolerance, however, varies both within and among individuals. How and why different people develop different manifestations of tolerance are perplexing.⁶ Metabolic tolerance refers to changes in the absorption, distribution, metabolism, and excretion of alcohol.⁹ These changes lead to a more rapid clearance of alcohol from the body. Tolerance also occurs at a cellular level in the brain itself (called functional tolerance), which reduces signs of intoxication, even at high BACs. Because of tolerance, habitual users may show minimal effects of a dose that would cause an intense reaction in a naïve drinker. Whereas social drinkers may show clear signs of intoxication at a BAC of 0.10%, such as nausea, slurred speech, and lack of coordination, heavy drinkers at that BAC may not show these signs.¹⁰ Added to this, some drinkers are simply less sensitive, by nature, to alcohol’s effects.¹¹ This is characteristic of people with alcohol dependence. Learned expectancies and Pavlovian conditioning also influence tolerance to alcohol’s effects.¹⁰

Still, tolerance has its own limitations, for as the drinking career progresses, over days, years and decades, so does liver damage from alcohol’s toxic effects. Factors that may affect the development of liver injury include the dose, duration, and type of alcohol consumed, drinking patterns, gender, ethnicity, and other risk factors, such as

obesity, iron overload, infection, and genetic factors.¹² The drinker typically is unaware of this process, but when liver function declines below a certain threshold, tolerance declines. If the drinking continues, the drinker begins to realize that they can no longer continue to “hold their liquor.”

There is a correlation between BAC and the drug’s behavioral and emotional effects, but there is also considerable variability. For example, tolerance enables some very heavy drinkers to survive BAC levels considered lethal (in the range of 0.40% to 0.50%).^{10,13} Memorable patients with BACs this high have been reported as conscious and able to carry on conversations.¹⁰ One report from Sweden describes a woman arrested for drunken driving with a BAC of 0.55%.¹⁴

T’s Story

It is commonly believed that people who are alcohol dependent are tolerant to all the effects of alcohol, and that tolerance protects a person from impairment caused by alcohol intoxication.¹⁰ T, another person interviewed for my study on the drinking and driving experiences of DUI offenders, fits this description.

“Usually I was the designated driver because my friends say I can drive better than anybody when I’m intoxicated. Other people, five beers and they’re slurring their words or something, but five beers is nothing to me. Even when I first started drinking, I could drink a 12-pack before I felt much effect from the alcohol.”

Driving Under the Influence

Both B and T fail to grasp the limitations of their alcohol tolerance. Alcohol’s detrimental effects

... I was the designated driver because my friends say I can drive better than anybody when I’m intoxicated.

on vision, vigilance, hand-eye coordination, anticipatory judgments, balance, gait, mental alertness, problem-solving ability, estimates of distance, and quick reaction to unexpected hazards are well documented.^{6,15} Driving combines a complex range of physical and mental activities, and all are adversely affected by alcohol.

Epidemiologic studies show that virtually all drivers with BACs above 0.08% to 0.10% are significantly more likely than sober drivers to cause a fatal motor vehicle crash. In landmark studies, Paul Zador calculated relative risks of fatal crash involvement at various BACs.^{16,17} The analyses used data on driver fatalities in single-vehicle crashes from the national Fatality Analysis Reporting System,¹⁸ in conjunction with driver exposure data from the national Roadside Breathtesting Survey.¹⁹ Zador estimates that each increase of 0.02% in the BAC of a driver with non-zero BAC nearly doubles the risk of a fatal crash. Crash risk rises with increasing BAC among all of the age and sex groups studied. At BACs in the 0.05% to 0.09% range, the likelihood of a crash is at least nine times greater than at zero BAC for all age groups. At very high BACs (at or above 0.15%), the risk of crashing is 300 to 600 times the risk at zero or near-zero BACs. Younger drivers with BACs in the 0.05% to 0.09% range have higher relative risks than older drivers because of immaturity, lack of tolerance to alcohol's effects, driver inexperience, and risk-taking propensity.²⁰

O's Story

Tolerance may have duped O into believing he was fine to drive. O, age 26 years, is described as a

nice guy, well thought of by friends and relatives. On a warm Sunday afternoon, O enjoyed a backyard barbecue with friends and their families in Santa Fe, NM. He left the party around 11:30 pm. About midnight he was seen driving his Jeep west in the eastbound lane of Old Las Vegas Highway and collided with a vehicle driven by A. She and four other high school girls were part of a caravan heading to a friend's house. According to a witness, A tried to avoid hitting the Jeep by swerving to the left, and crossing the center lane.²¹ When O tried to get back into the correct lane, he allegedly rammed A's car broadside. The entire passenger side of the victim's car was crushed, killing all of A's passengers. Blood tests later revealed O's BAC was 0.16%, twice the legal limit for intoxicated driving. The mug shot taken after the incident showed O grinning. He may not have felt very drunk, but his inappropriate smile revealed alcohol's betrayal.

O's friends from the gathering were dumbfounded. "He was fine," his friend said, "He hugged my children, myself, and he was fine." Another friend told police that O wasn't drunk and that was 30 minutes before the accident.²² The oft-quoted admonition, "friends don't let friends drive drunk," begs the question, how can friends tell if their friends are drunk? Tolerance cons many an observer.

Law Enforcement Challenge

Effective initiatives to reduce alcohol-related traffic injury and death are most likely to have a positive effect if they are comprehensive and community-focused. Such programs include: community collaboration, coordination, planning, and evaluation; court systems

with judges and prosecutors who are trained in adjudicating DUI cases; community-based health care interventions for alcohol-use disorders within medical facilities and community settings; community outreach and education regarding impaired driving; and, above all, active and highly visible law enforcement.

Tolerance poses a significant challenge for law enforcement. Signs of intoxication are easy to overlook, even when you are looking. A recent review²³ of three experimental studies on the ability to detect visible intoxication concludes that social drinkers, bartenders, and most police officers misjudge the target's level of intoxication about 75% of the time.^{10,23} The inability to accurately judge visible impairment shields intoxicated drivers from detection, for US law does not allow officers to pull over and test the BAC of drivers without probable cause. A recent case appealed to the Supreme Court draws attention to this predicament.²⁴ Police in Richmond, VA, stopped a suspected drunk driver when a concerned citizen reported his partial license plate number and driver description. When stopped, the driver had slurred speech, watery eyes, and exited his vehicle with difficulty. He subsequently failed the sobriety tests, was arrested, and later was convicted of DUI. The Virginia Supreme Court threw out the conviction because the arresting officer did not observe erratic or unlawful driving. This driver, who had previous DUI convictions and was undoubtedly tolerant to alcohol's effects, maintained his driving lane with the police on his tail. In other words, there was no probable cause. The US Supreme Court subsequently declined to hear the case.²⁵

Besides citizen call-ins, sobriety checkpoints comprise another widespread law enforcement measure that may be thwarted by tolerance. Checkpoints, conducted in 38 states, are roadblocks set up by law enforcement agents to make the public aware of the DUI laws, and to detect and detain impaired drivers. These roadblocks are an effective anti-DUI measure. The Centers for Disease Control reviewed 23 scientifically sound studies from around the world on checkpoints and concluded that they reduce alcohol-related crashes, typically by about 20%.²⁶ In conducting these checkpoints, officers are trained to look for signs such as open alcohol containers, drug paraphernalia, an odor of alcoholic beverages or other drugs, or the admission of drinking or drug use.²⁷ They are also trained to look for visible signs of intoxication, such as fumbling fingers, slurred speech, inconsistent responses, bloodshot eyes, and other signs of alcohol impairment. However, in tolerant individuals these signs may not be obvious.

Alcohol-impaired drivers are not uncommonly passed over at checkpoints. At checkpoints, officers have little opportunity to monitor a driver's handling of the vehicle or observe their behavior. If signs of impairment are not salient, the driver will be waved through. In one study, Wells et al²⁸ surveyed drivers not detained by police at 156 sobriety checkpoints in North Carolina. They found that more than 50% of the drivers with BACs over 0.08% were not detained.²⁸ The authors of that study recommend the use of passive alcohol sensors that detect alcohol in the driver's exhalations. This evidence is probable cause to conduct field sobriety tests and measure BACs.

M's Story

Does a failure to detect and arrest impaired drivers at checkpoints send the message that they are immune to arrest? Perhaps. Across the board, though, the participants in my study report they fear checkpoints, even when they dodge the arrest. One subject described her DUI history this way:

"I was going out every night to the bars drinking. It was an everyday thing for a couple of years. I'd leave the kids overnight with my mom, go out, and drink and go dancing. This guy would buy our beer—there were 20 beers on the table—and only three or four of us girls. We'd drink shots, too. By the time we left the bar we'd be really bombed. I've come close to accidents. About ten years ago I was drinking and I thought my driving was great, but I know now I was a lousy driver because I almost hit my friend's vehicle. We went to a second bar, and a third. That night I got the DUI."

After that experience, M cut back on her partying and went out only about once or twice a month. She recounts her attitudes regarding her own alcohol tolerance, and her experience at a checkpoint, on one of those nights:

"My son and daughter-in-law were staying with me, and I lent them the car. I told them to drive me to the bar and pick me up, because I was going to be drinking. Well, my son shows up drunker than me. 'Good Lord son!' I said, 'You know you're not supposed to be driving my car drunk.' I took over the driving. I only had four or five beers that night, so I wasn't drunk, but when we came to a checkpoint we both got scared. When they asked me if I'd been drinking, I told him, 'No, he has (pointing to my son).

I'm the designated driver. I must have been talking real good, so he let me go. That would have been my second [DUI]. At that moment I said to myself, 'No I gotta quit this.' I'm not taking those chances."

She quit drinking.

Conclusion

People who drink regularly may find they need to drink more and more to get the same effect. This phenomenon, called tolerance, is well described, but incompletely understood. Tolerance reduces the visible signs of intoxication. This makes it hard for others, including friends, alcohol servers, and law enforcement officers, to determine the drinker's level of driving impairment. Those who experience tolerance commonly believe that since they can "hold" their alcohol, they are capable of driving safely after drinking. But alcohol reduces the physical and mental dexterity required for safe driving. Studies have determined that the risk of causing a crash rises proportionally with BAC. Even at lower BACs (0.05% to 0.09%), the likelihood of a crash is at least nine times greater than at zero BAC. At very high BACs (at or above 0.15%), the risk of crashing is 300 to 600 times the risk at zero or near-zero BACs.

The Long Term

M no longer drinks. As for O, he is in jail awaiting trial. B and T both report they continue to drive after drinking. It's been 15 years since their first DUI convictions. T got a second conviction last year, but B has avoided further arrests. He

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is haughty. "It's like a video game to me. If I make it home, I win. If I don't, I lose. I know when I've had too much to drink, and I don't drive."

I doubt it. ❖

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The author(s) have no conflicts of interest to disclose.

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