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ABSTRACT

Alcohol intoxication increases the risk of highway accidents, the relative risk of crash probability increasing as a function of blood alcohol content (BAC). Because alcohol use is more prevalent than use of other drugs, more is known about the relationship between alcohol use and driving. Most states presume a BAC of .10% to be evidence of drunk driving. Drunk drivers tend to be males less than 24 years old. About twice as many men as women are involved in fatal traffic accidents when BAC is above .10%. Being divorced or separated, having a low income, and having a record of previous DWI arrests and moving violations also correlates statistically with DWI. While moderate to high alcohol dosage affects vision, eye-hand coordination, and reaction time, the most relevant driving-related difficulties are divided-attention tasks. Relative traffic accident risk begins to increase at BACs above .05%, and at .10% is about six times greater than when sober. Three behavioral tests, the Nystagmus Gaze, Walk and Turn, and One-Leg Stand tests, are recommended to determine intoxication. Without such specific tests, it is difficult to determine intoxication below a BAC of .15%, when relative risk of accident is about 20 times greater than when sober. (MSF)

# Driving While Intoxicated

by John Brick

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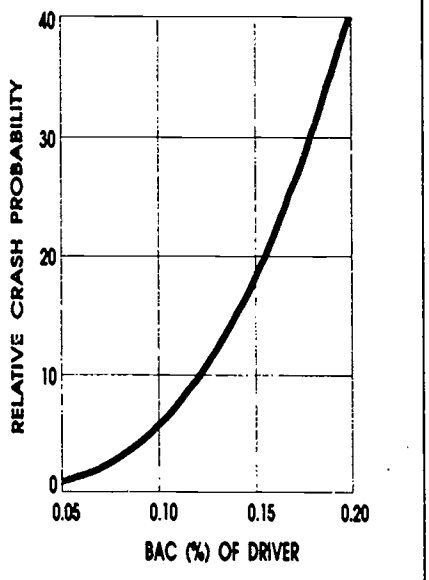
# DRIVING WHILE INTOXICATED

John Brick, Ph.D.

Many factors contribute to highway accidents, including roadway and vehicle design, traffic volume, and driver characteristics, such as their state of sobriety. Driving Under the Influence (DUI) of, or Driving While Intoxicated (DWI) on alcohol increases the probability of a motor vehicle accident. Other related, but less visible, public health risks include walking and boating while intoxicated. The results from experimental and epidemiological studies indicate that alcohol intoxication greatly increases the risk of accidents. Although many sources state that more than half of all fatal accidents *involve* alcohol, the fact that a driver was intoxicated does not mean that they *caused* the accident. However, when the intoxicated driver is assumed responsible, the relative risk of "crash probability" (see figure) clearly increases as a function of per cent blood alcohol concentration (BAC).

Other drugs, such as marijuana, may also increase accident risks, but their role in traffic accidents is not clear. For example, in most accidents in which marijuana use was detected, alcohol was also present, usually in large enough amounts so that alcohol intoxication alone could have accounted for the impairment. Even so, many of the effects of marijuana (e.g., memory lapse, distortion of time) intuitively would interfere with the ability to drive safely. The effects of cocaine on driving ability and risk for accident are equivocal at best. Although cocaine may alter vision (e.g., hallucinatory "snow lights," sensitivity to light) and mood (e.g., euphoria, depression, paranoia), at the present time it is speculative as to whether such effects are present to the extent that they will affect driving. In the future, drug screens may be routinely given following all accidents and more will be learned about the relationship between cocaine use and other drugs on driving ability. Because alcohol use is many times more prevalent than the use of other drugs, much more is known about the




relationship between alcohol intoxication and driving. Generally, alcohol is a central nervous system depressant that causes a dose-dependent decrease in cognitive and motor functioning. As the blood alcohol level rises, the signs and symptoms of alcohol intoxication increase in number and intensity so that laws restricting drinking and driving are necessary.

Regionally, legislation defining DWI varies. All but a few states have "per se" statutes in which no evidence (e.g., improper motor vehicle operation) other than an alcohol level that is above the "presumptive level" is required for a DWI conviction. The majority of states use a BAC of .10% as a presumptive level, which is "prima facie" (legally sufficient) evidence for drunk driving. Some states use different BACs to define a per se violation. For example, in Georgia the level is .12%; in Oregon it is .08%.

The most consistent profile for drunk drivers is that they tend to be males less than 24 years of age. About twice as many men are involved in fatal motor vehicle accidents when the BAC is greater than .10% compared to women. Other statistical correlations with DWI include being divorced or separated, having a low income, and having a record of previous DWI arrests and previous moving violations involving the use of alcohol.

Numerous laboratory studies have been performed to evaluate the effects of alcohol on psychomotor performance. The results of such studies suggest that alcohol significantly affects vision, eye-hand coordination, and reaction time at moderate-to-high dosage levels. The most relevant driving-related behaviors affected by alcohol are probably divided-attention tasks. Alcohol impairs the ability to pay attention and respond to multiple stimuli. It is believed that such laboratory findings translate well to the real-world driving situations where it is necessary to attend to many different events (road and traffic conditions, speed, traffic control devices, etc.), often in a nearly simultaneous fashion.

On closed-course driving tests, BACs of about .06% to .09% increase variability in lane position, brake use, and steering ability. Using a driving

simulator approach, it has been found that at BACs approaching .10% there are increases in braking, gear changing, and steering errors. The effects of alcohol are quite variable between individuals, however. The relative risk for a traffic accident begins to increase at BACs above .05%. At .10% the risk of an accident is about six times greater than when sober (see figure).

There are several behavioral tests to determine intoxication. Three tests recommended by the U.S. Department of Transportation (DOT) and commonly used to screen suspected drunk drivers at the roadside include the *Horizontal Gaze Nystagmus Test*, the *Walk-and-Turn Test*, and the *One-Leg Balance Test*. The *Horizontal Gaze Nystagmus Test* measures eye movements during a simple visual tracking task. Alcohol intoxication (as well as some neurological conditions) may result in "jerky" eye movements. The *Walk-and-Turn Test* measures the ability to walk in a straight line in a heel-to-toe manner, turn on one foot, and walk back. Alcohol intoxication may result in walking off the line, inability to turn, balance, and failure to follow instructions (e.g., keeping arms at sides, balancing, walking in a fixed number of steps, etc.). The *One-Leg Balance Test* is a divided-attention task that measures the ability to balance with one leg six inches off the ground while counting aloud rapidly from one-thousand-one to one-thousand-thirty. Alcohol intoxication may make it difficult to stand without wavering, putting your foot down and/or making counting errors. According to the DOT, when properly administered and scored, these psychophysical tests have the following accuracies in determining intoxication above a BAC of .10%:

- Nystagmus Gaze: 77% - 82%
- Walk-and-Turn: 68% - 80%
- One-Leg Stand: 65% - 78%

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For law-enforcement purposes, behavioral tests coupled with an objective blood or breath alcohol test provide convincing evidence of intoxication.

When an intoxicated person is given a laboratory test, it is fairly easy to detect intoxication. Even to inexperienced observers, the weaving, uncontrolled stops and other erratic driving that results from alcohol intoxication will be noticeable. However, in the absence of specific tests it is difficult to reliably detect intoxication until the person is well above the legal definition of intoxication. At a BAC of .15% or more, most drinkers will show the typical signs and symptoms often associated with alcohol intoxication (e.g., stumbling, inability to walk or stand normally, major changes in speech, mood or thinking). At this level of intoxication, the relative risk for an accident is nearly 20 times greater than when sober. In other words, when you see someone that "looks" drunk, they will not be able to drive a car safely regardless of how they feel or their previous drinking experiences.

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