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AUTHOR Milgram, Gail Gleason
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ABSTRACT

Ethyl alcohol (ethanol) is one of the few alcohols that humans can drink. This alcohol is a byproduct of yeast's reaction with the sugars in fruit or vegetable juice and the process stops naturally with about an 11 to 14 percent alcoholic concentration, although distillation can greatly increase the alcoholic content. Once ingested, most alcohol passes into the small intestines and then into the bloodstream. The body disposes of alcohol in two ways: (1) elimination through the lungs and kidneys; and (2) oxidation. The latter process removes 90 percent of the alcohol and the liver plays a major role in this mechanism. The liver, though, can only oxidize a certain amount of alcohol every hour so individuals are advised to drink slowly. Alcohol's effect depends on a variety of factors, including: (1) how one feels before drinking; (2) what the drinker expects alcohol to do; (3) how much one drinks; (4) how long one takes to drink; (5) the type of alcoholic beverage; (6) the size of the drinker; (7) food in the stomach; and (8) experience in using alcoholic beverages. The effects of alcohol are directly related to the concentration of alcohol in the blood. The first brain function to be impaired is usually one's ability to think and make decisions, followed by decreased motor function. In many states a blood alcohol concentration (BAC) of .10% is considered legal evidence that a driver is intoxicated. Some states use a BAC of 0.08% and in some European countries the legal BAC is 0.05%. (RJM)

FACTS ON THE EFFECTS OF ALCOHOL

by Gail Gleason Milgram

New Jersey Alcohol / Drug
RESOURCE CENTER AND CLEARINGHOUSE
Center of Alcohol Studies, Rutgers University

FACTS ON THE EFFECTS OF ALCOHOL

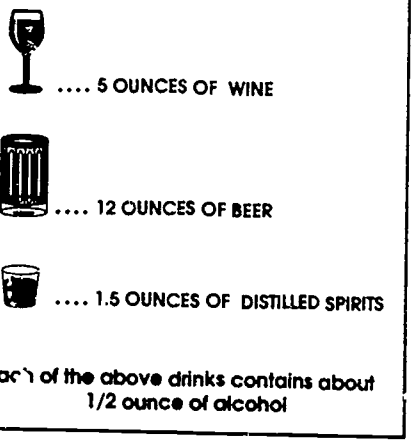
Gail Gleason Milgram, Ed.D.

Alcohol is a clear, thin, odorless liquid that boils at 173 degrees F (78 degrees C). It can burn and can also mix with water in any proportion. Most types of alcohol, such as amyl, butyl, isopropyl and methyl alcohols, ethylene glycol, and glycerol have many industrial and chemical uses. Ethyl alcohol (ethanol) is one of the few alcohols that man can drink, but it never exists full-strength in any alcoholic beverage. Ethanol or ethyl alcohol is the subject of this fact sheet, and from now on it will be referred to simply as "alcohol."

Alcohol is produced during a natural process called *fermentation*, which occurs when yeast, a microscopic plant that floats freely in the air, reacts with the sugar in fruit or vegetable juice, creating alcohol and releasing carbon dioxide. The process stops naturally when about 11 to 14% of the juice is alcohol because the amount of alcohol is enough to stop the action of the yeast. A similar process is used to make beer.

Distillation is the process used to make beverages with a higher alcohol content. In this process the liquid is heated until it vaporizes, and then the vapor is cooled until it condenses into a liquid again. Distilled alcoholic beverages (e.g., whiskey, gin, vodka, and rum) contain 40 to 50% alcohol. They are sometimes referred to as "spirits"or "hard liquor."

When someone drinks an alcoholic beverage it flows into the stomach. While it is in the stomach, the drinker does not feel the effects of the alcohol, but alcohol does not remain in the stomach very long. Some of it is absorbed through the walls of the stomach into the bloodstream, but most alcohol passes into the small intestine and then into the bloodstream, and this circulates throughout the body. Once alcohol is in the bloodstream it reaches the brain and the drinker begins to feel the effects of the alcohol. The reason that a larger person does not feel the effects of a drink as quickly as a smaller person is because the larger person has more blood and other body fluids and will not have as high a level of alcohol in the blood after drinking the same amount of alcohol.



The body disposes of alcohol in two ways: elimination and oxidation. Only about 10% of the alcohol in the body leaves by elimination from the lungs and kidneys. About 90% of the alcohol leaves by oxidation. The liver plays a major role in the body's oxidation of alcohol. When alcohol enters the liver, some of it is changed to a chemical called *acetaldehyde*. When acetaldehyde is combined with oxygen, *acetic acid* is formed. When the acetic acid is further combined with oxygen, carbon dioxide and water are formed.

The oxidation of alcohol produces calories. One ounce of pure alcohol contains about 163 calories (or about 105 calories in a 1 1/2 ounce glass of whiskey or gin) but it does not contain vitamins or other physically beneficial nutrients.

The liver can only oxidize a certain amount of alcohol each minute. The oxidation rate of alcohol in a person weighing 150 pounds is about 7 grams of alcohol per hour. This is equivalent to about 3/4 of an ounce of distilled spirits, 2 1/2 ounces of wine, or 7 3/4 or 8 ounces of beer per hour. If a person drank no more than 3/4 of an ounce of whiskey or half a bottle of beer every hour, the alcohol would never accumulate in the body and he or she would feel little of the effects of the alcohol and would not become intoxicated.

Oxidation continues until all the alcohol has left the body. Since the body can only remove a small amount of alcohol at a time, people are advised to drink slowly.

The effects of alcohol on an individual depend on a variety of factors. These include:

How one feels before drinking: If a person is upset and tense, very excited, sad, nervous or even extremely happy, he or she may tend to gulp drinks and actually drink more alcohol than planned.

What the drinker expects alcohol to do: Some people expect a drink to help them feel relaxed, happy, angry or sad. Quite naturally, these feelings can be produced by the drink; how you want to feel helps you feel that way.

How much one drinks: A person who has one drink during dinner is not likely to feel the effects of alcohol. But having six drinks before and during dinner means the individual might not make it through dessert.

How long one takes to drink: This is a critical factor: four drinks in one hour will have an obvious effect on the drinker, but the same four drinks over a four-hour period will probably have a very slight, if any, effect.

Type of alcoholic beverage: Some beverages have more alcohol in them than others. Beer has about 4.5% alcohol, "table wines" average from 11 to 14%, "fortified" or "dessert wines" (such as sherry or port) have 16 to 20%, and distilled spirits range from 40 to 50%. However, in normal size, each drink (i.e., 12 ounces of beer, 5 ounces of wine, and 1 1/2 ounces of distilled spirits) contains approximately the same amount of alcohol.

Size of the drinker: Because of the way alcohol circulates in the body, the size of the drinker also relates to the effects of alcohol. A person weighing 220 pounds will not feel the effects of a drink as much as a person weighing 120 pounds.

Food in the stomach: The alcohol does not affect the drinker until it has been absorbed into the bloodstream. Food in the stomach slows the rate of absorption, so that a drink after eating a meal will have less effect than one drunk on an empty stomach.

Experience in using alcoholic beverages: Someone drinking a glass of wine for the first time may feel a lightheadedness, but probably not on subsequent occasions. An experienced drinker knows what to expect from alcohol and learns to adjust his reactions to small or moderate amounts.

Alcohol acts directly on the brain and changes its ability to work. The effects of alcohol on the brain are quite complex, but alcohol is usually classified as a depressant. Judgment is the first function of the brain to be affected; the ability to think and make decisions becomes impaired. As more alcohol is consumed, the motor functions of the body are affected.

The effects of alcohol are directly related to the concentration (percentage) of alcohol in the blood. In the following description, the blood alcohol concentrations are those that would probably be found in a person weighing about 150 pounds. However, the effects vary among individuals and even in the same individual at different times.

At a blood alcohol concentration of 0.03% (after about one cocktail, one glass of wine, or one bottle of beer) the drinker will feel relaxed and experience a slight feeling of exhilaration. At 0.06% (after two cocktails, two glasses of wine, or two bottles of beer), the drinker will experience a feeling of warmth and mental relaxation; there will be a decrease of fine motor skills and he or she will be less concerned with minor irritations. At 0.09% (after three cocktails, three glasses of wine, or three bottles of beer), reaction time will be slowed, muscle control will be poor, speech will be slurred and the legs will feel wobbly. At 0.12% (after four cocktails, four glasses of wine, or four bottles of beer), his or her judgment will be clouded, inhibitions and self-restraint lessened and the ability to reason and make logical decisions will be impaired. At 0.15% (after five cocktails, five glasses of wine, or five bottles of beer),vision will be blurred, speech unclear, walking will be unsteady and coordination impaired. At 0.18% (after six cocktails, six glasses of wine, or six bottles of beer) all of the drinker's behavior will be impaired and he or she will find it difficult to stay awake. At a concentration of about 0.30% alcohol in the blood (after 10 to 12 drinks) the drinker will be in a semi-stupor or deep sleep. Most people are not able to stay awake and reach blood alcohol concentrations higher than 0.30%. If the blood alcohol does reach 0.50% the drinker is in a deep coma and in danger of death. As the alcohol level reaches 1% in the blood the breathing center in the brain becomes paralyzed and death occurs.

In many states a blood alcohol concentration (BAC) of .10% is considered legal evidence that a driver is intoxicated. Some states use a BAC of 0.08%. In some European countries the legal blood alcohol limit for a driver is as low as 0.05%.

Gail Gleason Milgram, Ed.D. *is a Professor and Director of the Education and Training Division, Center of Alcohol Studies, Rutgers University.*

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Center of Alcohol Studies
Smithers Hall-Busch Campus
Rutgers University
New Brunswick, NJ 08903
(201) 981 - 0964

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