

# Understanding Alcoholism

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## KEYWORDS

• Alcoholism • Ethyl alcohol • Methyl alcohol • Alcohol abuse

## KEY POINTS

- Ethanol is an ingredient that is intoxicating in nature.
- Alcohol is rapidly absorbed from the stomach, small intestine, and colon.
- Abuse of alcohol affects nearly every body system.
- Primary care providers are critical to diagnosing alcoholism.

This article provides an introduction to the health effects of alcoholism. Discussed are ethyl alcohol and methyl alcohol.

The National Survey on Drug Use and Health found that about 18.7 million Americans were dependent on or abused alcohol in 2005.<sup>1</sup> The 2011 National Survey of Drug Use and Health for ages 12 and older demonstrated that 82.2% of children ages 12 or older drink alcohol. Sixty-six percent had used alcohol within the past year, and 51.8% had used alcohol within the past month.<sup>2</sup>

## HISTORICAL DEVELOPMENT

Ethanol is an ingredient that is intoxicating in nature. This ingredient can be found in wine, liquor, and beer. The primary production of alcohol is through the fermentation of sugars, starches, and yeast. Alcohol is not considered an illicit drug when one is of legal age to drink. Alcohol is a central nervous depressant.<sup>3</sup>

Consumption of alcoholic beverages has a long history. Ten thousand years ago beer was made from grain. This process was discovered accidentally. In 1100 AD a guild was formed devoted to brewing beer. Eight thousand years ago, wine was consumed. Five thousand years ago vineyards were grown to make wine. In 2000 BC Hammurabi, the leader of Babylon, established rules for the sale and purchase of wine. In Ancient Greek culture, Dionysus/Bacchus was the god of wine. An alchemist in the sixteenth century discovered that alcohol was the essence from distillation (distilled spirits). During the middle of the eighteenth century alcohol assumed the current meaning of the intoxicating ingredient of many common beverages.<sup>3</sup>

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To further demonstrate this ancient awareness of intoxicating beverages, one can refer to the Bible. In Judges 13:3–4 it is stated: “you will conceive and bear a son... now then be careful to take no wine or strong drink and to eat nothing unclean.”<sup>4</sup>

According to the National Institute on Drug Abuse, alcohol is the number one drug of choice for American youth, yet the seriousness of alcoholism does not register with the general public or policymakers.<sup>5</sup>

## **PRODUCTION OF ALCOHOL**

The process for making alcohol begins by fermenting sugar to alcohol and then carbon dioxide. A significant portion of the US population abuses alcohol because alcohol is not a controlled substance. In some states alcohol is available in grocery markets and gas stations. In other states alcohol is only available at a licensed liquor store. The age when one can begin drinking varies from state to state. For example, in New Jersey, one cannot consume alcohol legally until the age of 21. Some individuals have a problem with this because the legal definition of an adult occurs at the age of 18, and certainly 18 year olds fight in wars for our country, yet in some states cannot legally purchase alcohol. The statistics on the dollar amount spent on the purchase of wine, beer, and liquor and advertisements for these products in the United States is staggering.

## **ABSORPTION**

Alcohol is rapidly absorbed from the stomach, small intestine, and colon. The maximal blood concentration is achieved within 30 to 90 minutes of ingestion. Alcohol can also be absorbed through the lungs. Alcohol is uniformly distributed throughout tissues and body fluids. Alcohol readily crosses the placenta with exposure to the fetus. Alcohol is primarily eliminated through the renal system, the urinary tract, exhalation, and metabolism. When alcohol is consumed, it passes from the stomach and intestines into the blood; this process is referred to as absorption. Alcohol is then metabolized by enzymes, which are body chemicals that break down and speed-up the reaction of other chemicals. The liver is the primary target organ that breaks down alcohol consumption. In the liver, an enzyme known as alcohol dehydrogenase mediates the conversion of alcohol to acetylaldehyde. This is then rapidly converted to acetate by other enzymes and is eventually metabolized to carbon dioxide and water. Alcohol is also metabolized in the liver by the enzyme cytochrome P450IIE1 (CYP2E1) system, which may be increased after chronic drinking. Most alcohol that is consumed is metabolized in the liver, but the small quantity that remains unmetabolized permits alcohol concentration to be measured in the breath and the urine. The liver can metabolize only a certain amount of alcohol per hour regardless of the amount that is being consumed. The rate of alcohol metabolism depends in part on the amount of metabolizing enzymes in the liver, which varies among individuals. There seems to be genetic determinants. In general, after the consumption of one standard drink the amount of alcohol in the drinker’s blood, which is referred to as the blood alcohol concentration, peaks within 30 to 45 minutes after ingestion. A standard drink is defined as 12 oz of beer; 8 oz of malt liquor; 5 oz of wine; or 1.5 oz of 80-proof of distilled spirits (a shot of liquor), all of which contain relatively the same amount of alcohol.<sup>5</sup>

The enzyme responsible for converting ethanol to acetylaldehyde is known as alcohol dehydrogenase. Acetaldehyde dehydrogenase (ALDH) is the enzyme for converting acetylaldehyde to acetate. There are genetic variations in ALDH, and variations among whites, African Americans, and Asians. Fifty percent of Asians have inactive

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